

THE INFLUENCE OF EXECUTIVE COGNITION ON COMPETITIVE DYNAMICS

JEREMY J. MARCEL,^{1*} PAMELA S. BARR,² and IRENE M. DUHAIME²

¹ *McIntire School of Commerce, University of Virginia, Charlottesville, Virginia, U.S.A.*

² *J. Mack Robinson College of Business, Georgia State University, Atlanta, Georgia, U.S.A.*

Prior competitive dynamics research has drawn on theories of information processing to model the subjective antecedents of executives' retaliation choices. This prior work has made great progress in developing our understanding of the retaliation choices most firms will make to a given type of attack. What the information processing perspective has not been able to do is explain firm-specific behavior to predict which competitive moves individual firms will challenge, or explain why individual firms differ in the types of actions that they are most likely to challenge. The goal of this paper is to sharpen the theoretical and empirical focus on predicting firm-level retaliation proclivities. We leverage managerial cognition research to examine the relationship between firm-level differences in the cognitive frameworks that executives possess, and firm-level differences in whether and how quickly firms challenge a market move. Results from a longitudinal study of the airline industry suggest that the addition of a cognitive perspective provides important insights into competitive retaliation. Copyright © 2010 John Wiley & Sons, Ltd.

INTRODUCTION

Top executives commit their firms to particular market actions because they hope to gain some advantage over competitors. Still, the chance that these efforts will yield superior profits decreases when other firms respond competitively (Schumpeter, 1934; Wiggins and Ruefli, 2005). For that reason, scholars suggest that top executives should formulate market initiatives with some anticipation for whether or not competitors will retaliate (Zajac and Bazerman, 1991).

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*Correspondence to: Jeremy J. Marcel, University of Virginia, McIntire School of Commerce, PO Box 400173, Charlottesville, VA 22904, U.S.A. E-mail: jmarcel@virginia.edu

Traditionally, competitive dynamics research has used an array of theories to model firm response and interaction: communication information processing theory (Smith *et al.*, 1991), multimarket commonality theory (Baum and Korn, 1999), strategic similarity theory (Gimeno and Woo, 1996), social network theory (Gnyawali and Madhavan, 2001) and upper-echelon theories (Hambrick, Cho and Chen, 1996). Despite an apparent plurality of theories, these perspectives all pivot on a single information processing argument—that retaliation is a function of factors that shape top executives' attention toward and interpretation of market moves.

Our review of this literature suggests that prior studies take one of two distinct perspectives on information processing and its role in competitive dynamics, which we label the *cue approach* and

the information *processing-propensity approach*. These two approaches reflect very different assumptions about the factors that influence managerial attention and interpretation, and how those factors direct competitive retaliation (Mischel, 1977; Ross and Nisbett, 1991). They also complement one another because they combine to outline broad central tendencies that predict how *most* firms *generally* respond to market moves. We argue, however, that the existing literature is incomplete because it does not fully examine the factors that cause firm-level behavior to vary from these broad central tendencies. Specifically, existing approaches are not well adapted to identifying which competitive moves a specific firm is most likely to challenge, nor, by extension, which competitive moves a firm is unlikely to challenge. The goal of this empirical study is to sharpen the empirical focus on the retaliation proclivities of individual firms.

This study draws on managerial cognition research (Barr, Stimpert, and Huff, 1992; Gioia and Thomas, 1996; Thomas, Shankster, and Mathieu, 1994; Nadkarni and Barr, 2008) to explore the connection between the cognitive frameworks that a firm's top executives possess and the specific competitive retaliations to which they commit their firms. Prior research shows that cognitive frameworks direct attention and affect interpretation. We hypothesize that across-firm heterogeneity in top executives' cognitive frameworks will also relate to whether and how quickly different firms respond to the same competitive action. In the interest of integrating our findings with prior research, we also examine the extent to which the subjective factors emphasized in the external cue and processing-propensity approaches moderate the influence of cognitive frameworks. We draw on longitudinal data for 10 large firms and 174 competitive attacks in the airline industry over a seven-year period. Our findings show that when executives at a firm possess cognitive frameworks that label a type of competitive action as strategically important, both the likelihood and speed with which they retaliate against that type of attack increase dramatically. We conclude by outlining the theoretical and practical implications of our findings, arguing that an emphasis on factors that drive across-firm differences in competitive retaliation is crucial if executives are to effectively anticipate and manage the competitive realities with specific rivals.

BACKGROUND AND HYPOTHESES

The focus of recent competitive dynamics research has been on exploring the longitudinal sequences of firm rivalry, as well as the performance consequences of aggression (Ferrier, 2001; Ferrier, Smith and Grimm, 1999). This focus on how interaction plays out over time is ultimately necessary for a better appreciation for how retaliation behaviors can impact firm competitiveness (Boyd and Bresser, 2008). However, there remain critical gaps in our fundamental appreciation for why executives at one firm will challenge another firm's market move. Clarifying the basic antecedents of retaliation is critical because this phenomenon represents the foundation on which much of the competitive dynamics literature is built. Our review of this literature reveals two different but complementary types of antecedents: the characteristics of the competitive actions or actors (the cue approach) and the characteristics of information processing in the potential responding firm (the processing-propensity approach). A summary of existing research as it relates to these two approaches is shown in Table 1.

The cue approach

A majority of prior empirical work in competitive dynamics emphasizes how characteristics of external cues predictably shape which actions most top executives are likely to notice, as well as how most executives are likely to interpret those actions (e.g., Smith *et al.*, 1991; Young *et al.*, 2000). This emphasis on external cues evolves most directly from neoinstitutional traditions (DiMaggio and Powell, 1983; Fombrun and Shanley, 1990), and from research detailing the diffusion of signals and information through competitive space (Rogers, 1983). The basic assumption of research using the cue approach is that competitive actions contain embedded signals that other firms must process and evaluate (Haveman, 1993; Rogers, 1983). Those signals are seldom entirely neutral in the sense that managers can plausibly apply any meaning they choose (Ross and Nisbett, 1991). Instead, competitive actions differ in the extent to which they cue predictable responses—that is, whether they encourage everyone to construe and respond to an event in the same way (Mischel, 1977). Much of the work in competitive dynamics research has logically sought to identify those cues that prompt

Table 1. Summary of factors empirically demonstrated to influence competitive response

	Characteristic of...	Subjective antecedent	Response characteristic and (effect)	Citation
<i>Cue Approach</i>	Actor	Reputation as market share leaders	Likelihood (+); imitation (-)	Smith, Grimm, and Gannon, 1992 ²
	Actor	Reputation as strategic player	Lag (+); imitation (-)	Smith <i>et al.</i> , 1992
	Actor	Reputation as price predator	Lag(-); imitation (-)	Smith <i>et al.</i> , 1992
	Actor	Industry tenure of TMT	Likelihood (+); imitation (+)	Smith <i>et al.</i> , 1992
	Action	Visibility	Likelihood (+); lag (-)	Chen and Miller, 1994; MacMillan, McCaffery, and Van Wijk, 1985
Action	Action	Strategic versus tactical	Likelihood (-); lag (+); order (-)	Smith <i>et al.</i> , 1991; Chen <i>et al.</i> , 1992
	Action	Irreversibility	Likelihood (-); lag (+)	Chen and Miller, 1994; Chen and MacMillan, 1992
	Action	Radicality	Lag (+)	MacMillan <i>et al.</i> , 1985; Smith <i>et al.</i> , 1989
	Action	Complexity	Lag (+)	MacMillan <i>et al.</i> , 1985
	Action	Degree of threat (<i>i.e.</i> , affect markets central within industry)	Likelihood (+); lag(-)	Chen and Miller, 1994; MacMillan <i>et al.</i> , 1985; Smith <i>et al.</i> , 1989; Chen <i>et al.</i> , 1992
Response Response	Response	Difficulty of potential response	Likelihood (+)	Chen and Miller, 1994
	Response	Implementation requirements of response	Likelihood (-); lag (+)	Chen and Miller, 1994
	Relational	Intensity of attack (<i>i.e.</i> , affects markets of a particular firm)	Likelihood (+); lag (-); Matching (+)	Chen and MacMillan, 1992; Chen <i>et al.</i> , 1992
	Relational	Multimarket contact between firms	Lag (-)	Young <i>et al.</i> , 2000
	Relational	Strategic (resource) similarity between firms	Lag (-)	Young <i>et al.</i> , 2000
<i>Processing Propensity Approach</i>	Responder	Unabsorbed slack	Likelihood (-); imitation (-)	Smith <i>et al.</i> , 1991; Hambrick <i>et al.</i> , 1996
	Responder	Absorbed slack	Likelihood (-); imitation (-)	Smith <i>et al.</i> , 1991
	Responder	Organizational size	Likelihood (+); lag (+); Response Visibility (-)	Chen and Hambrick, 1995; Hambrick <i>et al.</i> , 1996
	Responder	TMT size	Likelihood (-)	Hambrick <i>et al.</i> , 1996
	Responder	TMT industry tenure	Likelihood (-); order (+)	Smith <i>et al.</i> , 1991
Responder	Responder	TMT organizational tenure	Likelihood (+)	Hambrick <i>et al.</i> , 1996
	Responder	TMT level of education	Likelihood (+); imitation (+)	Hambrick <i>et al.</i> , 1996; Smith <i>et al.</i> , 1991
	Responder	TMT functional heterogeneity	Likelihood (-); lag (+)	Hambrick <i>et al.</i> , 1996
	Responder	TMT education heterogeneity	Likelihood (-); lag (+)	Hambrick <i>et al.</i> , 1996
	Responder	TMT organization tenure heterogeneity	Likelihood (-); lag (+)	Hambrick <i>et al.</i> , 1996
Responder	Responder	Structural complexity	Likelihood (-); order (+)	Smith <i>et al.</i> , 1991
	Responder	External orientations	Likelihood (+); lag (-); order (-)	Smith <i>et al.</i> , 1991; Smith <i>et al.</i> , 1989

² Much of Smith and colleagues' published research in competitive dynamics was originally tested in their book, *Dynamics of Competitive Strategy*. We have reduced redundancy in this table by reporting findings from this book only when those findings were not also published subsequently in journal form.

common behaviors among the greatest number of industry participants. For example, research shows that executives are likely to notice, and by extension are more likely to respond to, actions that are initiated by legitimate firms, as well as actions that are inherently public or visible or directed toward key markets (MacMillan, McCaffrey, and van Wijk, 1985; Smith *et al.*, 1991). Alternatively, executives are less likely to respond to actions that are irreversible or radical or complex because these actions tend to activate interpretations of 'riskiness' (Chen *et al.*, 2002). Likewise, researchers note that if two firms are strategically similar, if they are members of the same strategic group (Baum and Haveman, 1997; Osborne, Stubbart, and Ramaprasad, 2001, Strang and Meyer, 1994), or if they compete in common markets (Gimeno and Woo, 1996), any move by one will trigger predictable interpretations of 'relevance' or 'mutual interdependence' on the part of the other, which drives eventual responses in specific competitive situations.

The value of this approach for understanding competitive dynamics is that it is the nature of the cue, or the situation that firms encounter, that determines what is noticed or how it is interpreted and, thus, how executives will respond. Individual firms are presumed to respond differently only to the extent that the cues and situations that they encounter differ. As Ocasio notes, 'individual decision-makers will vary their focus of attention depending on the situation, and that consistency (or variance) in attention and behavior is dependent more on consistency (or variance) in the characteristics of the situation *rather than characteristics of the individuals*' (Ocasio, 1997: 190, emphasis added). Thus, competitive dynamics research using the cue approach theoretically addresses population-level behaviors, or how the average firm will respond in different scenarios.

The processing-propensity approach

The second major approach in competitive dynamics research, which we label the processing-propensity approach, evolves most directly from the upper-echelon research tradition (e.g., Carpenter, 2002; Miller, Burke, and Glick, 1998; Pelled, Eisenhardt, and Xin, 1999). For example, Hambrick *et al.* (1996) note that the main limitation of research that takes the cue approach is that it fails

to consider how organizational and team-level factors influence the thoroughness with which information about competitors' actions is processed by top managers and, by extension, how executives notice and process information about market actions. Differences in information processing are, in turn, related to variation across firms in their overall propensity to retaliate. For example, Smith and colleagues (1991) attributed the negative relationship between top management team (TMT) industry tenure and response to the fact that more experienced managers are less likely to undertake the exhaustive search processes necessary to monitor actions. Contrary to their expectations, Hambrick and colleagues (1996) found that TMT heterogeneity dampened a firm's overall tendency to retaliate, ostensibly because heterogeneity can promote team conflict that slows information processing routines, perhaps even preventing competitive response decisions altogether (O'Reilly, Caldwell, and Barnett, 1989). In this same vein, excessive organizational complexity (Smith *et al.*, 1991), firm-level internal orientations, lack of slack resources, or poor position in social networks (Gnyawali and Madhavan, 2001) hinder information collection processes so that firms demonstrate a low propensity to retaliate to actions in general. These across-firm differences in structure and routine are crucial because they can explain *gross* differences in a specific firm's overall propensity to notice and respond to *all* competitive actions (Hambrick *et al.*, 1996).

When considered simultaneously, the cue approach and the processing-propensity approach outline the broad central tendencies of competitive behavior. The cue approach predicts the general direction of managerial attention for all executives based on characteristics of the external context and the most likely interpretations of that context that executives will reach. The processing-propensity approach focuses on the extent to which each firm is more or less adept at noticing and thus responding to *all* types of actions. This prior research contributes to our understanding of competitive dynamics by highlighting the common and expected response of any given firm to a competitive situation. What prior work does not explain is why there is variation in response (and in timing of response) to the same competitive move by firms with similar processing propensities. We argue that it is crucial to understand why a particular firm systematically and quickly retaliates to

certain types of competitive attacks, while another competitor firm may be indifferent to those attacks but highly sensitive to others. Understanding competitive response at this level is necessary if the overarching research goal is to predict why executives at one firm challenge the actions of another (Chen, 1996). Thus, our study examines variation from a managerial cognition standpoint to pose and address a straightforward question: do firm-level differences in the cognitive frameworks that executives possess explain significant firm-level variance in the likelihood and speed of retaliation choices?

Cognitive frameworks and variance in competitive retaliation

Strategic decision making inevitably involves top executives sifting and reconciling large amounts of incomplete, ambiguous, and often conflicting data (McCall and Kaplan, 1985). This is particularly the case where top executives meet the challenge of observing and reacting to competitors' market actions. In highly competitive environments, for example, rivals purposefully launch moves when least expected and often do their best to obscure a wide range of information, including the rationale, implementation, and sometimes even the eventual outcomes of these attacks (D'Aveni, 1994). The very public, high-stakes, and risky nature of attacks also means that these actions are accompanied by a range of confounding 'after-market' explanations by management. These behaviors range from grandstanding and extrapolation of intent when actions are successful, to *ex post* rationalization, distancing, and reframing when actions fail. One result of this noisy information environment is that it complicates the executives' job of first monitoring competitors' attacks and then deciding whether and how to react (Chen, 1996).

Problems exist in dealing with this complexity because executives operate under conditions of bounded rationality and their eventual choices regarding competitive response reflect the inherent limitations of their information processing routines (Daft and Weick, 1984; March and Simon, 1958). Literatures in both cognitive and social psychology show that decision makers cope with this shortcoming in part by relying on subjective representations, or cognitive frameworks, that they distill from prior experience, and that subsequently shape their attention to and interpretation of the

environment (Nadkarni and Barr, 2008; Dutton, 1993; Fiske and Taylor, 1991; Galambos, Abelson, and Black, 1986).

Two findings from managerial cognition research are particularly relevant when studying the connection between cognitive frameworks and retaliation behavior. First, cognitive frameworks can differ significantly across firms. These differences exist because cognitive frames emerge largely from the private experiences and social interactions that are unique to individuals or teams (Kiesler and Sproull, 1982; Sutcliffe and Huber, 1998; Reger, 1990). The existence of significant cognitive diversity across firms has been empirically validated by numerous studies (Hodgkinson and Johnson, 1994; Reger, 1990; Reger and Palmer, 1996; Walton, 1986). The second important point is that firm-level differences in cognitive frameworks are systematically related to differences in firm-level strategic behavior. Research that examines strategic change and adaptation show that differences in cognitive frameworks lead to significant differences in whether and how quickly executives react to a wide range of external challenges, including changes in industry regulation and technology (Tripsas and Gavetti, 2000; Sharma, 2000; Gioia and Thomas, 1996; Barr and Huff, 1997). Clearly, differences in cognitive frameworks are an important determinant of large-scale strategic change. However, the possibility that cognitive frameworks will cause firms to react differently to competitive attacks has not been fully explored in competitive dynamics research.

Consistent with arguments made in the strategic change literature, we argue that cognitive frameworks will impact both the likelihood and speed of competitive retaliation because they affect two important aspects of information processing—noticing and interpretation. In practice, executives must first notice competitors' market attacks before they can commit their own firm to retaliate. Noticing, however, is not sufficient to drive reaction (Barr *et al.*, 1992). Executives must also interpret the information that they notice as important; as requiring response. Theory suggests that the causal logics embedded within cognitive frameworks affect both noticing and interpretation (Cyert and March, 1963; Kiesler and Sproull, 1982). In the remainder of this section, we outline these theoretical links and hypothesize a relationship between differences in executives' cognitive

frameworks and differences in firm retaliation behavior.

Theory suggests that cognitive frameworks affect noticing by directing attention (Kahneman, 1973). Generally speaking, individuals notice information that is salient and information is most salient when it is unfamiliar, differs from expectations, or is goal relevant (Nadkarni and Barr, 2008: 1399; Fiske and Taylor, 1991; Sutcliff and Huber, 1998). In estimating the influence of executives' cognitive frameworks on attention, empirical research shows that executives are particularly attentive to issues and information that they perceive, *a priori*, as causally affecting organizational outcomes. For example, Thomas, Sussman, and Henderson's (2001) findings suggest that cognitive frameworks can lead managers to focus telescopically on the types of information that they perceive as having been important in the past, and ignore other information. In their study of CEOs, Boyd and Fulk (1996) show that environmental scanning is directed primarily toward information that is labeled as strategically important. Gioia and Thomas (1996) also reported that decision makers tend to focus attention on issues that they consider strategic. Given the evidence that perceived strategic importance focuses managerial attention, it is logical to expect that competitive actions denoted in cognitive frameworks as being strategically important are more likely to be noticed when undertaken by competitors than those not so labeled. For the purpose of modeling competitive action and reaction, we define *strategic importance* as the belief held by top executives that a type of competitive action influences firm-level performance outcomes such as financial performance, competitiveness, or market position. Thus, we expect that cognitive frameworks that causally link a particular type of competitive action to some concept of firm performance will increase the likelihood that executives notice when competitors launch that type of attack in the marketplace. Executives, however, do not simply react to all information that they notice (Barr *et al.*, 1992). Once information is noticed, it must also be given meaning through the process of interpretation.

Similar to their influence on noticing, the cognitive frameworks that executives possess affect interpretation because perceived causal relationships between information and important outcomes are the preexisting constructs against which the relevance of new information is judged (Fiske and

Taylor, 1991). Thomas *et al.* (1994), for example, reported that organizational decision makers tend to interpret issues based mainly on whether they influence performance, and that these causal interpretations affected the subsequent course of organizational action. Other research shows that whether and how quickly firms respond to environmental shifts depends on whether executives view those events as causally linked to organizational outcomes (Barr *et al.*, 1992; Barr and Huff, 1997). Given this evidence that perceptions of strategic importance affect interpretation and willingness to react to information, it is logical to expect that competitive actions denoted in cognitive frameworks as being strategically important are more likely to be responded to, and more likely to be responded to quickly when undertaken by competitors than those not so labeled.

In sum, theory suggests that cognitive frameworks shape attention and affect interpretation, and by extension affect whether and how quickly executives react to external issues. Of particular importance to the likelihood and speed of firm-level action are beliefs regarding the extent to which a given action or event is linked to firm performance outcomes. We expect that similar processes influence decisions about competitive retaliation. Specifically, we hypothesize:

Hypothesis 1a: Executive-level cognitive frameworks that causally link a particular type of competitive action to performance outcomes are associated with a greater likelihood of firm retaliation when a competitor initiates that type of attack.

Hypotheses 1b: Executive-level cognitive frameworks that causally link a particular type of competitive action to performance outcomes are associated with a greater speed of firm retaliation when a competitor initiates that type of attack.

While prior work has established an important role for cognitive frameworks in directing top management attention and interpretation, this influence is bounded. The extent to which executives rely on socially constructed cognitive frameworks, and thus the extent to which differences in these frameworks foster heterogeneous firm-level behaviors, may depend on the strength of external cues, or

on information processing-propensity factors. To develop an integrated perspective that accounts for these possible interactions, we address these issues in the next two sections.

Cognitive frameworks and external cues as alternate sources of subjective inference

External cues, like socially constructed cognitive frameworks, are a source of subjective inference that executives rely on to make decisions without having to bear the cost of actively collecting and assessing new data (Mischel, 1977). If news of a competitor's market moves prompts uncertainty and the need for executives to choose a course of retaliation (Haveman, 1993; Smith *et al.*, 1991), then visible, easily discernable characteristics of that situation can prompt, or cue, plausible but similar reactions from most competitors (Mischel, 1977). As noted earlier, much of the work in competitive dynamics research has emphasized neoinstitutional thinking to identify the cues that prompt the most predictable and common behavior by competitors (e.g., Smith *et al.*, 1991; Gimeno and Woo, 1996; Baum and Korn, 1999). But if cognitive frameworks and external cues are both sources of subjective inference, then executives' reliance on one source over the other can have important implications for the extent to which competitive behavior differs across firms. When executives base retaliation decisions on external cues, firms will react in a similar fashion to the same cue. A greater reliance on cognitive frameworks to evaluate that same action, however, should result in interfirm variation in the likelihood and timing of retaliation to the same action.

Whether executives' competitive retaliation choices are influenced more by external cues or by firm-specific, cognitive frameworks depends primarily on the capacity for each of these mechanisms to quickly satisfy some minimal information processing requirements that allow executives to act (Cyert and March, 1963). The ability of an external cue to influence managerial choice depends on the strength of that cue, or its magnitude (e.g., DiMaggio and Powell, 1983; Meyer and Rowan, 1977). For example, competitive situations marked by extremely high or extremely low values for actor legitimacy, attack intensity, organizational similarity, or multimarket commonality will exert relatively strong influences on retaliation decisions. In these situations, strong cues represent

a viable external source of inference that fosters widely held expectations regarding the best course of reaction. In the absence of strong and directive external cues, firm-level differences, like those that arise from differences in cognitive frameworks, should have a greater influence on retaliation (Mischel, 1977). For this reason, we hypothesize that the influence of across-firm differences in cognitive frameworks will relate more strongly to variance in retaliation behaviors when external cues are weak, and that differences in cognitive frameworks will relate less strongly to retaliation behaviors when external cues provide clear guidance regarding the appropriateness of response.

Hypothesis 2: The influence of cognitive frameworks on competitive response will be less when competitive situations are characterized by strong external cues (either positive or negative), and greater when competitive situations are characterized by weak external cues.

Interaction between cognitive frameworks and information processing propensity

Executives' cognitive frameworks direct attention, but they do so only within the broader context of organizational and team processes (Ocasio, 1997). Scholars who adopt the processing-propensity approach examine how noncognitive factors such as the availability of slack resources, TMT age, or levels of TMT industry tenure and heterogeneity affect competitive retaliation (Chen and Hambrick, 1995; Hambrick *et al.*, 1996). These factors are thought to affect how aggressively firms retaliate to the moves of rivals because they influence the thoroughness of executives' information processing activities, presumably by forcing executives to subordinate the influence of their existing cognitive frameworks in favor of more active, and presumably more exhaustive, collection and analysis of current data (Amason and Sapienza, 1997; Pelled *et al.*, 1999)¹.

¹ Slack resources are argued to affect the resources that managers can commit to active data collection (Smith *et al.*, 1991), while TMT age and experience relate to managerial tendencies to favor theory-driven versus active processes (Hambrick *et al.*, 1996). Characteristics of the TMT's composition—specifically characteristics that reflect levels of diversity—are argued to prompt active data processing because they increase the likelihood of group disagreement and task-oriented conflict, the resolution of which subsequently prompts added evidence gathering, debate, and consensus building. This type of conflict, and by extension

Cognitive theory suggests that decision makers will tend to use existing cognitive frameworks for understanding all but the most novel situations, and will usually continue to do so as long as perceptions provide an adequate means for interacting with the world (Louis and Sutton, 1991). Nevertheless, this tendency to make decisions based mainly on existing cognitive frameworks should be weaker when broader characteristics of the team or organization otherwise prompt decision makers to use active information processing routines. Routines that prompt decision makers to consider new information and reconcile discordant information increase the possibility that existing cognitive frameworks are disproved, or at least that their influence is subordinated to current evidence (Starbuck and Milliken, 1988). Conversely, the influence of cognitive frameworks on competitive response decisions should be greatest when organizational and social processes are such that top executives lack either the capacity or the tendency to process information thoroughly. For these reasons, we expect that lack of organizational resources, high levels of TMT industry tenure, and low levels of TMT heterogeneity will strengthen the relationship between executives' cognitive frameworks and retaliation decisions.

Hypothesis 3: The influence of cognitive frameworks on competitive response will be moderated negatively by unabsorbed organizational slack and TMT heterogeneity, and positively by TMT industry tenure.

METHODS

We studied the U.S. major domestic airline industry, defined as all domestic airlines that have annual sales in excess of \$100 million. This industry context was highly competitive while also consisting of a limited number of identifiable firms, which facilitated analyzing both executives' cognitive frameworks and competitive interactions over time. We selected the specific seven-year time frame between 1993 and 1999 in order to avoid the disruptive effects of industry shifts associated with

the factors that prompt it, has been shown to affect both likelihood and timing of response, the latter because the conflict resolution process tends to slow eventual decision making.

the difficult operating conditions following the Persian Gulf War, which persisted until 1992, and the negative effects of the terrorist attacks of September 11, 2001. We collected data on the 10 airlines that constituted the industry during that period.

We used two different content analysis techniques to gather and match historical data on executives' cognitive frameworks and actual patterns of firm interaction. We minimized the chances of researcher bias during the various coding phases by carefully sequencing the data collection activities.

Step 1: Identifying competitive action and response. We identified the patterns of firm action and competitive response that occurred during the sample period by analyzing the ((news archives of *Aviation Daily* and other comprehensive news databases (Chen and Hambrick, 1995; Ferrier, 2001). We followed the detailed procedure for structured content analysis described by Smith and colleagues (1991: 70–71). This process involved first identifying potential competitive exchanges by searching news archives for keywords that indicate that a competitive action and corresponding reaction had occurred (e.g. 'in response to,' 'reacted to,' 'following,' etc.). A firm was coded as having 'responded' when news sources stated that a specific behavior was a reaction to a specific market move initiated by another firm (Smith *et al.*, 1991). The retaliations coded ranged from immediate market-based reactions (e.g., *as matching a competitor's promotion, cutting travel agent commissions*) to immediate nonmarket-based reactions (e.g., *laws suits to challenge market entry by a competitor*) to the announcement of longer-term initiatives (e.g., *announcing and seeking regulatory approval for a new alliance*). In all cases, this process identifies specific countermoves, prompted by a rival's action, that firms took to defend or improve their positions in the marketplace (Chen, 1996). We identified initial attacks by searching backward through the archive to find the original report of the first action (Jauch, Osborn, and Martin, 1980). This procedure identified a total of 271 initial actions and 599 corresponding competitive responses.

Step 2: Creating a competitive action taxonomy. Our goal of exploring whether executives cognitively distinguish between various market attacks required that we construct a taxonomy that fulfills two key criteria. First, the taxonomy must represent the relevant forms of competition actually

used in the market at the time. Second, the categorical distinctions must be perceptually relevant and actually affect managerial choice.

Prior research provides some guidance. Cognitive group research demonstrates that executives routinely compare competitors along key strategic dimensions (Porac and Thomas, 1994). As one example, Baum and Lant (1993) find that hotel executives identify competitors with similar price and location and amenities as particularly relevant rivals. Our interest in characteristics of discrete market attacks, rather than broader firm-level strategic profiles that result from these choices over time, suggested a similar but slightly different approach. Specifically, we conceptualized 'action type' as the perceptually relevant basis of competitive interaction that affects management's response decisions.

To insure the objectivity of our taxonomy, we applied an inductive approach using a three-member expert panel and Q-sort procedures (Neuendorf, 2002). Each expert was given a stack of index cards containing the actual textual accounts of the 271 initial actions identified in Step 1. Experts were asked to sort the cards into categories of action. The experts first free-sorted the cards individually before they met to discuss differences and formalize the final taxonomy. This collaborative process resulted in a taxonomy of six action types: pricing, route, ticketing, collaboration, service, and cargo-related actions. The distinctions between these actions types are similar to those highlighted in other research on the airline industry (e.g., Gimeno and Woo, 1996). To preserve the integrity of the data collection process, the expert panel did not sort the actual competitive actions used by individual firms into the taxonomy at that time; that sorting was done later by naïve coders (Step 5).

Step 3: Analyzing cognitive frameworks. Because prior research shows that executives focus attention on data that they perceive *a priori* as 'strategically important' (Gioia and Thomas, 1996; Thomas *et al.*, 2001), and consistent with our definition of 'strategically important' as the belief that a type of competitive action influences firm-level performance outcomes, we next sought to identify the extent to which cognitive frameworks espoused a specific causal relationship between each type of competitive action and organizational performance. To accomplish this, we first used causal mapping techniques to analyze the accounts that

executives shared in their annual letters to shareholders during the sample period (Barr *et al.*, 1992). The causal mapping was completed concurrently with, but separately from, Steps 1 and 2. The rigorous protocol for identifying and coding all stated causal associations existing within a written message was initially developed by Axelrod (1976), and later elaborated by Huff, Narayanan, and Fletcher (1990). We used the full protocol, which specifies 10 distinct types of causality (e.g., Huff *et al.*, 1990: 315). As a simple example, the statement '*Customer demand for lower real air fares forces us to continue to reduce real costs through improved labor and capital productivity*' was coded as:

Cause concept	Relationship	Effect concept
<i>customer demand for lower real air fares</i>	+	<i>forces us to continue to reduce real costs</i>
<i>improved labor productivity</i>	+	<i>reduce real costs</i>
<i>improved capital productivity</i>	+	<i>reduce real costs</i>

Following prior research, we argue that causal analysis of shareholder letters provides longitudinal insight into executives' perception of the complex interplay between their own efforts, the external environment, and firm outcomes (Barr, 1998; Ginsberg and Venkatraman, 1992). Letters to shareholders are signed and publicly attributed to the CEO, who is most directly responsible for orchestrating firm action. However, in reality, formal organizational structure, the delegation of tasks, and the distributed nature of information and responsibility means that action requires executives to interact socially to reduce uncertainty and ambiguity. As Cho and Hambrick note (2006: 455, 459–460), this does not presume that top executives share a common set of perceptions, or that all executives are involved in every response decision, but rather that action is directed by the cognitive frameworks that are socially negotiated and advocated by those executives who exert the *most* influence over administrative processes (Walsh and Fahey, 1986). In practice, these differences in formal authority mean that the CEO is effectively the most powerful decision maker, but

one whose own perspective is shaped by the competing perspectives that subordinates hold, and that they must integrate for decision making (Calori, Johnson, and Sarnin, 1994; Hambrick, 1994; Halebian and Finkelstein, 1993). Scholars have specifically argued that the understandings conveyed in shareholder letters represent the socially negotiated perspectives of the CEO and other influential executives (D'Aveni and MacMillan, 1990; Cho and Hambrick, 2006).

Though prior research has demonstrated wide success linking causal statements elicited from shareholder letters to subsequent firm outcomes, some argue that issue framing, persuasion, and attribution biases distort measures of cognitive frames (Fiol, 1995). However, other research suggests that much of the apparently convenient attributions found in shareholder letters may reflect actual biases rather than effortful attempts at impression management (Clapham and Schwenk, 1991). Thus, while executives' perceptions of reality may be inaccurate while also tending to exculpate decision makers from blame, these cognitive frames may, in fact, reflect executives' current thinking. This is not to say that shareholder letters are free from persuasion. Indeed, shareholder letters may be expected to embody the same types of simplification, rationalization, and hedging that is likely when any informant is required to offer public explanations of his or her conduct. The relevant issue is not whether measures of cognitive frames extracted from shareholder letters include measurement error, but rather whether this measurement error is great enough to prevent detection of relationships that are, in fact, statistically significant. We suggest that empirical evidence repeatedly linking the statements espoused in shareholder letters to the firm's future actions strongly supports the notion that these accounts adequately reflect the subjective perspectives of actual decision makers (Cho and Hambrick, 2006), at least for the purpose of predicting firm-level strategic behavior (Clapham and Schwenk, 1991). In sum, these considerations suggest that causal mapping of shareholder letters represents one of the best available methodologies for meeting the goals of this study.

Letters to shareholders were available for 67 of the 70 sample firm years. Following prior research, shareholder letters were content analyzed by two independent research assistants unaware of the purpose of the study. Based on Robinson's (1957)

measure of agreement, intercoder agreement on the number of codable assertions in the sample text was 95.5 percent. Agreement on the identification of the cause concept (i.e., construct that causes), the effect concept (i.e., construct that is influenced), and the nature of the causal relationship (e.g., +, -, etc.) was 98.1, 96, and 94.7 percent, respectively. These levels of reliability far exceed the generally accepted lower bounds of intercoder reliability in qualitative management research. Intercoder and code-recode reliability were checked periodically throughout the remainder of this process and were consistent with the initial levels of reliability.

Step 4: Identifying the strategic importance of action types. Step 3 of the data collection process revealed all stated causal assertions that appeared in the executives' annual letters, assertions that represent a focus on a wide range of topics. This next step, Step 4, involved further content analysis of these causal assertions to identify those statements that directly address the types of action identified in the taxonomy. Specifically, we sought to identify espoused assertions that causally linked the six specific types of competitive action addressed in this study to some concept of organizational performance. To accomplish this, we applied a grounded process of variable identification to build dictionary lists of language proxies for each type of competitive action identified in Step 2, as well as for overall organizational performance (Neuendorf, 2002).

The individual components of every causal assertion (i.e., cause concepts and effect concepts) elicited in the causal mapping process were blind listed alphabetically in a single electronic file. The lead researcher then used the expert panel's description for each type of action to identify actual extracts of shareholder letter texts to build a dictionary list. For example, language such as 'pressure to lower fares,' 'fare competition,' or 'the ability to sustain higher fares' were tagged as constructs related to pricing actions. At the same time, shareholder language that could be reasonably coded as synonymous with overall organizational performance, both positive and negative, was identified and added to a separate dictionary. For example, phrases such as 'long-term success,' 'achieving record financial performance,' 'large losses,' 'market position,' 'competitiveness,' and so forth were noted as language proxies for organizational performance. These initial dictionary lists were

then submitted for approval to the expert panel. Several adjustments reflecting direction from the expert panel were made before consensus among the panel members was reached. Samples from the various dictionary lists are shown in the Appendix.

We next assessed whether executives' cognitive frameworks causally linked the six types of competitive action to overall firm performance. To account for changes in perception over time, we measured these cognitive frameworks in each year. In addition to direct causal relationships, we accounted for perceptual interrelatedness by coding second order mediated causal relationships. Direct causal relationships, or instances where a type of competitive action was noted as directly influencing organizational performance, were coded as 2. Second order mediated relationships between a type of action and organizational performance (e.g., ability to gain access to profitable new routes + increased traffic; increased traffic + winning in the marketplace) were coded as 1. Lastly, the lack of a stated causal link between a type of competitive action and performance resulted in a code of 0.

This coding process confirmed a significant level of perceptual diversity within the airline industry regarding which types of action influence firm performance. In each year, there were no instances where executives at all 10 airlines unanimously agreed that a type of action either influenced or did not influence firm performance. Only 25 percent of the time did more than half of the sample agree that a particular type of action influenced performance. Fifty-eight percent of the time, executives from three or fewer of the 10 firms agreed that a particular type of action influenced firm performance. The data also suggest variability in cognitive frameworks over time. In only two instances did executives at a firm claim, for six years straight, that a type of action influenced firm performance. Seventy percent of the time, the espoused relationship between a type of competitive action and performance changed during the sample period.

Step 5: Sorting competitive action data. Finally, the data collection process concluded when two new naïve coders independently categorized the 271 initial competitive actions identified in Step 1 into the taxonomy. Initial agreement between these coders was 93.5 percent. Following similar research, we asked the coders to undertake a

consensus-seeking process through which they further examined instances of disagreement (D'Aveni and MacMillan, 1990). Through that process the coders reached a final agreement of 98.6 percent. We excluded four initial actions on which agreement could not be reached, as well as all initial actions that were coded into the 'other' category. This resulted in 241 initial competitive attacks sorted into six action-type categories.

This lock-step data collection procedure resulted in two longitudinal databases that were used to test the hypotheses. The first contains a longitudinal record of 241 competitive attacks during the sample period, as well as the type of action used in that attack and whether and when each other firm retaliated. The second database contains a longitudinal record for each firm of whether cognitive frameworks causally link a type of competitive action to performance outcomes.

Measures

Likelihood of retaliation was measured as whether a firm retaliated against a specific market move (Chen and MacMillan, 1992). We coded a firm as responding (coded as 1) or not responding (coded as 0) to an attack based on the structured content analysis of *Aviation Daily*. *Retaliation lag* was defined as the number of days that lapsed before a response was reported in *Aviation Daily*. *Strategic importance* captures the extent to which the cognitive framework proffered by a firm's executives causally link the type of competitive action used in an attack to some form of organizational performance. As noted, we coded direct causal relationships as 2, mediated causal relationships as 1, and the absence of a causal relationship as 0. We measured executives' assertions regarding the importance of each type of action during the period preceding the year in which a rival's attack and the corresponding competitive retaliation were actually observed. This lag between cognitive frameworks and the observed patterns of interaction (i.e., action and response) assured that cognitive frameworks existed prior to the initiation of market actions, rather than *ex post*.

Given our goal to assess the influence of cognitive frameworks within the context of an integrated approach, our empirical model also measures an array of cue variables. First, we used two items to capture the overarching concept of firm legitimacy.

We measured *actor's size* as the amount of total assets owned by a firm in each year as reported in Compustat. We also measured *actor's performance* as the average return on assets (ROA) of a firm over the prior three years (Carpenter, 2002). These variables were measured in each year and were collected from Compustat.

Second, we measured *organizational similarity* as one minus the Euclidean distance between seven strategic dimensions that capture critical elements of strategy in the major airline industry. This resulted in a variable ranging from zero to one, with higher scores representing higher levels of organizational similarity. The seven dimensions are (1) *average density* of the markets served, (2) *average distance* of routes served, (3) *average seats per plane* for each market, (4) *average daily flight frequency*, (5) *average market share* in the markets in which they compete, (6) *customer service expense* per mile served, and (7) the *average fare premium* over standard industry fare level. The seven dimensions are similar to those used by Gimeno and Woo (1996), and were collected from TransStats, a public database operated by the U.S. Bureau of Transportation. Organizational similarity was measured for each pair of firms, in each year.

Third, we measured *multimarket commonality* according to the methodology set forward by Baum and Korn (1999) for each pair of firms in each year. Finally, to capture variation in importance that might be attributable to differences in geographic markets, we measured *attack intensity* as a binary variable, capturing whether a firm's attack affected a geographic market in which a potential responder competed (Chen, Smith, and Grimm, 1992). Both multimarket and intensity measures were coded from TransStats.

We also measured and accounted for three processing-propensity variables. First, *organizational slack* captured the overall level of resource availability, with higher scores reflecting an abundance of resources available for information processing routines. Consistent with prior research (Ferrier, 2001; Smith *et al.*, 1991), we measured organizational slack as the quick ratio for the focal firm in each year. Second, *TMT industry tenure* was calculated as the average number of years of experience in the airline industry for TMT members. Finally, we captured *TMT organizational tenure heterogeneity* using the coefficient of variation, calculated as the standard deviation

of the TMT's organizational tenure divided by the average organizational tenure (Hambrick *et al.*, 1996). Consistent with prior research (Carpenter, 2002), we defined the TMT as the top two tiers of management within the organization in each year. Data for TMT variables were collected from various sources including Standard & Poor's *Register of Corporations, Directors and Executives*, and Dun & Bradstreet's *Reference Book of Corporate Managements*.

Finally, we included a number of controls to capture the effects of other potential explanations for variation in the likelihood and speed of response. We controlled for each potential *responder's size* (i.e., total assets), *responder's performance* (i.e., three-year ROA), *TMT size*, and *mean TMT age*. We also controlled for each firm's *attack propensity*, calculated as the number of attacks that each firm initiated in the marketplace, in each year. Variables for the cross products were centered prior to the analysis.

ANALYSIS AND RESULTS

The entire dataset consisted of seven years of panel data with 241 individual attack events. Given that each initial attack prompted an opportunity for the other nine sample firms to react, the database includes a potential 2,169 observations, representing attacking-firm and responding-firm pairs. However, we employed a one-year lag design such that cognitive frameworks in one year were used to predict competitive actions and responses in the following year. This lag effectively restricted the data set to six analyzable panels consisting of 174 attacks, for a total of 1,566 attacker-responder observations. Three missing letters to shareholders further obliged us to exclude data regarding the competitive response behavior for three firm years. This reduced the final sample size to 1,439 analyzable attacker-responder firm observations, which is based on 174 analyzable attacks and 369 discernable retaliations. Summary statistics for all variables are shown in Table 2.

We used logistic regression to test hypotheses related to the likelihood that each separate firm retaliates against a specific market attack. Given that a major concern with cross-sectional time-series data is interdependence across observations (Sayrs, 1989), we clustered standard errors.

Table 2. Means and correlations

Variable	Mean	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Likelihood of retaliation	0.279	1.00														
2 Retaliation lag ³	6.058	0.31	1.00													
3 Strategic importance	0.794	0.07	-0.01	1.00												
4 Actor's size	12016	-0.04	0.03	-0.07	1.00											
5 Actor's performance	2.795	0.01	0.02	-0.01	-0.00	1.00										
6 Organizational similarity	0.782	0.19	0.04	0.12	-0.07	-0.02	1.00									
7 Multimarket similarity	1.297	0.24	0.05	-0.06	0.04	0.16	0.13	1.00								
8. Attack intensity	0.536	0.13	0.06	0.03	-0.14	-0.01	0.08	0.18	1.00							
9 Organizational slack	0.547	-0.04	-0.03	0.11	0.02	0.03	-0.18	-0.09	-0.06	1.00						
10 TMT industry tenure	19.799	-0.04	-0.01	0.16	-0.11	-0.05	-0.02	-0.46	-0.02	0.01	1.00					
11 TMT org tenure het.	0.697	0.17	0.05	0.01	0.02	0.01	0.13	0.33	0.07	-0.29	-0.10	1.00				
12 Responder's size	7844	0.37	0.19	0.06	-0.08	0.05	0.10	0.37	0.22	-0.13	-0.03	0.08	1.00			
13 Responder's performance	2.010	-0.07	0.02	-0.12	0.12	0.03	-0.16	0.09	-0.04	0.16	-0.38	-0.26	0.02	1.00		
14 Responder's TMT size	4.802	0.05	-0.03	-0.05	-0.09	-0.10	0.15	0.03	0.07	-0.20	0.23	0.04	-0.05	1.00		
15 Responder's TMT age	52.711	-0.14	-0.03	0.15	0.06	0.02	-0.01	-0.31	-0.08	-0.01	0.35	-0.20	-0.19	0.08	-0.20	1.00
16 Attack propensity	5.181	-0.01	0.00	0.50	-0.04	0.02	0.05	-0.02	0.03	0.02	0.04	-0.08	-0.10	0.02	0.04	0.04

³ The correlations in this table, including those for retaliation lag, are calculated from the total 1,439 observations, rather than from the subset of 369 retaliations for which we measured the lag variable.

Table 3. Cognitive frameworks, likelihood of retaliation, retaliation lag and interactions

	Model 1 Likelihood of retaliation	Model 2 Likelihood of retaliation	Model 3 Retaliation lag	Model 4 Retaliation lag
<i>Control variables</i>				
Responder's size (millions)	0.0001286**	0.0001291**	0.0002086*	0.0002246*
Responder's performance	-0.0349402*	-0.0325821**	0.1132742	0.0772708
Responder TMT size	0.0748097 ⁺	0.0845944 ⁺	-0.0637283	-0.0273451
Responder TMT age	-0.0103371	-0.0189955	0.3313555	0.4698407
Attack propensity	-0.0117055	-0.0115014	0.6899923*	0.7343618**
<i>External cue variables</i>				
Actor's size (millions)	-3.51e-06	-3.41e-06	-0.0000868	-0.0002382
Actor's performance	-0.0108743	-0.0087423	-0.0259068	-0.0553228
Organizational similarity	1.86166**	2.31675**	-4.117743 ⁺	-6.413947
Multimarket commonality	0.3959625*	0.2103285	0.874397	2.111173
Attack intensity	0.1417923	0.0120452	3.028304*	4.929055*
<i>Processing-prop. variables</i>				
Organizational slack	1.102446*	0.8880331	13.55539*	17.60364
TMT industry tenure	-0.010589	-0.0107986	-0.1008636	-0.0981726
TMT org. tenure het.	0.7650003**	1.070642**	2.054004	2.667294
<i>Cognitive frameworks</i>				
Strategic importance	0.1233193*	0.1517267**	-3.025181**	-2.77964**
SI × Actor size		-2.52e-06		0.0001388
SI × Actor performance		-0.0020837		0.0115738
SI × Organizational similarity		-0.7112733 ⁺		3.023021
SI × Multimarket commonality		0.2548144		-1.267461
SI × Attack intensity		0.1666298		-2.216786*
SI × Organizational slack		0.1589708		-3.174288
SI × TMT industry tenure		0.0000299		-0.0279189
SI × TMT org. tenure het.		-0.5299099*		-0.0016676
N	1439	1439	369	369
Log likelihood	-700.848*	-695.309*		
Pseudo R ²	0.1778	0.1843	0.1032	0.1212

⁺ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$.

Similarly, we used ordinary least squares regression with clustered standard errors to test hypotheses related to retaliation lag. Table 3 contains the results of the analysis. Models 1 and 3 of Table 3 show the baseline models predicting, respectively, competitive retaliation and retaliation lag. Models 2 and 4 include cross product moderation.

The analyses provide interesting results. Hypothesis 1a argues that differences in executives' cognitive frameworks will predict firm-level differences in whether firms retaliate against a competitor's market move. This hypothesis received very strong support. As expected, Model 1 shows that a firm is significantly more likely to challenge a competitor's market move when those executives possess cognitive frameworks that causally link the type of attack used to firm performance ($\beta = 0.12$; $p < 0.05$). In practical terms, calculation of the

odds-ratio shows that firms are roughly 25 percent more likely to retaliate against a particular market attack when executives' cognitive frameworks directly link that specific type of action to firm performance, as opposed to when there is no such link to performance.

The data also provide very strong support for Hypothesis 1b, which linked labeling of an action type as strategically important to faster retaliation speeds (i.e., shorter retaliation lags). As expected, Model 3 shows that the coefficient for *strategic importance* is significant and negative, indicating that cognitive frameworks that causally link the type of competitive action used to firm performance are associated with speedier retaliations ($\beta = -3.02$; $p < 0.01$). The average lag for all of the retaliations included in our sample is 6.7 days. Executives retaliated, on average, after 3.7 days when their cognitive frameworks labeled

a type of action as indirectly affecting firm performance. Executives retaliated, on average, within one day when those frameworks labeled the type of action used in the attack as directly linked to firm performance.

Hypothesis 2 addressed the extent to which the magnitude of external cues moderates the influence of cognitive frameworks on retaliation decisions. Consistent with prior research in this area, a number of the external cues *directly* predicted whether and how quickly a firm retaliates against a competitor's market action. Our results, however, do not support the hypothesized interactions. As expected, the interaction between organizational similarity and strategic importance is negative for predicting likelihood of retaliation, indicating that extremely high or low levels of similarity weaken the influence of executives' cognitive frameworks. Yet, this interaction is only marginally significant ($p < 0.10$). Contrary to our hypothesis, the coefficient for the interaction between attack intensity and strategic importance was negative and significant ($p < 0.05$) for retaliation lag. This indicates that the tendency for cognitive frameworks to shorten retaliation lags was stronger, not weaker, when external cues pertaining to the intensity of that action were strong. The interaction term for attack intensity was not significant when modeling likelihood of retaliation. Given these mixed findings, the study provides no support for Hypothesis 2.

Hypothesis 3 proposed that the influence of cognitive frameworks on retaliation will be weaker when organizational and TMT-level characteristics increase the likelihood that executives are already predisposed to using active, thorough information processing routines. Again, several of the processing-propensity variables *directly* predict either likelihood or lag of retaliation. However, only one of the three interactions that we examined was statistically significant. Specifically, the coefficient for the interaction between TMT organizational tenure heterogeneity and strategic importance is significant and negative ($p < 0.05$) for likelihood of retaliation, indicating that the influence of cognitive frameworks on likelihood of retaliation is weaker when teams already benefit from tenure heterogeneity. This interaction term was not significant for the analysis of retaliation lag. Based on this, we conclude that our analysis provides, at best, very weak support for Hypothesis 3.

DISCUSSION

Researchers have long sought to accurately model the factors that influence competitive response behavior. In their review and extension of competitive dynamics research, Hambrick and his colleagues (1996) argue that those factors that lead to across-firm differences in response behavior are particularly important for understanding the complex nature of market interaction. We agree with this argument and in this study seek to further our understanding of across-firm differences by investigating the influence of executives' cognitive frameworks on the retaliation behaviors of their firms. We note that the cue and processing-propensity approaches embody distinct sets of assumptions about information processing, which means that these two approaches effectively model different types of broad-based variance in competitive behavior. The central premise of our study is that firm-level differences that arise due to variation in cognitive frameworks represent yet a third type of variance; one that addresses the fine-grained and firm-specific retaliation proclivities that are not captured in prior research. We suggest that an integrated perspective that simultaneously considers all three approaches is crucial to developing a better understanding of how interaction unfolds in the marketplace.

Our results clearly demonstrate that differences in executives' cognitive frameworks relate systematically to whether and how quickly they commit their firm to challenge an adversary's action. At a broad level, this is consistent with theory that suggests that differences in executives' cognitive frameworks direct patterns of attention and interpretation (Thomas *et al.*, 2001). It is also consistent with empirical research from strategic management that demonstrates that differences in executives' cognitive frameworks cause firms to react differently to external stimuli (e.g., Fiol, 1989; Barr *et al.*, 1992), and with broader research that suggests that executives' subjective perceptions influence how these decision makers view competitive environments and firms (Lant and Baum, 1995). Within the context of competitive dynamics research, executives' cognitive frameworks explain why executives at a firm are systematically more likely to challenge some types of competitive action, but ignore others. Evidence of a significant link between cognitive frameworks and the likelihood and speed of competitive response

helps explain why and how these sensitivities differ from firm to firm. As noted in the results section, examination of the odds-ratio and regression coefficients show that the interfirm variations in response attributable to variation in cognitive frameworks are of practical, as well as statistical significance.

We also argued that the presence of strong external cues should lessen the influence of cognitive frameworks. We reasoned that strong cues clearly indicate the course of action that responders should take, thus minimizing the individual-level differences that are likely to flourish when executives cope with weak or ambivalent cues by referring to their own prior experiences. Our analysis provides only weak evidence that the magnitude of cues moderate our main effect. Of the five cue variables, only attack intensity affects the influence of cognitive frameworks on response. Contrary to our expectations, the effect between cognitive frameworks and response lag were larger when cues of intensity were strong. However, we found no evidence that the remaining four cues moderate the influence of response.

One explanation for the paucity of interactions between cues and cognitive frameworks may be that while external cues and existing cognitive frameworks are clearly distinct sources of subjective inference, as modes of information processing they are both sufficiently 'low-cost' that executives need not rely on one to the exclusion of the other. Theorists conceptualize information processing activities as existing along a continuum between active and theory-driven information processing (Walsh, 1988). The differences in cost (in terms of information speed and cognitive effort) between active and theory-driven routines are clear—active processing requires much greater time and effort (Gioia, 1986; Galambos *et al.*, 1986). However, both external cues and cognitive frameworks exist on the theory-driven end of that continuum. Cognitive scientists also suggest that decision makers will continue to base decisions on cognitive frameworks even when those frameworks apparently conflict with other sources of data, including the implicit meaning that they infer from external cues. Over the long term, repeated dissonance between executives' cognitive frameworks and cues can prompt executives to challenge and possibly revise their cognitive frameworks (Lant, Milliken, and Batra, 1992; Starbuck and Milliken, 1988). It is possible that by

examining the influence of cognitive frameworks and cues concurrently, our analysis does not capture the interaction and possible subjugation of cognitive frameworks that happens only over longer periods of time.

The finding of a significant and positive interaction between attack intensity and cognitive frameworks on speed of response was unexpected. However, it is consistent with work that in periods of stress—and high attack intensity would be considered stressful in most instances—individuals fall back on their most basic learned response (Barthol and Ku, 1959). Further study is necessary to determine the generalizability and cause of this relationship.

We hypothesized that cognitive frameworks will have a stronger influence on retaliation when the organizational and team-level characteristics that can prompt executives toward active information processing are otherwise absent. Of the three processing-propensity variables included in our analysis, only TMT organizational tenure heterogeneity significantly moderated the influence of cognitive frameworks on likelihood of retaliation. This finding is consistent with our argument that higher levels of heterogeneity increase the likelihood that executives use more thorough decision making processes, rather than rely on their cognitive frameworks (Bantel and Jackson, 1989). We did not, however, find a similar effect for response lag, indicating that the effect of cognitive frameworks on response lag is not influenced by the use of more thorough decision making processes. Though unexpected, this second result is consistent with findings by Eisenhardt (1989) that suggest that decision making can be both comprehensive and fast.

One interpretation of the insignificant interactions between cognitive frameworks and measures of slack is that the effect of these frameworks is independent of the additional data collection capabilities that have been linked to slack. The main effects for slack, however, suggests that, for our sample, additional slack may not be an indicator of information processing propensity, but rather an indicator of ability to respond. Firms with greater slack resources at their disposal may be more able to respond, and also have the luxury of delaying response until the effect of the initial action (on the initiating firm and/or on others in the industry) becomes clearer. Similarly, we also found neither a direct nor indirect effect for TMT industry tenure.

As we argued, prior research suggests that as the TMT gains industry experience, executives eschew active information search and processing in favor of more automatic reactions rooted in subjective beliefs. One possibility is that experience is a weak proxy for executives' likely adherence to cognitive frames, and that the stilted influence of long experience is difficult to detect when models directly control for multiple alternative sources of subjective inference, such as external cues and cognitive frameworks. Speaking generally, the weak interactions between the various processing-propensity variables and cognitive frameworks suggest that more work is needed to understand how, and under what contexts, these factors drive response in markets.

Our results have several implications for the study of competitive dynamics. First, our results contribute to competitive dynamics research by highlighting the importance of devoting more attention to the subjective factors that cause non-conforming, or idiosyncratic, patterns of attention and retaliation at the firm level. Evidence that unexamined cognitive differences can explain variation in firm-level behavior suggests that existing theories underestimate the extent to which competitive response behaviors vary across firms. Prior work (Hambrick *et al.*, 1996; Chen, 1996) has highlighted the importance of interfirm variation in response to the development of a theory of competitive dynamics, yet this has remained an under-studied phenomenon. The strong relationships that we found between cognitive frameworks and retaliation, over and above the effects of cues and processing propensity predicted by prior research, suggest that further investigation of more micro-level factors, including the cognitive frameworks of executives, would be a fruitful avenue for future research.

Second, our results suggest that an increased emphasis on variation in cognitive frameworks extends areas of competitive dynamics research that have focused on longer-term patterns of inter-firm rivalry rather than on discreet responses to particular actions. Research on multimarket commonality (Baum and Korn, 1999) and on resource similarity (Gimeno and Woo, 1996), for example, has examined broad factors that promote or repress the number of exchanges between pairs of firms over time. Our findings suggest that some appreciation for the specific patterns of cognitive agreement, or the specific issues on which

executives at different firms agree and disagree, provide useful insight into firm-specific patterns of competitive interaction. For example, cognitive agreement between firms regarding which types of actions influence firm performance may mean that executives at those firms closely monitor and assess the same type of actions. More specifically, understanding these patterns of agreement and disagreement may help clarify why long-term interfirm rivalry manifests through certain types of exchanges but not through others.

In the interest of offering further evidence as to the plausibility of this argument, we performed a *post hoc* analysis of our current data. Results of an analysis (not presented here) of the *firm-pair dyads* in our sample suggests that, over the long term, pairs of firms are more likely to interact competitively through the subset of action types that executives at both firms subjectively label as important, rather than through those action types that they disagreed upon ($p < 0.05$). Thus, future research might examine several questions linking specific patterns of cognitive agreement to long-term rivalry. For instance, how does the overall level of cognitive agreement between executives at two firms influence the severity of rivalry between those competitors? At the industry level, does an overall lack of cognitive diversity in markets lead to more intense rivalry? The answers to these questions have important prescriptive considerations for executives. To the extent that a firm's actions and strategies reflect the personal preferences of top managers (Hambrick and Mason, 1984), high levels of cognitive diversity may promote larger differences between firms, including higher levels of differentiation and the creation of unique and unassailable resource profiles. Conversely, the failure of executives to develop cognitively differentiated mindsets may result in an inability to find competitive positions safe from the negative consequences of rivalry. In any case, the strong influence of cognitive differences on decision making suggests that the mix of factors that promotes idiosyncratic versus isomorphic cognitive frameworks deserves more attention. Of particular importance is understanding why executives persist in holding nonconforming cognitions and how doing so might define firm behavior.

Finally, this study contributes to the broader literatures on managerial response to competitive issues and change. Ocasio's (1997) attention-based view of the firm highlights the multiplicity and

complexity of factors that influence information processing and subsequent organizational behavior. Prior strategy and cognition research has investigated how belief differences influence managerial response to a number of different stimuli (e.g., Barr and Huff, 1997; Gioia and Thomas, 1996; Kaplan, Murray, and Henderson, 2003; Tripsas and Gavetti, 2000). Other research has examined the industry, organizational, and social determinants of interpretation (Thomas *et al.*, 1994). This study builds on these literatures by assessing specific interactions between cognitively directed attention and both situated and distributed determinants of information processing. The results of our moderation analyses are surprising and contradict established views that the existence of strong situational cues or organizational factors will limit the extent to which cognitive frameworks of executives influence firm-level behavior. Our finding that cognitive frameworks have a direct effect that is evidently independent of these more macro-level factors points to the importance of further teasing out of the relationship between these different levels and types of information processing.

Our results also have implications for managers. In particular, our findings suggest that a better anticipation for whether and how a specific rival might respond differently to the various competitive repertoires at a manager's firm's disposal may help those executives better manage the competitive relationship with particular firms (Zajac and Bazerman, 1991). For example, executives may be able to reduce the risk of response from a troublesome rival by utilizing the types of action that they themselves view as important, but that they know to be valued less by their rival. This type of informed manipulation may even help firms attack rivals with greater immunity (Schumpeter, 1934).

Limitations and future considerations

Though our results suggest many benefits from a renewed and more detailed interest in exploring the subjective antecedents of firm response, it is important to note some limitations. First, many different kinds of managerial beliefs can influence executives' response decisions. Indeed, the kind of cause-effect relationships that we examined is only one of many subjective beliefs that can prompt heterogeneous firm behavior. While the variable that we explored explains significant variance, it is likely that, if anything, this study underestimates

the degree to which response behavior differs from firm to firm. Future research that simultaneously examines other subjective factors that are associated with nonconforming competitive behaviors would be useful.

Second, the nature of executives' language in the shareholders letter required that we make several methodological choices. For example, the causal-mapping protocol outlined by Huff *et al.* (1990: 315) includes several different *types of association* (e.g., positive effect, negative effect, no causal effect, indeterminate effect, example, equivalency, etc.). The specificity of executives' language meant that letters displayed several different types of association for the same concepts, which made it impractical to define only one relationship between concepts. Given our focus on establishing that perceptions of causality affect retaliation choices, we focused on whether letters outlined causal (versus noncausal) relationships between concepts. Thus, we were able to study only the effects of the existence of a stated causal influence of action types on firm performance outcomes, rather than the effects of the more specific types of causal linkages identified through the coding process. Prior research has also shown that executives exhibit different subjective sensitivities to threat and opportunity information (Jackson and Dutton, 1988). We, however, adopted the conservative approach that an initial focus only on the presence and degree of causality captured the relevant characteristics of executives' cognitive frameworks. Distinguishing between different types of causal relationships, as well as between positive and negative relationships, may empirically explain more variance than overall causality alone, but this issue is beyond the scope of this initial study. Future research that more closely examines both of these issues may be valuable for modeling why executives commit their firms to challenge an adversary's actions.

Third, our focus on offering a cognitive perspective on competitive dynamics led us to examine the relationship between cognitive frameworks and subsequent competitive retaliation. In developing our arguments, we tie causal beliefs theoretically to the processes of noticing and interpretation, but we do not empirically capture these intermediate steps of the information processing and retaliation process. It is possible, and even likely, that executives notice actions but do not respond because they decide that they should not. Our study examines a

limited number of bases for interpretation, namely perceived strategic importance and various external cues. Clearly, retaliation decisions involve a myriad of additional considerations that may prove a more nuanced view of how executives approach rivalry.

Finally, the fact that the airline industry has been studied so frequently by competitive dynamics researchers could be considered a limitation. However, studying the airline industry allowed us to gauge the value of an integrated perspective within the existing body of research. In retrospect, our findings may, in fact, provide a conservative estimate of the importance of cognitive frameworks because the airline industry provides a particularly harsh test of our central hypothesis. Though our data suggest that executives at different firms possess heterogeneous cognitive frameworks, competition in the airline industry effectively manifested itself through a relatively narrow range of traditional, non-innovative and presumably well-understood action types. Given that dynamism and strategic experimentation at the industry level should exacerbate differences between firms, follow-up studies linking cognitive frameworks to competitive response in other industries may find larger effect sizes.

CONCLUSION

Understanding the evolution of competitive dynamics requires an understanding of what drives response to competitive actions. Prior research utilizing theories of information processing has outlined the broad central tendencies that predict how firms react to competitive situation. Research has focused less on the retaliation proclivities of firms, or why and when the behavior of particular firms deviates from these central tendencies. Existing theory suggests that in complex and ambiguous situations, executives base their decisions in part on the cognitive frameworks that they distill from prior experience (Nadkarni and Barr, 2008; Walsh, 1995 Cyert and March, 1963). The cognitive frameworks that executives possess can differ substantially across firms, and research has shown that these differences lead to variance in a wide range of strategic decisions. Our empirical examination of this idea in the context of firm-level response to competitive action suggests that accurately modeling the likely competitive response

of individual firms will be difficult unless models directly account for the content of cognitive frameworks. At a broader level, we suggest that fully understanding the antecedents of competitive response behavior requires a greater emphasis on the many subjective factors that lead to idiosyncratic patterns of attention, interpretation, and reaction.

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APPENDIX: DESCRIPTIONS OF ACTION TYPES, PERFORMANCE, AND SAMPLE EXCEPTS FROM DICTIONARY LIST

Pricing actions: Competitive actions that fall into the *pricing domain* include all actions that affect the overall and final cost of air service to customers with the purpose of influencing product demand or market share. As such, this domain includes, but is not limited to, issues such as: price increases; price decreases; various forms of price promotion; promotional fares; introductory fares; and changes to pricing elements of a company's fare structure.

[*excerpts from dictionary*: 'a modest increase in average fares'; 'higher average fares'; 'fare increases'; 'rational pricing'; 'domestic fare war'; 'being competitive on price'; '...had to match fare actions'; 'our ability to provide low fares'; 'increased availability of low fares'; 'price competition'; 'low fare airlines'; 'fare promotions'; 'increased competition from low-cost', 'friends fly free program']

Route actions: Competitive actions that fall into the *route domain* include all actions that affect or alter the combination of markets/destinations that an airline serves. As such, this domain includes, but is not limited to, issues such as: adding *stand-alone* service to or from a new market; exiting an existing route; increasing daily frequencies on an existing route; decreasing daily frequencies on an existing route; formal filings with governmental agencies requesting new *stand-alone* or back-up service authority; formal filings with governmental agencies requesting renewal of *stand-alone* or back-up service authority; direct purchase of gates/authority from other companies.

[*excerpts from dictionary*: 'changes to the route structure'; 'additional route authorities'; 'increased service to Tampa'; 'entering 54 new destinations'; 'minimizing route overlap'; 'unprofitable flights have been eliminated'; 'increased departures'; 'acquired routes'; 'expanded routes'; 'added new markets'; 'continued development of routes'; 'adding to our list of destinations'; 'every new city that (company) enters'; 'international route structure'; 'inaugurated new service'; 'discontinued flying on routes']

Ticketing actions: Competitive actions that fall into the *ticketing domain* include all actions that affect or alter activities related to the distribution of passenger boarding authority. As such this domain

includes, but is not limited to, issues such as: airlines' utilization of travel agencies; changes to travel agent commission rates; computerized reservation systems (CRS); regulations related to CRS display; Internet-based ticket sales/reservations; telephonic-based ticket sales/reservations; ticketing related alliances with Internet companies; changes to ticket purchase rules; changes to ticket change/cancellation policies.

[*excerpts from dictionary*: 'Travel agent commissions'; 'changing commissions paid to travel agents'; 'commission caps'; 'electronic ticketing program'; 'electronic distribution'; 'E-tickets'; 'redesign booking system'; 'ticketless travel options'; 'emergence of Internet ticketing technologies'; 'reservations'; 'Internet booking systems']

Collaboration actions: Competitive actions that fall into the *collaboration domain* include all actions that affect or alter those *inter-airline* collaborative agreements that a company utilizes to complement, augment, or otherwise improve its own route system. As such, this domain includes, but is not limited to, issues such as: code sharing with domestic or foreign partners; equity or non-equity strategic alliances between domestic or foreign partners; formal request to governmental agencies requesting new *code-share* service authority; formal filings with governmental agencies requesting renewal of *code-share* service authority; formal filing with governmental agencies requesting authority to display one airline's code on another airline's flights; formal request to governmental agencies requesting anti-trust exemptions related with collaboration; joint marketing agreements; reciprocity between frequent flyer programs.

[*excerpts from dictionary*: 'new marketing alliances'; 'code-sharing agreement'; 'global alliance'; 'alliance partners'; 'expanding alliances'; 'code sharing'; 'formed an alliance with American Airlines'; 'the Delta-Air France partnership'; 'being part of a global network alliance'; 'an innovative alliance with Northwest'; 'exploit synergies from combined systems']

Service actions: Competitive actions that fall into the *customer service domain* include all actions that affect or alter the level/type of customer service experienced by an airline's passenger. As such, this domain includes, but is not limited to, issues such as: design of aircraft interiors related to customer comfort, preferences, or satisfaction; decoration of aircraft interiors related

to customer comfort, preferences, or satisfaction; variety of service class offerings (i.e., first-class, business-class, coach); aircraft cleanliness; passenger meals/beverages; aircraft amenities; leg room; quality/level of in-flight steward service; passenger service upgrades; airport lounges; airline membership clubs; frequent flyer programs, customer loyalty programs; on-time flying; reliability of baggage service.

[excerpts from dictionary: 'redefined customer service'; 'adding seats without adversely affecting leg room'; 'an industry leading business class service'; 'being superior in service'; 'commitment to customer service'; 'service accountability']

Cargo actions: Competitive actions that fall into the *cargo domain* include all actions that affect or alter aspects of an airline's non-passenger service activities. As such, this domain includes, but is not limited to, issues such as: shipment of freight; shipment of mail; cargo authorities; cargo authority renewals; freight contracts; cargo code sharing authorities.

[excerpts from dictionary: 'building a strong cargo presence'; 'being one of the leading air-freight operators'; 'increased our dedicated 747 cargo flights'; 'reliable mail and freight operation']

Other: Other represents a residual category for actions not readily classifiable above.

Organizational performance: This construct includes all concepts, terms, and references that can be reasonably considered synonymous with organizational-level performance. Some examples include: our performance; falling short of our goals; our success; profitability; stock price; earnings; poor results; competitive advantage, or our ability to compete in the marketplace; market leadership; reaching our goals; and so forth. Concepts, terms, and references were not included in this category on the sole basis that they are positive organizational aspects, or that they affect organizational performance.

[excerpts from dictionary: 'achieve record earnings'; 'future success'; 'our performance'; 'contributing to shareholder's utility'; 'building a world-class airline'; 'being the best'; 'excellent financial position'; 'long-term future'; 'growth'; 'being competitive in the marketplace'; 'large losses'; 'poor performance'; 'sub-par returns'; 'an amazing position in the marketplace'; '(company's) prosperity; 'profitability']