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THE DYNAMIC INTERPLAY OF CAPABILITY STRENGTHS AND WEAKNESSES: INVESTIGATING THE BASES OF TEMPORARY COMPETITIVE ADVANTAGE

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Foundational RBV work suggests that firms possess capabilities that represent strengths and others that represent weaknesses. In contrast, contemporary research has examined capability strengths while largely ignoring weaknesses. Addressing this oversight, we examine the direct and integrated effects of sets of capability strengths and capability weaknesses on competitive advantage and its empirical correlate—relative performance. Additionally, we explore how environmental and firm-specific factors influence change in these drivers of competitive advantage over time. Results suggest that weakness sets have a negative effect on relative performance, while strength sets have an increasingly positive effect. The integrative effects of strength and weakness sets affect relative performance in a complex manner. For example, while high strength/low weakness firms perform at high levels, firms integrating high strength with high weakness perform well, but experience considerably more variance in their realized outcomes. Lastly, we find that the strength and weakness sets change significantly over time in markets where competition is more intense, thereby undermining the durability of competitive advantage. Our theory and results indicate that achieving temporary advantage is more difficult than previously thought and that the erosion of advantage occurs routinely as a result of dynamic and interactive rivalry.

INTRODUCTION

Understanding the sustainability of competitive advantage is central to strategic management (Barney, 1991; Porter, 1985; Schendel, 1994). Prior work—primarily conducted in related fields, such as economics—suggested that sustained competitive advantage is possible in that while the performance of most firms converges toward average, some firms are able to resist this trend (e.g., Mueller, 1986; Waring, 1996). However, more recent work in strategic management demonstrates that such outcomes are rare and often only operative for short periods of time (Wiggins and Ruefli, 2002). Increases in rivalry—extending even to the levels of hypercompetition (D'Aveni, 1994)—and rapid technological changes (Bettis and Hitt, 1995) undermine the sustainability of a competitive advantage (Thomas, 1996). For example, dynamic and aggressive rivals can erode the market share of industry leaders, eventually leading to their dethronement (Ferrier, Smith, and Grimm, 1999). In fact, Wiggins and Ruefli (2005) concluded that prior research identifying firms with sustained competitive advantage likely identified companies that achieved a series of temporary advantages over time. Thus, evidence suggests that achieving sustained competitive advantage

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requires managers to understand the bases of competitive advantage as well as the factors that lead to dynamic changes in these bases that allow them to concatenate a series of temporary advantages.

A primary theory upon which to understand the bases of competitive advantage is the resource-based view (RBV) (Barney, 1991). The RBV suggests that when a firm resource is both valuable and rare, a competitive advantage is possible. A recent meta-analysis suggests that, indeed, the basic tenets of the RBV are largely supported (Crook *et al*., 2008). However, a review of the foundations upon which the RBV is based suggests that there is more to a competitive advantage than is often considered. The work of Selznick (1957), Penrose (1959), Wernerfelt (1984), and Rumelt (1984) (among others) proposes that the firm is a *bundle* of resources and capabilities[1] which together influence the achievement of a competitive advantage. Importantly, these scholars suggest that this bundle of capabilities is composed of both strengths and weaknesses. For example, Wernerfelt (1984) defines a resource as 'anything which could be thought of as a strength or weakness of a given firm' (1984: 172), Selznick (1957) discusses distinctive inadequacies in addition to a firm's distinctive competencies, and Penrose argues that deficient managerial talent can inhibit, at least temporarily, organizational objectives.

Despite these foundational positions, the dozens of empirical papers adopting a RBV framework have addressed only the effects of strengths on competitive outcomes. In contrast, only one piece, Arend (2008), has attempted to empirically demonstrate that *strategic liabilities* matter as well. Despite Arend's important work demonstrating that weaknesses influence firm turnarounds, much remains unknown about the influence of capability weaknesses on a firm's competitive advantage. In fact, the omission of weaknesses has been identified as a major shortcoming of the RBV (West and DeCastro, 2001), one that has led to the theoretical and empirical misspecification of competitive advantage. This suggests that our current understanding of the bases of competitive advantage is likely incomplete and its complex nature underappreciated. Indeed, this omission has ignited a theoretical debate (see Arend, 2003, 2004; Durand, 2002; Powell, 2001, 2002, 2003), along with calls to empirically examine the influence of capability weaknesses. For example, Arend states that 'the RBV only tells half of the story; the RBV considers only factors that positively contribute to sustained performance' (2004: 1003), while Montgomery implores researchers to examine 'the dark side of the resource spectrum' and the performance effects of firms having 'liabilities in their resource inventory' (1995: 261). Moreover, Armstrong and Shimizu (2007: 980) argue that 'demonstrating negative effects within the RBV framework will cross-validate the theoretical value of the RBV.'

This study heeds these calls to more fully explore the bases of competitive advantage as well as investigating factors that affect change in them. First, in light of the highly competitive markets in which firms must operate to gain any competitive advantage, we direct attention to the dynamic interdependence among multiple rivals and specifically their sets of capabilities. Importantly, in such rivalrous markets, we suggest that it is the relative (to competitors) instead of an absolute quality of capabilities that matters most for competitive advantage. Using this as a frame, we develop theory that guides our empirical investigation of the direct and integrated effects of both capability strengths and weaknesses on competitive advantage and its empirical correlate—relative performance (Arend, 2003). More specifically, by extending Arend's concept of strategic liabilities to incorporate a comparative lens (Jacobides and Winter, 2005), we identify in a more fine-grained manner a firm's individual capabilities as either a strength or a weakness (two distinct concepts) in relation to rivals. Moreover, because firms are conceptualized as bundles of capabilities, we examine multiple capabilities simultaneously, allowing us to study the direct and integrative effects of strength and weakness sets on relative performance. Second, we explore how environmental and firm-specific factors affect change in a firm's strength and weakness sets, which allows us to better understand the dynamics related to the durability of competitive advantage. This is especially important when firms in highly dynamic and rivalrous landscapes attempt to concatenate a series of temporary advantages.

Our theoretical and empirical examination offers several contributions to the literature. First, our

[1] Resources are the tangible and intangible assets that firms control and capabilities are the ability to perform 'a coordinated set of tasks utilizing organizational resources' (Helfat and Peteraf, 2003: 999). While for the sake of parsimony we primarily employ the terminology of capability here forward, the logic is valid for resources.

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extension of the strategic liabilities concept adds a richer understanding of how a comparative approach to value and rarity helps distinguish between capability strengths and weaknesses (e.g., Priem and Butler, 2001). Moreover, this effort complements investigations of rivals' dyadic action sequences (Ferrier *et al*., 1999), by reflecting more generally how relative strengths and weaknesses create a dynamic interdependence between multiple rivals competing in the same market space.

Second, focusing on capability sets, as opposed to one or two individual capabilities, demonstrates a more complete and, perhaps, accurate view of the relationship between capabilities and competitive outcomes. While prior research supports a positive relationship between capability strengths and performance (e.g., Carmeli and Tishler, 2004), we show that groups of strengths jointly produce a strong synergistic effect on relative performance. Additionally, we find that sets of weaknesses negatively affect relative performance. Most importantly, however, the integrative effects of strength and weakness sets suggest that the bases for even temporary competitive advantage are more complex than previously thought. For example, our results suggest that weaknesses can undermine the potential competitive advantage of firms possessing strengths; however, combining high levels of strengths with high levels of weaknesses can actually produce high relative performance, albeit with significant variation in realized performance (i.e., risky combination). Together, these contributions advance our understanding of the bases for competitive advantage from largely a single channel focus (i.e., identifying at least one valuable and rare capability) to a multi-channel understanding in which both strengths and weaknesses (and sets thereof) are considered simultaneously.

Third, because capability strengths and weaknesses affect competitive advantage, exploring how environmental and firm-specific factors influence their change over time increases our knowledge related to the durability of competitive advantage. In support of Wiggins and Ruefli (2005), we conclude that the durability of a competitive advantage is limited because strength and weakness sets change significantly over time in rivalrous markets (D'Aveni, 1994; Ferrier, 2001). As such, this research provides an understanding of some of the endogenous and exogenous factors affecting the temporal nature of competitive advantage.

Next, we examine prior literature on capability strengths and weaknesses and the theoretical frame provided by the RBV. This discussion concludes with the development of the concept of a firm's strength and weakness sets, followed by specific theoretical arguments and hypotheses. We then present the methods and the results of the hypotheses tests. A discussion of the findings, emphasizing their contributions as well as the study's limitations, concludes the paper.

CONCEPTUAL FRAMEWORK

Although several concepts related to weaknesses have been suggested, including core rigidities (Leonard-Barton, 1992), resource weaknesses (West and DeCastro, 2001), and competitive disadvantage (Powell, 2001), Arend's (2004) conceptualization of weaknesses as strategic liabilities is the most formally defined. Stated simply, strategic liabilities represent 'the other side of the ledger' (Arend, 2004: 1006) in resource-based logic. Specifically, Arend contrasted strategic assets, those capabilities following RBV tenets (e.g., valuable, rare, etc.) with strategic liabilities, which are capabilities that are costly (lead to high cost for the firm), supply restricted and appropriated by the firm. Supply restricted implies that strategic liabilities are not equally distributed among firms and cannot be converted to a benign state with any benefit to the firm because of the costs involved to do so. Thus, strategic liabilities represent the worst of capabilities. We argue that additional utility can be achieved in extending the treatment of strategic liabilities by relaxing the absolute (internal to the firm) perspective and instead utilizing a comparative approach, thereby allowing a broader conceptualization of weakness.

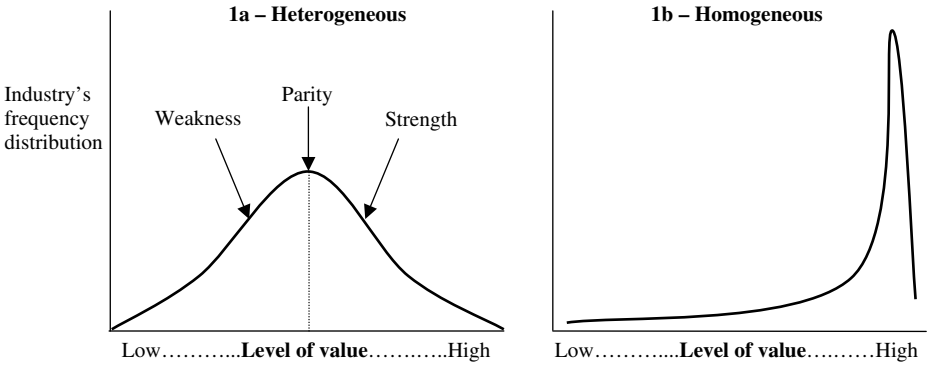
A comparative lens allows for a more fine-grained differentiation among rivals' capabilities. As Peteraf and Barney argue 'competitive advantage is the result of having *more* valuable resources than other firms' (2003: 317, emphasis added). Thus, 'it is the strengths relative to competitors that matter and not absolute strengths' (Wernerfelt and Karnani, 1987: 192). However, while the application of a comparative lens may help identify capability strengths of a firm in a particular competitive context (Grimm and Smith, 1997), it simultaneously suggests a question regarding the effects of *less* valuable capabilities.

Traditionally, within the RBV vernacular, value is based on the ability of the firm to use a capability to exploit an opportunity, neutralize a threat, and/or improve the efficiency or effectiveness of a firm, while rarity represents insufficient supply (Barney, 1991). As a result, some RBV work has focused primarily on capabilities that have the potential to produce an *absolute* level of gain (value) and on those that are in short supply (rare). However, rarity can exist both in terms of a capability's *presence* (or lack thereof) or its *level*. For a specific industry, it is likely that rarity will be more attuned to levels of effectiveness per capability as opposed to its mere existence. For example, Castanias and Helfat argue that 'managerial human capital. . .is scarce if a manager possesses higher quality skills relative to his or her competitors' (2001: 663). In other words, managerial capability is not rare per se, but high levels of managerial capability—beyond the skills possessed by competitors—are rare. Therefore, when using a comparative approach, the variance in the value of a capability across rivals delineates rarity and is important to competitive outcomes (Grimm and Smith, 1997).

Figures 1a and 1b graphically display the implications of variance in the value of a single capability across competitors. These figures model different frequency distributions based on the value of industry members' research and development (R&D) capability. As shown in Figure 1b, despite a high absolute level of value for all competitors' R&D (perhaps common in some high-technology industries), as the variance between competitors' R&D value approaches zero, the capability can offer only parity for the firms. For these firms, R&D will have little effect on a firm's competitive outcomes regardless of its absolute value. Thus, in this industry, rarity is neither in *presence* of capability as all competitors have a R&D capability, nor in *level*, as the variance in the value of competitors' R&D capability is close to zero. In this example, the possession of R&D capability by a firm can be thought of as a necessary condition for maintaining a competitive position, but an insufficient one to achieve competitive advantage.

However, as demonstrated in Figure 1a, increased variance in the value of competitors' R&D capability gives rise to rarity in the *level* of the capability. The distribution of value for the R&D capability in the industry specified in Figure 1a has several important competitive implications. First, a R&D capability that is above parity represents a strength for those firms. Moreover, the degree of strength increases as its relative value continues to increase beyond parity. Describing strength as a capability that is more valuable than rivals' corresponding capability fits well in the recent lens of comparative RBV research (Jacobides and Winter, 2005; Peteraf and Barney; 2003, Sirmon, Gove, and Hitt, 2008). Second, while this comparative approach allows for more complete and accurate identification of when a capability is likely to contribute to an advantage over competitors, it also allows for the modeling of weakness. Specifically, as shown in Figure 1a, a weakness exists when a capability's relative value is below parity with rivals. Moreover, the degree of weakness increases as its relative value continues to decline further below parity. Thus, as the variance increases among competitors' R&D capability value, so does its potential effect on performance outcomes.

Importantly, this conceptualization of weakness does not necessarily mean that the capability has a



Figures 1a and 1b. Rarity as a function of a capability's relative value among competitors

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negative value, but instead suggests that its value is less than similar capabilities held by rivals. Also, if a firm does not possess a requisite capability, it would represent a weakness. In total then, as increasing capability strengths lead to greater competitive advantage, increasing capability weaknesses are expected to contribute to competitive disadvantage. Thus, although we build on Arend's concept of strategic liabilities, in our conceptualization, weaknesses (1) do not have to be absolutely costly, only less valuable than competitors' and (2) can be converted from weakness to parity or strength over time with a net benefit to the firm. However, we acknowledge that the specification of a capability along the continuum between weakness and strength is contextually dependent and that converting a capability weakness into a strength involves costs.

Thus, in total, we argue that when the value of a firm's capability is below parity, it is a weakness and that the disadvantage associated with that weakness increases as its value decreases. The parallel and opposite effect operates for strengths and advantage. Therefore, instead of considering competitive disadvantage as the lack of competitive advantage, similar to Powell, we argue that competitive disadvantage exists when an underlying capability fails 'to satisfy the minimum success requirements. . .required of any firm' (Powell, 2001: 877).

Lastly, focusing on the linkages between individual capabilities and the firm's overall competitive advantage does not represent the intellectual roots of the RBV well (e.g., Carmeli and Tishler, 2004). In fact, Newbert (2008: 751) argues that 'it is unlikely that a firm's competitive position is solely attributable to any one specific resource or capability.' Likewise, work on complementarities is based on the integration of many capabilities (Black and Boal, 1994; Carmeli and Tishler, 2004; Stieglitz and Heine, 2007). Therefore, to examine a more accurate model of competitive advantage, we do not address one or two individual capabilities; instead, we explore how capabilities, which are individually identified as either being a strength or weakness, form sets of capability strengths and capability weaknesses that directly and interactively affect competitive advantage. Importantly, while any particular capability falls on a continuum from weakness to strength, it can be considered only one or the other at any particular time, unless it is found to be at parity where it contributes to neither set.[2]

THEORETICAL MODEL

Firms operate in dynamic marketplaces in which competitors act and react to each other in order to exploit any advantage and earn greater relative performance (Smith, Ferrier, and Ndofor, 2001). In fact, research shows that these rivalrous dynamics can lead to the dethronement of market leaders (Ferrier *et al*., 1999; Ferrier *et al*., 2002). When viewed by the end-user, this rivalrous environment highlights differences among rivals' market offerings as supported by their capabilities (Priem, 2007). Thus, the differences among rivals' capability strength and weakness sets are expected to affect a firm's relative performance (Grimm and Smith, 1997). We begin by examining the effect of strength sets.

Firm's strength set and relative performance

The growing literature on the RBV demonstrates that an individual capability yields positive performance outcomes when it is valuable and rare (e.g., Hitt *et al*., 2001). This relationship holds when value is viewed through a comparative lens; higher levels of relative value increase positive outcomes (Sirmon *et al*., 2008). However, this relationship may be even more substantial when considering the firm's set of strengths because it can include numerous capabilities. Thus, enhancing the firm's set of strengths is likely to differentiate the firm from rivals, leading to increasing levels of competitive advantage and higher relative performance.

Increasingly positive performance gains are expected for two reasons. First, an enhanced strength set yields synergy. In other words, the strengths embedded in a strength set can complement each other. These complementarities, or enhancing relationships (Black and Boal, 1994), occur when the marginal value of a strength is enhanced by increases in other strengths (Milgrom and Roberts, 1995). Complementarities allow firms to

[2] Despite not creating advantage, a capability at parity is important. Capabilities at parity offer more value than capabilities which represent weakness, but not as much as capabilities in positions of strength. Moreover, they are likely needed by the firm to be competitive. We thank a thoughtful reviewer for this important idea.

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improve both the quality and price of delivered goods/services, thereby not only growing market share but, perhaps, increasing the size of the market as well. Second, differences in rivals' strength sets allow managers to react to the same market conditions in unique ways (Chen, 1996). For example, management's awareness and motivation to engage in actions to improve their relative performance is affected by the firm's set of capabilities (Chen, Su, and Tsai, 2007; Smith *et al*., 2001). An enhanced strength set allows firms to increase both their aggressiveness and range of competitive actions (Ferrier, 2001), while likely reducing the effectiveness of competitors' retaliatory actions.

For example, Southwest Airlines' system of short haul, direct flights, along with its operating efficiencies and a highly motivated workforce (representing strengths) allow it not only to offer low fares, but also to differentiate its service in ways that are often superior to most competitors (Sirmon, Hitt, and Ireland, 2007). Southwest's set of strengths creates synergies that enrich its competitiveness by producing greater levels of end-user satisfaction. Moreover, its strengths protect the firm from competitive actions taken by rivals. Additionally, Southwest's strength set facilitates growth in the number of customers in the market by allowing it to effectively compete with substitute services (e.g., automobiles, buses, and trains). As Miller, Eisenstat, and Foote (2002: 47) suggest, market share is beneficial because to improve performance, a firm must 'satisfy the needs of a large enough audience.'

In total, increases in a firm's strength set differentiate it from rivals, allowing it to satisfy more end-users. The complementarities among the strengths multiply the value that can be created for the customer as each increase. In addition, the unique actions and responses possible with increasing strengths also enhance the value the firm can provide to customers above and beyond that provided by rivals. Based on these arguments, a firm's strength set is likely to have an increasingly positive effect on relative performance.

Hypothesis 1 (H1). There is positive curvilinear relationship between a firm's strength set and relative performance. The relationship grows increasingly positive as the firm's strength set increases.

Next, we consider how the firm's weakness set affects relative performance.

Firm's weakness set and relative performance

Similar to strengths, complementarities can exist among the firm's set of capability weaknesses, where the marginal value of a weakness decreases with increases in other capability weaknesses. Thus, akin to grouping several strengths, groups of weaknesses together are likely to produce increasingly negative performance outcomes. Research in competitive dynamics suggests that at least three factors contribute to a negative curvilinear relationship between the firm's weakness set and relative performance: (1) likelihood of being attacked, (2) inefficiencies, and (3) inability to exploit opportunities.

A traditional war strategy is to attack rivals in areas of weakness; the same logic is applicable in the current competitive landscape (Bettis and Hitt, 1995; Grimm and Smith, 1997). Thus, turning the awareness-motivation-capability perspective around suggests that executives should expect rivals to attack in areas where their firm is weak (Hitt, Ireland, and Hoskisson, 2009). West and DeCastro argue this is true because weaknesses 'lay open the organization to critical strategic vulnerabilities' (2001: 418). As a result, when a firm has weaknesses, the number and intensity of competitor attacks are likely to be higher and stronger. As the number and intensity of attacks increase, sales are likely to suffer and the possibility of repeat sales dissipates. This leads to increasingly negative relative performance.

Additionally, the weakness set can increase a firm's cost structure, which, in turn, impedes the firm's ability to profitably satisfy end-users. For example, costs increase from assigning employees to perform tasks for which they are inadequately trained. As a result, they perform the task poorly, requiring additional service to correct problems and/or to mollify dissatisfied customers. Furthermore, these weaknesses can be self-reinforcing (e.g., loss of repeat customers), thereby impairing future performance. For instance, Leonard-Barton (1992) argues that the most skilled people in a functional domain seek employment where their skills and abilities are highly respected and rewarded. Thus, as the best-trained people migrate to the top firms in their functional domain, the firms with less effective functional skills will

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		Relative strength set	
		Low	**High**
Relative weakness set	**Low**	**I** Offsetting - undifferentiated Neutral performance effect (0)	**II** Robust advantage Positive performance effect (+)
	High	**III** Undermining Negative performance effect (-)	**IV** Precarious advantage Positive performance effect (+)

Figure 2. Performance effects of a firm's integration of relative strength and weakness sets

become increasingly inefficient relative to their rivals, thus increasing their weakness sets.

Lastly, a weakness set can limit a firm's ability to pursue new opportunities. For example, if a firm's assets, which are often used to facilitate and, indeed, implement strategic actions, are of lower value, it may have to forego certain strategic options such as acquisitions, entry into international markets, or major investments in R&D. Excluding these actions from the firm's repertoire of strategic alternatives increases the firm's reliance on a more narrow set of actions; such a constraint has been shown to harm firm performance (Miller and Chen, 1996). Moreover, existing revenue streams are likely to be under increasing pressure from the attacks of stronger rivals. Therefore, increases in a firm's weakness set are expected to differentiate the firm from its rivals in a negative manner (i.e., rivals' gain in advantage over the focal firm), thereby producing a negative curvilinear effect on relative performance.

Hypothesis 2 (H2). There is a negative curvilinear relationship between the firm's weakness set and relative performance. The relationship grows increasingly negative as the firm's weakness set degrades (i.e., grows larger).

Powell stated that 'it seems unreasonable to expect competitive advantage to imply superior performance no matter what else the firms may be doing wrong' (2001: 877). Therefore, understanding the effect of strength/weakness integration on relative performance is important.

Integrative effect of weakness and strength sets on relative performance

In order to effectively compete against rivals, firms must complete many tasks that, in combination, contribute to the satisfaction of end-users as well as owners' wealth (Morrow *et al*., 2007; Sirmon *et al*., 2011). To accomplish these outcomes, firms must integrate their capabilities in ways that allow them to cope with external uncertainty (Thompson, 1967). Thus, a firm's strength and weakness sets are interdependent (Powell, 2001). We summarize the potential combinations of strength and weakness sets and their effect on relative performance in Figure 2.

While limited, the few works that have addressed potential outcomes from the integration of capability strengths and weaknesses suggest that a *net-effect logic* will prevail. Specifically, Powell (2001) argues that strengths and weaknesses will offset one another and when an imbalance occurs, performance will tip in favor of the dominant force (positive for strength and negative for weakness). Similar logic was proposed by Ray, Barney and Muhanna (2004). Specifically, they argued that a firm's performance depends on the net effect of several capabilities. Likewise, Arend (2004) argued that performance is a function of the aggregate of firm capabilities. For example, if a hospital's set of weaknesses is relatively low (e.g., based perhaps on nursing constraints, configuration and availability of facilities, etc.), while its strengths are high (e.g., perhaps based on location, and quality medical doctors) the net-effect logic suggests that the set of strengths will overwhelm the set of weaknesses, thereby producing positive outcomes. This particular combination is represented in Cell

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II of Figure 2. Where a firm's strength set is vastly superior to its weakness set, a *robust advantage* results and, with it, higher relative performance.

The inverse combination, a low strength set paired with a high weakness set, represented in Cell III of Figure 2, should have a negative effect on relative performance. In this case, the firm's strength set exists, but at low levels. The weakness set, however, is able to *undermine* the strength set's positive contribution to firm outcomes, resulting in negative relative performance.

The next combination, a low strength set paired with a low weakness set, represented in Cell I of Figure 2, is likely to yield neutral results. In this case, the opposing sets of strengths and weaknesses *offset* each other. There is very little to differentiate firms with this combination from competitors. These firms are close to average. As such, no consistent relative performance differences are expected for these undifferentiated firms.

The last combination, a high strength set paired with a high weakness set, represented in Cell IV of Figure 2, is more complex. On the one hand, the net-effect logic suggests that these firms are not likely to enjoy a relative performance differential because the strength and weakness sets neutralize each other. On the other hand, an opposing and compelling logic suggests that this combination is a reasonable approach for managers trying to improve performance in the presence of highly competitive rivals.

To the degree that managers are able to identify weaknesses and strengths, the first alternative they would likely consider is eliminating weaknesses while enhancing strengths. However, it should be noted that pairing high strengths with high weaknesses can provide some efficiencies to the firm. Specifically, selective allocation allows a firm to maximize the impact of its limited investment resources. Managers can carefully choose which capabilities to emphasize and focus their investments in those selected capabilities. By focusing their investments, they are more likely to realize capability strengths. This selective investment process forces trade-offs. The emphasis on certain capabilities requires a de-emphasis of investments in others, likely those the managers deem less important for the strategies they have formulated. Thus, by maximizing investments in capabilities that support a selective set of strategic actions (e.g., process innovation, internationalization, or M&As), managers can better ensure these capabilities are superior to rivals and simultaneously acknowledge their weaknesses. Additionally, explicitly considering both strengths and weaknesses can stimulate positive outcomes by increasing the breadth of the managers' field of vision (Hambrick and Mason, 1984), enhancing the comprehensiveness of their decision making (Simons, Pelled, and Smith, 1999), reducing strategic myopia and complacency (Levinthal and March, 1993), and leading to strategic consensus (Knight *et al*., 1999).

Firms pursuing this selective investment pattern will not possess a robust advantage, but instead may be thought to have a *precarious advantage*. While efficient in terms of investment costs, a precarious advantage requires managers to contend with both high strengths and weaknesses. Specifically, a precarious advantage requires managers to optimize a set of constrained competitive actions to leverage the firm's strengths and avoid or buffer against its weaknesses. For example, Costco has developed a focused set of important capabilities (e.g., supplier relations, human resources, and procurement) to offer superior value to a selected segment of customers with a limited set of merchandise relative to competitors that target a broader range of customers using a vast array of merchandise (Bell and Leamon, 1998). Research shows that competitive simplicity can produce highly variable performance outcomes (e.g., Ferrier and Lyon, 2004; Miller and Chen, 1996). Thus, high levels of strength allow for effective, yet limited, competitive actions, while high levels of weakness make the firm susceptible to attack. As such, the performance effects of a precarious advantage are likely to be vulnerable; such an advantage can lead to positive performance, yet with increased levels of variation in the realized positive outcomes as opposed to firms possessing a robust advantage.

Formally, we list the following hypotheses for firms represented by Cells II, III, and IV.[3]

Hypothesis 3a (H3a). The integration of a high strength set with a low weakness set has a positive effect on relative performance.

[3] A formal hypothesis for Cell I is not offered because it is a null hypothesis.

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Hypothesis 3b (H3b). The integration of a low strength set with a high weakness set has a negative effect on relative performance.

Hypothesis 3c (H3c). The integration of a high strength set with a high weakness set has a positive effect on relative performance.

Hypothesis 3d (H3d). Precarious advantage produces greater variation in performance outcomes than does a robust advantage.

Because we expect both strength and weakness sets to affect relative performance, understanding factors that influence change in these drivers informs the durability of any advantage.

Change in strength and weakness sets over time

The drive for profits increases dynamism in the competitive landscape (Bettis and Hitt, 1995; Ferrier, 2001). With such dynamic rivalry, scholars argue that competitive advantage is fleeting (D'Aveni, 1994) and empirical results exist that support this contention (Wiggins and Ruefli, 2005). Beyond a general indictment of high levels of rivalry, our understanding of the dynamics related to the durability of competitive advantage is limited. Indeed, if firms' strength and weakness sets change significantly over time, these changes could undermine the durability of a firm's competitive advantage (or, in some cases, help build a new competitive advantage).

Because rivals, even indirect rivals, work to continuously improve their capabilities in order to attain high relative performance, changes in the strengths and weakness sets are likely to occur. However, continuous development of new competitive advantages requires basic resources, such as investment dollars, to maintain or improve the relative strength of the firm's capabilities (Kor and Mahoney, 2005). Two sources of such resources are the external environment and the firm's current operations. Therefore, we investigate how environmental munificence (exogenous) and prior firm performance (endogenous) influence changes in the firm's strength and weakness sets over time.

Environmental munificence refers to 'the scarcity or abundance of critical resources needed by (one or more) firms operating within an environment' (Castrogiovanni, 1991: 542). When operating in munificent environments, the accessibility of requisite resources is not a major concern. Investment dollars, employees, and other resources are generally available to most or all competitors. Thus, while competing in munificent environments reduces the threat of failure, differentiating the firm's capabilities from rivals is more difficult because of the access to plentiful resources. For example, in munificent environments, all firms could strive to enhance their capability strengths. Furthermore, because capability strengths are critical to firm success (and thereby highly salient), managers are likely aware of rivals' actions to overtake their capability strengths and are motivated to prevent it from happening by taking similar actions, thereby triggering a Red Queen effect among rivals (Barnett and McKendrick, 2004). In this case, the availability of critical resources serves as a catalyst for firms' actions and reactions that, in fact, will not change their relative positions. Moreover, investment alone may not be adequate to build or increase capability strengths. Instead, managers' efforts to invest in and bundle resources to develop capabilities are needed to create relative strengths (Sirmon *et al*., 2008; Sirmon and Hitt, 2003; 2009). These special managerial skills are not equally distributed among rivals (Castanias and Helfat, 2001). Therefore, a munificent environment alone is insufficient to enhance strength sets.

The same logic can be applied to reducing capability weaknesses in munificent environments. Although munificence may allow firms to ignore weaknesses, there are theoretical reasons why munificence may allow competitive firms to reduce their set of weaknesses. First, theory suggests that approaching parity is far easier than building a competitive advantage (Barney, 1991). In other words, increasing a capability's relative value to the average (i.e., parity) is more likely than overtaking competitors with superior capabilities. Second, working to improve a capability to parity may not be as threatening to rivals in munificent environments. In fact, achieving such parity may not be adequate to trigger rivals' awareness nor motivate them to react. Such actions are unlikely to unleash a Red Queen effect among rivals. Therefore, while environmental munificence is unlikely to affect change in a strength set, it allows the firm to reduce its weakness set over time.

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Hypothesis 4a (H4a). Higher munificence leads to a decrease in firms' weakness sets over time.

Additionally, firms can utilize their own resources to change their strength and weakness sets. For instance, they can allocate flows of firm-specific resources (Dierickx and Cool, 1989) to enrich their stock of capabilities. Moreover, firm-specific resources are largely inaccessible to rivals. For example, financial resources generated by the firm's prior performance are available for its private use. The asymmetric nature of these resources allows the firm to potentially differentiate its capabilities from those of rivals because managers can direct these private financial resources into firm-specific R&D projects (Ndofor, Sirmon, and He, 2011), in-house training sessions, etc. Thus, higher prior performance provides an asymmetric source of firm-specific resources with which to enhance the firm's set of strengths and/or reduce its set of weaknesses.

Here, even if rivals are aware and motivated to match the firm's investments, they do not necessarily have access to the requisite resources to do so. This, in part, explains why it is especially difficult for firms experiencing poor performance to turn around their fortunes (Morrow *et al*., 2007); instead they often become less aggressive and slower to act (Ferrier *et al*., 2002). These arguments suggest that higher prior performance provides firms the opportunity to enrich their strength set as well as reduce their set of weaknesses over time.

Hypothesis 4b (H4b). Higher prior performance leads to an increase in firms' strength sets over time.

Hypothesis 4c (H4c). Higher prior performance leads to a decrease in firms' weakness sets over time.

METHODS

Sample

The data presented in this study were collected by the *Banque de France*[4] as part of its *Sesame* project. The *Sesame* project was a nonprofit venture developed to collect detailed strategic and managerial data on French industrial firms to complement the financial data that the *Banque de France* already possesses. A random sample of 4,169 small and medium sized industrial firms was selected to participate in the survey (Cool and Henderson, 1998). Because of the sample's size, each year econometricians from the *Banque de France* administered the survey to one-third of the sample, from 2001 to 2003. Thus, the data are not panelized. The interviews were conducted by *Banque de France* agents specially trained in survey techniques; they conducted personal interviews with CEOs using a computer-aided questionnaire. The businesses were classified according to the European equivalent of the SIC classification system (the NACE) at the three-digit level. We analyzed those firms that also had complete financial performance data, resulting in a final sample of 2,980 firms belonging to 78 separate industries. The average number of firms per three-digit industry is 38.21 and the average size of these firms is 104 employees (please see Appendix 1). This sample was used to test the performance hypotheses.

From 2004 to 2006, the *Banque de France* administered a second survey to the initial group of firms. This survey was identical to the initial instrument. In total, 1,868 firms from the first round participated in the second survey. Missing data limited the set of usable observations to 1,578. This sample was used to test hypotheses related to changes in strength and weakness sets.

Measures

Dependent variables

Three separate dependent variables were used to test the hypotheses. To assess the performance hypotheses, an accounting-based measure was used because many firms in the sample are private for which no market-based data are available. Specifically, we measured performance with firm value-added. This figure approximates the contribution the firm has made in the transformation process from inputs to finished output. It measures the full value actually created by the firm through its operations before its distribution to the firm's stakeholders (e.g., family members and employees). This measure corresponds to the total economic value created by the capital and labor

[4] No merchant or power relations exist between the *Banque de France* and the interviewed companies.

employed by a firm and is a fundamental performance metric (Lieberman and Dhawan, 2005). Value-added is calculated by subtracting from the firm's total revenue any intermediate consumption, which includes such items as raw materials, semifinished products, external services used to manufacture finished products, energy consumption, etc. Also, considering the presence of many private firms in the sample, in which owners may try to limit their declared net profit with tax strategies (George, 2005), value-added is a more accurate proxy for performance because it is less likely to reflect such biases. As such, this type of measure is an appropriate metric for empirical studies of the RBV, especially when private firms are in the sample. Also, because it is not a ratio, there are no concerns regarding the source of its variance.

Because our theory pertained to competitive advantage, a relative construct (Hitt *et al*., 2009), we utilized a relative performance measure as suggested by the literature (Arend, 2003). To calculate the *relative performance* measure, we industry centered value-added on three-digit industry classifications. Moreover, we lagged this variable to correspond to firm performance two years after the year the survey was completed.[5]

Importantly, these performance data were not collected via the *Sesame* questionnaire, but are part of the *Banque de France's* ongoing and regular financial data collection efforts for France's industrial firms. Therefore, common method bias is not a concern with these data. Furthermore, the *Banque* audits the figures where necessary to ensure their accuracy, increasing their validity. Finally, performance measures are not available for the second survey because they are still in the process of being centralized and validated by the *Banque de France*.

To test the hypotheses related to changes in strength and weakness sets, we compared firms' scores for their strength and weakness sets (described later) from the second survey to the corresponding scores from the first survey to produce the variables: *Strength Set Change* and *Weakness Set Change*.[6] These variables represent the difference between the strength (weakness) set at the time of the second survey and the strength (weakness) set at the time of the first survey. Again, these figures were computed for the 1,578 firms that were surveyed twice.

Independent variables

The variables of primary interest to the performance hypotheses are sets of strengths and weaknesses. Importantly, these variables represent a much larger number of capabilities than most prior research has examined. Specifically, we obtained data from the *Sesame* questionnaire which measures the relative value of six capabilities. The CEO (i.e., respondent) was asked to evaluate each focal capability against his/her firm's major competitors' functionally similar capabilities.[7] Respondents evaluated the focal capability as in a weaker position (−2), slightly weaker position (−1), average position (0), slightly stronger position (1), or among the strongest positions (2). The individual capabilities examined included: cost management, product reliability, product innovation, process innovation, brand management, and manufacturing flexibility. While this is not an exhaustive list, these capabilities are highly important for creating value in industrial firms, are output driven, and represent the major capabilities of the firms surveyed.

The strength set variable summarizes firm capabilities with values greater than major rivals, while the weakness set variable summarizes firm capabilities with values less than major rivals. To separate strengths from weaknesses, we utilized spline functions, which model differences in relationships above and below a critical threshold level (Greene, 2003; Greve, 2003). Importantly, the critical threshold was set at zero per item response.[8]

[5] Results with a one-year lag are substantively the same as those reported.

[6] Both of these variables satisfy the criteria for representing a normal distribution.

[7] Because respondents identified the subset of major competitors to which to compare their firm, there is a chance of inconsistent scores. However, three different empirical procedures address this concern. First, we tested, for each industry, the reliability of the six capability scales to measure the consistency among respondents. Cronbach's Alpha scores with a mean score of 0.68 indicate acceptable internal consistency. As a robustness check, we also run our analyses only with industries with Alpha >0.70, with no substantive changes in the outcomes. Second, closer examination of the mean industry standard deviation per strength (0.69–0.80) and weakness (0.41–0.79) suggest that responses were consistent. Moreover, the responses per industry do not deviate from normal distributions. We thank a thoughtful reviewer for suggesting we examine these attributes.

[8] To test the robustness of our results, we examined several alternative operationalizations. First, we kept our spline function set at zero but instead of following the Deephouse (1999) approach, we simply summed strengths and weaknesses. Second, we explored an empirically, rather than theoretically, set spline

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Thus, each capability score above parity was coded as a capability strength, while each capability score below parity was coded as a capability weakness. A value of 0 indicates a lack of strength or weakness and, while important to the firm, does not contribute to either set.

Second, following our theoretical approach emphasizing firms' sets of strengths and weaknesses in a competitive market, we used Deephouse's (1999) approach to compute strength and weakness set scores. The following equation illustrates the calculation of firm f's *strength set*, where S_{af} is the strength score for capability a for firm f, $Ave(S_{ai})$ is the average strength score for capability a in industry i, and $SD(S_{ai})$ is its standard deviation. Industry is based on the three-digit level. The corresponding weakness equation was utilized to compute each firm's *weakness set* score; before computing this variable the absolute value of the raw weakness scores was obtained.

$$\sum_{a=1}^{6} \left[(S_{af} - Ave(S_{ai}))/SD(S_{ai}) \right]$$

For hypotheses related to changes in strength and weakness sets, the variables of interest are munificence and prior performance. Environmental munificence refers to the availability of resources in the environment (Castrogiovanni, 1991). Following Sutcliffe's (1994) approach, industry sales were used to create a time trend regression analysis. *Munificence* is the unstandardized regression coefficient in the regression model divided by the mean of industry sales. The greater this value, the higher the industry's munificence score. Importantly, similar to our performance measure, the data used for these regressions were not obtained through the *Sesame* surveys, but were independently collected by the *Banque de France* as part of their population-level data collection effort. Thus, these figures are not influenced by sample size or by any specific firms in the sample, but reflect the entire population of firms in the focal industry. Lastly, *prior performance* is proxied by the firm's return on assets for the year of the first survey. Again, these data were gathered independently, thus, common method variance is not a concern.

Control variables

Several control variables were included in both analyses. First, because the initial data were collected over three years, we control for the year the questionnaire was administered. Two dummy variables control for the year effect: *Year 1* and *Year 2*. Second, we controlled for the size of the firm, because larger firms are likely to have larger revenues, costs and, perhaps, more capabilities, etc. *Size* is the log of the number of employees in the firm. Third, we controlled for the potential effect of membership in a trade group, because prior research suggests that group membership can affect a firm's competitive position based on access to group resources and capabilities beyond those held by the firm (Hoskisson *et al*., 2004). *Group* is a dummy variable, with a 1 indicating membership in a business group. Fourth, to control for potential differences between the firms that are publicly traded and private firms, we included a dummy variable for this dichotomy. *Public* is coded with a 1 indicating public ownership. Fifth, we controlled for the *age* of the firm by including the logarithm of the number of years since founding. Sixth, we controlled for the firm's level of *product diversification* based on a Herfindahl measure of revenues across a potential of ten separate product categories. All of these control variables were included in both sets of analyses.

Additionally, for the tests of the performance hypotheses, we included both prior performance and munificence, as discussed earlier, as controls. When testing the hypotheses related to changes in strength and weakness sets, we added three more controls. These included the number of *years between surveys.* This variable is a count of the years between the initial and the second survey. Also, we controlled for the *initial level of strengths* or *weaknesses.* These initial-level variables capture the dynamics of rivalry in each market.

Lastly, in both sets of analyses, we controlled for any other unobserved industry-level effects with *industry dummies* entered at the two-digit level. Industry clustered robust standard errors were applied to our regression modeling to provide conservative tests of our hypotheses.

location. Specifically, we used the sample mean per industry to establish the spline. For this empirically established spline, we developed two different approaches for the final variables. For one, we simply summed the strengths and weaknesses; for the other, we followed the Deephouse approach. All three of these alternative approaches produced substantially similar results (strength and weakness sets directly and interactively affect performance). We thank a thoughtful reviewer for this suggestion.

RESULTS

The descriptive statistics and correlations are presented in Table 1, while Table 2 presents the results of tests for the relative performance hypotheses. Table 3 provides the results of tests for the hypotheses related to changes in strength and weakness sets.

Hypothesis 1 suggests that relative performance will grow increasingly positive as the firm's strength set increases. Models 2 and 3 in Table 2 show that both the strength set variable and its square are positive and statistically significant. These results provide support for the hypothesized positive curvilinear relationship.

Hypothesis 2 proposes that relative performance grows increasingly negative as the firm's weakness set degrades (i.e., grows larger). As seen in Models 2 and 3 in Table 2, the weakness set variable is negative and statistically significant. However, its square is not statistically significant. These results do not support Hypothesis 2. Instead of a negative curvilinear relationship, the results show that a firm's set of weaknesses has a negative linear effect on relative performance.[9]

To test the hypothesized effects of the different combinations of strength and weakness sets on relative performance, we utilized dummy variables to identify the firms represented by the four cells presented in Figure 2. While median splits along the sample's strength set score and weakness set score could be used for the identification of these groups,[10] to ensure the precision of the test and to reflect the theoretical argument, we identified highs and lows at the 25th percentile level, which allowed for a strong degree of differentiation, yet offered a reasonable number of observations per group. For example, firms represented by Cell II in Figure 2 (high strength/low weakness) were coded with a dummy variable when their strength set was among the top 25th percentile and their weakness set was among the bottom 25th percentile. We repeated this approach until all firms represented by Figure 2 were identified. The comparison group for these groups of firms are the firms that do not meet these criteria; those that are near average in their industries.

The results for the tests of Hypotheses 3a, 3b, and 3c are listed in Table 2, Model 4. Hypothesis 3a suggested that the integration of a *high strength* set with a *low weakness* set positively affects relative performance. The positive and statistically significant coefficient for this grouping supports this hypothesis. Hypothesis 3b suggested that the integration of a *low strength* set with a *high weakness* set negatively affects relative performance. The negative and statistically significant coefficient for this grouping provides support for this hypothesis. Hypothesis 3c suggested that the integration of a *high strength* set with a *high weakness* set has a positive effect on relative firm performance. The positive and statistically significant coefficient for this grouping supports this hypothesis. Also, it is useful to note that, as expected, the integration of a *low strength* set with a *low weakness* set has no effect on relative performance.

Figure 3 provides a rich visual representation of the combinative effects strength and weakness sets have on relative performance. The figure is based on the equation listed in Model 5 and reflects the results offered in Model 4 as well. The central region of the surface is located at the intersection of the middle strength and middle weakness set values. It is not surprising to see that this central area relates closely with zero on the relative performance scale. Contrasting this central location with the four corners of the graph is informative and reflects the results in Model 4. Moreover, considering the dynamic nature of the graph's surface contours can provide additional understanding.

First, the robust advantage region (high strength/low weakness) generally offers much higher levels of relative performance. Likewise, the precarious advantage region (high strength/high weakness) also shows higher levels of performance. Third, the low strength/low weakness region, what we term *offsetting*, does not show much appreciable difference in relative performance. Fourth, the low strength/high weakness region, what we term *undermining* in Figure 2, shows large losses in performance. Additionally, the curvilinear surface demonstrates the increasingly positive effect of capability strength sets on relative performance.

Comparison of the robust and precarious advantage regions is important. Graphically, the precarious advantage region seems to offer the

[9] To ensure that the results for H1 and H2 were not driven by one of the underlining capabilities, we analyzed each spline specification per capability (before they were operationalized as sets). These results show that the outcomes for the sets are not the result of a single underlying capability, nor were any of the individual specifications counter to theory.

[10] The median split approach produced similar results with the low strength/low weakness group as the comparison.

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Table 1. Descriptive statistics and correlations

	Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Relative performance	173.95	365.65															
2	Year 1	0.34	0.47	0.03														
3	Year 2	0.33	0.47	−0.06	−0.51													
4	Size	4.23	0.80	0.72	0.01	−0.12												
5	Age	30.93	24.86	0.10	0.00	−0.01	0.15											
6	Group	0.39	0.49	0.32	0.00	−0.06	0.42	0.00										
7	Public	0.01	0.12	0.09	0.00	−0.01	0.11	0.04	0.04									
8	Prior performance	20.29	107.36	0.00	0.03	−0.01	−0.03	−0.04	0.02	−0.01								
9	Product diversification	0.15	0.22	−0.01	−0.01	0.01	0.01	0.06	−0.05	0.02	−0.02							
10	Munificence	0.04	0.04	0.00	0.02	−0.16	0.06	−0.06	0.07	−0.03	0.01	−0.05						
11	Strength set	0.01	2.74	0.07	−0.02	0.02	0.00	−0.07	0.00	0.01	0.03	−0.01	−0.01					
12	Weakness set	−0.05	2.33	−0.02	0.00	0.00	0.05	0.06	0.03	−0.01	−0.03	0.02	0.02	−0.10				
13	Low strength & low weakness	0.08	0.27	0.00	−0.01	0.03	−0.02	0.02	0.01	0.00	0.02	−0.01	0.00	−0.39	−0.30			
14	Low strength & high weakness	0.07	0.25	−0.02	0.02	0.00	0.05	0.04	0.04	0.03	−0.02	0.00	0.02	−0.36	0.52	−0.08		
15	High strength & low weakness	0.04	0.19	0.04	0.00	0.01	0.01	−0.05	0.01	0.02	0.00	0.00	0.00	0.24	−0.19	−0.06	−0.05	
16	High strength & high weakness	0.04	0.17	0.05	−0.01	0.00	0.04	−0.02	0.05	0.00	−0.01	−0.02	−0.02	0.21	0.19	−0.05	−0.05	−0.03

Correlations greater than 0.03 are significant at $p < 0.05$; correlations greater than 0.04 are significant at $p < 0.01$; n = 2,980.

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Table 2. Strength and weakness sets effects on relative performance

Variable	Model 1 Relative performance	Model 2 Relative performance	Model 3 Relative performance	Model 4 Relative performance	Model 5 Relative performance
Constant	−21632.940***	−21786.210***	−21769.360***	−21678.540***	−21788.770***
Year 1	462.152**	472.008**	472.882**	484.637**	478.197**
Year 2	597.491**	581.375**	583.900**	606.653**	574.931**
Size	5011.001***	5004.874***	5003.295***	5014.246***	5005.423***
Age	−3.660	−2.149	−2.140	−2.951	−2.247
Group	443.632**	449.502**	450.436**	436.703**	446.666**
Public	693.932	628.953	629.595	720.225	662.197
Prior performance	1.004+	0.866	0.868	0.958	0.867
Product diversification	−363.582	−340.470	−337.638	−347.214	−346.385
Munificence	−2737.559	−2695.303	−2686.905	−2523.158	−2767.025
Strength set		109.237***	106.784***		108.816***
Weakness set		−108.167**	−94.972**		−66.828*
Strength set squared		14.560**	14.957**		16.323*
Weakness set squared		2.787			
Strength set × weakness set					17.559+
Low strength & low weakness				120.727	
Low strength & high weakness				−989.144***	
High strength & low weakness				675.766*	
High strength & high weakness				845.521*	
F	407.70***	289.79***	313.99***	286.16***	290.18***
R^2	0.53	0.56	0.56	0.56	0.56
n	2980	2980	2980	2980	2980

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; directional hypotheses use single-tailed tests; industry dummies included but not listed.

Table 3. Firm and environmental effects on strength and weakness set change

	Model 6 Strength set change	Model 7 Weakness set change
Constant	0.043	0.042
Years between surveys	−0.018	−0.072
Year 1	−0.148	0.183
Year 2	0.077	−0.256
Size	0.016	−0.115
Age	0.001	0.000
Group	−0.125	−0.055
Public	1.300+	0.021
Product diversification	−0.365	0.292
Initial strength set	−0.487***	
Initial weakness set		−1.111***
Munificence	6.340	−9.240**
Prior performance	0.109*	−0.140*
F	21.07***	143.98***
R^2	0.15	0.53
n	1.578	1.578

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; industry dummies included but not listed.

highest potential performance, but analyses show that the coefficients for these two groups of firms, found in Model 4, are not statistically different ($f = 0.739$; ns). Second, we examined the differences in the variation between these two combinations to test Hypothesis 3d. The results indicate that firms with a robust advantage (high strength/low weakness) have far less variance in their performance outcomes than do the firms with a precarious advantage (high strength/high

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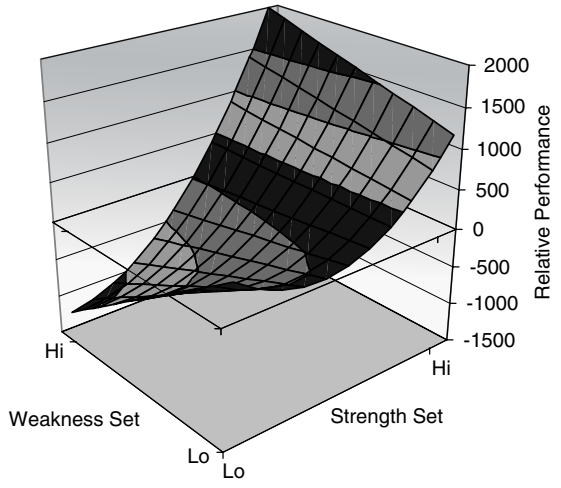

Figure 3. Response surface of the integration of strength and weakness sets

weaknesses) ($f = 1.873$, $p < 0.001$). More specifically, the standard deviation for performance in firms with a robust advantage is approximately 37 percent smaller than for firms possessing a precarious advantage. These results provide support for Hypothesis 3d and have important implications for the riskiness and durability of these two forms of advantage.

The results for the hypotheses related to change in strength and weakness hypotheses are listed in Table 3, Models 6 and 7. Hypothesis 4a suggested that environmental munificence helps firms reduce their weakness sets over time. As depicted in Model 7, munificence has a negative and statistically significant coefficient, providing support for this hypothesis. Hypothesis 4b suggested that higher prior performance would allow firms to increase their strength sets over time. The positive and statistically significant coefficient listed in Model 6 provides support for this hypothesis. Finally, Hypothesis 4c suggested that higher prior performance would allow firms to reduce their weakness sets over time. The negative and statistically significant coefficient for prior performance in Model 7 provides support for this hypothesis. Additionally, it is worth noting that consistent with our logic, the results shown in Model 6 indicate the lack of a statistically significant relationship between munificence and change in a firm's strength set.

Lastly, the strong effect for the initial strength variable in Model 6 and initial weakness variable in Model 7 indicate that, indeed, strong competitive efforts are being put forth by rivals.

DISCUSSION

Understanding the nature of competitive advantage is at the heart of strategic management (Grimm and Smith, 1997). As such, more fully identifying and investigating the bases of competitive advantage, as well as the factors that influence their change over time, is important to both theory and practice. By exploring the role of capability weaknesses along with capability strengths, we more fully describe the bases of competitive advantage. Moreover, our investigation of factors that affect change in firms' capability weakness and strength sets over time adds to the field's limited understanding of the dynamics related to the durability of competitive advantage. In total, our work demonstrates that the bases of competitive advantage are more complex than previously thought; strengths are not the only driver of competitive advantage—weaknesses matter greatly as well. Additionally, the durability of any advantage is undermined by rivals', even indirect rivals', ongoing and dynamic capability investments.

While Chen and Miller (1994) suggested that considering weakness is important to the strategic management of firms, research on the RBV has largely ignored the effects of capability weaknesses (Montgomery, 1995). Especially absent is empirical research on the effects of weaknesses on competitive advantage. As such, we build on prior conceptual work to theoretically differentiate capability strengths and weaknesses by viewing value and rarity through a comparative lens. Additionally, because firms are conceptualized as bundles of integrated capabilities, we focus on sets of capability strengths and weaknesses. And, as our results show, both strength and weakness sets have important direct and integrated effects on competitive advantage via its empirical correlate, relative performance. These results indicate that, indeed, the exclusion of weaknesses has limited our understanding of competitive advantage. In fact, our results suggest this void in prior research likely represents a critical limitation. Addressing this oversight is important for a more complete and accurate understanding of competitive advantage, but especially regarding the temporal nature of competitive advantage. A temporary advantage

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does not result only through the development or protection of strengths alone; weaknesses also matter.

More specifically, our empirical results show that a firm's set of capability strengths has an increasingly positive relationship with relative performance. This result is important for at least three reasons. First, this outcome suggests that synergistic effects exist among strengths. Second, the results suggest that continuing to build capability strengths pays major dividends. Thus, firms should not remain static after achieving success; they should continue to develop their capabilities, thereby adding to their competitive advantage and resulting performance. Third, this research is the first to specify and support the functional form of the firm's strength set: strengths complement one another and yield increasingly positive relative performance.

Another important finding pertains to the direct effects of weakness sets on competitive advantage and relative performance. While we hypothesized a negative curvilinear relationship, we found a strong negative linear relationship. Perhaps the curvilinear effect, which was expected to occur at the highest levels of weaknesses, is not identified because firms exit markets when they have such high levels of weakness. Regardless, the negative outcome demonstrates that weaknesses are important to relative performance and should be considered in future RBV research.

The importance of weaknesses is underscored by the results of the integration hypotheses. The limited theory pertaining to strength/weakness integration suggests that a counterbalancing relationship with performance exists; one that favors the greater force (Powell, 2001; Ray *et al*., 2004). The nonsignificant results for the integration of low strength and low weakness sets are consistent with this logic, as are the results for Hypothesis 3b, which show that integrating a low strength set with a high weakness set negatively affects relative performance. Firms in this latter condition possess an overall competitive disadvantage. However, it is important to note that without consideration of weaknesses, RBV-based logic would have suggested that these firms would, perhaps, be adequate performers because some level of strength is possessed; while not the best performers, these would not be expected to perform so poorly. Our results indicate that modeling weaknesses along with strengths provides a more accurate picture of firm outcomes.

Next, integrating high strength and low weakness sets (robust advantage) and integrating high strength and high weakness sets (precarious advantage) positively affect relative performance. The latter finding runs contrary to the net-offset logic and, instead, supports our arguments pertaining to efficient investments. That is, a discriminating investment strategy that maximizes some capabilities at the expense of others can be beneficial, yet entails risk. While high performance is possible with both approaches, a precarious advantage produces much more performance variation than a robust advantage. Moreover, it is likely that a precarious advantage is less durable because the high level of weaknesses makes the firm vulnerable to rivals' attacks. Research in competitive dynamics suggests that rivals are more likely to attack when they perceive a higher probability of success (Chen *et al*., 2007; Hitt *et al*., 2009). Therefore, firms holding a precarious advantage could benefit by directing profits toward the elimination of weaknesses, thereby reducing their vulnerability to attacks and prolonging their advantage.

In total, these results underscore the importance of having a more complete understanding of the bases of competitive advantage. There is more to realizing a competitive advantage—even temporary advantage—than most previous research has suggested. Instead of focusing exclusively on strengths, our research suggests that the focus should expand. Specifically, sets of strengths, sets of weaknesses, and their integration should be considered. Incorporating weaknesses along with strengths enhances the efficacy of RBV logic with respect to competitive advantage. Moreover, as Figure 3 shows, the contours of the response surface suggest a dynamic relationship between strength and weakness sets. For example, decreasing weakness is positive when a firm possesses low levels of strength, but negative (or neutral, because the coefficients for the precarious and robust advantages are not statistically different) when possessing high levels of strength. This indicates the value of understanding how strength and weakness sets affect performance in a range of conditions.

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Understanding dynamics related to the durability of competitive advantage

To understand the dynamics related to the durability of advantages, we also examined how environmental and firm-based factors affect changes in the capability sets. Through this, we studied exogenous and endogenous antecedents of temporary advantage. Theory suggests that prior performance and environmental munificence likely influence change in a firm's strength and weakness sets over time. Understanding these influences is important because continuous investments by rivals, even indirect rivals, in the development of their capabilities results in a dynamic marketplace where current competitive advantages can be lost.

First, the results show that initial levels of strength and weakness sets are strong indicators of change in a firm's strength and weakness sets over time. Thus, a strong *parity effect* occurs among rivals. Firms put forth significant effort to gain ground on major competitors by increasing their own capability strengths and eliminating capability weaknesses. If these variables were not significant predictors, it would suggest that an advantage hierarchy is present and resistant to change, but this is not the case. Also, reviewing the distribution of strength and weakness sets across time shows that while individual firms jockey, either losing or gaining advantage as they adjust their capabilities, the overall distribution of advantage in the market space remains stable. In other words, competing in an age of temporary advantage does not mean competitive advantage is impossible; rather it means maintaining a differentiated stock of capabilities is difficult in dynamic markets.

In order to create a series of temporary competitive advantages, firms need to invest in capabilities that help them maintain/improve their relative positions. The results suggest that in munificent environments, firms are either (1) not aware or (2) not motivated to respond to rivals taking actions to reduce their weakness sets, but that they are (1) aware of, (2) motivated to, and (3) capable of matching investments (because resources are openly available) in order to increase strength sets. Thus, munificent environments allow firms to reduce weaknesses, but are less likely to facilitate strength gains relative to the competitors. As such, a Red Queen effect (Barnett and McKendrick, 2004) exists for strengths, but not for weaknesses, when resources are highly accessible.

Next, the results show that higher performance leads to positive changes in both strength and weakness sets over time. Firm-generated resources help firms avoid the erosion of competitive advantage. Or for firms with a precarious advantage, directing firm-generated resources to the elimination of weaknesses may be most important. Because these firms are vulnerable to rivals' attacks, reducing weaknesses is important. Missing this opportunity could lead these firms from a precarious advantage to a position where weaknesses undermine their strengths. These results, together with the results pertaining to munificent environments, may help explain why firms get trapped in death spirals (e.g., Arend, 2008; Ferrier *et al.*, 2002; Morrow *et al.*, 2007). Decreasing performance and low munificence eliminate an ability to build strengths or eliminate weaknesses. Firms facing these conditions are unlikely to overcome their competitive disadvantages.

Collectively, these results improve our understanding of factors that influence changes in the bases of competitive advantage and its durability. Moreover, these results offer compelling evidence of the mechanisms that propel an age of temporary advantage.

Limitations and future research

Similar to most research, this study has limitations, many of which provide direction for future research. First, our data on capabilities are perceptual in nature. Although perceptual measures are commonly used to measure capabilities (e.g., Cool and Henderson, 1998; Danneels, 2008) and prior research has shown that they often demonstrate sufficient validity (Wall *et al.*, 2004) like ours do,[11] we cannot be certain that our results are not influenced by perceptual filters. As such, additional research based on objective measures would be useful. Second, this research represents an extension of prior work that commonly focuses on one or two capabilities. Nonetheless, the six capabilities we measured, while a significant increase, do not represent all firm capabilities. Continued expansion of the capabilities considered would be useful.

[11] Please see Footnotes 6 and 7.

Third, our examination of the complementarities embedded in the firm's strength and weakness sets focused on synergistic relationships. However, it is possible that such relationships could make the firm susceptible to quick erosion of its competitive advantage if a strength becomes obsolete, for example. In fact, such a situation might mimic the results reported in Cell III of Figure 2, where capability weaknesses overwhelm the firm's strengths and led to poor performance.

In fact, investigating other combinations of strengths and weaknesses in more detail might provide additional contributions to the literature. Specifically, our results demonstrated that combining high strength and high weakness sets is a rewarding, yet risky, option. Future research could help us understand the vulnerability created by this combination. Alternatively, future research could investigate how firm strategy or structure can leverage this particular combination for optimal performance. Specifically, studying the effects of various types of interdependence (pooled, sequential, or reciprocal) among strengths and weaknesses could offer significant contributions to our understanding of how firms optimize performance. Additionally, investigating how capability strengths and weaknesses affect the firm's alliance strategy could prove useful. Also, future research that examines how the characteristics of the firm's competitive actions (e.g., aggressiveness, response speed, competitive repertoire simplicity, unpredictability, deviance, etc.) mediate the capability-performance relationship would be very useful. Or, research might examine how a firm's strength and weakness sets influence the use of these competitive behaviors. These considerations could further our understanding of, for example, mutual forbearance, and how capabilities influence competitive dynamics more generally.

Fourth, while we emphasized competitive interdependence in our study, we did not have data on specific competitive actions or dyadic competitive interactions. Instead, we directed attention to the dynamic interdependence among multiple rivals by focusing on their sets of capabilities. Based on prior research, we assume that specific actions are based on the firm's capability sets, which is consistent with the RBV and competitive dynamics literature (Barney, 1991; Grimm and Smith, 1997). Future research could make a contribution by combining the logics of capabilities and competitive dynamics to investigate how similarity in firms' strength and weakness sets affects competitive tension (Chen *et al*., 2007).[12] In fact, using the awareness-motivation-capability framework to specifically contrast how weaknesses affect interfirm dynamics based on multimarket overlap or commonality (Chen, 1996; Gimeno, 1999; Gimeno and Woo, 1996) could be informative. Our results imply that similar capability weaknesses may influence the intensity of competitive tension between rivals differently than do similar capability strengths.

Fifth, our results pertaining to changes in firms' strength and weakness sets over time suggest that the durability of competitive advantage is limited. However, because the linkage in this study is indirect, research is needed to show how changes in capability sets over time directly affect the firm's ability to gain or sustain a competitive advantage. Specifically, our aggregation of multiple capability strengths does not allow for fine-grained analyses of the influence each specific capability has on a firm's outcomes. More direct tests of the effects of changes in the composition of capability strength/weakness sets over time on firm performance are needed.

Finally, our study examined manufacturing firms; research should be extended to examine the capabilities of service firms to determine if the results of this study generalize to other industries.

Managerial implications

This work provides several implications for managers. First, configurations of capabilities must be effectively managed. In particular, managers must manage both capability weaknesses and strengths effectively. Developing a temporary advantage is not just about protecting or creating strengths, but also addressing weaknesses. In fact, reducing or eliminating capability weaknesses may be an expedient route to higher firm performance. Theory suggests that achieving parity with rivals is less difficult than surpassing the better competitors in an industry. Thus, to improve performance, managers could, perhaps, first concentrate on reducing weaknesses, which might allow their firm

[12] We thank a very insightful reviewer for offering us this comment.

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to achieve performance parity. While the results provide partial empirical support for Powell's (2001, 2002) suggestion that a primary strategic difference among firms is not strength, but weakness, they also suggest that improving capability strength is important. In fact, the highest performers in our sample possessed high levels of strength and these strengths provided an increasingly positive effect on performance.

It is also important for managers to recognize that current strengths could become tomorrow's weaknesses if investment is not sustained. In dynamic environments, maintaining a relative position requires managers to enhance their firm's capabilities (Sirmon *et al*., 2007). Rivals are continuously searching for ways to overcome their competitors' competitive advantage. As such, all firms must continuously develop their capabilities, requiring ongoing investments (Kor and Mahoney, 2005) and emphasis on effective management (Sirmon *et al*., 2007).

CONCLUSION

This research endeavored to increase our understanding of the bases of competitive advantages as well as the dynamics related to the durability of such advantages. The study focused on capability strengths and capability weaknesses. Our approach addresses several gaps in current theoretical approaches, especially prior work on the RBV, and opens promising opportunities for future research on temporary advantage. The results of this research enable scholars to more effectively determine how and why some firms achieve competitive advantage and superior relative performance, as well as uncover the factors that affect the temporal nature of that advantage.

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APPENDIX 1. DISTRIBUTION OF FIRMS ACROSS INDUSTRIES

NAF Industry Name (2-digit)	Industry code (3-digit)	Number of observations	Average # of employees
Food and beverage industries	151	105	108.3
	152	19	117.9
	153	21	110.0
	155	28	142.9
	156	16	69.0
	157	20	131.9
	158	98	98.9
	159	40	78.5
Textile industries	171	6	72.7
	172	21	114.3
	173	16	86.9
	174	27	77.9
	175	31	94.5
	177	13	199.4
Manufacture of wearing apparel	182	91	74.0
Manufacture of leather products and footwear	191	10	51.8
	192	10	59.6
	193	22	135.2
Manufacture of wood and wood products	201	42	65.2
	202	14	148.9
	203	36	91.6
	204	40	68.9
	205	11	63.2
Manufacture of pulp, paper, and paperboard	211	14	14.0
	212	91	91.0
Publishing, printing, and recorded media	221	5	143.2
	222	128	68.6
Chemical industry	241	44	117.5
	243	28	99.5
	244	23	119.7
	245	36	71.2
	246	24	84.7
Manufacture of plastic and rubber products	251	21	107.8
	252	209	101.3
Manufacture of other nonmetallic mineral products	261	29	132.0
	262	18	108.9
	263	5	65.2
	266	42	76.5
	267	16	59.8
	268	5	145.0
Metallurgy	271	5	254.6
	272	8	178.3
	273	12	68.8
	274	12	148.4
	275	31	183.6
Manufacture of fabricated metal products	281	96	83.3
	282	16	60.3
	283	78	62.9
	284	75	112.7
	285	218	65.5
	286	59	107.3
	287	75	106.3

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APPENDIX 1. (CONTINUED)

NAF Industry Name (2-digit)	Industry code (3-digit)	Number of observations	Average # of employees
Manufacture of machinery and equipment	291	48	105.9
	292	80	105.7
	293	34	75.1
	294	29	75.4
	295	96	102.8
Manufacture of electric machineries and equipments	311	22	120.3
	312	20	106.7
	313	8	195.9
	314	5	44.8
	315	26	53.8
	316	16	98.1
Manufacture of radio and television equipment	321	38	144.9
	322	24	118.6
Manufacture of optical and photographic equipment	331	36	93.4
	332	33	112.6
	333	20	73.8
	334	18	93.4
Manufacture of motor vehicles	342	37	107.5
	343	32	165.8
Manufacture of other transport equipment	351	19	101.6
	353	15	245.6
Manufacture of furniture	361	106	88.3
	362	15	82.7
	364	11	138.9
	365	9	75.3
	366	23	82.9
	Averages	**38.2**	**104.0**

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