JOURNAL OF MANAGERIAL ISSUES
Vol. XIV Number 2 Summer 2002: 162-180

Strategic Aggressiveness, Variation, And Surprise: How The Sequential Pattern Of Competitive Rivalry Influences Stock Market Returns*

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In a boxing match, a boxer may use a particular sequence of punches, such as series of jabs followed by an uppercut punch. The opponent may respond adaptively with a similar sequence or a very different sequence of punches, such as a series of body punches followed by overhand punch. Indeed, as the fight progresses, the sequential pattern of punches influences not only the boxers' choice of punches in ensuing time periods, but also the judges' evaluation of each round and, most importantly, the eventual outcome of the fight. Likewise, head-to-head competition between rival firms has much in common with sports and games (O'Driscoll and Rizzo, 1985), and is a process very similar to that of a boxing match between two heavyweight fighters (D'Aveni, 1994). We thus apply a dynamic process model of competitive rivalry and examine how the sequential pattern of competitive behaviors among rivals influences firm performance.

We developed our study to advance both theory and managerial thought rooted in the competitive dynamics stream of strategic management research that has recently developed theory and empirical methods centering on the conceptualization of firm

* An earlier version of this paper was presented at the 2000 Strategic Management Society meeting in Vancouver, Canada. We would like to acknowledge Doug Lyon's contribution of the TMT-related data and ideas included in this article, as well as Michael Holmes for providing the *WinPhaser* sequence analysis software. The second author gratefully acknowledges financial support from the Summer Research Grant Program at the School of Management at George Mason University. Finally, we thank two anonymous reviewers for their comments and ideas that helped us improve the article.

strategy as competitive action (e.g., Chen, 1996; Ferrier *et al.*, 1999; Grimm and Smith, 1997; Lee *et al.*, 2000; Miller and Chen, 1996; Smith *et al.*, 1992; Young *et al.*, 1996). In general, early research in this stream focused attention on the *action-reaction dyads* level of analysis (Chen *et al.*, 1992; Smith *et al.*, 1991), whereby the characteristics of an individual competitive action, as well as the characteristics of the competing firms, are important predictors of the intensity of an individual competitive response. More recently, this research demonstrated a link between the characteristics of an aggregated set of actions over a finite time period and performance—the *action repertoire-year* level of analysis (e.g., Chen and Hambrick, 1995; Deephouse, 1999; Ferrier *et al.*, 1999; Gimeno and Woo, 1996; Miller and Chen, 1996; Young *et al.*, 1996).

Overall, this stream of research suggests that aggressive competitive behavior—more actions, innovative and radical actions, quick response, complex and differentiated action *repertoires*—is related to better organizational performance. Unfortunately, this earlier research cannot completely inform managers as to how an aggressive, adaptive strategy impacts performance as the pattern of competitive moves unfolds dynamically throughout a given time period. In particular, limited insights may be gleaned at the action-reaction dyad level because pairs of actions are disconnected from other actions over time. Further, while the *repertoire* level of analysis accounts for the firm's entire set of actions, it is linked primarily to end-of-year financial outcomes such as market share and profitability. In fact, little research to date has examined the *contemporaneous* effect of a proximal pattern or stream of actions on performance, or employed a performance measure that captures the dynamic, fine-grained nature of competitive interaction (except Bettis and Weeks, 1987; Lee *et al.*, 2000). Accordingly, building on a few recent studies (i.e., Ferrier, 2001; Ferrier, 2000), we believe ours is the first to explore the relationship between stock market returns and patterns in the sequence of competitive behaviors that unfolds over time.

Strategy as a Sequence of Competitive Actions

Our definition of competitive action is consistent with prior research—competitive actions are *externally directed, specific, and observable competitive moves initiated by a firm to enhance its relative competitive position* (Ferrier *et al.*, 1999; Smith *et al.*, 1991; Young *et al.*, 1996). Using individual competitive actions as building blocks, we define strategy at the *action sequence* level of analysis—*the ordered pattern of repeatable competitive actions carried out in strategic time* (Ferrier, 2001; Ferrier, 2000). This definition is consistent with previous process-oriented strategic management research that conceptualizes strategy as: patterns or consistencies in streams of behaviors (Mintzberg and Waters, 1985), a chronological sequence of events that unfold over time (Van de Ven, 1992), a coordinated series of actions (MacCrimmon, 1993), and a simultaneous and sequential strategic thrust consisting of many actions (D'Aveni, 1994). Further, our definition confines the observation of strategy to a moving window of "strategic time" in which adaptive strategic decisions are made (Ramaprasad and Stone, 1992).

Based on prior research and theory from competitive dynamics (e.g., Ferrier, 2001; Ferrier, 2000; Grimm and Smith, 1997) and hypercompetition (e.g., D'Aveni, 1994), as well as other disciplines that explicitly account for sequences of events (e.g., Abbott, 1990; Sankoff and Kruskal, 1983), we adopted the following four action sequence dimensions that best captured the extent to which a firm's pattern or stream of competitive actions could be characterized as aggressive and disruptive.

Strategic Intensity. This is defined as the extent to which a firm carries out a large number of competitive actions in rapid succession. In contrast to prior research that explored the firm's total competitive activity (e.g., Ferrier *et al.*, 1999; Young *et al.*, 1996), strategic intensity represents a fine-grained approach to conceptualizing strategy as an aggressive sequential thrust of multiple initiated moves and competitive responses as they are carried out over time (D'Aveni, 1994). This concept also accounts for both periods of relative aggressiveness and inactivity over time.

Strategic Complexity. This dimension is defined as the extent to which a sequence of actions is composed of actions of *many* different types (as opposed to a simple action sequence consisting of a *few* types). This concept is similar to the simplicity/complexity of a firm's entire *repertoire* of competitive actions (Ferrier *et al.*, 1999; Miller and Chen, 1996). However, sequence complexity explicitly accounts for periods of relative complexity and simplicity of multiple actions over time. Consistent with previous research, firms that carry out a complex sequence of actions are more aggressive than firms carrying out a simple sequence of actions (D'Aveni, 1994; Ferrier *et al.*, 1999; Miller and Chen, 1996).

Strategic Unpredictability. This is defined as the extent to which a firm's sequential order of competitive actions is dissimilar from one period to the next. Firms that purposefully carry out changes in the sequence of actions create surprise and aggressively disrupt the *status quo* of competition within an industry (D'Aveni, 1994; Kirzner, 1973; MacCrimmon, 1993; O'Driscoll and Rizzo, 1985).

Strategic Heterogeneity. This dimension is defined as the extent to which the focal firm's sequence of competitive actions is dissimilar from that of its rival. Firms that carry out a sequence of actions different from that of rivals actively seek to disrupt the pattern of competition (D'Aveni, 1994; Kirzner, 1973). This dimension is consistent with the concept of action *repertoire* heterogeneity (Deephouse, 1999; Ferrier *et al.*, 1999; Gimeno and Woo, 1996), but also accounts for periods of relative competitive similarity/differences between rivals over time.

In the next section, we draw from and integrate theory in competitive dynamics, finance, and strategic decision making to motivate a set of hypotheses that predict that these four action sequence characteristics will be related to stock market returns.

CONCEPTUAL BACKGROUND AND HYPOTHESES

Most finance and accounting research has demonstrated a strong relationship between stock market variables such as *beta* and stock prices. However, some research suggests that firm-specific factors are better predictors of stock market returns than systematic market-based risk (*beta*)

(Chatterjee *et al.*, 1999). For instance, this research suggests that changes in a company's stock price were related to changes in corporate strategy such as acquisitions, spinoffs, divestitures, and joint ventures (e.g., Hite and Owers, 1983; Kaplan and Weisbach, 1992; McConnell and Nantell, 1985). However, only a few studies that explore the relationship between a firm's competitive tactical and strategic actions and stock price have been attempted (e.g., Bettis and Weeks, 1987; Lee *et al.*, 2000). Therefore, by integrating the competitive dynamics view of "strategy as action" (e.g., Smith *et al.*, 1992) with a strategic view of finance (e.g., Chatterjee *et al.*, 1999), our model depicted in Figure I suggests that the four attributes of a firm's sequence of competitive actions (noted above) relate to varying levels of both tactical-strategic risk and decision-making risk, which impact the firm's stock price.

Action and Decision Risk

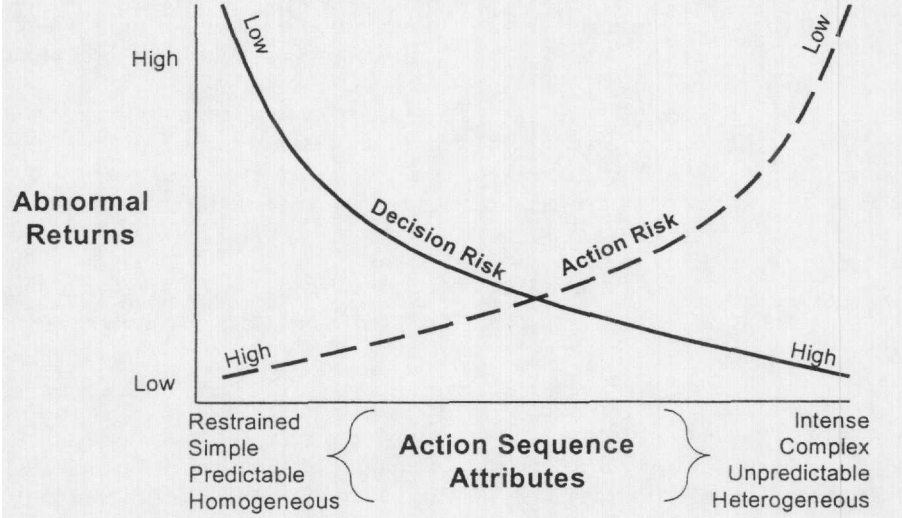
First, we adopted ideas from Chatterjee *et al.* (1999) regarding their definitions and use of tactical and strategic risk in predicting stock returns and integrated these concepts with recent research in competitive dynamics. For instance, these authors argue, "If tactics are firm-specific actions that are easily reversible, then tactical risk is the uncertainty in a firm's expected returns that managers can reduce" (Chatterjee *et al.*, 1999: 558). Similarly, these authors argue that strategic risk represents the probability that a firm cannot shield itself from competitive forces following committed, long-term irreversible actions. So, to the extent that a firm's sequence of competitive actions contains both tactical and strategic actions and firm-level unsystematic risk is an important predictor of stock price (Levy, 1978; Merton, 1987), we believe that the level of strategic intensity, complexity, unpredictability, and heterogeneity speaks more broadly to the firm's level of *action risk.*

Indeed, a key principle in dynamic competitive interaction is to move quickly and aggressively to preemptively beat rivals to the punch, which, in turn, slows ability of rivals to respond (D'Aveni, 1994; Smith *et al.*, 1992). When confronted with a less aggressive, simple, or familiar competitive challenge, rivals quickly learn how to untangle and respond to the attack using rigidly structured, yet highly efficient problem-solving mechanisms (Heiner, 1983; Levinthal and March, 1993). Thus, a simple or predictable strategy places the aggressor firm "at risk." However, as the level of strategic complexity and/or uncertainty increases, rivals systematically reduce and simplify information processing, which reduces the rate of learning and slows the speed of competitive response (Starbuck, 1983). This, therefore, reduces action risk.

We predict that the relationship between the *focal* firm's sequence intensity, complexity, unpredictability, and heterogeneity and *action risk* will decrease at an increasing rate (see dashed curve depicted in Figure I). This curvilinear relationship might occur because at low levels of strategic intensity, complexity, unpredictability, and heterogeneity (focal firm), rivals are capable of quickly sensing and reacting to simple competitive attacks. However, as the level of the focal firm's strategic intensity, complexity, unpredictability, and heterogeneity increases, it becomes increas-

FIGURE I

Characteristics of Action Sequences, Risk, and Abnormal Returns



ingly difficult for rivals to unravel and respond to the aggressor's competitive attacks, such that the rival's capability and speed of competitive response at high levels of strategic complexity, for example, is significantly slower than the speed of competitive response at intermediate levels of strategic complexity.

Second, at low levels of strategic intensity, complexity, unpredictability, and heterogeneity the firm's top management team (TMT) is capable of quickly conceiving of, deciding on, and implementing strategy. However, as these sequence characteristics increase, so too does the potential for conflict (Jehn, 1995; Schweiger *et al.*, 1989) and the need for decision comprehensiveness, complexity, and consensus (Fredrickson, 1984; Lumpkin and Dess, 1995; Knight *et al.*, 1999; Simons *et al.*, 1999). Therefore, high levels of strategic intensity, complexity, unpredictability, and heterogeneity are associated with lower levels of decision-making speed and quality (decision risk). We predict that the relationship between *focal* firm's strategic intensity, complexity, unpredictability, and heterogeneity and *decision risk* increases at a decreasing rate, such that the speed and quality of decision making at high levels of strategic intensity, complexity, unpredictability, and heterogeneity is only marginally lower than the speed of decision making and quality at intermediate levels of strategic complexity (see solid curve depicted in Figure I).

More importantly, however, is how the dual and simultaneous competing effects of action and decision risk relate to the focal firm's stock market returns, given the inverse relationship between firm-specific systematic risk and returns. As depicted in Figure I above, our research model sug-

gests that the attributes of the focal firm's sequence of competitive actions gives rise to both action risk and decision-making risk, which have equal and opposite curvilinear relationships with abnormal returns. On one hand, we argue that a predictable strategy, for example, carried out by the focal firm will be related to higher returns, owing to high decision quality and speed (low decision risk). On the other hand, an unpredictable strategy carried out by the focal firm slows the rate of the rival's competitive response (low action risk) and will be related to higher returns. Therefore, consistent with process theory that views behavior as the resultant of opposing forces (e.g., Lewin, 1951; Van de Ven, 1992), assessing the relationship between the *focal* firm's level of strategic intensity, complexity, unpredictability, and heterogeneity and *total risk* is accomplished by implicitly summing the focal firm's decision risk and action risk across all levels of strategic intensity, complexity, unpredictability, and heterogeneity. This results in a U-shaped curvilinear relationship between each of these dimensions and the focal firm's abnormal stock market returns. This relationship is inverted for the relationship between the focal firm's strategic intensity, complexity, unpredictability, and heterogeneity and the *rival's* abnormal stock market returns. Specifically, we predict that the relationship between the focal firm's competitive intensity, complexity, unpredictability, and heterogeneity will exhibit an inverted U-shaped relationship with the rival firm's stock returns. The U-shaped relationship depicted in Figure I provides our general hypothesis (for the focal firm's stock price). The specific hypotheses are as follows:

Hypothesis 1a: The focal firm's level of strategic intensity will exhibit a U-shaped relationship with the focal firm's stock market returns.

Hypothesis 1b: The focal firm's level of strategic intensity will exhibit an inverted U-shaped relationship with the rival firm's stock market returns.

Hypothesis 2a: The focal firm's level of strategic complexity will exhibit a U-shaped relationship with the focal firm's stock market returns.

Hypothesis 2b: The focal firm's level of strategic complexity will exhibit an inverted U-shaped relationship with the rival firm's stock market returns.

Hypothesis 3a: The focal firm's level of strategic unpredictability will exhibit a U-shaped relationship with the focal firm's stock market returns.

Hypothesis 3b: The focal firm's level of strategic unpredictability will exhibit an inverted U-shaped relationship with the rival firm's stock market returns.

Hypothesis 4a: Strategic heterogeneity will exhibit a U-shaped relationship with the focal firm's stock market returns.

Hypothesis 4b: Strategic heterogeneity will exhibit an inverted U-shaped relationship with the rival firm's stock market returns.

METHOD

Sample

Because the strategies of the largest firms are likely to be the most observable (Fombrun and Shanley, 1990), we used a sample of market-leading firms from prior research (Ferrier, 2001; Ferrier *et al.*, 1999). This sample included all members of the *Fortune 500* (1987-1993) that were ranked No. 1 or No. 2 in their respective industries in terms of U.S. market share and have Rumelt's (1974) specialization ratios (i.e., sales in largest 4-digit SIC industry to total sales) greater than 0.70 (dominant- or single-business firms). This matched-pairs sampling approach ensures that each firm is keenly aware of each other's

competitive strategy and ensures that their actions are directed towards the line of business on which these firms are most the highly dependent (Chen, 1996).

In the process of merging top management team demographic data to this sample, we eliminated several firms from the sample because they did not have TMT data listed consistently in ***Dun and Bradstreet Reference Book of Corporate Management*** during 1987-1993. We then further reduced the sample to include only all firm-pairs that had daily stock returns during the period 1986-1993 available in the file of the Center for Research in Security Prices (CRSP). The resulting sample consists of a pooled, seven-year cross-sectional database for the two largest single-business firms across 11 different 4-digit SIC industries.

Dependent variable

Cumulative Abnormal Stock Price Returns. We used event study methodology to test the *abnormal stock price returns* of the focal and rival firms related to the sequential patterns of competitive actions. We used the approach recommended by McWilliams and Siegel (1997) in their survey of event methodology. Abnormal returns capture the financial impact of unanticipated and new information associated with the action sequences, and accounts for the market's assessments on the differential effects of both strategic actions (e.g., new products) and tactical actions (e.g., price cuts) at the time these actions were carried out.

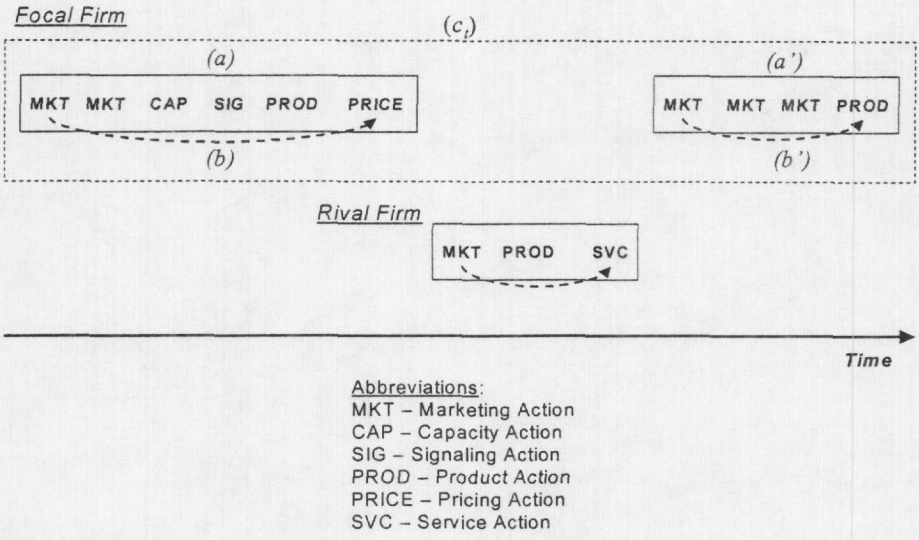
We computed the cumulative abnormal returns (CARs) and standardized cumulative abnormal returns (SCARs) for a two-day window—the day before and the day of the appearance of each news headline (i.e., each competitive action) in the data set. The two-day window captures the possible "leakage" prior to the publication of the news headline that corresponds to a particular strategic action or tactic. We also computed the cumulative abnormal returns for an action sequence (i.e., two-day CARs and SCARs at the time of each action and then summed all the CARs and SCARs for the yearly action sequences for each firm). The cumulative SCARs that correspond to each action in the sequence of competitive actions carried out in a given year served as the dependent variable for the study.

Independent variables

For each firm in our sample, we used all the competitive actions identified by Ferrier *et al.* (1999). Those authors defined competitive actions as "externally-directed specific, and observable competitive moves initiated by a firm to enhance its competitive position" (1999: 378). The competitive actions were identified by applying structured content analysis to approximately 4,600 news headlines pertaining to each firm in the sample found in the 1987-1993 U.S. volumes of ***F&S Predicasts***. Each news headline was coded into one of the following six general competitive action categories: product actions, pricing actions, marketing actions, capacity-related actions, service actions, and overt signaling actions (see Ferrier *et al.*, 1999 for sample headlines corresponding to each action type). To check the reliability of coding, two academic experts in strategic management independently coded a representative sample (N=300) of news

FIGURE II

Attack Characteristics and Measures



Abbreviations:
MKT – Marketing Action
CAP – Capacity Action
SIG – Signaling Action
PROD – Product Action
PRICE – Pricing Action
SVC – Service Action

headlines into one of the six action categories. Using Perrault and Leigh's (1989) index of reliability, this categorization approach yielded an index value of 0.91, which indicates a high degree of reliability. We used a chronological account of these actions to construct the following measures.

Strategic Intensity. Strategic intensity was measured as the average number of competitive action events that comprise the focal firm's competitive attacks carried out in a given year deflated by the average time span of each competitive attack. As depicted in Figure II, this measure represents the annual average of the focal firm's first attack (*a*), consisting of six action events, and the firm's second competitive attack (*a'*), consisting of four action events, and so on. We deflated the number of competitive actions by the duration of a particular competitive attack, measured as the number of days elapsed from the first action in a given attack to the last action of the attack. Attack duration is depicted by the time spans *b* and *b'* in Figure II (see Ferrier, 2001; Ferrier, 2000). High scores indicate that a firm typically carries out furious bursts of competitive actions against rivals; low scores indicate that firms typically carry out competitive activity only sporadically.

Strategic Complexity. To measure the extent to which a firm's competitive attack consists of a broad range (as compared to a narrow range) of different action types, we used a Herfindahl-type index that accounts for the weighted diversity among all six action types, which accounts for the relative frequency with which either tactical and strategic actions are carried out (Ferrier *et al.*, 1999). First, we calculated the ratio of actions in each

of the six action categories to total actions. Then, to account for the weighted distribution of actions carried out across categories, we squared each of these action-type proportions. Finally, we summed these squared proportions to arrive at the measure for attack complexity. As depicted in Figure II, the complex attack (*a*) consists of five of the six possible action types. By contrast, the simple attack (*a'*) consists mainly of marketing actions. For the analyses, we calculated the annual average of attack complexity. Firms with high scores carry out competitive attacks that typically consist of a broad range of action types; low scores indicate that a firm typically carries out competitive attacks with just a few action types.

Strategic Unpredictability. Consistent with prior research using sequence analysis techniques, we used optimal matching analysis to measure the magnitude of change in the firm's sequence of actions from one time period to the next (see Abbott, 1990; Ferrier, 2001; Ferrier, 2000; Sabherwal and Robey, 1993; Sankoff and Kruskal, 1983). Optimal matching calculates the "distance" between any two action sequences by accounting for the costs of insertions, deletions, and substitutions among all action types (known as INDEL costs) needed to transform one action sequence to exactly match another (Sankoff and Kruskal, 1983). For example, in order to transform the focal firm's attack *a* to exactly match attack *a'* depicted in Figure II, several insertions, deletions, and/or substitutions are needed. For instance, after accounting for the first two marketing actions and one product action that already "match," one additional marketing action would need to be substituted for a capacity action, one signaling action would need to be inserted prior to the product action, and a price action would be inserted at the end of the action sequence.

INDEL costs represent pair-wise differences across all six action categories based on how each action differs from the others (Sankoff and Kruskal, 1983). We established a matrix of INDEL costs across all action types according to several important characteristics of each type of competitive action developed in prior research (see Chen *et al.*, 1992; Smith *et al.*, 1992). More specifically, two academic experts separately ranked the six different action types according to the following characteristics: strategic vs. tactical, action irreversibility, action magnitude, scope and nature of implementation requirement, response time, and response likelihood (see Smith *et al.*, 1992). Then, pair-wise "costs" were established on a five-point scale ranging from 0.2 to 1.0. For instance, the costs of inserting and deleting a *marketing* action for a *pricing* action (both tactical actions) is rather small (cost = .20). By contrast, the substitution of a *marketing* action (tactical) for a *capacity-related* action (strategic) would be assessed a higher cost (.80). Based on this procedure, we established the matrix of pair-wise INDEL costs across all action categories.

Once the INDEL matrix was established, we used the optimal matching procedure to calculate the dissimilarity between the focal firm's entire sequence of competitive actions (see *ct* in Figure II) carried out in year *t* and that carried out in year *t-1*. A high optimal matching score indicates that the firm is strategically *unpredictable*; low scores indicate that the firm's entire sequence of competitive actions

changes little from year to year (i.e., *predictable*).

Strategic Heterogeneity. To measure the extent to which the focal firm's action sequence is different from/similar to its rival's sequence carried out the preceding year, we again used the optimal matching distance measure discussed above. If the pair of sequences depicted in Figure II represent the pattern of competitive actions carried out by the focal firm and a rival, then optimal matching analysis could produce a measure of between-firm sequence resemblance/dissimilarity. High scores indicate that the focal firm and rival are strategically *heterogeneous* with regard to the action sequences each carries out. Low scores suggest that both firms carry out *similar* action sequences.

Control Variables

Previous research suggests that several industry- and firm-specific variables influence competitive activity and firm performance. Therefore, we included the following control variables in the analysis: barriers to entry, industry concentration, industry growth, organizational slack, and top management team (TMT) heterogeneity. For the sake of parsimony, we calculated a composite measure for barriers to entry represented by the sum of the year-by-year pooled industry means for investments in R&D, selling activities, and total assets (see Ferrier *et al.*, 1999; Young *et al.*, 1996). We measured industry concentration using the Hirschman-Herfindahl Index. We controlled for the effect of industry growth on firm performance by including the year-to-year percentage change in gross industry sales.

We also included a measure for unabsorbed organizational slack—the quick ratio (i.e., the ratio of current assets less inventory to current liabilities)—since slack resources influence the firm's motivation and ability to compete aggressively (Young *et al.*, 1996). Finally, since recent research has demonstrated a link between TMT characteristics and strategic behavior (Hambrick *et al.*, 1996), we included a measure of TMT heterogeneity. We used Blau's (1977) index of heterogeneity across six different degree categories (i.e., business, science, liberal arts, engineering, law, and other) to calculate TMT educational heterogeneity. To calculate TMT industry experience heterogeneity, we used a coefficient of variation, defined as the standard deviation divided by the mean, for each TMT member's years of experience within the focal industry (Wiersema and Bantel, 1992). We used the two TMT measures above to develop a parsimonious composite measure of TMT heterogeneity calculated as the sum of the two standardized individual TMT heterogeneity measures noted above (Ferrier, 2001; Ferrier, 2000). Consistent with the individual TMT measures, high scores for our composite TMT measure indicate that the TMT possesses, overall, a diverse set of experiences, cognitive perspectives, and backgrounds.

Table 1 reports the means, standard deviations, and correlations among all variables in our analyses.

ANALYSIS AND RESULTS

Table 2 reports the results of the linear and quadratic regression analyses that test hypotheses 1 through 4, which predict that the characteristics of the sequence of a firm's series of

TABLE 1

Descriptive Statistics and Correlations (N = 154)

Variables	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10
1. Focal Firm Stock Returns	-.190	3.421										
2. Rival Firm Stock Returns	-.101	3.532	.18									
3. Strategic Intensity	2.52	19.78	.04	-.05								
4. Strategic Heterogeneity	.582	.212	-.18	.01	.43							
5. Strategic Unpredictability	.508	.199	.01	-.11	.22	.13						
6. Strategic Complexity	.290	.220	-.02	.07	-.27	.00	.11					
7. Industry Concentration	.171	.122	.03	.06	-.03	-.17	-.02	.22				
8. Industry Growth	.197	.178	-.01	-.12	-.08	.09	-.13	.14	.10			
9. Barriers To Entry	4,018	5,029	-.05	-.04	.10	.02	-.06	.16	-.06	-.21		
10. TMT Heterogeneity	-.103	1.84	-.09	.00	.19	.13	.03	.14	.02	.09	-.25	
11. Unabsorbed Slack (QR)	.931	.738	-.19	-.06	.09	.21	-.04	-.25	-.32	.19	-.34	.08

NOTE: All underlined correlations are significant at $p < .05$ level or better.

competitive moves would impact abnormal stock returns. In predicting the focal firm's stock price (hypotheses variants *a*), the quadratic model exhibits greater predictive efficiency than the linear model, as evidenced by a significant improvement in model fit and variance explained. However, in predicting the rival firm's stock price (hypotheses variants *b*), only the linear model was found to be significant.

Our two significant models predict 17-20% of the variance in the dependent variable, which represents a "small" effect size, according to Cohen (1988). Thus, based on a significance level of $\alpha = .05$ and an effect size of .20, a sample size of 155 would be required to produce power of .80 (Ferguson and Ketchen, 1999). Our regressions were performed using a pooled cross-sectional sample of 154 firm-years.

Hypotheses 1a and 1b were not supported, as the coefficients for strategic intensity were not significant for either quadratic model. However, we found a significant negative linear relationship between the focal firm's level of strategic intensity and the rival's stock price ($\beta = -.318$, $p<.01$). Thus, when a focal firm carries out more total actions per unit time, the rival experiences a significant decrease in stock market returns.

Providing support for hypothesis 2a, the focal firm' strategic complexity exhibited a U-shaped relationship with its stock price (linear: $\beta = -.775$, $p<.01$; square: $\beta = .727$, $p<.01$). However, no significant relationship was found between the focal firm's strategic complexity and the rival's stock price. Thus, hypothesis 2b was not supported.

Hypotheses 3a and 3b predicted that the focal firm's level of strategic unpredictability would exhibit a U-shaped relationship with gains in its stock price and an inverted U-shaped relationship with the rival's stock price. These hypotheses were not supported. Instead, the focal firm's strategic unpredictability exhibited a negative linear relationship with the rival's stock price ($\beta = -.166$, $p<.05$). Thus, focal firms that carried out an unpredictable pattern of competitive actions were able to inflict damage on the rival's stock price.

We found support for hypothesis 4a, which predicted that the focal firm's strategic heterogeneity would exhibit a U-shaped relationship with its stock price (linear: $\beta = -.556$, $p<.10$; square: $\beta = .566$, $p<.10$). However, focal firm strategic heterogeneity was not significantly related to the rival's stock price.

DISCUSSION

We applied a dynamic process model of competitive interaction by analyzing how the sequential patterns of competitive behavior unfold for firms engaged in head-to-head competition and how these patterns affect firm performance. Specifically, we linked the patterns of competitive actions between rivals to their stock market returns. We found support for two variants of our four main hypotheses. However, we also found unexpected, yet interesting linear relationships pertaining to two other variants of our hypotheses.

First, we found a curvilinear relationship between strategic complexity and stock price returns. That is, the stock market rewards the aggressor firms at outer ranges of strategic complexity—either a very narrow or broad range of action types. We reasoned that the effect of the focal

TABLE 2

Regression Results: Focal Firm and Rival Firm Abnormal Stock Market Returns on Dimensions of Competitive Attack (N = 154)

	Focal Firm's Stock Price		Rival Firm's Stock Price	
	Linear Model	Quadratic Model	Linear Model	Quadratic Model
Strategic Intensity	-.099	.073	-.318**	-.179
Strategic Intensity Squared		-.382		-.170
Strategic Heterogeneity	-.235*	-.556†	.104	-.577†
Strategic Heterogeneity Squared		.566†		.733*
Strategic Unpredictability	.024	.238	-.166*	.190
Strategic Unpredictability Squared		-.341		-.329
Strategic Complexity	-.033	-.775**	-.041	-.469†
Strategic Complexity Squared		.727**		.380†
TMT Heterogeneity	-.228*	-.056	.075	.087
Unabsorbed Slack	-.375*	-.349*	-.146†	-.180
Barriers To Entry	-.453**	-.417**	-.236*	-.222†
Industry Growth	.007	-.135	-.137†	-.141†
Industry Concentration	-.109	.023	-.001	.032
Model F =	1.39	1.70*	1.90*	1.40
Model R-square =	.13	.21	.14	.17
Durbin-Watson =	1.81	1.75	1.96	1.96

Values reported are standardized coefficients. One-tailed tests were used, which are directionally predicted in the hypotheses.
† $p<.10$, * $p<.05$, ** $p<.01$

firm's strategic complexity on its stock returns is a function of the dual opposing sources of risk: that associated with decision-making speed and quality of the aggressor firm, and the risk associated with speed and ability of rivals to respond. For firms that carry out a simple sequence of actions, for example, investors value the firm's ability to quickly conceive of, decide on, and implement a simple set of actions (low decision risk). Yet at the highest levels of strategic complexity, investors also value the ina-

bility and slower speed at which rivals are able to untangle and respond to a complex sequence of actions (low action risk).

Second, we also found a curvilinear relationship between the focal firm's strategic heterogeneity and its stock returns. That is, the stock market rewards firms competing at the outer ranges of strategic heterogeneity—either for very similar or different sets of competitive actions carried out. We speculate here that on one hand, investors may reward competing firms that carry out very familiar (perhaps "institutionalized") patterns of competitive behaviors (Chatterjee *et al.*, 1999: 562). In other words, because each competitor carries out a perceived "winning game plan," investors may view this as normal competition. On the other hand, investors may also reward industry trailblazers and disruptors that carry out patterns of competitive actions that are viewed as radically different from industry norms. Thus, investors reward focal firms because it is perceived that they are competing with a different, yet potentially viable game plan rather than by direct "slug-it-out" competition. In sum, investors appear to value both similarity and certainty in a sequence of strategic actions, as well as uniqueness.

Third, although most prior research has explored how the focal firm's strategy affects its stock price, our study suggests that how the focal firm's strategy affects its *rival's* stock returns is equally important. To date, there has been limited empirical evidence (except Bettis and Weeks, 1987; Lee *et al.*, 2000) examining the impact of strategic actions on rivals in the context of head-to-head rivalry. Interestingly, we found that our results provide additional insight as to the asymmetric consequences of head-to-head rivalry. For instance, we found a significant negative linear relationship between the focal firm's strategic intensity and its rival's stock returns. That is, the stock market doesn't so much reward aggressor firms that take more actions in shorter time periods as much as it penalizes rivals. We also found a significant negative linear relationship between the focal firm's level of strategic unpredictability and its rival's stock returns. This suggests that aggressors that carry out an unpredictable sequence of moves are not so much rewarded by investors, but rather that the rival is penalized by investors.

Managerial Implications

Our dynamic model of competitive interaction captures how the sequence of competitive behavior impacts short-term, dynamic performance outcomes. As such, we expect our findings to not only advance strategy theory, but also assist managers to make informed choices about the requisite level of strategic aggressiveness, complexity, unpredictability, and strategic differentiation with which competitive actions are implemented over time.

Owing perhaps to a greater emphasis on short-term performance and hypercompetition, managers increasingly use stock returns as an important decision-making barometer (Bruckner *et al.*, 1999). Just as ringside judges evaluate the competitive interaction between two boxers, the stock market can indeed act as a good messenger and inform managers about their strategy either by rewarding or penalizing them for their strategic and tactical decisions.

Our sequencing view of competitive interaction also complements current "practical" thinking that views strategy as a dynamic process (Mintzberg and Lampel, 1999) through which leading firms can successfully challenge (or fend off challenges by) rivals by being aggressive, adaptive, and disruptive (D'Aveni, 1999). Indeed, to improve stock returns (or to inflict damage on rivals), managers could "script" an entire sequence of competitive actions much in the way that American football coaches sometimes script a series of different types of plays. Such "planned surprises" might result from implementing a series of actions that include low-cost bluffs, decoys, and/or feints (McGrath *et al.*, 1998) that, from the perspective of rivals, appear complex and unpredictable.

To simultaneously reduce both action and decision risk, managers could strategically diversify the functional and experiential composition of the top management team (TMT). TMTs that have a complex and diverse set of experiences, backgrounds, and perspectives possess diverse information sources and skill sets useful for developing responses to complex strategic challenges. With regard to the characteristics of a firm's sequence of competitive actions, TMT experiential and functional diversity may be linked with strategic flexibility, complexity, and aggressiveness (Hambrick *et al.*, 1996), as well as "diversity, novelty, and comprehensiveness in the set of recommended solutions" to strategic and decision-making challenges (Wiersema and Bantel, 1992: 96). Indeed, recent studies found that TMT heterogeneity was related to strategic complexity and strategic heterogeneity (Ferrier, 2001; Ferrier, 2000). However, these studies also suggest that diverse TMTs were less able to sustain competitive attacks of significant duration, suggesting conflict within the TMT.

Also, we believe that managers may find it fruitful to incorporate our dynamic, sequence-level view of competitive interaction into their competitive intelligence data analysis and interpretation *repertoires*. More specifically, just as an experientially and functionally diverse TMT could reduce decision risk associated with increasing levels of strategic complexity and unpredictability, so too can an experientially diverse environmental scanning and competitor intelligence unit reduce the firm's action risk when rivals carry out a strategically intense, complex, unpredictable, and heterogeneous sequence of competitive actions.

Limitations and Avenues for Future Research

This research is not without limitations. First, given the definition of competitive action, we excluded the firm's *internal* actions (such as using new information systems, reorganizing, or the shift to lean manufacturing) from the analysis because such actions are beyond the scope of the study and are largely unobservable to industry participants. Nevertheless, some writers argue that competitive behavior is a function of the firm's resource profile, whereby resources and actions may be two sides of the same coin (e.g., Grimm and Smith, 1997). Future research could examine the sequential link between developing internal actions and resources, competitive behavior, and external performance outcomes.

Second, since the process of competitive interaction was examined across multiple industries, our findings have broad generalizability. However, because the methodology for collecting competitive actions is critically dependent on the newsworthiness of the firms in the sample, the hypotheses were tested using only the two largest firms in each given industry. We recognize that rivalry occurs across all industry participants, but it is reasonable to assume that market leaders have the greatest impact on competitive dynamics and hence stock market reactions. Even so, future research could examine sequential competitive interaction in a systemic manner among *all* firms competing in a given industry.

Conclusions

In sum, our findings help advance recent research in competitive dynamics by exploring how the pattern of competitive actions that unfold over time impacts an important measure of firm performance (stock prices) that is temporally proximate to the competitive actions carried out. Indeed, in contrast to other studies that explore the impact of an annually aggregated set of competitive actions on year-end performance measures, our study offers a more fine-grained view of the process of competitive interaction. Further, our study also contributes to the stream of research in finance that explores the relationships between various aspects of firm-specific, non-systematic risk and market returns. In particular, our conceptualization of *action risk* and *decision risk* represent potentially important strategic sources of variation in market returns.

Because we explored the potential for non-linear relationships between competitive strategy and performance, our results uniquely suggest that firms that find themselves "stuck in the middle" with respect to either strategic complexity or strategic heterogeneity experience lower performance. This is congruent with Porter's (1980) contention that firms that fail to choose between a low-cost or differentiation strategy will also experience poor performance, although recent thinking about generic business-level strategies suggests that firms that are "stuck in the middle" fare no worse than firms that carry out a strategy with a distinctive emphasis on either low-cost or differentiation (Campbell-Hunt, 2000).

Most importantly, our findings provide further support for the hypercompetition view of rivalry (D'Aveni, 1994) and stand in contrast to recent speculation that hypercompetition may be a psychological scapegoat or an exogenous determinant of poor firm performance (see Makadok, 1998). In particular, we found that independent of broad economic conditions or industry growth, firms outperform rivals by keeping them off balance through the initiation and sustaining of an aggressive, complex, and unpredictable sequence of competitive actions. Indeed, this is congruent with many of D'Aveni's (1994) "new 7 S's of hypercompetition" and is consistent with recent research that suggests that poor performance is the result of being challenged by more aggressive rivals (Ferrier, 2000; Ferrier *et al.*, 1999; Young *et al.*, 1996).

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