

LIFE IN THE FAST LANE: ORIGINS OF COMPETITIVE INTERACTION IN NEW VS. ESTABLISHED MARKETS

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Prior work examines competitive moves in relatively stable markets. In contrast, we focus on less stable markets where competitive advantages are temporary and R&D moves are essential. Using evolutionary search theory and an experiential simulation with in-depth fieldwork, we find that the relationship between performance and subsequent competitive moves depends on the type of market, not just on whether performance is high or low. High performers seek to maintain status quo, but this requires different strategies in different markets. They are conservative in established markets and bold in new ones. In contrast, low performers seek to disrupt the status quo. Again, this requires different strategies in different markets. Unlike high performers, low performers are bold in established markets and conservative in new ones where they lack understanding of how to disrupt rivals. Overall, our results incorporate unstable markets in theories of competitive dynamics and competitive interaction in theories of evolutionary search. By examining R&D moves, we also extend competitive dynamics research to include technology-based firms for whom temporary advantages are often essential. Copyright © 2010 John Wiley & Sons, Ltd.

INTRODUCTION

How do firms generate temporary competitive advantages? Organization and strategy theorists highlight several types of competitive moves that firms use to defend or improve their position relative to competitors (Chen and Hambrick, 1995; Ferrier, Smith, and Grimm, 1999; Katila and Chen, 2008). For instance, researchers have studied pricing and advertising (e.g., Smith, Ferrier, and Ndo-for, 2001) as well as capacity (e.g., Audia and Greve, 2006) and boundary (Ozcan and Eisenhardt, 2009) moves in varied empirical settings from airlines (Miller and Chen, 1996) to robotics (Katila

and Chen, 2008), shipbuilding (Greve, 2003a), and Fortune 500 firms (Ferrier, 2001). The core premise is that engaging rivals through competitive moves generates a series of temporary advantages that lead to superior performance.

Several insights emerge from this research. Normative insights suggest that making more moves, more complex moves, and more aggressive moves (i.e., sooner) leads to higher performance (Young, Smith, and Grimm, 1996; Grimm, Lee, and Smith, 2006; Ozcan and Eisenhardt, 2009). Descriptive insights center on the motivations of executives to engage their competitors. One explanation is that strategic incentives, especially the need to improve performance, will spur competitive moves (Smith *et al.*, 2001; Greve, 2003b). Another is that firms are more likely to enact moves if they know that their competitors are unlikely or unable to respond with damaging counter moves (Gimeno, 1999).

Keywords: competition; evolutionary search; temporary advantage; R&D; new markets

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Yet despite these influential insights, the literature on competitive moves leaves open several issues. First, although theoretical arguments suggest that temporary advantage and the need to frequently engage competitors is more likely in some markets than in others (Grant, 1996; Thomas and D'Aveni, 2009), empirical studies often focus on established markets such as airlines, shipbuilding, and banking. As a result, *new markets* in which *competitive dynamics* and *temporary advantage* may be especially germane are largely unexplored. In particular, while there is some understanding of first mover entry (Lieberman and Montgomery, 1988, 1998), there is little understanding of the motivations for later competitive moves as new markets unfold. Indeed, authors have encouraged research on competitive moves in new markets where the need to build temporary advantages is particularly relevant (see Smith et al., 2001).

Second, while much empirical literature on competitive dynamics focuses on highly observable moves such as pricing and advertising that are available from archival sources, it often overlooks less visible *R&D moves*. Yet, it seems likely that these moves, which are more difficult for competitors to track and more likely to disrupt them (and so be more advantageous), are highly relevant, especially in markets where advantage is otherwise extremely temporary.

Third, while much empirical literature focuses on the benefits of frequent moves, *avoiding competition* can be advantageous as mutual forbearance suggests.¹ Reconciling these contrasting views suggests the need for clarifying when firms may prefer fewer moves (and, thus, disengaging with competitors) as a way to extend the duration of competitive advantage. The motivations to enact versus avoid market moves that engage competitors directly may be particularly sensitive to the nature of advantage in specific market contexts.

Our purpose is to address these open issues. Specifically, we ask '*what motivates firms to engage in competitive moves in established markets with moderately temporary advantages versus new markets with highly temporary advantages?*' In

response, we conceptualize competitive moves as evolutionary search (Nelson and Winter, 1982; Katila and Chen, 2008), and examine predictions about the determinants of such search in established and new markets.

Our research design is a longitudinal, experiential simulation in which participants manage firms that compete against each other in a computer-simulated environment. Our simulation includes two different markets (i.e., an established and a new market) and, thus, provides a unique opportunity to contrast markets that differ with regard to the likely duration of advantage. We collect quantitative data for 32 runs of the simulation involving 480 participants, spanning 1999 to 2006. We supplement these data with in-depth fieldwork with participant-managers.

We have three core contributions. First, we challenge traditional theory by identifying intriguing differences in the origins of competitive moves across markets. The relationship between performance and competitive moves depends on the type of market, not just on whether performance is high or low. In general, *high performers* are motivated to engage in competitive moves to *maintain the status quo* in a market and *low performers* to *disrupt* it. But these goals require different search solutions in different markets. High performers move conservatively in established markets but engage in bold moves in new markets. By contrast, low performers boldly try to disrupt their rivals' positions in established markets, but move conservatively in new markets. Overall, our results depart significantly from the usual explanation that high performers are likely to make fewer moves than low performers.

Second, we incorporate competitive dynamics in evolutionary search theory (e.g., Katila and Chen, 2008; Katila, Bahceci, and Miikkulainen, 2010). The search literature is often firm centric. Our contribution is to examine how rival firms that start from different starting positions on a landscape (i.e., high and low performing), use different types of problem-solving moves (i.e., R&D and marketing), and search across different landscapes (i.e., known and emerging), enact and respond to each others' moves. Overall, we find that firms do not search in isolation. Competitor search influences motivations to search, especially for low performers. High performers are also influenced by competitors in established markets, but less so in new markets.

¹ When the same competitors interact in multiple market segments, they are less likely to compete aggressively in any one of them because they are aware of retaliation across the other segments (Gimeno and Woo, 1999; Jayachandran, Gimeno, and Varadarajan, 1999). Edwards (1955) labeled this concept mutual forbearance.

Our third contribution is a fresh approach to studying competitive moves. Despite their advantages, experiential simulations where participant-managers interact in a computer-simulated environment are rarely used to study competitive moves and firm performance.² Thus, our multi-method combination of simulation and fieldwork introduces a significant empirical approach to a literature that is 'biased toward archival research' and leaves management intentions and interactions unexplored (Smith *et al.*, 2001: 2).

THEORETICAL BACKGROUND

Competitive moves and temporary advantage

Two literatures are particularly significant in characterizing the strategies that may generate temporary competitive advantages. The first focuses on *characteristics of environments* in which competitive advantage is likely to be temporary. It suggests that competitive advantage is likely to be temporary in high-velocity environments (Eisenhardt, 1989) that are characterized by instability and intense *rivalry*. New markets, which are typically more unpredictable and intensely competitive than established ones, are prototypical high-velocity environments. The argument is that instability creates rapidly changing opportunities that offer competitive advantages with temporary duration (Santos and Eisenhardt, 2009). Slogans such as *you snooze, you lose* colloquially capture strategy in these environments. Hypercompetition among intense rivals and undefined turfs of competition further accentuate the likelihood of temporary advantage by creating 'competence-destroying turbulence' (D'Aveni, 1999: 134) and a 'constant condition of disequilibrium' (D'Aveni, 1994: xiii). Here, terms like *gold rush* and *land grab* capture the intense competition for new opportunities. Taken together, the core argument is that strategies that engage competitors frequently

in the pursuit of a series of temporary advantages are necessary to achieve superior performance in high-velocity environments (Tushman and Anderson, 1986; D'Aveni, 1994). Empirical studies of fast and frequent competitive maneuvering in such environments support this argument (Brown and Eisenhardt, 1998; Zott, 2003; Thomas and D'Aveni, 2009).

The second literature focuses on the *characteristics of competitive maneuvering* (i.e., moves intended to defend or improve a firm's position relative to its rivals) (Chen, Smith, and Grimm, 1992). This literature emphasizes the interplay of competitive moves, interdependence among rivals, and firm performance. In particular, it posits that competitive moves can create or enhance the competitive advantages of the focal firm and undermine the advantages of its rivals (Chen and Hambrick, 1995; Ferrier *et al.*, 1999; Katila and Chen, 2008). For instance, researchers have studied pricing, routing, and advertising moves that are intended to maintain the firm's existing position (Miller and Chen, 1994; Smith *et al.*, 2001), as well as capacity and geographic expansion moves to extend that position (Audia and Greve, 2006).

Empirical research on competitive moves offers valuable insights. Studies in a variety of contexts, such as airlines (Miller and Chen, 1994), trucking (Audia, Locke, and Smith, 2000), radio broadcasting (Greve, 1998), and Fortune 500 firms (Ferrier *et al.*, 1999) examine the effects of fast, diverse, and frequent moves on firm performance. Although these studies show the benefits of engaging competitors speedily (Chen and Hambrick, 1995; Ozcan and Eisenhardt, 2009), asynchronously (Katila and Chen, 2008), and diversely (Miller and Chen, 1996), the most consistent findings center on *move frequency* (Young *et al.*, 1996; Ferrier *et al.*, 1999; Chen, 2007). For example, in a study of competitive moves in the software industry, Young *et al.* (1996) show that more frequent competitive moves yield a higher returns on assets and sales. More frequent competitive moves are also linked to lower likelihood of dethronement of industry leaders (Ferrier *et al.*, 1999) and improved market share (Ferrier, 2001).

A second set of empirical studies examines why some firms engage in frequent moves while others do not. Some studies point to performance-based incentives. The argument is that managers enact competitive moves more frequently when their firms perform poorly and make fewer moves

² Audia *et al.* (2000) is an exception. But, our studies differ. Audia *et al.* used a single-session behavioral simulation while ours is a longitudinal experiential study run across seven rounds and six weeks. Also, their study involved individual undergraduate students responding to scenarios, while our decision makers were teams of masters students with managerial experience interacting with other teams in a computer-simulated industry environment. We also differ from many other (particularly marketing-focused) studies that have used Markstrat simulation data because our research focus is on origins of competitive moves.

when they are doing well (Greve, 1998, 2003b; Smith *et al.*, 2001). Other studies find that firms engage in more moves when their competitors are unlikely or unable to respond with effective countermoves (Evans and Kessides, 1994; Chen, 1996; Gimeno, 1999). Still others argue that only resource-rich firms can make many moves (Cyert and March, 1963). Overall, prior research offers diverse motivations for why firms might make frequent competitive moves.

Despite these valuable insights, several unexplored questions remain. First, there is little insight into competitive moves in *new markets* in which competitive dynamics and temporary advantage may be especially germane, and yet the findings from established markets may not be relevant. For example, while past performance and comparison with rivals may motivate competitive moves in relatively stable established markets, these comparisons are likely to be unclear, unreliable, or simply not available in new markets. Indeed, rivals are likely to be changing (Santos and Eisenhardt, 2009), while anticipating the consequences of moves is likely to be challenging (Katila and Shane, 2005). Second, there is little insight into origins of *R&D moves* that are essential in many markets, yet extant research based on highly observable moves may not be helpful. In other words, the motives to engage in less observable (and ambiguous) moves like R&D are likely to differ from those to enact observable (and unambiguous) moves such as pricing. Third, theory and evidence typically indicate that more *frequent moves* are high performing. Yet, high-performing firms may not always prefer to make many moves, particularly in markets where competitive retaliation is likely. Thus, it is unclear when firms would be motivated (or not) to engage in moves. Overall, the competitive dynamics literature offers an incomplete view of the origins of diverse moves in markets with varied temporary advantage. We address these gaps.

Competitive moves as evolutionary search

Recent research hints that an evolutionary search perspective in which competitive moves are conceptualized as problem-solving search in a landscape (Katila, 2002; Katila and Chen, 2008) might be a useful theoretical lens to understand competitive moves in varied markets (Smith *et al.*, 2001; Greve, 2008). Given its focus on learning through

search rather than rational optimizing (Argote, 1999) and its ability to address environmental dynamism and incorporate competition (Katila and Chen, 2008), an evolutionary perspective is especially likely to extend understanding of competitive dynamics into unstable and rivalrous settings such as new markets.

The search perspective rests on several fundamental insights. One is that managers are boundedly rational, so they avoid the need to anticipate events, optimize, and develop long-term strategies. Rather, they solve pressing problems using local responses (Cyert and March, 1963). A central characteristic of this problem solving is simplicity: search is simple minded and local in the neighborhood of the problem and current alternatives (Martin and Mitchell, 1998). As a consequence, immediate problems (such as poor performance) and proximate solutions motivate search.

A second is that managers search for a better competitive position in a knowledge space, conceptualized as a landscape. They move in search of high performance with their position on the landscape topography indicating their success. Several empirical studies confirm that representing firm behavior as search fits with how firms solve problems, such as those in R&D and innovation (Clark *et al.*, 1987; Helfat, 1994; Katila, 2002). Thus, the evolutionary lens is especially useful for examining the origins of distinct competitive moves (R&D, market) in different market landscapes—i.e., our research context.

HYPOTHESES: ORIGINS OF COMPETITIVE MOVES

In this section, we use evolutionary theory to develop hypotheses about the origins of competitive moves. We contrast the motivations of firms to engage in moves in markets in which advantage is likely to be moderately temporary (established market) and in markets in which advantage is likely to be highly temporary (new market).

Markets with moderately temporary advantages

From the evolutionary theory perspective, established markets with moderately temporary advantages can be conceptualized as search landscapes that are *relatively stable* and *organized* into well-defined turfs of competition. These landscapes are

relatively stable such that few new peaks rise and old peaks sink slowly as their attractiveness wanes. They are also organized, yet crowded. Competitors occupy relatively well-established and well-known positions in the landscape and accurate maps of the landscape—e.g., peaks and valleys—exist. Some firms are likely to occupy areas with high peaks (with typically moderately sustainable, high performance) while others occupy low peaks or even the valleys (with low performance). Further, norms of mutual forbearance often develop to regulate competitive behavior (Evans and Kessides, 1994; Chen, 1996; Gimeno, 1999). Thus, established market landscapes are likely to have relatively stable competitive structures.

Given the relatively stable topography of established markets, we propose in Hypothesis 1 that *high-performing firms* in established markets tend to *avoid market moves* in order to maintain the beneficial status quo. Because high-performing firms have relatively entrenched positions, they are likely to avoid initiating competition with firms in other (nearby) market segments and instead focus on maintaining their own position (i.e., peaks). Introducing products to market segments that are typically already occupied by other firms is likely to invite retaliation (cf. Gimeno, 1999; Gimeno and Woo, 1999). This is especially likely because market moves are highly salient and, therefore, likely to generate fast, vigorous competitive responses. Market moves are also relatively easy to imitate because they are less ambiguous than other types of moves, such as R&D. So, the relative benefits of such disruptive moves may be short lived. Moreover, high performers may be vulnerable to retaliation in several market segments where they are presently strong, making market moves particularly unattractive for them. In contrast, since poorly performing firms occupy low-market positions (i.e., valleys) and have little to protect or lose but immediate (performance) problems to solve, these firms have high incentive to upset the current competitive landscape by making market moves to disrupt rivals' market segments.

In contrast, we propose in Hypothesis 2 that *high-performing firms* are highly motivated to engage in *frequent R&D moves*. In order to remain attractive to customers, these firms use repeat R&D moves to improve their products and maintain their current market positions (peaks). This is especially important in established markets where there are

many rivals and relatively low switching costs, i.e., in markets where the advantages are moderately temporary. In these markets, firms need to keep moving locally (i.e., innovating) to maintain their current positions and the attractiveness of their peaks. In contrast, low-performing firms are likely to rely less on R&D moves because their effects are less immediate and less clearly helpful for them. Second, high-performing firms engage in frequent R&D moves because such moves help them modify product functionalities according to their own idiosyncratic advantages and, thus, create products that their competitors do not have. This further helps them retain their position on a peak and defend against possible attacks. In contrast, low-performing firms are likely to have few, if any, idiosyncratic advantages to exploit through R&D. Third, high-performing firms may be especially motivated to engage in R&D moves because they are less likely to incur effective retaliation than other types of moves (cf. Miller and Chen, 1994). These moves are less visible, making them more ambiguous than other types of moves. Illustrating this lack of visibility, one participant-manager in our simulation noted that if a potential rival were spending a lot on R&D, *'then they were up to something,'* but it was unclear what. Indeed, even when competitors can observe R&D moves, they are only a possible competitive threat because it is unclear whether the moves are made to outcompete the focal firm or attack others or are simply irrelevant. These possibilities make R&D moves confusing for other firms to interpret, so they are less likely to enable effective retaliation.

Overall, we propose that high-performing firms use frequent R&D moves to keep offering products that are attractive to customers, align product competition with their own advantages, and make it more difficult for rivals to predict, plan, and execute their competitive responses. In contrast to poorly performing firms that use market moves to disrupt the landscape, high-performing firms engage in R&D moves to preserve the current topography (cf. Miller and Chen, 1994). We propose:

Hypothesis 1 (H1). High-performing firms will be less likely to enact market moves than low-performing firms in markets with moderately temporary advantages.

Hypothesis 2 (H2). High-performing firms will be more likely to enact R&D moves than low-performing firms in markets with moderately temporary advantages.

Markets with highly temporary advantages

From the evolutionary theory perspective, new markets with highly temporary advantages can be conceptualized as search landscapes that are *unstable* and *intensely competitive*. These landscapes are unstable such that new peaks often arise frequently as the market unfolds and as rival firms make moves that reshape the landscape. Thus, the terrain is 'in an early stage of formation' (Santos and Eisenhardt, 2009: 644). Second, since the terrain is largely unknown (i.e., locations of peaks and valleys are unmapped), firms learn about the terrain only through search which further intensifies competition. For example, through both local and nonlocal search, firms attempt to learn more about new product characteristics and customer segments (Katila and Ahuja, 2002). Illustrating search in an unknown terrain, one participant-manager described the new market as '*a black box that nobody knows... We sort of pitch out ideas and put them on the wall, throw some number in, and the actual preferences [of customers] are revealed when you start to move.*' In addition to unknown customers and undefined product attributes (Hargadon and Douglas, 2001), there are no well-defined turfs of competition or spheres of influence to defend (Katila and Shane, 2005). This makes the landscape unstable and the competition intense.

Given the unknown topography of new markets, we propose in Hypothesis 3 that *high-performing firms* are particularly motivated to engage in *frequent market moves* in new markets for several reasons. First, since the new market landscape is in flux, firms that currently occupy high-performing positions have a high incentive to make market moves in order to keep pace with the changing topography of the landscape. Product introductions to new segments help firms understand the market (e.g., segment growth, customer preferences, effective sales channels). Such moves can also provide valuable information about customers' willingness to pay for particular features. In contrast, low-performing firms that occupy the valleys of the new landscape are more likely to be overwhelmed by instability, see few immediate solutions, and

adopt a *wait and see* strategy that lets the landscape *explore for them* (i.e., wait for new peaks to arise rather than engage in instant market moves). Consistent with this logic, several high-performing teams saw the new market as a *land grab* opportunity that needed to be exploited quickly before others entered, while unsuccessful teams focused on the '*risks of the unknown market*' and avoided moves. In fact, many low performers blamed the instability of the market for their poor performance. Second, high-performing firms are more motivated to engage in market moves because of momentum. That is, executives are likely to face high uncertainty in new markets and, thus, look to their recent past for simple and local solutions. Consequently, since high performers in new markets are likely to have engaged in frequent market moves in the past (Sorenson, 2000), they are likely to continue making market moves. Low performers are similarly likely to persist, so they make few market moves. Third, unlike established markets, firms in new markets can experiment with market moves without incurring significant retaliation. Information is often poor. Competitors are usually not entrenched in market segments, as the segments are ambiguous, competitive threats are unclear or even nonexistent, and norms of mutual forbearance are unlikely to exist. Thus, market moves in new markets are less likely to incur retaliation than those in established markets, especially if conducted by high-performing firms that can retaliate aggressively. Together, these arguments suggest that high-performing (not low-performing) firms are motivated to engage in market moves in new markets.

We propose in Hypothesis 4 that *high-performing firms* are particularly motivated to engage in *frequent R&D moves* in new markets for several reasons. First, since new but unpredictable peaks often arise as markets clarify, high-performing firms are highly motivated to keep pace by engaging in frequent R&D moves that offer technical alternatives to capture them. Consistent with this logic, one participant-manager described, '*Since we don't have a lot of information on customer preferences and purchase criteria [in the new market], we began development on a product with average specifications, and then will tweak/improve the product as additional information becomes available.*' Moreover, since undiscovered peaks are often near other peaks (Kauffman, 1995) and, thus, reachable through locally

proximate R&D moves (i.e., products developed for one segment can typically be offered in nearby segments), high-performing firms (since they have already discovered at least one peak) can more readily use R&D moves to capture other peaks and so are more motivated to do so. Second, high-performing firms are likely to be more confident given their success and, thus, more willing to engage in R&D moves in an unknown market, as illustrated by a manager of a high-performing firm who said *'if it fails, we'll struggle our way back...so we'll try to be the risk takers.'* In contrast, low-performing firms may lack the confidence to act in a new market that they do not understand, given its instability and their lack of success. These firms may also see no immediate path for how to use R&D moves to improve their position.

Overall, high-performing firms seek to maintain their position in new markets through aggressive market and R&D moves to learn about the new landscape and stay ahead of competitors (Katila and Chen, 2008). By contrast, low-performing firms in the market are paralyzed by the instability, unsure what to do and, thus, avoid moves. We hypothesize:

Hypothesis 3 (H3). High-performing firms will be more likely to enact market moves than low-performing firms in markets with highly temporary advantages.

Hypothesis 4 (H4). High-performing firms will be more likely to enact R&D moves than low-performing firms in markets with highly temporary advantages.

METHODS

Research setting

We tested the hypotheses using data from an experiential simulation, Markstrat3 (Larréché and Gatignon, 1998). Markstrat is a longitudinal simulation in which participant teams comprise the firms that compete with each other in a computer-simulated industry environment. The teams make a variety of competitive moves in each round of play in order to outmaneuver their rivals, gain competitive advantage, and perform well (Chen, 2007).

The Markstrat industry consists of two hypothetical product markets, Sonite and Vodite. At the

beginning of the simulation, all firms compete in the established Sonite market. This market has five customer segments. In each segment, customers have different preferences for specific product features. The segments also differ by size, margins, price sensitivity, and customer growth. In contrast, the Vodite market is new. Characteristic of new markets, the three emerging customer segments are unstable and disorganized. Customer preferences, including desired product features and adoption, preferred distribution channels, and price sensitivity, are unpredictable. Finally, like most new markets, there is very little information about the Vodite market. Indeed, it does not exist until a firm introduces a product.

A key difference between the two markets is the degree to which competitive advantage is likely to be temporary. Competitive advantage in the Sonite market is moderately temporary. Firms begin the simulation with existing products that are purchased by customers in existing segments. Their products have revenues, some brand loyalty, and at least some fit with customer preferences. But the market also has relatively low switching costs and limited intellectual property protection through secrecy, but not patenting. Thus, rivals can make competitive moves that overtake or outmaneuver entrenched firms (Teece, 1986; Katila, Rosenberger, and Eisenhardt, 2008). Nonetheless, firms can create a moderately sustainable advantage because it takes rivals time to develop better, or at least equal, products, produce them, and persuade customers to buy them.

By contrast, competitive advantage in the Vodite market is highly temporary. Unlike in the Sonites market, firms enter the Vodite market with few competitive advantages except, perhaps, financial resources. Indeed, it is unclear who the competitors will be and in what segments they will emerge. As firms begin to make competitive moves, the pace of change often accelerates. One team described *'the market [Vodite] changed so much. Our competitors would do things that were unpredictable... it didn't make sense for us to look too far ahead.'* For these reasons, competitive advantage in the Vodite market is likely to be highly temporary.

Five firms compete in each Markstrat industry. Participant teams decide their own firm's competitive moves and can monitor those of their competitors. They have several information sources. For example, teams receive an industry newsletter after every round. The newsletter contains public

reports on the stock market, economic variables, such as inflation and GNP growth rates, and performance indicators for all firms. Teams can also purchase data on the competitive moves made by all firms, including pricing information, product introductions and modifications, and advertising and R&D expenses. Thus, there are many information sources to assist the teams.

Experiential simulations such as ours have several advantages. First, they provide complete, transparent information on the actions of all participants (Larréché, 1987; Lant and Montgomery, 1992). For example, rather than capture only certain types of highly observable moves (e.g., pricing and newsworthy moves) or certain competitors (e.g., largest firms) as is typical of archival studies, simulations typically record all moves by all firms in an industry. Thus, researchers can gather uniquely comprehensive data sets and measure variables that would otherwise be difficult, costly, and perhaps impossible to obtain in real settings (e.g., discrete R&D investments). Second, the standardized structure of experiential simulations controls for some confounding variables, such as macroeconomic shocks and government interventions. This sharpens and isolates the phenomena of interest. Thus, like laboratory experiments, experiential simulations offer measurement, comparability, and control benefits that are less available with other methods. Third, the longitudinal nature of experiential simulations enables study of firm and industry evolution and, thus, leads to a more accurate understanding of causality.

In addition, Markstrat offers several further advantages, which make it particularly appropriate for our research. First, the Markstrat industry consists of two distinct product markets with differing likelihood of temporary advantage. As noted above, the established Sonite market offers some (although modest) possibility of a moderately sustainable competitive advantage, while the Vodite market offers no such advantage. Second, Markstrat provides a realistic view of competition. Based on several decades of theoretical and empirical research (e.g., Larréché and Gatignon, 1998), it has been used extensively in prior strategy research, and has been shown to provide an accurate description of competition among firms (e.g., Hogarth and Makridakis, 1981; Glazer, Steckel, and Winer, 1987; Lant and Hurley, 1999; Marinova, 2004). In fact, practicing managers who have participated in Markstrat have identified the

simulation's realism as one of its greatest strengths (Kinnear and Klammer, 1987). Third, the outcomes of simulation runs are idiosyncratic and emergent. Although each simulation begins with the same initial conditions, very different outcomes emerge from the complex interactions of rivals. For example, Markstrat industries sometimes evolve into near monopolies—with a single dominant firm—or into duopolies, while at other times all five firms lock in head-to-head competition. Since the Markstrat simulation involves firms engaging in complex, competitive interactions with each other (Gatignon, 1987), the likely outcomes of firm interactions and subsequent firm performance are emergent and unpredictable, just as they are in real industries.

Like all research methods, experiential simulations have limitations. To focus on the key aspects of the focal phenomena, some complexity is deliberately eliminated (Davis, Eisenhardt, and Bingham, 2007). In the case of Markstrat, there are restrictions. For example, firms cannot form alliances, make acquisitions, or enter new markets other than Vodites. Also, firms do not implement moves beyond the time and expense required to make them (Lant and Montgomery, 1992). Nonetheless, the simulation does enable a rich exploration of firm performance and key competitive moves and their implications for temporary advantage in distinct markets.

Sample and data sources

We conducted the simulation in a core masters-level class on strategy at a major U.S. west coast university. As a key component of the class, students participated in the simulation to gain hands-on, strategic experience. Groups consisting of three students formed each firm's top management team. Although Markstrat has been found to be very engaging and motivating due to its realism (Clark and Montgomery, 1996), we further motivated participants by using their firm's performance as a significant part of their course grade. Thus, participants were highly motivated to engage and perform well, just as managers of real firms are.

We gathered data during eight academic quarters, spanning 1999 to 2006. The data cover 32 industries (i.e., runs of the simulation) and 160 firms (i.e., five firms per industry). Although each of the five firms had a different starting position

(i.e., relative competitive position) in an industry, these starting positions were constant across all 32 runs of the simulation. In all industries, the simulation ran for seven rounds over six weeks, with a consistent number of days between each round for teams to analyze, discuss, and make their moves. We archived all data generated by the simulations. The result is a uniquely comprehensive set of quantitative data to study competitive moves. It is our main data source.

We also gathered demographic data. The average age of participants is 24 years, and most participants have at least two to three years of work experience. Sixty-seven percent of participants are male. Forty-four percent of participants are from the U.S. We formed the teams through random assignment, but stratified them to ensure that each had members with diverse national backgrounds and work experiences. In an additional analysis (available from the authors) we used demographic variables to control for team heterogeneity (Hambrick, Cho, and Chen, 1996), and our original results held.

As in all experiential simulation research, we must use care when generalizing the results beyond the focal demographic. Prior research using Markstrat finds no empirical differences in behavior between teams of masters students and teams of executives (Lant and Montgomery, 1992; Clark and Montgomery, 1996). This may mitigate concerns about generalizing to real executive behaviors and actual industry competition. Further, because the average age of the participants in our study is relatively young, the participant teams may be especially representative of executive teams in technology-based ventures.

To supplement our main data source of simulation runs, we collected additional data (both quantitative and qualitative) on teams and their moves. First, we conducted 45-minute semi-structured interviews with eight participant teams. These interviews provide insight into the process of deciding competitive moves and reveal which moves participants thought were most crucial. Second, we reviewed all 160 team papers and final presentations completed in conjunction with the simulation. We then prepared written cases for 20 teams stratified by starting position and industry. In each industry, one case focuses on the competitive moves of a high-performing team and another focuses on the competitive moves of a low-performing team. The cases give rich

understanding of the motivation for competitive moves. Third, we collected in-depth survey data for a sample of the teams—i.e., we surveyed 40 teams and asked them (1) What were the 2 to 3 most important decisions that you made this round? and (2) Why did you make them as you did? Fifty-five percent responded in all rounds, and all teams responded for at least three rounds. We coded and analyzed their responses to understand how teams viewed the competitive moves and their significance for competitive advantage. Of the 228 distinct competitive moves mentioned, 34 percent are R&D moves and 30 percent are market moves. Together, these data further confirm the importance of R&D and market moves (the focus of our hypotheses) for competitive interaction and competitive advantage.

Within the categories of R&D and market moves, we selected six competitive moves (three R&D and three market moves) to study further. Based on our analyses of the data described above, these six moves were considered the most important and captured the most crucial aspects of firm strategy. We confirmed these choices by analyzing several other moves, such as pricing and advertising. These did not significantly influence the results.

Measures

The dependent variables are frequencies of competitive moves. Consistent with competitive dynamics research measuring move frequency (Young *et al.*, 1996; Ferrier *et al.*, 1999), we use a count of competitive moves. Our first dependent variable is the frequency of *market moves*. We began by separating market moves into three types: market probe, market entry, and market exit. We used specific market moves in each market and in each round to code these moves. We then counted their number. We summed these moves for each firm in each round to compute market moves. Our second dependent variable is frequency of *R&D moves*, also measured as a count of moves made by each firm. Similar to market moves, we separated R&D moves into three types: R&D probe, R&D product, and R&D process. We used R&D moves in each market and in each round to code them, and then we counted their number. We summed these moves for each firm in each round to compute R&D moves. See the Appendix for technical details.

We also created two related dependent variable measures: *diversity of market moves* and *diversity of R&D moves*, because prior work has shown that both frequency and diversity of moves may boost competitive advantage. We measured diversity of moves as the diversification of the firm's market and R&D moves across customer segments in each round (number of Sonite segments ranged from zero to five and Vodite segments from zero to three). We calculated diversity using a Herfindahl index: $1 - \sum (N_a/N_T)^2$, where N_a equals the number of market or R&D moves made in segment a , and N_T equals the total number of (market or R&D) moves made. The measure ranged from 0 to 1, where higher values indicate greater move diversity.

The main independent variable is *firm performance*. We measure firm performance as the firm's market share in each round. Depending on the competitive move of interest, Sonite market share or Vodite market share was used. As a widely used assessment of performance relative to competitors (Armstrong and Collopy, 1996), market share measures the relative success of firms by providing explicit comparison to rivals. It is particularly appropriate for our study because it allows us to compare across simulation runs by controlling for industry size and other extraneous differences, such as pricing. Consistent with these arguments, studies of competitive moves have frequently used market share as the firm performance measure (Chen and MacMillan, 1992; Makadok, 1998; Ferrier et al., 1999; Ferrier, 2001). Our qualitative data confirm our choice as most interviewees discussed market share (and related revenues) at length in describing their competitive move strategies. We also used alternative measures of performance, including revenue, stock price, and total profit with qualitatively similar results.

There are several control variables. We control for *firm resources* to ensure that the availability of resources (rather than firm performance) did not explain frequency of moves. We measured resources as a firm's total revenue in each round (in millions of dollars, standardized). This is an appropriate measure because firms with more revenue are likely to have more resources than firms with less (Greve, 1998). Like other studies using Markstrat (Ross, 1987; Glazer et al., 1987), we also used starting position as a measure of firm resources. Markstrat assigns different starting

positions in the Sonite market to each of the five firms such that some teams begin with more resources than others (e.g., superior product portfolios). We used a dummy variable for discrete starting positions to control for this difference. The results, available from the authors, were similar to those for the original resources measure.

We control for *demand diversity* because diversity of consumer demand increases available opportunities and, thus, may trigger diversity in competitive moves (Miller and Chen, 1994) while lessening the frequency of specific moves. We measured demand diversity using a Herfindahl-type index per round: $1 - \sum (P_a/P_T)^2$, where P_a equals the number of products in segment a , and P_T equals the total number of products in all the segments in the (Sonite or Vodite) market. The measure ranges from 0 to 1 where higher values indicate greater diversity.

We control for the frequency of *competitor moves*. When competitors make many moves, especially relative to a focal firm, this hypercompetitive activity by rivals is likely to spur more moves by the focal firm (D'Aveni, 1994). We measured competitor moves as the number of moves made by all firms less those made by the focal firm. We compute this measure for each firm in each round and for each product market (i.e., Sonite or Vodite).

We control for the growth of the industry sector using the *sector growth* variable. Because slowly growing demand in a sector intensifies competition as firms increasingly compete for the same customers, we control for it. We measured industry sector growth as the percentage change in total industry revenue (sum of Sonite and Vodite markets) in each round.

We collected longitudinal data for each of the first six rounds of the Markstrat simulation. Although the simulation has seven rounds, we omitted the final round data to eliminate any possible end game actions. All statistical models consist of round-by-round panel data. To establish correct causal relationships, we use a lagged variable design. We recorded antecedents of moves (e.g., performance) at round r and predicted move frequency in round $r+1$.

Statistical methods

Since our dependent variable, move frequency, is a count variable, we use Poisson regression.

To account for firm heterogeneity, we use the Generalized Estimating Equations (GEE) method. The GEE method accounts for autocorrelation that arises because each firm (team) is measured repeatedly across multiple rounds of competition (Liang and Zeger, 1986; Haveman and Nonnemaker, 2000). The standard errors are derived from the Huber/White robust estimator of variance that is insensitive to the correlation structure in the GEE method.

We also predict diversity of moves, using Generalized Least Squares (GLS) regression. Since GLS models control for firm-specific variability in time series data, they do not produce biased estimates as OLS models might. Specifically, the GLS model corrects for autocorrelation and heteroscedasticity that arise in pooled time series data (Sayrs, 1989). Our data are subject to autocorrelation since each firm is measured repeatedly across multiple rounds and subject to heteroscedasticity because move diversity may increase over time as markets develop.

RESULTS

Table 1 contains descriptive statistics and correlations. On average, firms made 2.4 competitive moves in each round in the established Sonite market and 1.3 competitive moves per round in the new Vodite market. Across both markets, firms generally made more R&D moves (1.4 Sonite and 0.8 Vodite) than market moves (0.9 Sonite and 0.5 Vodite). Market share variation is greater in the new Vodite market, consistent with work showing greater performance volatility in markets where advantages are more temporary (Thomas and D'Aveni, 2009).

The variables show considerable variance, and the correlation matrix indicates low correlation among independent variables. The moderate correlation ($r > 0.5$) between firm resources and performance is an exception. Consequently, these variables are entered in the models both separately and simultaneously, but the results are mostly unaffected. Since potential collinearity may inflate standard errors, but does not invalidate significant parameter estimates (Darlington, 1990), multicollinearity does not pose a threat to the results that we report.

Tables 2 and 3 report the results for the established and new markets, respectively. The co-

Table 1. Descriptive statistics and correlations

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Firm performance: Sonite	0.20	0.08															
2. Firm performance: Vodite	0.09	0.22	0.01														
3. Firm resources	0.00	1.00	0.65	0.52													
4. Demand diversity: Sonite	0.78	0.02	-0.0003	-0.17	0.001												
5. Demand diversity: Vodite	0.42	0.27	-0.001	0.01	0.03	0.001											
6. Competitor moves: Sonite	10.04	4.28	0.01	-0.09	-0.02	0.18	-0.20										
7. Competitor moves: Vodite	4.66	3.99	-0.02	0.10	0.003	-0.23	0.46	-0.27									
8. Sector growth	0.26	0.17	-0.002	0.24	0.17	-0.15	-0.47	-0.07	0.16								
9. Market moves (frequency): Sonite	0.94	1.05	-0.10	-0.08	-0.03	0.09	-0.07	0.11	-0.16	-0.06							
10. R&D moves (frequency): Sonite	1.41	1.53	0.02	-0.16	-0.04	0.13	0.01	0.03	-0.05	-0.07	0.07						
11. Market moves (frequency): Vodite	0.47	0.84	0.07	0.34	0.13	-0.25	0.21	-0.10	0.28	0.12	-0.07	-0.20					
12. R&D moves (frequency): Vodite	0.83	1.16	0.11	0.36	0.26	-0.11	-0.03	-0.08	0.14	0.16	-0.02	-0.002	0.31				
13. Market moves (diversity): Sonite	0.52	0.38	-0.04	-0.18	-0.004	0.29	0.02	0.23	-0.21	-0.13	0.05	0.10	-0.28	-0.08			
14. R&D moves (diversity): Sonite	0.40	0.30	0.02	0.01	-0.01	0.04	0.10	-0.07	0.12	0.05	0.04	-0.06	-0.06	0.05	-0.08		
15. Market moves (diversity): Vodite	0.22	0.28	-0.01	0.14	0.04	-0.06	0.06	0.09	0.11	0.05	0.01	-0.11	0.94	0.14	0.001	-0.08	
16. R&D moves (diversity): Vodite	0.25	0.30	0.06	0.31	0.17	-0.15	0.06	-0.10	0.17	0.05	-0.01	0.09	0.33	0.90	-0.13	0.26	0.18

Table 2. Antecedents of move frequency in the established Sonite market: GEE Poisson regression results^a

	Table 2a. Frequency of market moves			Table 2b. Frequency of R&D moves		
	1	2	3	1	2	3
Firm performance		−1.957*** (0.447)	−2.307*** (0.551)		0.411 (0.357)	1.133* (0.492)
Firm resources	−0.078† (0.040)		0.050 (0.047)	−0.029 (0.033)		−0.099* (0.046)
Demand diversity	3.189 (2.415)	3.145 (2.414)	3.018 (2.416)	3.468† (1.998)	3.420† (1.996)	3.571† (2.001)
Competitor moves	0.026** (0.009)	0.027** (0.009)	0.027** (0.009)	0.003 (0.007)	0.003 (0.007)	0.003 (0.007)
Sector growth	−0.242 (0.230)	−0.325 (0.228)	−0.389 (0.236)	−0.396* (0.194)	−0.425* (0.192)	−0.339† (0.195)
Constant	−2.787 (1.873)	−2.358 (1.872)	−2.176 (1.879)	−2.363 (1.548)	−2.401 (1.548)	−2.685† (1.556)
Wald Chi ²	19.52***	34.51***	35.55***	10.65*	11.16*	15.43**

† p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001; two-tailed tests; N = 800.

^a Robust standard errors are below coefficients.Table 3. Antecedents of move frequency in the new Vodite market: GEE Poisson regression results^a

	Table 3a. Frequency of market moves			Table 3b. Frequency of R&D moves		
	1	2	3	1	2	3
Firm performance		0.737*** (0.167)	0.712** (0.239)		1.164*** (0.134)	0.835*** (0.190)
Firm resources	0.138** (0.042)		0.009 (0.062)	0.271*** (0.033)		0.123* (0.049)
Demand diversity	0.788** (0.258)	0.797** (0.257)	0.793** (0.259)	−0.387† (0.204)	−0.289 (0.202)	−0.376† (0.206)
Competitor moves	0.005 (0.014)	0.016 (0.015)	0.016 (0.015)	0.012 (0.013)	0.029* (0.013)	0.027* (0.013)
Sector growth	−0.465 (0.336)	−0.323 (0.337)	−0.333 (0.343)	−0.429 (0.278)	−0.090 (0.279)	−0.261 (0.285)
Constant	−0.391† (0.211)	−0.659** (0.222)	−0.649** (0.232)	0.301† (0.171)	−0.187 (0.183)	−0.032 (0.191)
Wald Chi ²	32.50***	40.21***	40.29***	67.43***	78.07***	85.09***

† p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001; two-tailed tests; N = 435.

^a Robust standard errors are below coefficients.

efficients indicate the antecedents of competitive move frequency in each market. Tables 4 and 5 are similar, but with competitive moves measured by their diversity.

Findings for markets with moderately temporary advantages

Table 2a displays the analysis predicting the origins of frequent market moves, and Table 2b shows the origins of frequent R&D moves in the established Sonite market. Model 1 in both tables includes the control variables only. Firms made

more market moves when the established market was rivalrous (*competitor moves*), a result consistent with crowded established markets where competitive moves encourage quick retaliation. We also find that firms made more R&D moves when the overall market demand in the Sonite and Vodite markets declined (*sector growth*), suggesting that firms engaged in more invisible R&D moves and kept honing their products when the overall market shrank. The results also show that resource availability (*firm resources*) did not consistently drive competitive moves in established markets.

Table 4. Antecedents of move diversity in the established Sonite market: GLS regression results^a

	Table 4a. Diversity of market moves			Table 4b. Diversity of R&D moves		
	1	2	3	1	2	3
Firm performance		−0.386* (0.154)	−0.535** (0.187)		0.294** (0.103)	0.296† (0.161)
Firm resources	−0.005 (0.014)		0.023 (0.017)	0.011** (0.004)		−0.0002 (0.008)
Demand diversity	3.028*** (0.833)	3.097*** (0.823)	3.006*** (0.825)	−0.190 (0.676)	−0.204 (0.671)	−0.247 (0.668)
Competitor moves	0.022*** (0.003)	0.022*** (0.003)	0.022*** (0.003)	−0.005† (0.003)	−0.004 (0.003)	−0.004 (0.003)
Sector growth	−0.212** (0.074)	−0.221** (0.072)	−0.249*** (0.075)	0.079† (0.041)	0.070 (0.049)	0.063 (0.046)
Constant	−2.020** (0.645)	−1.992** (0.637)	−1.890** (0.641)	0.606 (0.520)	0.550 (0.517)	0.583 (0.512)
Wald Chi ²	95.76***	102.87***	106.17***	22.30***	19.86***	21.41***

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; two-tailed tests; $N = 681$ for market moves and $N = 467$ for R&D moves.

^a Robust standard errors are below coefficients.

Table 5. Antecedents of move diversity in the new Vodite market: GLS regression results^a

	Table 5a. Diversity of market moves			Table 5b. Diversity of R&D moves		
	1	2	3	1	2	3
Firm performance		0.122* (0.059)	0.200* (0.078)		0.422*** (0.046)	0.343*** (0.064)
Firm resources	0.003 (0.015)		−0.027 (0.019)	0.100*** (0.015)		0.037* (0.019)
Demand diversity	0.092 (0.086)	0.077 (0.084)	0.101 (0.084)	−0.005 (0.073)	−0.029 (0.060)	−0.035 (0.067)
Competitor moves	−0.007 (0.005)	−0.004 (0.005)	−0.004 (0.005)	0.005 (0.005)	0.013** (0.004)	0.012** (0.004)
Sector growth	−0.243* (0.120)	−0.236* (0.118)	−0.194 (0.120)	−0.447*** (0.079)	−0.353*** (0.079)	−0.373*** (0.078)
Constant	0.291*** (0.073)	0.246** (0.076)	0.215** (0.078)	0.432*** (0.055)	0.279*** (0.059)	0.303*** (0.060)
Wald Chi ²	8.21†	12.34*	15.51**	99.00***	138.56***	133.21***

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; two-tailed tests; $N = 236$ for market moves and $N = 260$ for R&D moves.

^a Robust standard errors are below coefficients.

To test Hypothesis 1 on market moves, Model 2 in Table 2a introduces the firm performance variable. We argued that in established markets, firms avoid market moves when they have performed well, but make them more frequently when they have performed poorly (H1). As expected, the coefficient for firm performance is negative and significant ($p < 0.001$) in Model 2 and remains significant in the full model that includes the somewhat correlated firm resources variable. Thus, the results support H1 and indicate that high-performing firms avoid disruptive market moves.

To test Hypothesis 2 on R&D moves, Model 2 in Table 2b similarly introduces the firm performance variable. We argued that in established markets, firms will be motivated to make frequent R&D moves when they perform well (H2). The coefficient for firm performance is positive but not statistically significant in Model 2 and positive and significant ($p < 0.05$) in the full model. Together, the results support H2 and indicate that it is the high-performing rather than the low-performing firms that are motivated to make R&D moves in established markets.

Findings for markets with highly temporary advantages

Table 3a displays the analysis predicting the origins of frequent market moves, and Table 3b shows the origins of frequent R&D moves in the new Vodite market. Model 1 in both tables contains control variables. Firms did not make significantly more market moves when competitors moved aggressively (*competitor moves*), consistent with the uncrowded landscape of new markets with no well-defined turfs of competition or spheres of influence to defend. But they made more market moves when new types of customer demand emerged (*demand diversity*). Consistent with unexplored opportunities in new markets then, competitors did not focus on retaliation in existing market segments, but rather made market moves as new and diverse customer segments emerged. Unlike in the established market, resource-rich firms (*firm resources*) were more likely to make frequent market and R&D moves.

To test Hypothesis 3 on market moves, Model 2 in Table 3a introduces the firm performance variable. We argued that in new markets, firms will engage in market moves more frequently when they perform well (H3). As expected, the coefficient for firm performance is positive and significant ($p < 0.001$) in Model 2 and positive and significant ($p < 0.01$) in the full model. Thus, the results support H3 and suggest that high-performing firms engage in market moves to learn about the new market and stay in front of competitors.

To test Hypothesis 4 on R&D moves, Model 2 in Table 3b introduces the firm performance variable. We argued that firms will engage in frequent R&D moves in new markets when they perform well (H4). As expected, the coefficient for firm performance is positive and significant ($p < 0.001$) in Model 2 and in the full model. The results support H4 and indicate that it is the high-performing rather than the low-performing firms that enact R&D moves.

Tables 4 and 5 report the GLS regression results for the diversity of market and R&D moves in the established Sonite and new Vodite markets, respectively. The results support our main findings in Tables 2 and 3. These results also suggest that when the overall industry shrinks, firms are especially likely to use diversifying moves into the new Vodite market to identify new opportunities.

Together, these analyses provide strong confirmation of our main propositions.

Additional analyses

We conducted additional analyses. First, we further probed the relationship between firm performance and competitive moves. While our evolutionary search arguments suggested and found a continuous relationship between performance and competitive moves, we also considered whether firms may initiate search when confronted with failure relative to a reference point (Cyert and March, 1963; Greve, 2003b). Based on data from the Markstrat environment and participant interviews indicating that competitors used their rivals' performance as their benchmark (this relative performance also influenced participants' class grades), we used industry mean as a reference point—i.e., we expected that performance below the mean compared to the rest of the teams in the industry would lead the focal firm to alter the number and diversity of its competitive moves. Following Greve (2003b), we used the equation $Y_{r+1} = f[\beta_1(P_r - L_r)I_{Pr > Lr} + \beta_2(P_r - L_r)I_{Pr \leq Lr} + \beta_3 X_r]$ where the outcome variable is Y_{r+1} , (competitive move frequency and competitive move diversity), β_1 is the effect of performance when performance is above the reference point, and β_2 is the effect when performance is below the reference point. P_r signifies a firm's performance while L_r signifies the reference point (mean industry market share in the round). The indicator variable, I , takes the value of 1 if the subscript was true and 0 otherwise. X_r is a vector for control variables. This equation enabled us to test if performance relative to a reference point leads firms to alter the frequency (or diversity) of their competitive moves. Significance tests of the coefficients provide evidence of an effect on competitive moves, while the comparison of the coefficients indicates how the effect changes going from below to above a reference point.

Our results (details available from the authors) indicate that the slope of the performance variable indeed shifts, but the sign of the coefficients remains unchanged for below versus above the reference point. For example, in the established market, the coefficients for below-the-mean and above-the-mean performance variables are both negative and significant in predicting frequency of market moves and both positive and significant in predicting frequency of R&D moves. But there is a slight

variation in the value of the coefficients. The negative relationship between performance and market moves is more pronounced for *below*-the-mean performers and, in contrast, the positive relationship between performance and R&D moves is more pronounced for *above*-the-mean performers. That is, a decline in performance is particularly likely to encourage those firms that perform worse than the upper half of the industry to use more market moves. Similarly, an improvement in performance is particularly likely to encourage those firms that perform better than the lower half of the industry to use more R&D moves. These findings are consistent with our hypothesized effects in established markets that emphasize the attractiveness of market versus R&D moves to low-versus high-performing firms, respectively. Thus, these results further support our original findings.

We also conducted analyses with alternative measures of firm performance. In (unreported) results, we used stock price and return on investment as independent variables. Because these variables are not available for Sonites and Vodites separately, we used an aggregate measure. We also used aggregate market share (Sonite and Vodite). These results (available from the authors) are consistent with our original findings.

DISCUSSION

We examine the origins of competitive moves. Specifically, using the lens of evolutionary search theory, we study how prior performance influences a firm's propensity to engage its competitors in two markets where competitive advantage is moderately and highly temporary, respectively. Relying on experiential simulation methods coupled with in-depth fieldwork and covering 32 industries with 160 firms, we have several key findings.

Key findings for competitive moves

Market moves

We find that market moves originate for different reasons in the two markets. In *established markets* with *moderately temporary advantages*, high-performing firms are motivated to avoid market moves. Consistent with prior research (Gimeno and Woo, 1996), norms of mutual forbearance emerge in these markets because it is easy for

rivals to detect and respond to market moves that encroach in their occupied customer segments. Thus, high-performing teams conservatively seek to maintain the status quo. As one successful team noted '*we envision our Sonite [established] market share stabilizing around 30 percent, making our company a secondary player with no interest in taking over the market.*' In contrast, low-performing teams eschew the status quo. For example, a low-performing team felt '*compelled to compete in the low end [Sonite market segment]*' to prevent a particularly aggressive firm from '*obtaining a complete stranglehold.*' Thus, these low-performing teams attempt to disrupt the status quo despite the risks of challenging rivals in their established turfs. Overall, our findings provide strong qualitative and quantitative evidence that, as predicted by our evolutionary theory hypothesis, high-performing firms avoid market moves that attempt to scale occupied peaks, while low-performing firms engage in them in order to disrupt the advantages of others.

Conversely, high-performing firms are motivated to make frequent market moves in *new markets* with *highly temporary advantages*. In these markets, customer segments have not developed, rivals are confused, and advantages are likely to be highly temporary. In the language of landscapes, peaks are ambiguous, unpredictable, and fluctuating such that they are often unknown, unstable, or indefensible. A consistent finding in our written cases is that high-performing firms often quickly released products into the new Vodite market without much information. These moves were motivated by their interest in exploring the new market. But their effect was often to surprise and confuse other firms, especially low-performing firms. For example, one low-performing team expressed surprise by saying '*it was without knowing any information, that they [the other firm] introduced a product just right there. They were a really risky team.*' While the team ascribed their rival's uninformed market move to an inherent propensity for risk, they failed to consider that their rival was engaging in search to locate successful product-market combinations. In contrast, a high-performing team described their release of a very basic product that they intended to '*tweak and improve*' as they learned, illustrating the confident use of market entry moves to explore and learn the new landscape. In contrast, low performers avoided market moves because they did not see

an immediate way to use them to disrupt others in a new market.

R&D moves

We find that high-performing firms prefer to engage in more frequent R&D moves than low-performing firms in *both* established and new markets, but for different reasons. In *established markets*, as anticipated by our evolutionary theory hypothesis, the R&D moves of high-performing firms focus on creating a series of temporary advantages in order to remain on existing peaks and possibly raise them. In contrast, such fine-tuning moves did not make sense to poorly performing firms that currently occupied valleys. Rather, they focused on market moves that can have immediate effects. As one participant-manager on a low-performing team stated '*we would look at our market share and we would focus on those products where we were losing out. We would increase our advertising on those.*' Others recognized the value of R&D moves only in hindsight: '*[Last round] our competitors were a step ahead of us. They did R&D to improve their products and we didn't. We just relied on sales and marketing.*' In other words, while market moves were a natural proximate solution to pressing performance problems, poorly performing firms often did not recognize that longer-term R&D moves might also be a solution.

In *new markets*, R&D moves play a different role that focuses on wide-ranging exploration of the new landscape. Intriguingly, high-performing firms moved aggressively while lagging firms were hesitant. As one low-performing manager noted, '*In regard to the Vodite market, we thought 'let's wait and see'... We decided to focus on only one project so as to learn more about the market and then conduct R&D later to differentiate more. We did not want to commit to multiple projects for a so far unproven market.*' Another weak-performing team noted that '*we have adopted more of a 'wait and see' strategy for the Vodite market before we start expensive R&D.*' In contrast, a high-performing team said that '*we spent a lot on R&D.*' Thus, we find strong qualitative and quantitative support for the argument that high performers are especially motivated to engage in R&D moves in new markets.

Overall, our results are a significant departure from the usual explanation that high performers are

likely to make fewer moves than low performers. Rather, we find that this result is contingent on market type and move type—i.e., high performers are likely to make more market moves in new markets and more R&D moves in both kinds of markets.

Contributions to theories of temporary advantage

More broadly, we add insights to several literatures through our focus on temporary competitive advantage. First, we contribute to *competitive dynamics*. This literature emphasizes established markets like airlines, radio stations, and trucking. In contrast, we contribute by extending competitive dynamics to markets with varying temporary advantages. Our results suggest that high-performing firms are motivated to maintain status quo, but that this requires different search strategies in different markets. In established markets, high performers bolster their positions on existing peaks. In new markets, they boldly attempt to capture new peaks. By contrast, low-performing firms seek to disrupt the status quo, but this similarly requires different strategies in different markets. In established markets, low performers are aggressive risk takers that disrupt their rivals. In new markets, they are paralyzed risk avoiders because they lack the market understanding necessary to disrupt rivals.

Our findings conflict with traditional predictions of competitive dynamics. In markets with highly temporary advantages, strong performance (rather than a poor one as predicted by conventional theory) motivates moves. One explanation is that while high performers avoid competitive confrontation in the established market (where entrenched rivals have somewhat sustainable advantages and clear visibility of rivalrous moves), the ambiguity of new markets provides a shield to engage in moves (Zajac and Bazerman, 1991). In fact, our fieldwork suggests that managers of poorly performing firms were often surprised by the competitive moves of their higher performing rivals. As one said '*we did not expect [one of the market leaders] to invest in an R&D project...without any prior market information.*' Another manager anticipated entry, but not later moves and said '*before the Vodite entry, we knew that they were going to Vodites. But after that, we weren't sure if they were improving a lot of*

existing products or introducing a lot of new products.' Such moves left poor performers confused and reactive. Overall, high performance prompted firms to seize the initiative in new markets. In fact, we saw that high-performing firms often adopted an *all or nothing* strategy and seemed inspired by the opportunity for a *land grab*. One high-performing manager enthusiastically described the new Vodite market as '*the Wild West*.'

We also contribute to theories of temporary advantage with insights into *mutual forbearance*. Prior research shows that when firms compete in overlapping market segments (Gimeno and Woo, 1996), they refrain from engaging one another. This mutual forbearance is typically beneficial, especially when firms occupy spheres of influence (Gimeno, 1999). We extend the implications of mutual forbearance by confirming that high performers act in accordance with mutual forbearance in established markets where competitive advantages are moderately temporary. But we contribute the further insight that forbearance breaks down when competitive advantages are highly temporary. Here, high-performing firms are motivated to engage in *land grabbing*, and are not concerned with mutual forbearance. Indeed, mutual forbearance is likely to be irrelevant when there is no status quo to disrupt. This suggests a key boundary condition for the widely observed finding that firms refrain from moves because of mutual forbearance—i.e., the relevance of mutual forbearance is contingent upon the market.

Contributions to theories of evolutionary search

We also extend the scope of *evolutionary theory* to competitive markets and to markets in which the duration of competitive advantage differs. Research using evolutionary theory often focuses on search by single firms on one (usually stable) landscape. We add to the theory by examining competitive interaction and search on different landscapes, including new ones in which advantages are highly temporary.

Importantly, we contribute to the growing interest in competition that creates instability on landscapes. Recent research has begun to incorporate competition in evolutionary theory by modeling landscapes in which learning from rivals is more or less difficult (Rivkin, 2000; Csaszar and Siggelkow, 2009) and where firms search by taking

into account how others search (Katila and Chen, 2008; Katila *et al.*, 2010). For example, Katila and Chen (2008) find that firms innovate more effectively when they search either early or late and avoid synchronizing their search with rivals. Our results further suggest that these performance patterns may persist: high performers are motivated to be *out of sync* by avoiding *lock-step* moves in congested established markets, and boldly search to get a *head start* in wide-open new market landscapes. In contrast, low performers are much more likely to be driven to counterproductive *in sync* search with their competitors. Our contribution to evolutionary search theory is, thus, a nuanced view of how different starting positions differently influence competitive search in different landscapes.

Our second contribution is to use evolutionary theory to develop the theoretical roots of competitive dynamics as encouraged by Smith *et al.* (2001). By building on evolutionary theory, we conceptualize competitive moves as a search to solve problems. In particular, the evolutionary search lens provides an accurate portrait of the origins of competitive dynamics in fast-paced and unpredictable (new) markets and for diverse (R&D and market) competitive moves. Most importantly, we use evolutionary theory to combine the literatures on high-velocity, hyper-competitive environments with competitive dynamics and, thus, forge a richer theory of strategy when competitive advantage is temporary.

Finally, we contribute a new methodology to study competition. While past competitive dynamics research relies almost exclusively on archival data, we use a longitudinal experiential simulation. Like all research designs, this one has limitations. These limitations relate primarily to restrictions in the simulation (e.g., inability to make acquisitions [Puranam, Singh, and Zollo, 2006]). But this method also enables the capture of uniquely comprehensive information about moves and markets, controls for many extraneous factors and isolates the phenomena of interest. Thus, by using an experiential simulation coupled with fieldwork, we respond to a challenge by Smith *et al.* (2001: 46) to glean 'primary data directly from managers who actually make decisions and implement competitive actions.'

Limitations and future work

Like all research, ours has limitations that open up opportunities for future work. First, we focus on two markets where competitive advantage is temporary, but we leave unexplored markets (including new ones) where advantages are more sustainable. Future research could explore the implications of such markets for the origins of moves. Second, since we focus on the origins of moves, we neglect implications for performance. For example, while we observe that low-performing firms engage in disruptive market moves in established markets, we do not examine whether this strategy is effective. Similarly, we leave open whether some originally low-performing firms (in the established market) can prosper by *starting over* in the new market. Indeed, studying interactions across the two markets is an intriguing path for future research. Third, since our additional analyses offer only a glimpse of performance threshold effects, more detailed analyses could examine these effects further. For example, we focus on the effects of failure (and success) relative to an industry reference point. So, further analysis including other reference points might be informative. Finally, since our study uses experiential simulation with fieldwork, future research could re-examine our predictions in an (albeit less-controlled) industry setting.

CONCLUSION

To understand how firms live *life in the fast lane*, we examine firm performance and competitive interaction in new versus established markets. We conclude that high performance motivates search for continued dominance. This means conservative moves to bolster strategic position in more stable established markets, but bold moves to capture new opportunities in new markets where advantages are highly temporary. Conversely, low performance motivates disruptive market moves in established markets where advantages are moderately temporary, but conservative restraint in new markets where advantages are highly temporary. Together, the findings confirm that an evolutionary theory perspective that joins competitive dynamics with varied environments can provide a rich understanding of temporary advantage and the origins of competitive moves.

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APPENDIX

Measures of a firm's commercialization and market moves (labeled as *market moves*) were based on any changes in the customer segments in which the firm marketed products in each round. There were three types. *Market probe* is an entry into a customer segment in which the firm did not compete in the prior round, with a product that is supported by minimal advertising (less than \$1.5 million). Our interviewees indicated that Markstrat participants view \$1.5 million as a modest advertising expenditure, consistent with an experiment to learn about a market (Brown and Eisenhardt, 1997). By contrast, we measure *market entry* as entry into a customer segment in which the firm did not compete in the prior round, with a product that is supported by significant advertising (greater than \$1.5 million). Since this is a major market investment, actual advertising expenditures were much higher, continued over several

rounds of competing in the customer segment, and often consumed significant portions of the teams' budgets. We measure *market exit* as withdrawal of all products from a customer segment in which the firm is competing. We summed these moves to compute *market moves*.

Measures of a firm's R&D investment moves (labeled as *R&D moves*) were based on three types of R&D investments. An *R&D probe* is a \$100,000 investment to create a prototype of a new product. Its rationale is typically to experiment to learn more about feasibility and cost. By contrast, an *R&D product move* is an R&D investment exceeding \$100,000 to further develop a new product. Thus, product moves are much more costly and considerably larger than a probe. We measure an *R&D process move* as an R&D investment in an existing product that reduces its production cost. We then summed these moves to compute *R&D moves*.