Strategic Management Journal
Strat. Mgmt. J., **37**: 1132–1153 (2016)
Published online EarlyView 5 June 2015 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/smj.2376
Received 20 August 2013; *Final revision received 4 November 2014*

THE CLOCK IS TICKING! EXECUTIVE TEMPORAL DEPTH, INDUSTRY VELOCITY, AND COMPETITIVE AGGRESSIVENESS

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We examine how the interplay between executive temporal depth (time horizons that executives consider when contemplating past and future events) and industry velocity (the rate at which new opportunities emerge and disappear in an industry) shapes competitive aggressiveness (a firm's propensity to challenge rivals directly and intensely in order to maintain or improve its market position) and firm performance. Based on panel data (from 1995 to 2000) from 258 firms in 23 industries, we found that executive temporal depth exhibited different patterns of relationships with competitive aggressiveness in low- and high-velocity industries. Moreover, competitive aggressiveness had a positive main effect on firm performance, but this effect was stronger in high-velocity industries than in low-velocity industries.

INTRODUCTION

Based on the Austrian view of the market as a disequilibrium system (Kirzner, 1997), competitive dynamics research rests on the premise that changing conditions render a firm's positioning in a competitive market temporary either in the short run or the long run (Chen and Miller, 1994; D'Aveni, Dagnino, and Smith, 2010; Ferrier, 2001; Ferrier, Smith, and Grimm, 1999). This inherently temporal nature of competitive phenomena has brought the issue of time to the forefront of research on competitive dynamics. This research has identified two sets of temporal forces governing the creation and erosion of competitive advantage—macro and micro. Industry-level macro temporal forces (e.g., hypercompetition, dynamism, and velocity) define the time windows of opportunities available for incumbents to establish new advantages and negate the advantages of competitors and impose different levels of pressure on incumbents to retaliate (Chen *et al.,* 2010a; D'Aveni *et al.,* 2010; Davis, Eisenhardt, and Bingham, 2009; Katila, Chen, and Piezunka, 2012; Rindova, Ferrier, and Wiltbank, 2010). Micro temporal forces, in the form of speed, intensity, timing, and sequences of actions taken by individual firms, determine their competitive advantages over rivals and in turn their survival and success (Derfus *et al.,* 2008; Ferrier, 2001). Firms that take speedy and frequent competitive actions are better positioned competitively and show superior performance (Katila and Chen, 2008; Rindova *et al.,* 2010).

Despite the rich insights yielded by this literature, several gaps remain in our understanding of how time manifests in competitive dynamics.

Keywords: competitive dynamics; temporal orientation; executive cognition; competitive aggressiveness
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A particularly prominent gap pertains to the limited understanding of how executives' *temporal orientations* (relatively stable tendencies in evaluating and interpreting time) shape competitive behaviors. This gap is especially important because competitive dynamics scholars recognize that "competitive actions can be seen as products of the perceptions … of [competitive] actors in an organization" (Chen and Miller, 2012: 29). Building on the upper echelons perspective (Hambrick and Mason, 1984), this research emphasizes that executive orientations create filters in how they notice and interpret competitive cues and in turn determine a firm's overall propensity to initiate new and responsive actions (Chen and Miller, 2012). Studies have shown that cognitive categorization of competitors (Porac, Thomas, and Baden-Fuller, 1989; Reger and Huff, 1993), competitor acumen (Tsai, Su, and Chen, 2011), cognitive frameworks (Marcel, Barr, and Duhaime, 2011), and perceived competitive tension (Chen, Su, and Tsai, 2007) explain additional variance beyond that caused by industry and firm factors.

Research on the subjective perspective of time in strategy has also stressed that executives' temporal orientations mold expectations and evaluations of decision situations and form the basis of executives' strategic choices (Ancona, Okhuysen, and Perlow, 2001; Bluedorn, 2002; Das, 1987). Studies have shown that temporal heuristics and preferences used by managers in sequencing and pacing activities are critical to capturing new opportunities, becoming informed of external environmental changes, and adjusting firm strategies to these changes (Bingham and Eisenhardt, 2011; Gersick, 1994). This research suggests that executives' temporal orientation likely serves as a third temporal force in determining competitive behaviors of firms.

We address this gap by examining the role of executive temporal orientation in driving competitive behaviors of firms. We capture executive temporal orientation by the concept of *temporal depth,* which refers to the temporal distance into the past and the future that executives typically consider when contemplating events that have happened or may happen (Bluedorn, 2002; Bluedorn and Martin, 2008). Time horizons are fundamental aspects of a firm's strategic orientation (Das, 1987). Short time horizons provide flexibility and quick adaptation but also give rise to temporal myopia and economic short-termism (Laverty, 1996; Marginson and McAulay, 2008). Long time horizons lend foresight in management but delay short-term adaptation to changing environmental conditions (Levinthal and March, 1993; Miller, 2002). Therefore, variation in consideration of time horizons has implications for strategic choices (Laverty, 1996; Marginson and McAulay, 2008; Souder and Bromiley, 2012).

Anecdotal examples show that executives vary in their temporal depth orientation, which guides their strategic philosophy. A *Financial Times* article in 2009 described Jack Welsh, CEO of GE, as the "father of the [short-term] shareholder value movement." Dowd and Hutchinson (2010: 150) explain how "Jack Welsh used short-term results to determine bottom ranking 10 percent of managers each year so he could fire them." In contrast, the following quotes from Costco CEO James Sinegal's interviews illustrate his long-term orientation:

> *I think the biggest single thing that causes difficulty in the business world is the short-term view. We become obsessed with it. But it forces bad decisions. (*http://ethix.org/2003/04/01/a-long-term-business-perspective-in-a-short-term-world)

> *Wall Street is in the business of making money between now and next Tuesday. We're in the business of building an organization, an institution that we hope will be here 50 years from now. (*http://blog.acton.org/archives/58360-fulfillment-and-flourishing-at-costco.html)

This long temporal depth has defined Costco's strategic philosophy of treating employees as a future investment (e.g., paying higher wages and benefits and opportunities for growth) and focusing on long-term customer loyalty (e.g., membership programs) rather than short-term sales.

We propose that the relationship between executive temporal depth, competitive behaviors, and firm performance will be moderated by *industry velocity*, defined as the rate at which new opportunities emerge and disappear in an industry (Davis *et al.,* 2009; Eisenhardt and Martin, 2000). By determining how quickly technologies, products, and competitive actions become obsolete in an industry, industry velocity sets the competitive clock for incumbent firms to act and react. Therefore,

DOI: 10.1002/smj

we contend that a match between executive temporal depth and the wavelength implied by industry velocity (short vs. long duration of competitive change cycles) will enhance competitive behaviors and in turn firm performance, whereas a mismatch between the two will undermine both. We conceptualize competitive behaviors as *competitive aggressiveness*, a fundamental concept capturing interfirm rivalry (Chen *et al.,* 2010a). It is defined as "the propensity of a firm to directly and intensely challenge rivals in order to maintain or improve its market position" (Yu, Subramaniam, and Cannella, 2009: 128). We test this model using panel data (1995–2000) on 258 firms from 23 industries.

This study advances existing research in two ways. First, it extends research on time in competitive dynamics by introducing a third temporal force—executives' temporal orientation. This subjective perspective of time complements research on both industry-level (macro) temporal forces and firm-level (micro) competitive behaviors. By integrating research on the three temporal forces, this study presents a more complete understanding of how time manifests in competitive dynamics. Second, whereas strategy research has focused almost exclusively on future time horizons, we examine the impact of both past and future time horizons on competitive behaviors and firm performance. By highlighting the distinct relationships of executive past and future time horizons to competitive aggressiveness in varied industry velocity contexts, this study presents a more fine-grained conceptualization of time horizons in strategy.

THEORY DEVELOPMENT

Research on time in competitive dynamics

Competitive dynamics research has identified two temporal forces—macro and micro. *Macro temporal forces* are temporal features of the environment that serve as time givers and determine the degree to which the competitive advantage enjoyed by incumbent firms is temporary or sustainable (Derfus *et al.,* 2008; Miller and Chen, 1996). Several temporal features of the environment have been identified, including hypercompetition (Chen *et al.,* 2010a; D'Aveni *et al.,* 2010; Thomas and D'Aveni, 2009), industry velocity (Eisenhardt and Martin, 2000), industry dynamism (Davis *et al.,* 2009), market uncertainty (Chen and Miller, 1994) and nascent vs. established industries (Chen *et al.,* 2010b; Katila *et al.,* 2012; Rindova *et al.,* 2010). *Micro temporal forces* are reflected in the actions taken by individual firms in creating and pursuing new opportunities. Temporal features of firm actions, such as speed, timing, volume, and unpredictability, have been shown to influence firm performance (Ferrier, 2001; Katila and Chen, 2008; Rindova *et al.,* 2010).

A key notion of this research is that macro (industry-level) and micro (firm-level) temporal forces interact in shaping interfirm rivalry. Because the competitive rules of success and the temporal contingencies facing incumbent firms are unique to an industry, performance benefits that firms derive from action attributes such as speed and volume depend on the temporal features of the industry (Chen and Miller, 1994; Derfus *et al.,* 2008; Ferrier, 2001). Chen *et al.* (2010b) and Katila *et al.* (2012) found that the frequency and type (exploratory and exploitative) of R&D and market moves yielded different levels of firm performance in new and established markets. Similarly, Chen *et al.* (2010a) found that action speed and volume were more strongly associated with superior performance in fast-changing, hypercompetitive industries than in slow-changing industries. Finally, Rindova *et al.* (2010) found that simple and predictable sequences of competitive moves received higher investor evaluation in nascent industries.

Together, this research highlights that both firm and industry temporal forces are central to determining competitive behaviors and outcomes. We add to this existing body of literature by theorizing that subjective perspective of time is likely to serve as a third temporal force in shaping the creation and erosion of competitive advantage.

Subjective perspective of time in competitive dynamics

Drawing on the upper echelons theory (Hambrick and Mason, 1984), competitive dynamics studies have stressed the subjective basis of competitive behaviors. As top managers sift through and reconcile large amounts of incomplete, ambiguous, and conflicting data, their orientations and perceptions enter greatly into the decision to undertake a competitive action (Chen and Miller, 2012; Hambrick, Cho, and Chen, 1996). This literature has identified executive awareness as a key driver of problem sensing, interpretation, and enactment of environmental cues and, in turn, of competitive

DOI: 10.1002/smj

behaviors (Marcel *et al.,* 2011). Perceptual filters enhance or inhibit executives' awareness of the relevant cues in the competitive environment and determine the degree to which executives can accurately gauge critical threats and opportunities and match perceived problems with strategic solutions (Chen, 1996; Ferrier, 2001). As Chen *et al.* (2007: 103–104) state "Indeed, the perceptions of decision makers … —the level of competitive apprehension or anticipation they feel as they observe, filter, and act on competitive information—inform the way a firm acts (strategically or competitively) on those perceptions." Porac and Thomas (1990: 228) also explain how "decision makers make sense of competitive environments by developing cognitive taxonomies that summarize the similarities and differences among [rival] organizations." Similarly, Livengood and Reger (2010) emphasized that how the firm sees itself and its domain in the competitive arena can help explain why firms act and react the way they do. Strategists' inaccurate assumptions about the competitive landscape create blind spots or judgmental impairment, prompting them to overlook the emergence of a new rival (Chen and Miller, 2012).

Empirical evidence supports the subjective nature of interfirm rivalry. Porac *et al.* (1989) found that Scottish knitwear manufacturers varied in their definition of competitors and criteria for competing. Reger and Huff (1993) showed that incumbent firms clustered competitors based on their perceptions of shared strategic commonalities among rivals. Recent studies have found that executives' competitor acumen (Tsai *et al.,* 2011), perceived competitive tension (Chen *et al.,* 2007) and cognitive frameworks (Marcel *et al.,* 2011) drive competitive behaviors and outcomes.

However, this literature has not addressed executives' temporal orientation. This gap is especially important because strategy scholars increasingly emphasize that strategic decisions are made by individual strategy makers whose temporal orientation cannot be ignored because such omitting provides "a misleading conception of time when it relates to strategy making" (Das, 2004: 59). According to this view, executives mentally create their own "temporal zones" (e.g., short-term vs. long-term) when deciding on strategic actions, irrespective of the actual environment they face (Barringer and Bluedorn, 1999; Huy, 2001). These temporal orientations serve as temporal filters that mold expectations and evaluations of decision situations and form the basis of choices related to resource allocation and prioritization, as well as recognition of the timing and urgency of strategic activities (Das, 1987). Drawing on this research, we argue that executives' temporal orientations will serve as filters that shape which competitive stimuli executives selectively perceive and which stimuli they ignore, and how they interpret the noticed stimuli, which in turn influences competitive behaviors. We examine the relationships between executives' temporal depth, competitive aggressiveness, and firm performance.

Executive temporal depth and competitive aggressiveness

Research in psychology has identified several facets of people's temporal orientation, defined as inherent, persistent, and relatively stable tendencies in evaluating and interpreting time (Bluedorn, 2002; Zimbardo and Boyd, 1999). Studies in this stream have made significant progress in identifying and validating specific forms of temporal orientations such as time perspective (Zimbardo and Boyd, 1999) and temporal depth (Bluedorn, 2002). These temporal orientations hold considerable promise for sharpening the temporal lens and advancing theory and research on the subjective view of time in strategy (Ancona *et al.,* 2001). Recently, Nadkarni and Chen (2014) found that CEO temporal focus (the degree to which CEOs characteristically devote attention to the past, present, and future time frames) influenced rate of new product introductions.

We examine a unique form of temporal orientation not addressed in previous research—temporal depth, which refers to the temporal distance (or time horizons) into the past and the future that executives typically consider when contemplating events that have happened or may happen (Bluedorn, 2002; Bluedorn and Martin, 2008). Temporal depth is especially relevant to the context of strategy because time horizons are fundamental aspects of a firm's strategic orientation (Das, 1987) and influence a broad range of strategic behaviors such as technological and capital investments (Laverty, 1996; Marginson and McAulay, 2008; Souder and Bromiley, 2012). Katila and Chen (2008) found that the time horizon of search (early vs. late) determined the frequency and innovativeness of new products introduced by the firm. Das (1987) found that executives in the same industry differed in their subjective time horizons, and these differences

DOI: 10.1002/smj

influenced the time horizons they considered in strategic planning. However, much of this research has examined mostly future time horizons. Gavetti and Levinthal (2000) argued that both backward and forward looking searches are essential to strategic adaptation. Temporal depth provides a comprehensive framework for understanding how time horizons considered in strategic decisions can stem from executives' innate orientation towards temporal distance into the past as well as the future.

Temporal depth subsumes two distinct dimensions, *past temporal depth* (PTD) and *future temporal depth* (FTD), each of which is associated with different information processing filters (Bluedorn, 2002). PTD, which captures how far back executives tend to go when considering past events (Bluedorn and Martin, 2008), has both pros and cons for decision making. On the positive side, a long past temporal depth promotes a deeper understanding of the past and increases the chances of matching current situations with relevant lessons from prior situations to solve current problems quickly (Bluedorn, 2002; Clark and Collins, 1993). With the passage of time, events and situations become more understandable and explicable in terms of normative, situational, and objective forces (Taylor and Fiske, 1978). Whereas "people may have trouble seeing the forest for the trees for near-past events and situations, the passage of time allows one to take a cognitive step back and view the larger canvas" (Miller and Porter, 1980: 537–538). Strategy researchers have also argued that cumulative past experience built through repeated observations and actions provides a deeper understanding of the technological and market context and reduces errors and false starts in initiating actions such as new product introductions (Helfat, 1997; Katila, 2002). At the same time, a long PTD can filter out critical aspects of the current context and prompt executives to consider distant past cues that may no longer be relevant. Such consideration of outdated information can inject errors and backtracking into evaluations of strategic alternatives (Brown and Eisenhardt, 1997). Nerkar (2003) advocated the virtues of "recency" in avoiding errors and competence traps that can hamper creation of new knowledge.

FTD—how far ahead executives tend to look when considering the future—is also considered a double-edged sword in decision making (Bluedorn, 2002). A long FTD promotes "pattern recognition," the ability to visualize long-term future changes that are not easily visible in the short run (Strathman *et al.,* 1994). Such pattern visualization increases executives' awareness of distant future developments and allows them to make *a priori* investments to prepare for such developments. Executives with a short FTD may fail to foresee and prepare for potential future environmental opportunities and threats in advance (Bluedorn, 2002; Bluedorn and Martin, 2008). Strategy scholars also contend that the tendency to look into the long run can enhance competitiveness of firms in the marketplace by promoting foresight of management and by allowing managers to meticulously prepare for future developments (Miller, 2002). Overlooking the distant future can result in temporal myopia and short-termism, which prompt investment in technological and market opportunities that yield quick returns in the short run but can damage future competitive advantages of the firm (Chen and Miller, 2015; Laverty, 1996; Levinthal and March, 1993; Marginson and MacCaulay, 2008). However, a long FTD can make executives overcommitted to long-term goals and undermine their ability to adjust to critical short-term changes. Such hesitance to deviate from the long-term vision can create rigidities that can blind managers to changes in the short-term environmental conditions and create inertia in adapting to these changes (Levinthal and March, 1993).

We argue that executive temporal depth will create temporal filters that influence executives' awareness of the temporal significance of the competitive landscape and their consideration of competitive alternatives, in turn shaping competitive behaviors of firms. Specifically, we focus on the influence of executive temporal depth on a firm's competitive aggressiveness, which has emerged as a fundamental concept capturing interfirm rivalry. Competitive aggressiveness reflects the degree to which a firm engages intensely with its rivals through its competitive repertoires, which are a set of market actions (e.g., price changes, product line or service alterations) used by a firm in a given year to proactively get ahead of rivals and to respond to rivals' actions (Yu *et al.,* 2009). These action repertoires lie at the core of competitive aggressiveness and lend a holistic understanding of the approaches that competing firms stake in vying against one another (Chen *et al.,* 2010a). A firm is said to have a high degree of competitive aggressiveness "if it has rapidly taken a large number of actions. The integrated consideration of both action volume and speed is essential for

DOI: 10.1002/smj

revealing the nuance of temporary advantage" (Chen *et al.,* 2010a: 1413). Aggressiveness allows firms to proactively seize new opportunities ahead of rivals and to shorten the duration of advantages enjoyed by rivals. By undertaking more actions (volume) and acting more quickly in the wake of rivals' moves (speed), firms can proactively address the time-dependent nature of competitive advantage (Andrevski, Brass, and Ferrier, forthcoming; Eisenhardt, 1989; Ferrier, 2001). Therefore, time-sensitive elements of competitive behaviors lie at the heart of competitive aggressiveness. As Chen *et al.* (2010a: 1413) advocate, competitive aggressiveness "represents a fine-grained investigation at the micro firm-behavior level."

The relationships of PTD and FTD with competitive aggressiveness are likely tenuous because of the opposing mechanisms associated with them. PTD may promote aggressiveness by providing a deeper awareness of the broad historical competitive trends but may also hinder it by prompting executives to consider distant past cues that may no longer be relevant and by hampering their awareness of the nuances of the current competitive context. Similarly, FTD may enhance competitive aggressiveness by inducing executives to detect long-term competitive patterns and prepare for distant future developments ahead of competitors but may also inhibit aggressiveness by undermining executives' awareness of short-term changes. A potential resolution to the question of whether PTD and FTD enhance or inhibit competitive aggressiveness is examination of the environmental conditions within which executives operate, a point to which we now turn.

The role of industry velocity

"One of the hallmarks of strategy research is that relationships are typically contingent (i.e., it depends)" (Carpenter, 2002: 276). The contingency perspective in strategy has long recognized that the influence of executives' orientations on strategic behaviors is contingent on the demands posed by the environment such that a match between executive orientations and the environment results in superior firm performance (Keck, 1997; Lawrence and Lorsch, 1967). Consistent with the contingency perspective, the entrainment theory explains how the temporal adjustment of internal organizational activities to the temporal features of the environment results in superior adaptation and performance (Ancona and Chong, 1996). Entrainment is defined as the process by which activity cycles of one system synchronize to those of another, more dominant system (Ancona and Chong, 1996; Bluedorn, 2002). The dominant system, typically referred to as the time giver, sets the tempo (i.e., the speed at which the activity is to be performed) of activity cycles to which the organization must entrain. The time giver for an organization is its external environment, and effective adjustment to external temporal parameters is central to maximizing firm performance (Ancona and Chong, 1996). Successful environmental adaptation requires adjustment of temporal milestones, pacing, and sequencing of internal organizational activities to environmentally imposed time limits (Gersick, 1994; Sastry, 1997).

In this sense, executives are closely tied to environmental pacers such as technology, market, and competitor cycles, and temporal orientations of executives are likely to affect their ability to entrain to external temporal cycles (Ancona *et al.,* 2001; Okhuysen and Waller, 2002). When executives' temporal orientations are compatible with the external temporal demands of the environment, executives can accurately detect and monitor external temporal contingencies and undertake responsive actions to adjust the internal activities of the firm to the external temporal requirements. In contrast, an inconsistency between the two can prompt executives to miscalculate environmental temporal demands and to undertake actions that are misaligned with these demands (Huy, 2001). Empirical studies have found that a fit between external environmental tempo setters such as hypercompetition (Chen *et al.,* 2010a), dynamism (Nadkarni and Chen, 2014), and turbulence (Hambrick, Geletkanycz, and Fredrickson, 1993) and managerial orientations maximized competitive behaviors and outcomes.

Drawing on the contingency and entrainment perspectives, we theorize a moderating effect of *industry velocity* (also referred to as industry clock speed), which reflects the speed or rate at which new opportunities emerge and disappear (Davis *et al.,* 2009; Eisenhardt and Martin, 2000). In the competitive context, opportunities embody new sources of gaining competitive advantages (e.g., technological and product innovations) and of destroying the advantages of rivals. In high-velocity industries, characterized by high rates of new product

DOI: 10.1002/smj

introductions, technological changes, and competitive actions, competitive advantages are rapidly created and destroyed. High level of competitive activity in the form of new products, mergers and acquisitions, market expansion, and strategic alliances compress the temporal window of opportunities and push rivals into accelerating the pace of responses (Derfus *et al.,* 2008). As Chen *et al.* (2010a: 1410) state, "firms engage in an escalating series of competitive actions simply to maintain pace with opponents." Conversely, in low-velocity industries, characterized by few and rare changes in products, technologies, and other competitive actions, incumbents enjoy longer temporal windows of opportunities and sustainable advantages from existing competitive actions (Nadkarni and Narayanan, 2007). Because industry velocity serves as a critical temporal contingency for incumbent firms, we propose that it will moderate the influence of executive temporal depth on competitive aggressiveness as well as the influence of competitive aggressiveness on firm performance.

We propose two broad sets of relationships. First, we expect that executive PTD and FTD will exhibit different patterns of relationships with competitive aggressiveness in high- and low-velocity industries (H1 and H2). Second, we argue that the positive effect of competitive aggressiveness on firm performance will be stronger in high-velocity industries than in low-velocity industries (H3).

HYPOTHESES

Executive PTD and competitive aggressiveness

PTD allows for depth of understanding of the historical context and increases the chances of quickly finding relevant lessons from a wide range of past actions and outcomes in undertaking present behaviors (Bluedorn, 2002; Miller and Porter, 1980; Zimbardo and Boyd, 1999). We propose that these attributes associated with executive PTD will promote awareness of the competitive landscape and in turn increase competitive aggressiveness in low-velocity industries, but inhibit competitive awareness and in turn aggressiveness in high-velocity industries. In low-velocity industries, where rate of technological and market changes is slow and rivals engage each other in similar ways over time, incumbents enjoy competitive advantages over a long period of time (Katila *et al.,* 2012; Katila and Chen, 2008; Thomas and D'Aveni, 2009). Competitive interactions patterns in low-velocity environments emerge in the long run rather than the short run (D'Aveni *et al.,* 2010; Eisenhardt and Martin, 2000). Because a long executive PTD is associated with "an increased ability to detect patterns by making it possible to perceive patterns displaying longer wavelengths" (Bluedorn and Martin, 2008: 15), detection of broad historical patterns that are not easily visible in the short run may increase executives' awareness of hidden threats of rivals' actions and alert them to the necessity and urgency of initiating competitive actions. Such acute awareness of subtle opportunities and threats enhances executives' realization of the need for proactively undertaking a large number of new actions and responding in a speedy manner (Chen, 1996; Chen *et al.,* 2007; Ferrier, 2001). By considering a longer time horizon, executives can draw on and combine many more pieces of information to quickly find many solutions to current competitive problems.

Conversely, in high-velocity industries, short product and process life cycles and new ways of problem solving quickly decrease the usefulness of past knowledge, experiences, and advantages (D'Aveni, 1994; Davis *et al.,* 2009; Eisenhardt and Martin, 2000). Because competitive interaction patterns in high-velocity industries emerge in the short term rather than the long term (D'Aveni *et al.,* 2010), "The past must not be interpreted as a simple recipe for success that can be used for a long time" (Bluedorn, 2002: 128). Rather, looking into the distant past may constrain executives' awareness of the short-term changes in the competitive landscape and prompt them to miscalculate the temporal window of opportunities in initiating actions and responses (Barringer and Bluedorn, 1999; Bluedorn and Martin, 2008). As a result, executives may face considerable delays in action taking and may be left with only a small number of viable competitive action alternatives. By ignoring the current happenings and selectively perceiving distant historical events that may no longer be relevant, executives with a long PTD are likely to "become increasingly removed from other forms of experiences and more vulnerable to change in their environments … Knowledge about and use of old competencies can inhibit efforts to change" (Levinthal and March, 1993: 102). Such lack of awareness can foster passivity and hamper quick precipitation of a large volume of competitive actions in these contexts (Bettis and Hitt, 1995; Marcel *et al.,* 2011; Miller

DOI: 10.1002/smj

and Chen, 1994). Tripsas and Gavetti (2000) found that cumulative past experiences frequently constrained executives' timely competitive responses in the fast-changing digital photography industry.

Hypothesis 1 (H1): Industry velocity will moderate the relationship between executive PTD and competitive aggressiveness such that this relationship will be positive in low-velocity industries, but negative in high-velocity industries.

Executive FTD and competitive aggressiveness

In low-velocity industries, changes in technologies, competition, and customer preferences are gradual and subtle, occur over relatively long cycles, and are not easily visible in the short term (Chen *et al.,* 2010a; Davis *et al.,* 2009; Eisenhardt and Martin, 2000). We expect that a long FTD will positively influence firms' competitive aggressiveness in these environments, for two reasons. First, the competitive dynamics literature has argued that acute awareness of the competitive structure allows executives to notice and proactively respond to more opportunities and threats ahead of rivals (Chen *et al.,* 2007; Ferrier, 2001). In slow-changing industries, where changes in the competitive environment occur gradually and only manifest in the long run (Eisenhardt and Martin, 2000; Nadkarni and Narayanan, 2007), the "pattern detection" ability associated with FTD is likely to promote an acute awareness of the competitive environment (Bluedorn and Martin, 2008). A long FTD may alert executives to potential developments in the distant future that are not easily visible in the short run, allowing them to quickly recognize and respond to more opportunities and threats ahead of rivals in a proactive manner, in turn resulting in greater competitive aggressiveness. Katila and Chen (2008) found that firms that initiated competitive moves over a longer time horizon engaged in an early search for new opportunities ahead of rivals and precipitated greater number of new products.

Second, strategy research has argued that, in low velocity environments where changes are slow and can be gauged accurately in advance, an extensive and exhaustive *a priori* long-term strategic analysis can reduce potential barriers to identifying new opportunities as well as to coordinating and allocating resources needed to quickly realize multiple opportunities (Forbes, 2007). In contrast, a short executive FTD may hinder awareness of the long-term trajectories of technological, market, and competitive changes. Because changes in the short term are few in low-velocity industries (Davis *et al.,* 2009), a short-term orientation may engender "temporal myopia" such that executives fail to proactively predict, prepare for, and act on long-term changes in the competitive environment (Chen and Miller, 2012; Levinthal and March, 1993: 110). Thus, a long executive FTD will facilitate competitive aggressiveness in low-velocity industries, whereas a short FTD will hinder aggressiveness.

In contrast, competitive dynamics scholars increasingly highlight the short time frame of competitive advantage in high-velocity industries, where technologies, markets, and competitors shift continually and competitive advantages erode very quickly (Bettis and Hitt, 1995; Chen *et al.,* 2010a). In such industries, the advantages of FTD are likely to occur only up to certain levels, beyond which a longer FTD can hinder competitive aggressiveness, for several reasons (Barringer and Bluedorn, 1999; Bluedorn and Martin, 2008). First, an excessively long FTD "engenders a reluctance to deviate from a long-term view of the future despite short-term environmental change." (Barringer and Bluedorn, 1999: 425). Because changes occur frequently and in the short term rather than the long term, an overly long FTD may hinder awareness of critical short-term competitive changes (Barringer and Bluedorn, 1999), reducing both the speed and volume of viable competitive actions. Competitive dynamics research has stressed that flexibility in resource allocation and coordination is central to instilling competitive aggressiveness (Chen and Miller, 1994; Ndofor, Sirmon, and He, 2011).

Second, unlike low-velocity industries, in which changes occur mainly in the long term, high-velocity industries are characterized by continuous and rapid changes in technological and competitive trajectories. Long-term predictions are difficult, and little concrete, detailed information about distant future events can be deduced in advance (Eisenhardt and Martin, 2000). As Bettis and Hitt (1995: 12) argued, "forecasting can be useful, but only in certain ways … the time frame of forecasting has shrunk, but it is still important." Because long-term trends are unknowable in such environments, a series of nested short- and medium-term decisions lends more flexibility than long-term oriented options (McGrath and Tschan, 2004). Thus, an excessive executive FTD may hinder awareness of the competitive context.

DOI: 10.1002/smj

Together, this research suggests that, in high-velocity industries, a very short FTD may give rise to temporal myopia, whereas a very long FTD may create rigidities. A moderate temporal depth may allow executives to develop tentative and multiple possible futures over a manageable time horizon, while continuously refining these futures based on concrete short-term feedback. Such balancing of not-too-distant future scenarios with short-term considerations allows executives to create an "up-to-date view of the future" without creating rigidities or biases associated with forecasting too far into the future (Brown and Eisenhardt, 1997: 29).

Hypothesis 2 (H2): Industry velocity will moderate the relationship between executive FTD and competitive aggressiveness such that this relationship will be linear positive in low-velocity industries but inverted U in high-velocity industries.

Competitive aggressiveness and firm performance

Aggressive firms can secure first mover advantages by proactively exploiting more opportunities ahead of competitors, can offset the efficacy of rivals' actions by introducing a large number of new actions, and can defend their market positions through timely responses to rivals' actions (Chen *et al.,* 2010a; D'Aveni, 1994; Ferrier *et al.,* 1999). Action speed and volume are associated with improved firm profitability (Chen *et al.,* 2010a; Hambrick *et al.,* 1996) and market share (Ferrier *et al.,* 1999; Hambrick *et al.,* 1996).

Recent studies have argued that this effect may be stronger in fast-changing environments than in slow-changing environments (Chen *et al.,* 2010a). The Austrian school emphasizes that firms undertake competitive actions to exploit the opportunity for profit (Kirzner, 1997), and it is critical that firms' actions are aligned with the window of opportunities embedded in specific markets. In fast-changing environments, where competitive advantage is temporary and actions become obsolete very quickly, competitive aggressiveness is even more critical to survival and success than in slow-changing environments, where competitive advantage may be relatively more sustainable and the ramifications of not acting quickly and intensely are less devastating. Chen *et al.* (2010a) found that aggressiveness was more positively related to firm performance in fast-changing environments than in slow-changing environments. Together, these arguments suggest that

Hypothesis 3 (H3): Industry velocity will moderate the relationship between competitive aggressiveness and firm performance such that this relationship will be more positive in high-velocity industries than in low-velocity industries.

METHODS

Time frame and sample

The time frame for our study spanned the years 1995–2000—executive temporal depth data from 1995 to 1999, competitive aggressiveness data from 1996 to 2000, and year-end firm performance data from 1996 to 2000. The economic conditions from 1995 to 2000 were relatively neutral, with no exogenous shocks such as the "soft landing" in 1995, September 11 in 2001, and financial crises from 2007 to 2008, all of which could disrupt the underlying competitive structures of industries in the short term and could confound predictions of incumbent firms' competitive behaviors (Marcel *et al.,* 2011; Rindova *et al.,* 2010; Yu *et al.,* 2009).

The population for our study consisted of large (total assets > $1 billion) (John, Lang, and Netter, 1992), established (at least 10 years old), and single business (>70 percent revenue from primary business) U.S.-based firms available in the COMPUSTAT database between 1995 and 2000. Such principal single-business firms have interacted with and survived in their respective competitive environments over time and have a coherent competitive agenda (Derfus *et al.,* 2008). We excluded firms belonging to industries (based on two-digit SIC code) where competition was not clearly observable through publicly available records (e.g., business service industries such as advertising agencies) or where measuring competitive actions such as new product introductions was difficult (e.g., the finance and insurance industries). We stratified the population of firms satisfying these criteria along industry lines and then randomly selected a representative sample of firms from each industry (e.g., Leiponen and Helfat, 2010). The final sample comprised 258 firms from 23 industries (15–29 percent firms in each industry).

DOI: 10.1002/smj

Data source for executive temporal depth

We used three archival sources to derive executive temporal depth—letter to shareholders (LTS) in the annual reports (Nadkarni and Barr, 2008), management's discussion and analysis (MD&A) in the 10-K forms, and executive conference calls with analysts (Kimbrough and Louis, 2011). Such triangulation provides a comprehensive information set for construction of executive orientations and overcomes the biases associated with each archival source (Chatterjee and Hambrick, 2007). First, because these documents are published periodically, they are not laden with incomplete memory and retrospective biases and are more suitable for longitudinal designs (Nadkarni and Barr, 2008). Second, the consistent format of these documents based on prescriptions by the security and exchange commission (SEC) improves comparability across firms (Miller *et al*., 1996). Finally, these documents are nonintrusive and avoid problems of priming and researcher bias associated with eliciting orientations through interviews (Chatterjee and Hambrick, 2007).

LTS is an especially useful source for deriving temporal depth of executives because it is CEOs' public addresses of major priorities and themes that are important to the firm, including past achievements, current and future challenges, and plans for the future (Osborne, Stubbart, and Ramaprasad, 2001). Although LTS are signed and publicly attributed to the CEO, the strategic themes included in LTS represent "the socially negotiated perspectives of the CEO and other influential executives" (Marcel *et al.,* 2011: 124). As the chief cognizer and chief attention regulator of the firm, the CEO must heed competing perspectives of other influential executives and integrate these perspectives for decision making. Therefore, LTS reflect the aggregate perceptions of executives who play a central role in shaping firm strategies (Marcel *et al.,* 2011). LTS have been used to measure executives' perceptions of their environment (Nadkarni and Barr, 2008), their entrepreneurial focus (Cho and Hambrick, 2006), and their temporal focus (Nadkarni and Chen, 2014; Yadav, Prabhu, and Chandy, 2007).

The second source—MD&A in 10-K forms—is useful in deriving temporal depth because "it is intended to give constituents the opportunity to look at the company through the eyes of management by providing both a short- and long-term analysis of the business of the company" (Bryan, 1997: 286). It is required by law and is monitored by the SEC. Studies have shown that executives' assertions in MD&A are consistent, have strong intercoder reliability, and shape future investments made by the firm (Bryan, 1997; Miller *et al*., 1996).

Finally, conference calls, where executives comment on past results and highlight the implications of current strategies for future financial performance, are becoming an increasingly important voluntary disclosure mechanism for firms. They are suitable for constructing executive temporal depth because they provide a greater volume of disclosure and emphasize both backward-looking and forward-looking details (Kimbrough and Louis, 2011).

We obtained LTS from Mergent Online and MD&A from Edgar database at www.sec.gov. Because conference call transcripts are open to the public only after 1999, we were able to get full transcripts of conference calls for 1999 from the LexisNexis academic database. However, we obtained selective executive assertions in the conference calls from 1995 to 1998 quoted in multiple published articles. We combined texts from the three sources into a single document separately for each year to construct yearly measures of executive PTD and FTD for each firm.

Measures and controls

Executive temporal depth

We used a three-step content analysis procedure to measure executive PTD and FTD. In Step 1, two coders blind to the study hypotheses independently identified statements in the two documents that specified exact numerical past and future time horizons[1]: year (e.g., 1990, 2001, 2005) and time spans (e.g., six months, two years, decade) (PTD: $\kappa = 0.84$, FTD: $\kappa = 0.80$). Following is an example

[1] For firm-year observations (8.47 percent) with no explicit date or time frame, we followed prior literature and computed PTD and FTD from qualitative references of time frame in the executive documents (e.g., Stephan, Liberman, and Trope, 2011). Short-term (e.g., now, immediately, quick, shortly, and short-term), medium term (e.g., in the medium-term, in the coming years), and long-term (long time from now, long-term) references were assigned the average short-term, medium-term, and long-term temporal distance in the executive documents of the focal firm for the remaining years in our dataset. Moreover, we also confirmed that dropping these qualitatively derived cases did not alter the results.

DOI: 10.1002/smj

of a clear past time span in Boeing's MD&A in 1995:

> The major focus of development activities over the past three years has been the 777 wide-body twinjet which entered service in May 1995.

The following quote illustrates an explicit future date in Merck's 1998 LTS:

> … Today, our medicines span 19 therapeutic categories … by 2002, it may be 24.

In Step 2, we ranked the sentences in ascending order based on the length of the time horizon (in years) from the shortest to the longest. In the final step, we computed PTD and FTD based on these rank-ordered sentences. Studies using an archival approach to assessing executives' orientations typically employ established scales to develop corresponding archival measures (Chatterjee and Hambrick, 2007). Accordingly, we used Bluedorn's (2002) six-item temporal depth index (TDI) (PTD: three items; FTD: three items; α: 0.88) as a basis to compute three measures each of PTD and FTD from the rank-ordered sentences of time horizons. The three PTD items in TDI measure the time horizons that executives typically consider when thinking about the short-term past, medium-term past, and long-term past on a 15-choice scale ranging from 1 day to 25 years. The three FTD items in TDI measure the same three time frames and use the same scale.

Consistent with TDI, we computed six measures of PTD and FTD. The first measure of PTD was the longest past date or time span cited in the three documents. Consistent with the long-term past item in TDI (Bluedorn, 2002), this measure indicates how far back executives look in discussing long-term historical issues. The second measure was the median past date or time span cited in the documents. This measure is consistent with the medium past item in TDI (Bluedorn and Martin, 2008). The final measure was the shortest past date or time span cited in the documents, which corresponds to the short-term past item in TDI (Bluedorn and Martin, 2008). The longest, median, and shortest future date or time span cited in the documents corresponded with the three FTD items in TDI. Cronbach's alpha was 0.71 for PTD and 0.78 for FTD. Therefore, we created composite measures of executive PTD and FTD by averaging the three individual items. Table A1 illustrates how our archival measures of PTD and FTD correspond with the items in TDI.

We validated the archival measures of PTD and FTD in a separate study of 176 middle managers (70 percent males, mean age = 35 years, mean work experience = 10 years) enrolled in four sections of an MBA-level strategic management course at a major Eastern university. Archival measures of PTD ($\alpha = 0.82$) and FTD ($\alpha = 0.79$) were based on managers' submission of a three-page, required case analysis write-up assignment of a Harvard business case. The executives also completed the TDI scale (α: PTD = 0.88, FTD = 0.85) (Bluedorn, 2002). As expected, archival PTD items correlated much more strongly to corresponding PTD items ($r = 0.74–0.80$) in TDI than to FTD items in TDI ($r = 0.35–0.42$), and archival FTD items had stronger correlations to the respective FTD items ($r = 0.71–0.78$) in TDI than to PTD ($r = 0.32–0.38$) in TDI. These results confirm the convergent and discriminant validity as well as reliability of our archival measures.

Competitive aggressiveness

Following previous studies in competitive dynamics, we used *structured content analyses of news headlines* to identify competitive actions of firms (Chen and Miller, 1994; Ferrier, 2001; Rindova *et al.,* 2010; Yu *et al.,* 2009). All news headlines were manually coded through a series of steps. First, the coders identified all news headlines for our sampled firms between 1996 and 2000 appearing in the LexisNexis online database, which covers over 10,000 publications and has been used to identify competitive actions (Rindova *et al.,* 2010). Second, two coders evaluated each headline to eliminate duplicate news releases of the same action and to determine whether a headline represented a competitive action, defined as "externally directed specific and observable competitive moves initiated by a firm to enhance its competitive position" (Ferrier *et al.,* 1999: 378). A total of 20,418 competitive actions were identified by the coders ($\kappa = 0.81$).

Following Chen *et al*. (2010a), we created a composite competitive aggressiveness measure based on action volume and action speed. Action volume was total number of competitive actions initiated by a

DOI: 10.1002/smj

firm in a given year (Andrevski *et al.,* forthcoming). Action speed was the average length of time lag in the focal firm's actions and rivals' immediately preceding actions in a given year (Derfus *et al.,* 2008). The shorter the time lag, the faster the action speed. We reverse coded the speed measure by taking its inverse (Derfus *et al.,* 2008). Factor analysis yielded a single factor (eigenvalue: 1.74; factor loadings: action volume = 0.93 and action speed = 0.93). Therefore, we calculated a composite measure of competitive aggressiveness by averaging the standardized scores of speed and volume. Results based on the two individual dependent variables were consistent with those based on the composite measure. We lagged the yearly competitive aggressiveness measure behind the executive temporal depth by one year to ensure that executive temporal depth existed prior to the initiation of competitive actions, rather than *ex post* (Marcel *et al.,* 2011).

Industry velocity

Industry velocity reflects how quickly opportunities appear and disappear in an industry (Davis *et al.,* 2009; Eisenhardt and Martin, 2000). In a competitive context, creation and erosion of advantages are tied to how quickly competing firms undertake competitive actions in an industry (D'Aveni *et al.,* 2010; Derfus *et al.,* 2008). Firms controlling the most market share (> 80 percent) dominate the competitive structure of an industry and define the rules of competition for their industry (Derfus *et al.,* 2008), thus setting the velocity for their industry. Using the procedures we explained earlier, we first identified competitive actions initiated by dominant firms in an industry and then computed industry velocity by averaging the competitive actions (total competitive actions/number of firms) of these dominant firms in a given year. Examples of high-velocity industries are the computer (e.g., Dell), semiconductor (e.g., AMD), telecommunications (e.g., ADC), and motion picture and entertainment industries (e.g., AMC). Examples of low-velocity industries are metal and plastics (e.g., Ball Corporation), office furniture (e.g., Steelcase), tire and rubber (e.g., Goodyear), and food packaging (e.g., Crown Holdings).

Firm performance

Following prior competitive dynamics studies (e.g., Derfus *et al.,* 2008), we used two accounting measures of performance—return on sales (ROS) and return on assets (ROA)—at the end of the same year as the competitive aggressiveness measure. Consistent with prior studies, we combined the *z*-scores of the two measures into a composite measure of firm performance (Bromiley and Harris, 2014). Results based on performance data at the end of the year following the competitive aggressiveness measure were consistent with the main results.

Control variables

We used several industry, firm, and TMT controls in our analyses. *Industry concentration* (market share controlled by largest firms in an industry) creates entry barriers and restricts the intensity of competition in an industry (Ferrier, 2001). In highly concentrated industries, dominant firms are less pressured to engage in aggressive actions. In less concentrated industries, with few entry barriers, incumbents have to be aggressive to fend off attacks and retaliations from varied competitors. We used a Herfindahl index for industry concentration for each two-digit SIC code for each year (Derfus *et al.,* 2008; Ferrier, 2001).

Industry unpredictability is a key contingency for incumbent firms (Bergh and Lawless, 1998). In unpredictable industries, where competitive cues are difficult to understand, firms quickly try out larger numbers of actions in the hope that at least a few can generate competitive advantages. In predictable industries, the competitive recipes are well known and firms can realize advantages with a few strategies. We regressed industry values of shipment over five years against time (1995–2000) and used the standard error of the regression coefficient related to a time dummy variable divided by the average value of industry's shipments to compute a standardized index of industry unpredictability (Bergh and Lawless, 1998).

High *industry growth* (percentage change in firm sales from the previous year to a focal year) (Derfus *et al.,* 2008) provides competitive buffers for incumbents to expand sales and maintain their market share. However, firms in saturated industries are forced to search continually for new ways of competing simply to maintain their market share (Ferrier, 2001).

We controlled for *industry homogeneity*, which captures the degree to which incumbents in an industry follow well-defined recipes or patterns

DOI: 10.1002/smj

of strategic resource allocations (Zhang and Rajagopalan, 2003). In homogeneous industries, in which the causal relationship between strategy and performance is very clear, firms take fewer strategies to obtain a satisfactory level of performance. Conversely, in heterogeneous industries, where there is little clarity in competitive cues, incumbents quickly undertake many actions so that at least some will succeed. We used Zhang and Rajagopalan's (2003) computation of industry homogeneity based on six strategic dimensions (advertising intensity, R&D intensity, plant and equipment newness, nonproduction overhead, inventory levels, and financial leverage). For each dimension, we calculated variance among all the firms in each industry, standardized it for each dimension by the sample, and multiplied it by −1. We averaged the six standardized dimensions to derive an overall measure of industry homogeneity.

Smaller firms tend to be flexible, search for new opportunities, and challenge the status quo (Smith, Ferrier, and Ndofor, 2001), whereas large firms tend to be bureaucratic and resist competitive pressure (Ferrier *et al.,* 1999). We measured *firm size* by the logarithm of the six-year average of total employees (Chen and Miller, 1994). We controlled for *slack resources,* which provide firms leeway to experiment with new actions and manage responses to rivals (Ferrier, 2001). We used three measures of slack: current ratio computed as current assets/current liabilities (available slack), debt-equity ratio (potential slack), and the general and administrative expenses to sales ratio (recoverable slack) (Cheng and Kesner, 1997). *Past performance* increases reinforce the value of existing competitive actions, whereas performance decreases promote initiation of new actions (Chen and Miller, 1994). We measured the one-year rate of change in ROA and ROS (McDonald, Khanna, and Westphal, 2008) immediately preceding competitive aggressiveness data.

Finally, we controlled for *TMT demographic diversity* and *TMT size* because TMTs with diverse background and larger in size may generate diverse opinions and perspectives and have access to a larger pool of information, resulting in more aggressive competitive actions (Ferrier, 2001; Hambrick *et al.,* 1996; Wiersema and Bantel, 1992). We defined TMT members as those individuals at the two highest levels of management identified in the Dunn and Bradstreet reference book of corporate management. TMT heterogeneity was computed by three measures—educational background (Blau index; business, science, liberal arts, law, engineering, and others), functional background (Blau index; engineering/R&D, finance/accounting, legal, human resources management, manufacturing, logistics, purchasing, public relations, and general management), and organizational tenure (coefficient of variation: SD/mean) (Ferrier, 2001; Hambrick *et al.,* 1996). TMT composite heterogeneity index was the sum of the three standardized individual heterogeneity measures.

ANALYSES AND RESULTS

Analyses

Model testing

We used the generalized least squares (GLS) models, which correct for and provide consistent estimates in the presence of groupwise heteroskedasticity, cross-group correlation, and within-group auto-correlation (Greene, 2003) in pooled cross-sectional observations such as ours (258 firms for five years: 1,186 firm years). The Hausman test (Hausman, 1978) results were insignificant. So, we used random effects (rather than fixed effects) estimation procedures.

We used the established stepwise moderation approach (Aiken and West, 1991) to test for the interaction effects of executive temporal depth and industry velocity on competitive aggressiveness. We entered the controls in Model 1 and added the main effects of executive temporal depth and industry velocity in Model 2 and the hypothesized interaction effects between executive temporal depth and industry velocity in Model 3. We further tested the main effects of executive temporal depth separately for high- and low-velocity industries. Such a median split-sample approach is recommended for testing nonlinear interactions and to better understand bidirectional moderation (e.g., Morse, Nanda, and Seru, 2011). We used identical procedures to test for the moderating effects of industry velocity on the relationship between competitive aggressiveness and firm performance.

We mean centered predictor variables in all the regression models to minimize multicollinearity (Aiken and West, 1991). The variance inflation factors for all independent variables were below the recommended level of 10.

DOI: 10.1002/smj

Correction for endogeneity

A host of unmodeled factors could influence executive temporal depth, competitive aggressiveness, and firm performance. To correct for this endogeneity, we followed the procedures recommended by Chatterjee and Hambrick (2007) and Hambrick (2007). Accordingly, we regressed executive PTD and FTD on industry dummies (based on two-digit SIC codes) and firm (past performance, slack resources, and R & D expenditures) variables one year prior to executive PTD and FTD variables. Using regression coefficients for these industry and firm variables, we calculated each executives' predicted PTD and FTD score and included these values as endogeneity correction control variables in testing the moderation models.

Results

Table 1 provides descriptive statistics and correlations among the study variables. Tables 2 and 3 summarize results from the regression analyses.

In Table 2, the interaction term executive PTD × industry velocity is significant (B = -0.08, $SE = 0.03$, $p < 0.05$). In the split-sample tests, PTD is positively related to competitive aggressiveness in low-velocity industries (B = 0.06, $SE = 0.02$, $p < 0.05$) but negatively related to aggressiveness in high-velocity industries (B = -0.16, $SE = 0.05$, $p < 0.01$). These results support H1.

The value of distant past is evident in this quote from executives of PPG industry (the top 25 percent in competitive aggressiveness) in the low-velocity chemical manufacturing industry:

> *The first coat, which provides rust protection, was the result of a chemistry that PPG patented 20 years ago and today is the industry standard.* (LTS, 1997)

Executives of Texas Industries, ranked in the bottom 25 percent in competitive aggressiveness in the low-velocity construction materials industry, cited short-term past orientation:

> *We make our own opportunities for profitable growth—and that's exactly what happened last year.* (LTS, 1998)

The assertions of executives in high-velocity industries were the opposite. This quote of Liz Claiborne executives (top 25 percent in competitive aggressiveness) explains how focusing on "today" rather than the distant past is key in the high-velocity cosmetic industry.

> *… our environment is in constant flux, and effectively managing change requires different skills than in the past. Today, we prize the ability not just to sell, but to analyze and understand, not just to design and create, but to do so within the context of current customer and consumer preferences …* (LTS, 2000)

However, executives of Dionex (bottom 25 percent in competitive aggressiveness) in the high-velocity analytical laboratory instrument manufacturing industry, cited the distant past:

> *We continue to improve our products, strengthen our customer relationships, and expand the applications for our systems. This has been our strategy for the past twenty years and will continue to guide our future growth.* (LTS, 1998)

The interaction term, FTD square × industry velocity (B = -0.09, $SE = 0.04$, $p < 0.01$) is significant. In the split-sample tests, FTD is positively related to competitive aggressiveness in low-velocity industries (B = 0.07, $SE = 0.02$, $p < 0.01$). In high-velocity industries, the positive FTD term (B = 0.15, $SE = 0.07$, $p < 0.05$) and the negative FTD-square term (B = -0.11, $SE = 0.04$, $p < 0.01$) support the inverted U-shaped relationship in H2.

This quote from Alberto Culver executives (top 25 percent in aggressiveness) imply the importance of a long-term future horizon in the low-velocity household consumer industry:

> *We continue to aggressively prune underperforming brands and stock-keeping units from our portfolio in order to concentrate on products that have the greatest long-term potential for the company … We have been able to achieve strong top and bottom line growth while continuing to make substantially increased marketing investments that will benefit our business in the long run.* (LTS, 1997)

Conversely, executives of Tredegar, a firm low in competitive aggressiveness (bottom 25 percent) in

DOI: 10.1002/smj

Table 1. Descriptive statistics and correlations[a]

Variables	Mean	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
Controls															
1. Firm size[b]	3.19	0.74	1												
2. Organizational slack	0.97	1.33	−0.18	1											
3. Past performance change	0.02	0.20	−0.00	−0.05	1										
4. TMT size	6.18	1.18	0.14	−0.07	−0.02	1									
5. TMT heterogeneity	0.01	0.70	−0.02	0.02	−0.03	0.29	1								
6. Industry concentration	0.04	0.05	0.03	0.03	−0.01	0.05	0.04	1							
7. Industry unpredictability	0.02	0.02	−0.01	0.09	0.06	0.09	0.03	0.57	1						
8. Industry growth	0.06	0.12	0.01	0.03	0.03	−0.08	−0.05	0.06	0.12	1					
9. Industry homogeneity	0.10	0.51	0.15	−0.04	−0.03	−0.01	−0.02	0.23	0.10	0.06	1				
Study variables															
10. Industry velocity	26.72	29.70	−0.05	−0.03	−0.01	0.04	0.08	−0.12	−0.08	−0.20	−0.60	1			
11. Executive PTD	4.97	2.57	−0.06	0.02	0.02	−0.10	−0.01	0.02	0.00	−0.05	−0.11	0.09	1		
12. Executive FTD	4.88	3.01	−0.04	0.00	0.04	0.01	−0.01	−0.05	0.00	−0.00	−0.03	−0.04	0.18	1	
13. Competitive aggressiveness	−0.05	0.55	0.26	−0.00	0.07	0.10	0.07	−0.03	−0.00	−0.00	−0.20	0.15	−0.01	0.02	1
14. Performance	0.00	0.94	−0.07	0.07	0.25	−0.00	−0.10	0.06	0.06	−0.03	−0.12	0.07	0.06	0.05	0.15

$N = 1{,}186$.
Executive PTD = executive past temporal depth; executive FTD = executive future temporal depth.
[a] Correlations with value greater than |0.06| are significant at $p < 0.05$.
[b] Logarithm transformation

DOI: 10.1002/smj

Table 2. Moderated regression results for executive temporal depth, industry velocity, and competitive aggressiveness

	Full sample			Split sample			
				Low velocity		High velocity	
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Intercept	−0.06	−0.04	−0.00	−0.15	0.28	−0.01	0.15
	(0.07)	(0.08)	(0.08)	(0.10)	(0.17)	(0.19)	(0.20)
Control variables							
Firm size	0.30***	0.30***	0.30***	0.22***	0.20***	0.53***	0.53***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.07)	(0.07)
Organization slack	0.05	0.04	0.05^{+}	0.00	0.01	0.24	0.20
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.19)	(0.20)
Past performance	0.08**	0.08**	0.07**	0.01	0.00	0.24***	0.24***
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.07)	(0.07)
TMT size	0.05^{+}	0.05	0.04	−0.02	−0.01	0.12*	0.11*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)
TMT heterogeneity	0.03	0.03	0.03	0.07*	0.07**	0.00	−0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)
Concentration	0.00	0.00	0.00	−0.01	−0.02	0.06	0.11
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.19)	(0.20)
Unpredictability	0.00	0.00	0.00	0.03	0.03	0.01	−0.01
	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.16)	(0.16)
Growth	0.01	0.01	0.01	0.00	0.00	0.03	0.03
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.09)	(0.09)
Homogeneity	−0.21***	−0.19***	−0.19***	−0.12*	−0.10*	−0.27*	−0.34**
	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.11)	(0.12)
PTD endogeneity control	0.04	0.04	0.04	0.02	0.05	−0.20^{+}	0.27^{+}
	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.12)	(0.14)
FTD endogeneity control	−0.04	−0.05	−0.05	0.03	0.00	−0.13	−0.18
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.10)	(0.11)
Independent variables							
Velocity		0.04	0.14*		0.80**		−0.11
		(0.06)	(0.07)		(0.28)		(0.09)
Executive PTD		−0.04	−0.05^{+}		0.06*		−0.16**
		(0.03)	(0.03)		(0.02)		(0.05)
Executive FTD		0.07^{+}	0.10*		0.07**		0.15*
		(0.04)	(0.04)		(0.02)		(0.07)
FTD square[a]		−0.02	−0.05*				−0.11**
		(0.02)	(0.02)				(0.04)
Velocity × PTD[b]			−0.08*				
			(0.03)				
Velocity × FTD[b]			0.05				
			(0.05)				
Velocity × FTD[b]square			−0.09**				
			(0.04)				
Years dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log-likelihood	−1620.6	−1628.1	−1627.4	−568.1	−564.2	−932.0	−930.3
N[c]	1,186	1,186	1,186	593	593	593	593

[a] The inverted-U relationships of executive PTD and FTD to competitive aggressiveness did not hold in low velocity industries.
[b] We tested the three-way interactions between velocity, PTD, FTD/FTD square. These three-way interactions were insignificant.
[c] The total number of observations used in regression models was smaller than original sample size ($N = 1{,}290$) due to missing values of the independent, dependent, and control variables.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$ (two-tailed); standard errors in parentheses

the low-velocity plastic films industry, exhibited a short-term future orientation:

> *Looking ahead, Tredegar's immediate challenge is to accelerate growth … Building value in today's world depends on our ability to use information and knowledge to drive innovation.* (LTS, 1997, 1998)

However, assertions of executives in high-velocity industries were the opposite. Executives of Western Digital (top 25 percent in competitive aggressiveness) explained the value of intermediate FTD in adapting to market changes in the high-velocity computer hard disk industry:

> *… With the vast and rapidly growing market before us, our challenge is to execute properly*

DOI: 10.1002/smj

Table 3. Moderated regression results for competitive aggressiveness, industry velocity, and firm performance

	Full sample			Split sample			
				Low velocity		High velocity	
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Intercept	−0.02	−0.01	−0.03	−0.17	−0.28	0.14	0.14
	(0.09)	(0.09)	(0.09)	(0.12)	(0.26)	(0.15)	(0.15)
Controls							
Firm size	−0.03	−0.07*	−0.06*	−0.04	−0.07	0.08^{+}	0.03
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)
Slack resource	0.08**	0.07*	0.07*	0.02	0.02	0.79***	0.74***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.11)	(0.11)
Past performance	0.25***	0.24***	0.24***	0.24***	0.24***	0.23***	0.21***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)
TMT size	0.04	0.03	0.03	0.01	0.01	0.09*	0.08^{+}
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
TMT heterogeneity	−0.13***	−0.14***	−0.13***	−0.05	−0.06	−0.19***	−0.19***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
Concentration	0.12**	0.12**	0.12**	0.14**	0.14**	−0.21	−0.23
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.14)	(0.14)
Unpredictability	−0.01	−0.01	−0.01	−0.01	−0.01	−0.02	−0.02
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.13)	(0.13)
Growth	−0.04	−0.03	−0.03	−0.02	−0.01	−0.08	−0.08
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.07)	(0.07)
Homogeneity	−0.04	0.00	0.00	0.03	0.05	−0.05	−0.03
	(0.05)	(0.05)	(0.05)	(0.06)	(0.07)	(0.09)	(0.1)
Independent variables							
Velocity		0.03	0.03		−0.22		−0.01
		(0.06)	(0.06)		(0.41)		(0.07)
Competitive aggressiveness		0.14***	0.11***		0.14*		0.11**
		(0.03)	(0.03)		(0.06)		(0.03)
Velocity × aggressiveness			0.05^{+}				
			(0.03)				
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log likelihood	1637.9	1631.6	1632.9	798.7	797.9	824.6	824.0
N[a]	1,186	1,186	1,186	593	593	593	593

[a] The total number of observations used in regression models was smaller than original sample size ($N = 1{,}290$) due to missing values in the independent, dependent, and control variables.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; $^{+}p < 0.1$ (two-tailed); standard errors in parentheses

> *the plans we've developed to serve it. Western Digital continues to have adequate capital resources for the near and intermediate term …* (LTS, 1999)

Executives from Biomet Inc., a medical device manufacturing company low on competitive aggressiveness (bottom 25 percent), depicted a long-term future orientation:

> *As we look forward to our next twenty years of growth, Biomet is committed to expanding its global market share by improving upon the high quality products and services offered to customers and patients throughout the world.* (LTS, 1997)

In Table 3, competitive aggressiveness relates positively to firm performance (B = 0.14, $SE = 0.03$, $p < 0.001$) for the full sample as well as for the low- (B = 0.14, $SE = 0.06$, $p < 0.05$) and high-velocity groups (B = 0.11, $SE = 0.03$, $p < 0.01$). Industry velocity × competitive aggressiveness has a positive effect on firm performance (B = 0.05, $SE = 0.03$, $p < 0.1$). Thus, H3 is marginally supported.

DISCUSSION

Theoretical implications

We built on and extended research on time in competitive dynamics by examining how executive temporal orientation interacts with industry

DOI: 10.1002/smj

velocity in shaping competitive aggressiveness. This study yielded two broad sets of results. First, it illustrates that the role of executive temporal depth in shaping competitive aggressiveness is contingent on industry velocity. Executive PTD promoted aggressiveness in low-velocity industries but hindered it in high-velocity industries, whereas FTD promoted aggressiveness in low-velocity industries but had an inverted-U relationship in high-velocity industries. Second, PTD and FTD showed different relationship patterns to aggressiveness in the two contexts. In low-velocity contexts, both PTD and FTD enhanced aggressiveness. However, in high-velocity contexts, PTD hampered aggressiveness, but FTD enhanced it up to a point, beyond which it was dysfunctional. These results specify the environmental boundary conditions of executive temporal orientation in shaping competitive aggressiveness and highlight the importance of considering temporal direction (past versus future) in addition to time horizons. These results have two key implications for research on competitive dynamics.

First, competitive dynamics research has explained how industry-level temporal forces such as hypercompetition (D'Aveni *et al.,* 2010), velocity (Eisenhardt and Martin, 2000), dynamism (Davis *et al.,* 2009), uncertainty (Chen and Miller, 1994) and nascent versus established industries (Chen *et al.,* 2010b) serve as time givers and determine the temporariness or sustainability of advantages enjoyed by incumbents from their competitive actions. Firms that successfully match the temporal aspects of their micro competitive actions to the temporal features of the environment enjoy superior performance, whereas firms that fail to adapt to their environment face major losses (Ancona *et al.,* 2001; Davis *et al.,* 2009; Katila *et al.,* 2012). Our results add to this body of research by suggesting a third temporal force—executives' temporal orientation. Our results demonstrate that innate temporal orientations of executives are central to promoting competitive adaptation through speedy precipitation of a large volume of competitive actions. Thus, this study highlights the importance of subjective perspective of time in understanding competitive phenomena.

At the same time, the effects of executive temporal orientation are contingent on macro temporal forces—industry velocity. Our results suggest that executive PTD and FTD orientations promote competitive aggressiveness and in turn superior performance in high-velocity environments but may be dysfunctional in low-velocity environments and vice versa. An important implication of these moderation results is that not only is executive temporal orientation an important force in shaping temporally rooted competitive behaviors, but also that executive temporal orientation cannot be considered in isolation of macro temporal features of the environment. Rather, temporal features of the macro industrial environments serve as boundary conditions for the relationship between executive temporal orientation and firm behaviors. This result is especially notable because research on objectively based macro temporal forces and subjective perspective of time has progressed along independent lines. Our results suggest that the two perspectives are complementary and together provide a more complete understanding of how time manifests in competitive behaviors. The integration of macro, micro, and subjective temporal forces presented in this study is consistent with the entrainment theory, which suggests that the degree of "temporal fit" between managers' executive temporal orientations and external clocks set by the environmental factors promotes effective adaptation, whereas a misfit between the two hinders adaptation (Ancona and Chong, 1996; Ancona *et al.,* 2001).

The results of this study constitute a first step in explicating the interaction between subjective temporal forces and macro (environmental) factors in predicting competitive behaviors and firm performance. Future studies could further explore the mechanisms through which executive temporal orientation promotes or hinders competitive behaviors in high- and low-velocity environments. Several streams of research are pertinent in theorizing these mediating mechanisms. Literature on temporal aspects of strategic decision making is particularly relevant in this regard. Because executive temporal orientations represent innate and relatively stable temporal tendencies (Bluedorn, 2002; Zimbardo and Boyd, 1999), they are likely to shape temporal heuristics, pacing and sequencing rules described in the strategic decision-making literature (Bingham and Eisenhardt, 2011; Gersick, 1994; Sastry, 1997). Because different environments necessitate different temporal rules and heuristics, the relationship of executive PTD and FTD to aggressive behaviors may be mediated by these unique context-relevant rules and heuristics. For example, a short temporal depth is associated with spontaneity and flexibility, whereas a long

DOI: 10.1002/smj

temporal depth promotes systematic preparation for the future (Bluedorn, 2002; Zimbardo and Boyd, 1999). Short PTD and medium FTD may dispose executives to develop loose and flexible temporal ordering and sequencing rules in undertaking firm strategies, all of which are suitable in dynamic environments. In contrast, long PTD and FTD may prompt executives to develop in advance a complete, clearly ordered map of all future choice points that are pertinent to undertaking aggressive behaviors in stable environments.

Another potential mediation mechanism is the notion of perceived competitive tension (Chen *et al.,* 2007). For example, in high-velocity industries, executives with low PTD and medium FTD may experience higher competitive tension and are more aggressive in response to what they believe will happen in future, not what happened in the past. As such, PTD and FTD could trigger different forms of perceived competitive tension: reflective competitive tension derived by what happened in the past vs. anticipatory competitive tension derived by beliefs of what might happen in the future. These reflective vs. anticipatory competitive tensions will enhance or hamper competitive aggressiveness.

Future studies could combine insights on executives' temporal depth from this study with strategic decision-making literature and perceived competitive tension literature to pose this question: How do executive temporal orientations influence competitive behaviors differently in different environments? Thus, the temporal mechanisms specified in the strategic decision-making literature and different forms of perceived competitive tension could serve as potential mediators in environment-specific relationships between executive temporal orientation and firm actions.

Second, prior research has considered only future time horizons (Das, 1987; Laverty, 1996; Marginson and MacCaulay, 2008; Souder and Bromiley, 2012). We demonstrated the role of both past and future time horizons in shaping competitive behaviors. Interestingly, the distinction between past and future time horizons seems pertinent to understanding competitive behaviors in high-velocity environments but not in low-velocity environments. Substantively, the relationships of executive PTD and FTD were consistent in low-velocity industries, but PTD and FTD exhibited different patterns of relationships in high-velocity industries. Whereas a short PTD yielded superior competitive aggressiveness and firm performance, a moderate FTD maximized competitive aggressiveness and firm performance in high-velocity industries. These results are consistent with the temporal depth literature, which argues that the information-processing mechanisms associated with PTD (deeper understanding and learning) are distinct from those associated with FTD (visionary thinking and pattern detection) (Bluedorn, 2002). Bluedorn and Martin (2008) found that PTD and FTD of entrepreneurs related differently to perceived temporal flexibility, work stress, and preference for working fast. Our results suggest that the differences between PTD and FTD are pronounced in some environments (high velocity) but not in others (low velocity).

Limitations and conclusions

Our study is bound by some limitations. Our findings based on single business firms may not apply to diversified firms facing multimarket competition. Similarly, the five-year time frame of our study captured a unique time period for the nature of competitive interactions among firms, and this time period corresponding to our results limits generalizability of our findings.

In conclusion, this study underscores the substantive value of executive temporal orientation in understanding competitive behaviors and firm performance in different industry contexts. We hope that the promising results of this study stimulate further research on executive temporal orientation, firm behaviors, and outcomes. Such research could improve our understanding of how time manifests in competitive behaviors and firm strategies.

ACKNOWLEDGEMENTS

We gratefully acknowledge insightful suggestions of Dr. Margarethe F. Wiersema (associate editor) and two anonymous reviewers. We also received helpful suggestions on earlier versions of the manuscript from Ming-Jer Chen, Tieying Yu, and scholars at the Chinese Management Scholar Workshop, Boston, 2012.

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APPENDIX

Table A1. Derivation of archival measures of PTD and FTD based on temporal depth index

	TDI items[a]	Corresponding archival measure in our study
PTD	When I think about things that happened recently, I usually think about things that happened this long ago	The *shortest* time span between the past date cited in combined text and the date of the combined text from LTS, MD&A, and conference call transcripts
	When I think about things that happened a middling time ago, I usually think about things that happened this long ago	The *median* time span between the past date cited in combined text and the date of the combined text from LTS, MD&A, and conference call transcripts
	When I think about things that happened a long time ago, I usually think about things that happened this long ago	The *longest* time span between the past date cited in combined text and the date of the combined text from LTS, MD&A, and conference call transcripts
FTD	When I think about the short-term future, I usually think about things this far ahead	The *shortest* future time span between the future date cited in the combined text and the date of the combined text from LTS, MD&A, and conference call transcripts
	When I think about the mid-term future, I usually think about things this far ahead	The *median* future time span between the future date cited in the combined text and the date of the combined text from LTS, MD&A, and conference call transcripts
	When I think about the long-term future, I usually think about things this far ahead	The *longest* future time span between the future date cited in the combined text and the date of the combined text from LTS, MD&A, and conference call transcripts

[a] Each item has 15 options: 1 day, 1 week, 2 weeks, 1 month, 3 months, 6 months, 9 months, 1 year, 3 years, 5 years, 10 years, 15 years, 20 years, 25 years.

DOI: 10.1002/smj