One Man's Death is Another Man's Bread: The Effect of a CEO's Sudden Death on Competitors' Strategic Investments

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ABSTRACT   We examine how a CEO's sudden death influences competitors' strategic investments. Consistent with the literature on death awareness and the expectancy-valence model, we suggest that a CEO's unexpected death can trigger competitors' competitive moves. Using a difference-in-differences methodology, we show that a competitor increases strategic investments after its peer firm experiences a CEO's sudden death. This effect becomes stronger when the competitor and its peer firm share similar resource allocation profiles or the competitor possesses greater organizational slack. Our supplementary analysis shows that a competitor increases its strategic action intensity following a CEO's sudden demise at a peer firm. This study contributes to the competitive dynamics literature by highlighting how critical events affecting the cognitive base and values of strategic leaders expose strategic vulnerability and in turn evoke competitive moves by competitors in response to the events.

Keywords: CEO death, competitive dynamics, strategic vulnerability, strategic investments

INTRODUCTION

Research on competitive dynamics has shown that firms constantly engage in competitive actions and responses to achieve a competitive advantage and strengthen their market position. This research has identified several drivers that evoke competitive responses when a firm *is attacked* by a rival. A firm's response to an attack by its rivals is influenced by various factors, including the attributes of attacks (Chen and MacMillan, 1992; Chen and Miller, 1994), firm-level characteristics (Smith et al., 1991), resource- and

market-related factors (Yu and Cannella, 2007), and top management team characteristics (Hambrick et al., 1996). However, existing research has paid limited attention to how and why critical events *not* involving attacks *but* affecting the cognitive base and values of strategic leaders can have an impact on a competitor's competitive moves taken in response to the events. The limited attention is surprising, given the role of cognitive base and values of decision-makers in micro-competitive decision-making and behaviour (Hambrick et al., 1996). Delving into the psychological processes of decision-makers can provide an important perspective for scholars to expand our understanding beyond the extant focus on the action-response dyad. This study examines the under-researched theme of human factors to unpack the micro-level underlying mechanism that explains how and why critical events not entailing attacks can trigger competitive moves.

To fill this research gap, we focus on the sudden death of a chief executive officer (CEO) because, among various micro-level factors, the death of a rival constitutes a critical event, making it an ideal context for advancing theoretical perspectives. On the one hand, competitor CEOs may not take any competitive actions because they might be compassionate about the deceased CEO.[1] On the other hand, competitor CEOs may engage in competitive behaviour because they could exploit the firm's strategic vulnerability arising from the sudden death of a CEO.[2] Given the tension between these logics, this study disentangles the effects of a CEO's sudden death at a peer firm on the cognitive base and values of strategic leaders and its competitors' competitive behaviour by examining the question of how and why *a competitor* (the focus of this study) changes its strategic investments when *a peer firm* (a direct rival within the same industry) experiences the sudden death of its CEO.

The literature on death awareness offers theoretical guidance on why such an occurrence could make a peer firm more vulnerable to its competitors. Reconciling oneself to the fact that one's death is inevitable is one of the most ubiquitous experiences humans have (Greenberg et al., 1997). Death awareness can have a strong influence on people's motivations and behaviours (Pyszczynski et al., 2003) because it can engender two general types of consequences: death anxiety and death reflection (Grant and Wade-Benzoni, 2009). Death anxiety leads to self-protective responses and disengagement from the workplace, whereas death reflection gives rise to the contemplation of one's life and prosocial behaviour. Thus, a CEO's sudden death at a peer firm may induce top executives of the *peer firm* to disengage from their work at least in the short term, reevaluate their goals and values, and even reallocate corporate resources in the long run. As a result, the peer firm may have difficulty responding to competitive actions, creating an invaluable window of opportunity in which competitors take advantage of the peer firm's vulnerability.

We propose that *competitors* may increase their strategic investments to exploit the strategic vulnerability arising from the sudden death of a CEO at a peer firm. The expectancy-valence model (Vroom, 1964) provides a theoretical framework for why competitor CEOs may increase their strategic investments to exploit a CEO's sudden death at a peer firm. This model has been used to understand an individual's motivation to take an action and is the micro-level underpinning for the framework of competitive dynamics (Chen and Miller, 1994; Yu and Cannella, 2007). According to this model, two conditions underlie the proclivity to act: (1) a subjectively desired outcome of acting (valence), and (2) the perceived likelihood of earning the desired outcome (expectancy) (Atkinson, 1964; Vroom, 1964). This model suggests that a CEO's sudden death may induce competitor CEOs to take competitive actions

because taking advantage of the peer firm that has difficulty retaliating against competitive attacks enables competitor CEOs to earn a desired outcome and have a higher probability of earning such an outcome. In sum, building on the literature on death awareness (Grant and Wade-Benzoni, 2009) and the expectancy-valence model (Vroom, 1964), we argue that a CEO's unexpected death affecting the cognitive base and values of strategic leaders may expose a firm's strategic vulnerability and induce its competitors to take competitive moves in terms of strategic investments.

We focus on a firm's strategic investments (financial investments on acquisitions, research and development [R&D], and capital expenditures) because these investments can enhance a firm's competitive position in the marketplace (Hoskisson et al., 2017). We develop theoretical arguments and empirically test the relationship between the sudden death of a CEO at a peer firm and the strategic investments made by competitors in response. Specifically, we find that a CEO's sudden death leads a competitor to increase its strategic investments. The effects become stronger when resource allocation profiles between a competitor and its peer firm are similar, or when a competitor has greater organizational slack. Supplementary analyses corroborate this argument by showing how a competitor increases the intensity of its strategic actions following the unexpected demise of a CEO at a peer firm.

This study makes several contributions. First, it advances the literature on competitive dynamics focusing on antecedents that evoke competitive responses. The literature has shown that various factors can trigger a firm's response to an attack by its rivals (e.g., Chen and MacMillan, 1992; Chen and Miller, 1994; Hambrick et al., 1996; Smith et al., 1991; Yu and Cannella, 2007). This study advances this stream of research by identifying how critical events not involving attacks but affecting the cognitive base and values of top executives act as an antecedent that elicits competitive actions. Second, it contributes to the literature on how the death of corporate leaders influences firm outcomes. Recent work has shown that a director's death leads a firm to make fewer acquisitions (Shi et al., 2017a) and increase its level of corporate social responsibility (CSR) (Chen et al., 2020). Departing from this line of research focusing on firms undergoing a corporate leader's death, this study sheds light on how competitors' strategic decisions are influenced by the demise of a leader at a peer firm by delineating the psychological mechanisms of top executives.

THEORETICAL DEVELOPMENT

A CEO's Sudden Death, Death Awareness, and Top Executives

The upper echelon perspective proposes that boundedly rational decision-makers bring a cognitive base and values to their strategic decision-making, and that their experiences influence how they interpret strategic situations, leading to different firm decisions and outcomes (Hambrick and Mason, 1984). Anchoring on this perspective, competitive dynamics research has shown that the attributes of top managers can affect a firm's competitive moves (e.g., Ferrier, 2001; Hambrick et al., 1996; Smith et al., 1991). Consistent with this research, we propose that a CEO's sudden death at a peer firm may affect a firm's strategic decisions by influencing the cognitive base and values of top executives. Research indicates that awareness of another's death may

remind individuals of their own mortality, and that self-relevance plays a critical role in the conditioning of such mortality awareness (Grant and Wade-Benzoni, 2009). Because a top executive team is a dominant coalition that makes daily strategic decisions (Hambrick and Mason, 1984), where top executives are physically and emotionally proximate to a CEO, the sudden demise of a CEO will likely remind them of their own mortality and influence their motivations and behaviour.

Since death awareness can have a strong effect on individuals' motivations and behaviour (Pyszczynski et al., 2003), it can lead individuals to show two broad types of short- and long-term responses: death anxiety and death reflection (Grant and Wade-Benzoni, 2009). Death anxiety describes individuals' emotional experiences such as fear, stress, strain, and exhaustion, resulting in self-protective responses and disengagement from the workplace (Kivimäki et al., 2002). Individuals who become aware of their own mortality tend to retreat from full participation in their work, at least in the short run (Bertrand and Mullainathan, 2003). For instance, CEOs who experience an independent director's death become less acquisitive (Shi et al., 2017a). Death reflection describes individuals' cognitive state of death awareness (Grant and Wade-Benzoni, 2009). Post-traumatic growth theory posits that the awareness of mortality leads individuals to engage in death reflection (Calhoun and Tedeschi, 2001; Tedeschi and Calhoun, 2004) because they consciously contemplate the meaning and purpose of their own lives and demonstrate prosocial behaviour (Cozzolino et al., 2004). Research has shown that CEOs in this situation tend to increase firm-level CSR activity (Chen et al., 2020).

In sum, a CEO's sudden death at a peer firm may lead top executives of the peer firm to disengage from their work and shift their managerial attention and corporate resources to prosocial activity. As a result, a peer firm experiencing the sudden death of its CEO may have difficulty responding to competitors' strategic moves. Such a vulnerability may offer an invaluable window of opportunity for competitors seeking to gain an advantage.

A CEO's Sudden Death, Competitor CEOs, and Competitors' Competitive Moves

Unlike top executives at the peer firm, competitor CEOs witnessing this event may not experience death awareness because of low self-relevance to the event.[3] Although competitor CEOs are likely to socially identify with the deceased CEO (McDonald and Westphal, 2003, 2010), they are not physically and emotionally close to him or her. In addition, top executives at the apex of a firm's hierarchy are driven by achievement, power, and social status (Davis et al., 1997; Park and Westphal, 2013). This suggests that competitor CEOs may not only disregard their own mortality but also capitalize on a CEO's sudden death at a peer firm.

The expectancy-valence model (Vroom, 1964) offers theoretical predictions for why *competitors* make competitive moves in response to a CEO's sudden death at a peer firm. This model provides a psychological foundation for the framework of competitive dynamics (Chen and Miller, 1994; Yu and Cannella, 2007).[4] It proposes that there are two conditions that underpin a proclivity to take an action: (1) an individual's subjective *value* of an action (valence), and (2) an individual's assessment of

the *probabilities* of achieving a reward from an action (expectancy) (Atkinson, 1964; Vroom, 1964). Drawing on the expectancy-valence model, we propose that the unexpected death of a CEO at a peer firm may induce competitor CEOs to take competitive actions by strengthening their motivation to attack the peer firm because attacking the peer firm debilitated by the sudden demise of its CEO can increase both value and probabilities of successful competitive actions taken in response. Our proposition is consistent with the insight of the legendary military strategist Sun Tzu, who maintained that one can advance without impediments if one strikes at an enemy's weak points (Griffith, 1963), suggesting that attacking at an enemy's weak points can increase both *value* and *chance* of victory (McNeilly, 1996). Korean military history supports our premise. In the event of his death, Admiral Yi Sun-Shin ordered his staff to keep his death a secret because it could affect the morale of his fleet and give his enemy a chance to attack his ships.[5] The logic of traditional military strategy and history is applicable in competitive dynamics because a firm may gain an advantage by taking competitive actions to exploit a rival's strategic vulnerability arising from the sudden death of a CEO (West and DeCastro, 2001).

Top executives who have experienced a CEO's sudden death may experience death anxiety and disengage from their work at least in the short run. CEOs experiencing anxiety choose less risky strategic decisions (Mannor et al., 2016), and CEOs going through death awareness become less acquisitive (Shi et al., 2017a). The top executives may also engage in death reflection and contemplate the meaning of their own lives. They may focus on prosocial behaviour and commit themselves to prosocial initiatives in the long run (Chen et al., 2020). As a result, a firm experiencing the sudden death of its CEO may be unable to react quickly to an attack by its rivals. In addition, a CEO's sudden death may influence the process of CEO succession and delay a firm's competitive responses. The sudden death of a CEO may be overwhelmingly disruptive to firms because the board of directors is unable to immediately select a successor (Wiersema, 2002). Incoming CEOs must go through a transition period to adapt to a new environment (Gabarro, 2007; Shen and Cannella, 2003). As such, competitors may see such disruption as a chance to take advantage of a firm's weakness (Derfus et al., 2008; Ferrier, 2001). In sum, when a peer firm goes through the unexpected death of its CEO, it may have difficulty responding quickly to competitive actions. Since competitive actions that go unchallenged or to which response is delayed can create value (Chen and MacMillan, 1992), competitor CEOs' competitive moves can lead to more gains than losses, increasing the value of competitive actions.

Because top executives who have experienced a CEO's sudden death likely deprioritize business in the short term (Bertrand and Mullainathan, 2003; Shi et al., 2017a), they may not be able to quickly respond to competitive attacks. Taking quick actions and responses is one of the critical components needed to maintain a firm's competitive advantage over its rivals (Smith et al., 2001). An inability to respond quickly may weaken a firm's capability to guard against attacks by its competitors. Moreover, the top executives may also shift their managerial attention and corporate resources to non-competitive initiatives, such as firm-level pro-social activity (Chen et al., 2020), making fewer resources available for competitive actions and undermining the firm's capabilities to respond to competitive attacks. In addition, a firm experiencing a CEO's sudden death may endure a certain period of inability to take actions, disrupting its strategy formulation and implementation (Burchard et al., 2021).

At the same time, top management team members may leave the firm, leading to a loss of critical resources for strategy formulation and execution. Because of such disruption, a CEO's unexpected death can drive stock price volatility, which increases the cost of capital and reduces the attractiveness of firm equity (Clayton et al., 2005; Worrell and Davidson III, 1987). In this way, the unexpected death of a CEO at a peer firm may create a relative imbalance in firm resources between the peer firm and its competitors and give the competitors an advantage to develop and implement strategic actions. Thus, competitor CEOs may become confident in their capability to take competitive actions against the peer firm debilitated by the sudden demise of its CEO.

Taken together, a CEO's sudden death at a peer firm may lead competitor CEOs to engage in competitive actions because seizing an invaluable opportunity arising from the sudden death can increase both value and chance of successful competitive actions against the peer firm.

A CEO's Sudden Death and Competitors' Strategic Investments

We propose that the sudden death of a CEO at a peer firm may induce competitors to increase their strategic investments. CEOs have broad discretion over a firm's strategic investments – financial investment in acquisitions, R&D, and capital expenditures (e.g., Hambrick and Finkelstein, 1987; Sanders and Hambrick, 2007). Such strategic investments are characterized by some common 'strategic' attributes (Connelly et al., 2010; Shi et al., 2019). They require a significant commitment of resources such as financial assets, people, and organizational structure (Miller and Chen, 1994). Because strategic investments involve a substantial outlay, they are difficult to reverse (Chen and Macmillan, 1992; Hambrick et al., 1996). They are also challenging for rivals to imitate due to time compression diseconomies (Dierickx and Cool, 1989). Moreover, strategic investments involve a significant upfront investment, and any return bears fruit only in the long term (Miller and Chen, 1996).

Strategic investments can enhance a firm's market position vis-à-vis its rivals in a variety of ways. For instance, acquisitions can help firms diversify into new products and geographic markets to achieve economies of scale and scope, preempt competition from rivals (Haleblian et al., 2009), and reconfigure their businesses by accessing target resources (Karim and Mitchell, 2000). R&D investments can contribute to the introduction and improvement of products and services, and they can play a critical role in a firm's innovation and its capability to learn faster than its rivals (Cohen and Levinthal, 1989, 1990). Capital expenditures can be used to open new facilities and upgrade existing ones in order to improve a firm's competitive position vis-à-vis its rivals (Henderson and Cool, 2003). Strategic investments can also strengthen a firm's competitive advantage by reducing the intensity and speed of competitive responses (Chen et al., 1992; Chen and Miller, 1994).

These strategic investments are likely to yield better returns when a peer firm is in a vulnerable position. Because firms compete to source valuable and unique resources and capabilities, to acquire new customers, and to retain existing customers, any vulnerability exposed by a CEO's sudden death could allow competitors to make greater strategic investments and strengthen their own competitive positions. Therefore, we suggest that a CEO's sudden death may lead competitors to increase their strategic investments.

Hypothesis 1:   A CEO's sudden death at a peer firm will lead a competitor to increase its strategic investments in the post-death period.

Moderating Effect of Similarity in Strategic Resource Allocation Profiles

We posit that similarity in strategic resource allocation profiles between a competitor and its peer firm may strengthen the relationship proposed in our main hypothesis. Market commonality and resource similarity are two major factors that determine the intensity of a competitive rivalry (Chen, 1996). Strategic resource allocation profiles refer to the deployment of strategic resources across major functional dimensions, with each dimension representing a salient aspect of business strategy (Finkelstein and Hambrick, 1990; Geletkanycz and Hambrick, 1997). When strategic resource allocation profiles between firms are similar, resources are configured to develop similar capabilities and pursue similar business strategies (Geletkanycz and Hambrick, 1997). Such a rivalry between firms becomes intense (Chen, 1996; Gimeno and Woo, 1996). As a result, similar strategic resource allocation profiles between firms strengthen the motivation to take competitive actions against a rival (Chen et al., 2007; Chen and Hambrick, 1995). In this case, competitor CEOs may be more motivated to increase strategic investments to exploit any vulnerability arising from a CEO's unexpected death at a peer firm. In contrast, when strategic resource allocation profiles are dissimilar, firms have different capabilities and business strategies, indicating that rivalry between firms is less intense, and competitor CEOs thus have less motivation to make competitive moves. In such cases, competitors may be less likely to increase strategic investments. Thus, we propose the following hypothesis:

Hypothesis 2:   Similarity in strategic resource allocation profiles between a competitor and a peer firm will positively moderate the relationship between the competitor and its strategic investments, such that the increase in the strategic investments of the competitor from the pre-death period to the post-death period will be stronger when similarity in strategic resource allocation profiles between the competitor and the peer firm is higher.

Moderating Effect of Organizational Slack

The extent to which a CEO's sudden death at a peer firm influences a competitor's strategic investments may also be contingent on its organizational slack, defined as a cushion of actual or potential resources that are not being used by a firm and that allow it to adapt to both internal and external pressures and make strategic changes (Bourgeois III, 1981). Organizational slack enables a firm to make bold strategic moves and increase its chance of gaining a competitive advantage over its rivals. For instance, firms with greater slack resources tend to have a better ability to execute more competitive moves (Young et al., 1996) and carry out aggressive competitive actions (Ferrier, 2001). When a competitor has greater organizational slack, it may increase its strategic investments following a CEO's sudden demise at a peer firm because greater organizational slack gives competitor CEOs sufficient resources available to increase strategic investments. In contrast, when organizational slack is low, a

firm may lack the resources to formulate competitive initiatives and execute competitive actions (Young et al., 1996). In such cases, competitor CEOs may be constrained from increasing strategic investments to exploit the sudden demise of a CEO at a peer firm. Therefore, we posit:

Hypothesis 3: Organizational slack will positively moderate the relationship between a competitor and its strategic investments, such that the increase in the strategic investments of the competitor from the pre-death period to the post-death period will be stronger when organizational slack is greater.

Three-Way Interaction Effects of Similarity in Strategic Resource Allocation Profiles and Organizational Slack

We further argue that such strategic investments will be greatest when both similarity in strategic resource allocation profiles between a competitor and its peer firm and organizational slack are higher. When organizational slack is greater, the effects on competitors' behaviour of similarity in strategic resource allocation profiles may become stronger. In this case, firms that are motivated to make strategic moves may be able to deploy resources to engage in faster and more aggressive strategic actions. Thus, competitor CEOs may increase strategic investments to capitalize on the unexpected demise of a CEO at a peer firm. In contrast, when firms that are motivated to make competitive actions lack organizational slack, they may not be able to make quick and aggressive competitive moves. In this case, competitor CEOs may not be able to increase strategic investments in order to exploit the vulnerability of a peer firm experiencing a CEO's sudden death. Therefore, we posit that competitors' strategic investments will be greatest when strategic resource allocation profiles between a competitor and its peer firm are similar and organizational slack is higher. Thus, we posit the following:

Hypothesis 4: The moderating effect of similarity in strategic resource allocation profiles between a competitor and a peer firm on the relationship between a competitor and its strategic investments is stronger for a competitor with greater organizational slack.

The theoretical model delineating the relationships proposed in Hypothesis 1–4 is summarized in Figure 1.

METHODOLOGY

Sample

We drew our sample from several data sources: (1) Standard and Poor's ExecuComp; (2) data on the sudden deaths of CEOs from Quigley et al. (2017)[6] and of CEO Dismissal Data (Gentry et al., 2021); (3) Hoberg-Phillips Text-based Network Industry Classification (TNIC); (4) Standard & Poor's Compustat; (5) the SDC Platinum database; and (6) Institutional Brokers Estimates System (IBES). Our sample began with all the US
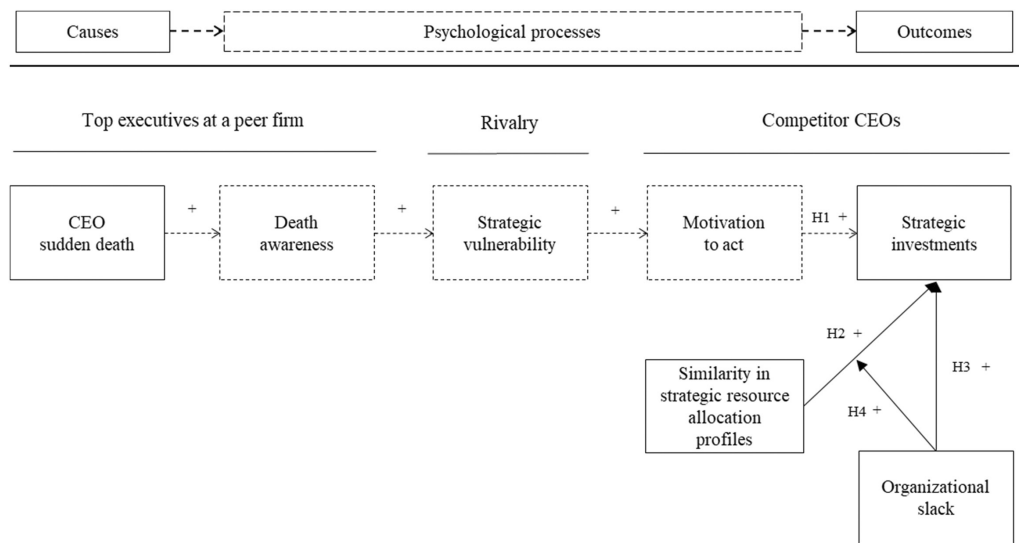
Figure 1. The effects of a CEO's sudden death at a peer firm on the cognitive base and values of top executives who have experienced a CEO's sudden death and competitor CEOs who have witnessed the sudden death

public firms covered by ExecuComp, which offers the executive compensation data for S&P 1500 firms. We identified competitor CEOs and their compensation information from this data set. We also obtained firm-level accounting information from Standard & Poor's Compustat, acquisition data from the SDC Platinum database, and analyst coverage data from the IBES.

For the initial sample of death events, we obtained information that identified 240 public companies based in the USA whose CEO died while in office between 1950 and 2009 (Quigley et al., 2017) and identified seven CEO sudden deaths between 2010 and 2016 from CEO Dismissal Data (Gentry et al., 2021). Quigley and colleagues' data set was compiled by searching obituary listings in the S&P Register of Corporations, Directors, and Executives, the *Wall Street Journal*, the *New York Times*, and executive deaths compiled by Etebari et al. (1987), as well as from Lexis-Nexis, Mergent Web-Reports, and ProQuest. This data set identifies only sudden deaths of CEOs that occurred 'instantaneously or within a few hours of an abrupt change in the person's previous clinical state' (Nguyen and Nielsen, 2010). A CEO death was not coded as a sudden death if it could have been expected (e.g., following serious injury or acute accident). We used consistent criteria to identify the seven deaths from CEO Dismissal Data.

We then identified competitors of the late CEO's firm. Defining the competitors was critical to our empirical investigation. We used TNIC data (Hoberg and Phillips, 2016), following prominent competitor studies that also implemented a DiD approach (Ammann et al., 2016; Connelly et al., 2020; Shi et al., 2017b). According to Hoberg and Phillips (2016), the TNIC database identifies competitive intensity between a pair of public firms by examining two firms' pairwise product similarity.

Specifically, it examines the language used in the business description of the firms' 10 K reports; pairs of firms with a product similarity rating of 21.32 per cent or above are classified as competitors. With this criterion, TNIC classifies 2 per cent of all firm-pairs as competitors, which is comparable to the SIC 3-digit industry code. Securities and Exchange Commission (SEC) regulations require that all public companies in the USA report their significant products offered to customers. To this end, the TNIC database may have advantages in identifying direct competitors. It not only accurately measures the product similarity based on the business descriptions found in 10 K reports but also captures market changes over time and takes into account product diversification (Hoberg and Phillips, 2016). Further, because the TNIC captures product similarity between a pair of firms, it offers non-transitivity properties. Thus, if Firms A and B have 30 per cent product similarity whereas Firms B and C offer 27 per cent and Firms A and C have a product similarity rating of 15 per cent, the SIC classification would classify all three firms as competitors but TNIC would classify only Firms A and B and Firms B and C as competitors, whereas Firms A and C would be considered non-competitors.

When we matched a firm experiencing a CEO's sudden death with competitors using the TNIC database, we limited our sample to deaths since 1996, because the TNIC database begins in 1996. There are 58 cases of CEO sudden deaths between 1996 and 2016, and we also excluded those firms that had no competitors in the year of the CEO's demise. Because the death of a firm's director or CEO influences the focal firm's strategic actions, such as acquisitions (Shi et al., 2017a) and CSR (Chen et al., 2020), we added a condition that competitors had not experienced the death of any director or CEO during the sample period. We gathered information about director deaths provided by the BoardEx database and Lexis-Nexis searches and excluded competitors who had lost a director or CEO during the sample period. In the case of multiple CEO deaths, we focused on the first, following a prior study (Shi et al., 2017a). This left a total of 403 competitors of 39 firms that experienced the sudden death of a CEO who satisfied our criteria.[7] Thus, a firm that experienced the sudden death of its CEO was matched with 10.33 competitors on average who satisfied our criteria.

Competitors were then matched with a control group. This study implements a DiD analytical model, an approach that relies on the parallel pre-trend assumption. That is, the treatment group and control group would have exhibited similar trends of the variable of interest (i.e., dependent variable) without the treatment. For competitors, a CEO's unexpected death at a peer firm functions as a quasi-random external shock (treatment), an ideal setting to apply the DiD analytical model. Strategic investments of competitors vis-à-vis that of control firms in the pre- and post-death periods may show the effect of such a treatment on a firm's strategic investments. Thus, it is critical to identify a control group with a similar degree of strategic investments before a CEO death occurs.

We used one-to-one coarsened exact matching (CEM) to match competitors to a control group. CEM utilizes monotonic imbalance bounding, which may reduce model dependence, bias, causal estimation error, and inefficiency (Iacus et al., 2011). In particular, stringently matching observable variables by CEM can alleviate the

concern about biases caused by the correlation between observable and unobservable variables (Altonji et al., 2005). Thus, although stringent matching may lead to a smaller sample matched to a control group, it results in better quality causal inferences. When matching competitors with control firms, in addition to the strategic investments variable, we included firm size, debt-to-equity ratio, and firm performance. In doing so, we took the value of the variables prior to a CEO's demise (i.e., one year before his or her death) and obtained a matched pair for 256 competitor firms. We then constructed panel data for seven-year firm-year observations, starting three years before the CEO's demise and ending three years after. Our final sample included the sudden death of 39 CEOs and 3250 firm-year observations made from 256 competitor-control firm pairs.

Dependent Variable

The strategic investments variable was operationalized as the sum of acquisitions, R&D, and capital expenditures scaled by revenue (Chatterjee and Hambrick, 2011; Connelly et al., 2020; Zhu and Chen, 2015). Acquisition, R&D, and capital expenditures are indicators of strategic investments and share a few common strategic characteristics (Connelly et al., 2010; Shi et al., 2019). Strategic investments require significant resource commitment (Miller and Chen, 1994), are difficult to be reversed (Chen and Macmillan, 1992; Hambrick et al., 1996), and pay off in the long term (Miller and Chen, 1996). Thus, the ratio of the summation of these three variables to revenue shows a firm's overall strategic moves, which is consistent with our theory. We obtained R&D and capital expenditures from the Compustat database. We measured acquisition expenditure as the total transaction values for all acquisitions completed in a year as reported in the SDC Platinum database, following prior study (Sanders and Hambrick, 2007). As discussed in the robustness tests and supplementary analysis section, we conducted robustness checks using alternative measures of the dependent variable.

Moderating Variables

We used two moderating variables, *similarity in strategic resource allocation profiles* and *organizational slack*. First, to capture the similarity in strategic resource allocation profiles between a competitor and a peer firm experiencing a CEO's sudden death, we categorized resources into six dimensions including advertising intensity (operationalized as advertising expense over sales), R&D intensity (operationalized as R&D expenditure over sales), plant and equipment (P&E) newness (operationalized as net P&E over sales), non-production overhead (operationalized as sales, general, and administrative expenses over sales), inventory level (operationalized as inventories over sales), and financial leverage (operationalized as debt over equity), categories that are often used to examine the strategic similarity between competitors (Carpenter, 2000; Finkelstein and Hambrick, 1990).

To operationalize *similarity in strategic resource allocation profiles*, we calculated the reverse-coded Euclidean distance between a competitor and a peer firm experiencing the unexpected death of its CEO in the six strategic resource dimensions. To measure the distance,

we calculated the Euclidean distance between the strategic resource allocation profiles of a competitor firm and the peer firm, as follows:

$$D_{ab} = SQRT\left[\left(A_a - A_b\right)^2 + \left(R_a - R_b\right)^2 + \left(P_a - P_b\right)^2 + \left(S_a - S_b\right)^2 + \left(I_a - I_b\right)^2 + \left(F_a - F_b\right)^2\right],$$

where 'a' refers to the firm experiencing the death of its CEO and 'b' refers to a competitor. A, R, P, S, I, and F each refers to the standardized score of advertising expense over sales, R&D expenditure over sales, net P&E over sales, sales, general, and administrative expenses over sales, inventories over sales, and debt over equity. When we standardized each variable, we used the competitor group (including the peer firm experiencing the unexpected death of its CEO) defined by the TNIC of each peer firm experiencing the death event to capture each competitor's distance to the peer firm experiencing the death event in the competitor group. We reverse-coded this variable to construct *similarity in strategic resource allocation profiles*.

We constructed an alternative measure of *similarity in strategic resource allocation profiles*. Specifically, we standardized each of the six dimensions by the competitor group defined by TNIC of each peer firm experiencing the unexpected death of its CEO (including the firm experiencing the death event). We then calculated the absolute difference between a competitor and the peer firm in six dimensions of strategic resources and added them up (Carpenter, 2000; Finkelstein and Hambrick, 1990), which captures each competitor's distance to the peer firm experiencing the death event in the competitor group. Finally, we multiplied this variable by minus one (-1) to construct the *similarity in strategic resource allocation profiles* variable, which is similar to strategic conformity used in prior studies (Carpenter, 2000; Finkelstein and Hambrick, 1990).

Following prior studies (Chen et al., 2007; Chen et al., 2010; Ferrier, 2001), *organizational slack* was operationalized as current assets scaled by current liabilities. Organizational slack can vary in its recoverability, and current ratio may indicate liquid, immediately available resources in the firm's possession (Bourgeois III, 1981; Bourgeois III and Singh, 1983). Thus, this variable is appropriate for our study because competitors may need immediately available resources to make strategic investments following the demise of a CEO at a peer firm.

Control Variables

We included the following control variables to account for the influence of firm, CEO, and industry characteristics on strategic investments. We controlled for *firm size*, operationalized as natural logarithm of total assets (Chatterjee and Hambrick, 2011) since larger firms may have different propensities in making strategic investments. We also controlled for *debt-to-equity ratio*, operationalized as the ratio of total liabilities to equity. Firms may be less likely to increase their strategic investments when financially constrained by high liabilities but more likely to do so when there is lower liabilities relative to equity. We controlled for *firm performance*, measured as the ratio of earnings before interest and tax to total assets, as poor performance may encourage making strategic investments

to change the status quo and improve poor performance (Cyert and March, 1963; Taylor and Greve, 2006).

Given the discretion of CEOs when it comes to a firm's strategic investments (Hoskisson et al., 2017), we controlled for competitors (treatment group) and their control group's CEO characteristics, such as *CEO age, CEO ownership, CEO duality, CEO tenure, CEO in the money*, and *CEO gender*. *CEO age* is measured as age of a CEO. A CEO's age indicates the CEO career horizon, and short career horizon (i.e., higher CEO age) often leads to fewer activities whose outcomes are uncertain and long-term (Cho and Kim, 2017; Matta and Beamish, 2008). We controlled for *CEO duality, CEO tenure*, and *CEO ownership* because they are indicators of CEO power, which in turn may affect a firm's resource allocation to strategic investments (Chatterjee and Hambrick, 2011). *CEO tenure* was measured as the total number of years an individual had served as CEO of a firm. *CEO duality* was operationalized as a dichotomy variable, receiving a score of one if a competitor CEO was the board chairman and zero if not. Using data from Standard & Poor's ExecuComp, we measured *CEO ownership* as a ratio of the number of shares the CEO owns to the total number of shares outstanding. Prior research demonstrates that CEO stock option induces CEOs to increase risky strategic outlays (Sanders and Hambrick, 2007). *CEO in the money* was operationalized as the natural logarithm of the Black-Scholes value of vested and unvested in-the-money options held by a CEO. We also controlled for *CEO gender* because it may affect a firm's tendency toward taking risk and making investments (Chen et al., 2016; Palvia et al., 2015). To control for the monitoring effect of securities analysts (Chen et al., 2015) on a firm's strategic investments, we included *analyst coverage*, measured as the number of analysts following a competitor firm, which was obtained from the IBES. We also controlled for industry strategic investments measured as the median strategic investment of firms in the same industry (SIC 2-digit). All financial variables were winsorized at 1 per cent and 99 per cent to mitigate the impact of outliers. As a robustness check, we used variables winsorized at 2 per cent and 98 per cent and at 3 per cent and 97 per cent, respectively, and the regression results with such different sets of variables remained similar.

Difference-in-Differences Analyses and Coarsened Exact Matching

We implemented a DiD approach to test our hypotheses. Our model treats the competitors of a peer firm experiencing the unexpected death of its CEO as a treatment group and compares their strategic investments with that of control group, those firms that did not experience the sudden death of a CEO at a peer firm. The following is our DiD specification:

$$\text{Strategic investments}_{i,t} = \alpha_i + \alpha_t + \beta_1 \text{ Competitors in post} - \text{death period}_{it} + \gamma X_{i,t} + \varepsilon_{i,t}$$

where i indexes firm and t indexes year. Competitors in post-death period is a dummy variable and it is coded as one if a competitor of the firm experiencing a death event is in the post-death firm-year, and zero otherwise. That is, a competitor of the firm experiencing an unexpected CEO death receives a value of one only if the observation occurs

in a firm-year following his or her death, and zero if the observation takes place in the firm-year prior to or during the year of his or her death. Control firms (i.e., those firms that did not experience the unexpected death of a CEO at a peer firm) always receive a value of zero. *Competitors in post-death period* is the primary independent variable of interest in our study. The coefficient of interest is β_1 measures the effect of a CEO's sudden death on a competitor's strategic investments and Hypothesis 1 predicts that the coefficient β_1 should be positive. α_t denotes year fixed effects and α_i denotes firm fixed effects, which were included to account for temporal effects and time-invariant firm characters, respectively. $\varepsilon_{i,t}$ is the error term and standard errors were clustered at the firm level.

Table I reports the univariate and multivariate imbalance between treatment and control groups. *L1 statistics* measures the imbalance between treatment and control groups and it ranges between zero and one, with lower values representing higher balance between treatment and control groups (Iacus et al., 2011). As shown in Table I, both multivariate and univariate L1 statistics decreased substantially after the CEM procedure. Likewise, Table II reports the *t*-test of univariate differences in means between the treatment and control groups and the results show that there is no substantial difference between the two groups.

RESULTS

The descriptive statistics and pairwise correlations are reported in Table III. In a DiD setup, it is important to establish a parallel pre-trend between treatment and control groups. We tested the pre-trend assumption of the DiD model by plotting the average values of strategic investments for treatment and control groups from $t-3$ to $t+3$. Figure 2 shows that strategic investments of treatment and control groups followed a parallel trend prior to sudden death events. As shown in Figure 2, the yearly mean differences between treatment and control groups were statistically insignificant until one year before a CEO's demise. However, the mean differences in strategic investments between the treatment and control groups became significant the following year – the year of CEO death (year t). A leads and lags regression model also shows that the coefficients of the competitors in the period prior to a CEO's death period were insignificant. Analysis on the variance inflation factor (VIF) indicates that VIF scores range between 1.02 and

Table I. Coarsened exact matching (CEM): univariate and multivariate L1 statistics

	Before CEM	*After CEM*
Univariate L1 statistics		
Firm size	0.130	0.079
Firm performance	0.160	0.048
Debt-to-equity ratio	0.159	0.044
Strategic investments	0.236	0.152
Multivariate L1 statistics	0.982	0.812

Note: Variables are defined in the Methodology section.

Table II. Coarsened exact matching (CEM): t-test difference in mean for the matched sample

	Treatment	*Control*	*p-value*
Firm size	7.206	7.233	0.840
Firm performance	0.095	0.096	0.964
Debt-to-equity ratio	1.432	1.523	0.959
Strategic investments	0.191	0.166	0.137

Note: The final CEM-matched sample consists of 256 pairs of treatment and control groups; variables are defined in the Methodology section.

1.47, indicating that multicollinearity is not a concern for our sample. Table IV reports the results of Ordinary Least Squares (OLS) regressions for the relationship between a CEO's unexpected death and a competitor's strategic investments. Hypothesis 1 argues that the sudden death of a CEO at a peer firm will lead a competitor to increase its strategic investments in the post-death period. As shown in Model 1 of Table IV, the coefficient estimate for *competitors in post-death period* is positive and significant ($\beta = 0.043$, $p = 0.003$), supporting Hypothesis 1. Our findings are economically significant. The coefficient estimate indicates that the level of strategic investments by competitors is 23.8 per cent greater than that of a control group in the post-death period. However, note that control variables were not included in Model 1 because control variables often bias a treatment dummy in DiD models (Angrist and Pischke, 2008). In Model 2, where all control variables were included, the result remained the same ($\beta = 0.039$, $p = 0.006$), supporting Hypothesis 1.

It is possible that these results are driven by characters of different strata in control firms created during the CEM matching procedure. Model 3 replaced firm fixed effects with strata fixed effects and the result remained the same ($\beta = 0.047$, $p = 0.000$). Another potential concern is that although Models 1 and 2 included year fixed effects to account for temporal trends, there is a potential concern that time-varying industry conditions may affect a competitor's strategic investments. To alleviate this concern, instead of year fixed effects, Model 4 includes joint fixed effect of year-industry (SIC 2-digit) to account for the effect of any industrial trends or changes on strategic investment. Even so, the result remained the same ($\beta = 0.032$, $p = 0.073$). These robust results across different models strongly support Hypothesis 1.

We tested the moderating effects of *similarity in strategic resource allocation profiles* in Table V. Hypothesis 2 proposes that a competitor will increase its strategic investments given greater similarity in strategic resource allocation profiles between a competitor and its peer firm. As shown in Model 1 of Table V, the coefficient estimates for the interaction between *competitors in post-death period × similarity in strategic resource allocation profiles* is positive and significant ($\beta = 0.025$, $p = 0.001$), supporting Hypothesis 2. In Figure 3, we plotted high and low *similarity in strategic resource allocation profiles* at mean minus one standard deviation and at mean plus one standard deviation, respectively. *Competitors* and control firms are a dummy variable; *competitors* receive one while control firms receive zero. As

Table III. Descriptive statistics and pairwise correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Strategic investments	0.191	0.250	1.00												
2 Firm size	7.349	1.500	−0.06	1.00											
3 Firm performance	0.090	0.085	−0.22	0.01	1.00										
4 Debt-to-equity ratio	1.561	1.937	−0.08	0.33	−0.15	1.00									
5 Organizational slack	2.413	2.088	0.28	−0.39	−0.06	−0.28	1.00								
6 CEO age	55.463	7.248	−0.08	0.14	0.04	0.05	−0.05	1.00							
7 CEO ownership	0.593	2.978	0.00	−0.06	−0.03	−0.03	0.01	0.03	1.00						
8 CEO duality	0.597	0.491	−0.02	0.18	0.05	0.06	−0.10	0.21	0.04	1.00					
9 CEO tenure	7.734	7.318	0.06	−0.12	0.06	−0.09	0.10	0.36	0.18	0.24	1.00				
10 CEO in the money	6.550	3.794	0.09	0.14	0.25	−0.04	0.05	−0.08	−0.09	0.09	−0.03	1.00			
11 Analyst coverage	0.964	1.161	0.08	0.08	0.11	−0.11	0.17	0.04	0.00	0.01	0.08	0.10	1.00		
12 Industry strategic investments	0.141	0.126	0.29	0.06	−0.06	−0.04	0.09	0.02	0.02	−0.07	0.01	0.05	0.05	1.00	
13 Similarity in strategic resource allocation profiles	−0.804	1.194	0.00	0.08	−0.07	0.10	−0.15	0.01	−0.10	0.02	−0.08	0.01	0.00	0.03	1.00

Note: N = 3250; all correlations with an absolute value equal to or greater than 0.04 are statistically significant at p < 0.05.
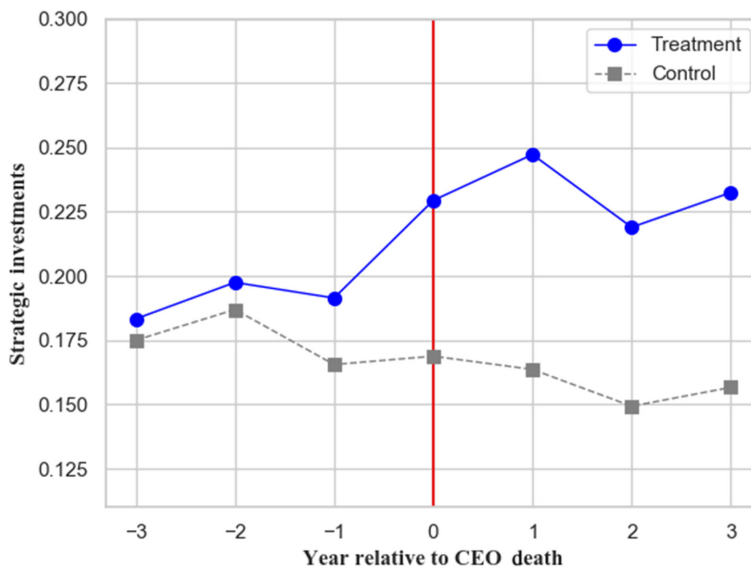
T-test difference in mean between treatment and control groups						
Event year	t-3	t-2	t-1	death year	t+1	t+2	t+3
t-statistics	-0.39	0.44	-0.49	-2.54	-3.36	-3.03	-2.88
p-value	0.69	0.66	0.14	0.01	0.00	0.00	0.00

Figure 2. Difference-in-differences analysis: parallel trend graphs [Colour figure can be viewed at wileyonlinelibrary.com]

noted, we also conducted a robustness check with an alternative operationalization of the variable and the result remained similar ($\beta = 0.014$, $p = 0.000$).We tested the moderating effects of *organizational slack* in Model 2 of Table V. Hypothesis 3 proposes that a competitor will increase its strategic investments given greater organizational slack. As shown in Model 2, the coefficient estimates for the interaction between *competitors in post-death period × organizational slack* is positive and significant ($\beta = 0.018$, $p = 0.019$), supporting Hypothesis 3. Figure 4 plotted high and low *organizational slack* at mean minus one standard deviation and at mean plus one standard deviation, respectively. *Competitors* and control firms are a dummy variable; *competitors* receive one while control firms receive zero. Finally, Hypothesis 4 proposes that for competitors with higher organizational slack, the positive effect of similarity in strategic resource allocation profiles on strategic investments is stronger. As shown in Model 3, the coefficient estimates for the interaction between *competitors in post-death period × similarity in strategic resource allocation profiles × organizational slack* is positive and significant ($\beta = 0.016$, $p = 0.000$), supporting Hypothesis 4. Figure 5 illustrates the relationship among *competitors in post-death period*, *similarity in strategic resource allocation profiles*, and *organizational slack*. *Competitors* and control firms are a dummy variable; *competitors* receive one while control firms receive zero. We plotted low and high moderating variables at mean minus one standard deviation and mean plus one standard deviation. The slope test results also show that there are significant slope differences between lines (1) and (2) ($p < 0.001$), between lines (1) and (3) ($p < 0.05$), and between lines (1) and (4) ($p < 0.01$), thereby, supporting Hypothesis 4.

Table IV. Difference-in-differences analyses for the effect of CEO sudden death on competitors' strategic investments

Variables	(1)	(2)	(3)	(4)
Competitors in post-death period	0.043***	0.039***	0.047***	0.032*
	(0.003)	(0.006)	(0.000)	(0.073)
	[0.015]	[0.014]	[0.011]	[0.018]
Firm size		0.050***	0.032**	0.050**
		(0.006)	(0.032)	(0.048)
		[0.018]	[0.015]	[0.025]
Firm performance		−0.463***	−0.619***	−0.405**
		(0.001)	(0.000)	(0.024)
		[0.142]	[0.146]	[0.178]
Debt-to-equity ratio		−0.002	−0.003	−0.002
		(0.467)	(0.137)	(0.652)
		[0.003]	[0.002]	[0.004]
Organizational slack		−0.000	0.016***	−0.002
		(0.949)	(0.004)	(0.820)
		[0.006]	[0.006]	[0.007]
CEO age		−0.002*	−0.002***	−0.002
		(0.091)	(0.010)	(0.183)
		[0.001]	[0.001]	[0.001]
CEO ownership		0.000	−0.000	0.000
		(0.772)	(0.802)	(0.565)
		[0.001]	[0.001]	[0.001]
CEO duality		0.043*	0.010	0.021
		(0.054)	(0.438)	(0.354)
		[0.022]	[0.012]	[0.022]
CEO tenure		0.002*	0.002**	0.003
		(0.084)	(0.020)	(0.111)
		[0.001]	[0.001]	[0.002]
CEO in the money		0.002	0.004***	0.001
		(0.342)	(0.001)	(0.529)
		[0.002]	[0.001]	[0.002]
CEO gender		−0.023	−0.017	0.025
		(0.761)	(0.651)	(0.808)
		[0.075]	[0.038]	[0.103]
Analyst coverage		−0.009	0.010*	−0.007
		(0.496)	(0.087)	(0.698)
		[0.013]	[0.006]	[0.017]

(Continues)

Table IV.   (Continued)

Variables	(1)	(2)	(3)	(4)
Industry strategic investments		0.492***	0.329***	9.567
		(0.002)	(0.000)	(0.257)
		[0.158]	[0.052]	[8.429]
Constant	0.180***	−0.065	−0.158	−1.363
	(0.000)	(0.657)	(0.345)	(0.274)
	[0.045]	[0.147]	[0.167]	[1.246]
Firm fixed effects	Yes	Yes	No	No
Year fixed effects	Yes	Yes	Yes	Yes
Matched pair fixed effects	No	No	Yes	No
Industry × Year fixed effects	No	No	No	Yes
Observations	3250	3250	3250	3250
R-squared	0.593	0.610	0.445	0.725

Note: p-value in parentheses; standard errors in brackets; standard errors are clustered at firm-level.
***$p < 0.01$;
**$p < 0.05$;
*$p < 0.1$, two-tailed test.

Competitors' Competitive Action Intensity

To complement our findings from regression analysis on strategic investments, we constructed competitive action intensity, strategic action intensity, and tactical action intensity. Following prior study (Ferrier, 2001; Guo et al., 2020; Young et al., 1996), we measured competitive action intensity, strategic action intensity, and tactical action intensity as the total number of competitive actions, strategic actions, and tactical actions initiated by a competitor. Although our measure of strategic investments may capture a firm's overall investment in strategic moves to take advantage of a peer firm experiencing a CEO's sudden death, competitive action intensity captures specific competitive actions taken by competitors, thereby complementing our main analyses. We identified competitive actions, including new product actions, facility open and upgrade, facility sale and close, pricing actions, marketing actions, acquisitions, strategic alliances (joint venture and partnership), market expansion, and legal actions (Connelly et al., 2017; DesJardine et al., 2022; Shi and DesJardine, 2022). We categorized market expansion, acquisitions, alliances and facility open and upgrade as strategic actions following prior studies (DesJardine et al., 2022; Ye et al., 2021). Strategic actions often require a longer-term commitment of considerable resources and are difficult to reverse and implement (Hambrick et al., 1996; Smith et al., 1991), and thus entail substantial commitment and uncertainty. In contrast, tactical actions often require fewer resources and relatively easy to implement and reverse (Shi and DesJardine, 2022; Smith et al., 1991). We categorized pricing actions, marketing actions, product release, facility close and sale, and legal actions as tactical actions. When we excluded facility open and upgrade from strategic actions or classify product actions as strategic actions, the results were consistent.

Table V. Difference-in-differences analyses for the effect of moderators on competitors' strategic investments

Variables	(1)	(2)	(3)
Competitors in post-death period (Competitors)	0.079***	−0.006	−0.030
	(0.000)	(0.759)	(0.281)
	[0.021]	[0.019]	[0.028]
Firm size	0.051***	0.049***	0.048***
	(0.005)	(0.007)	(0.007)
	[0.018]	[0.018]	[0.018]
Firm performance	−0.455***	−0.437***	−0.400***
	(0.001)	(0.001)	(0.001)
	[0.139]	[0.134]	[0.125]
Debt-to-equity ratio	−0.002	−0.002	−0.002
	(0.415)	(0.446)	(0.403)
	[0.003]	[0.002]	[0.002]
Organizational slack	0.000	−0.008	−0.013*
	(0.976)	(0.213)	(0.088)
	[0.006]	[0.006]	[0.008]
CEO age	−0.002*	−0.002*	−0.002*
	(0.089)	(0.092)	(0.092)
	[0.001]	[0.001]	[0.001]
CEO ownership	0.000	0.000	0.000
	(0.812)	(0.777)	(0.931)
	[0.001]	[0.001]	[0.001]
CEO duality	0.041*	0.043*	0.041*
	(0.063)	(0.051)	(0.059)
	[0.022]	[0.022]	[0.022]
CEO tenure	0.002*	0.002*	0.002*
	(0.091)	(0.095)	(0.096)
	[0.001]	[0.001]	[0.001]
CEO in the money	0.002	0.002	0.002
	(0.339)	(0.231)	(0.198)
	[0.002]	[0.002]	[0.002]
CEO gender	−0.022	−0.014	−0.006
	(0.777)	(0.860)	(0.950)
	[0.078]	[0.081]	[0.091]
Analyst coverage	−0.008	−0.010	−0.011
	(0.514)	(0.424)	(0.391)
	[0.013]	[0.013]	[0.012]

(Continues)

Table V.   (Continued)

Variables	(1)	(2)	(3)
Industry strategic investments	0.489***	0.465***	0.428***
	(0.002)	(0.003)	(0.006)
	[0.157]	[0.156]	[0.155]
Competitors × Similarity in strategic resource allocation profiles	0.025***		−0.019
	(0.001)		(0.127)
	[0.007]		[0.012]
Competitors × Organizational slack		0.018**	0.044***
		(0.019)	(0.000)
		[0.007]	[0.011]
Similarity in strategic resource allocation profiles × Organizational slack			−0.005
			(0.131)
			[0.004]
Competitors × Similarity in strategic resource allocation profiles × Organizational slack			0.016***
			(0.000)
			[0.004]
Constant	−0.085	−0.049	−0.057
	(0.561)	(0.741)	(0.704)
	[0.146]	[0.148]	[0.151]
Firm fixed effects and Year fixed effects	Yes	Yes	Yes
Matched pair fixed effects	No	No	No
Industry × Year fixed effects	No	No	No
Observations	3250	3250	3250
R-squared	0.612	0.613	0.619

Note: p-value in parentheses; standard errors in brackets; standard errors are clustered at firm-level.
***$p < 0.01$;
**$p < 0.05$;
*$p < 0.1$, two-tailed test.

To identify competitive actions, we used RavenPack News Analytics data, which have been widely used by recent studies in management (e.g., Connelly et al., 2017; Hayward and Fitza, 2017). RavenPack scans and categorizes competitive actions for more than 36,000 companies, including all of our sample firms from *Dow Jones, Financial Wires, Wall Street Journal, Barron's,* and *MarketWatch*, as well as the daily press releases from 22 different newswires.[8]

Table VI reports the results of negative binomial regression. Note that the sample size of these analyses is smaller than that of main analyses because RavenPack data set starts in 2000. We used negative binomial regression as our dependent variables are over-dispersed (i.e., the variance is much larger than the mean).[9] Thus, we estimated negative binomial models using the *xtnbreg, fe* command in *Stata*. We also conducted Hausman test
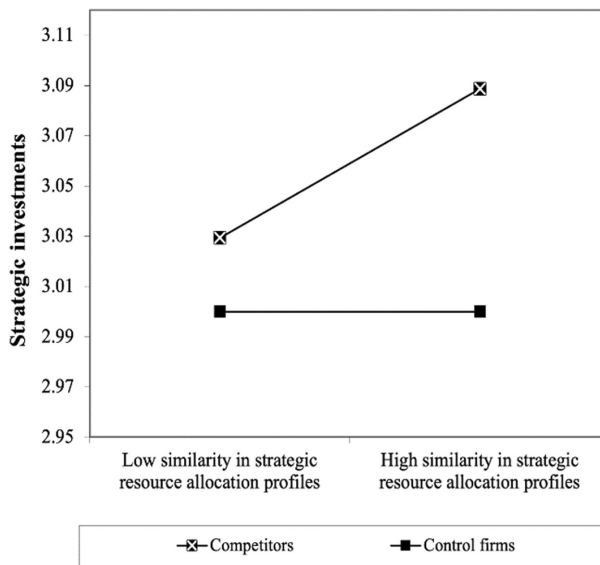
Figure 3. Two-way interaction effect of competitors and similarity in strategic resource allocation profiles

that indicated that it is appropriate to use fixed effect in our analyses ($Chi^2 = 261.02$, p-value = 0.000).

As shown in Table VI, competitors increase competitive action intensity following a CEO's sudden death and this effect appears to be driven by increased strategic action intensity rather than tactical action intensity. Specifically, Model 2 shows that competitors increase competitive action intensity ($\beta = 0.250$, $p = 0.002$). Model 4 and Model 6 show that competitors increase their strategic action intensity ($\beta = 0.421$, $p = 0.000$) but not tactical action intensity ($\beta = 0.071$, $p = 0.441$). The results indicate that competitors initiate strategic actions rather than tactical actions when peer firms experience a CEO's unexpected death. These findings support our core argument that competitors will engage in competitive moves to exploit the vulnerability of peer firms resulting from a CEO's sudden death.

Robustness Tests and Supplementary Analyses

We conducted a range of robustness and supplementary analyses. First, we propose that a CEO's sudden death at a peer firm induces top executives at the peer firm to exhibit death anxiety and death reflection, whereas competitor CEOs who seek self-interests have distance from the CEO death and dismiss death awareness due to low self-relevance to the deceased CEO. With a subsample (n = 2234), we conducted supplementary analysis to verify our core theoretical argument that self-relevance determines the degree to which death awareness influences individuals' motivations and behaviour. Specifically, we measured *similarity in demographic attributes* between a deceased CEO and a competitor CEO and tested the effect of *similarity in demographic attributes* on competitors' strategic investments.[10] A supplementary analysis not reported in this manuscript found that a
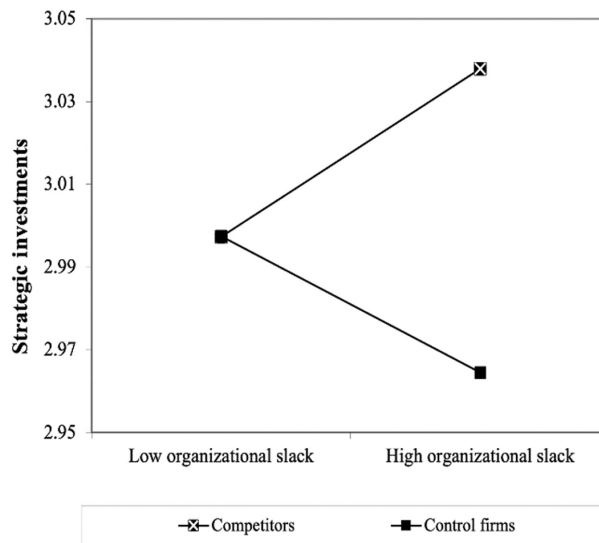
Figure 4. Two-way interaction effect of competitors and organizational slack
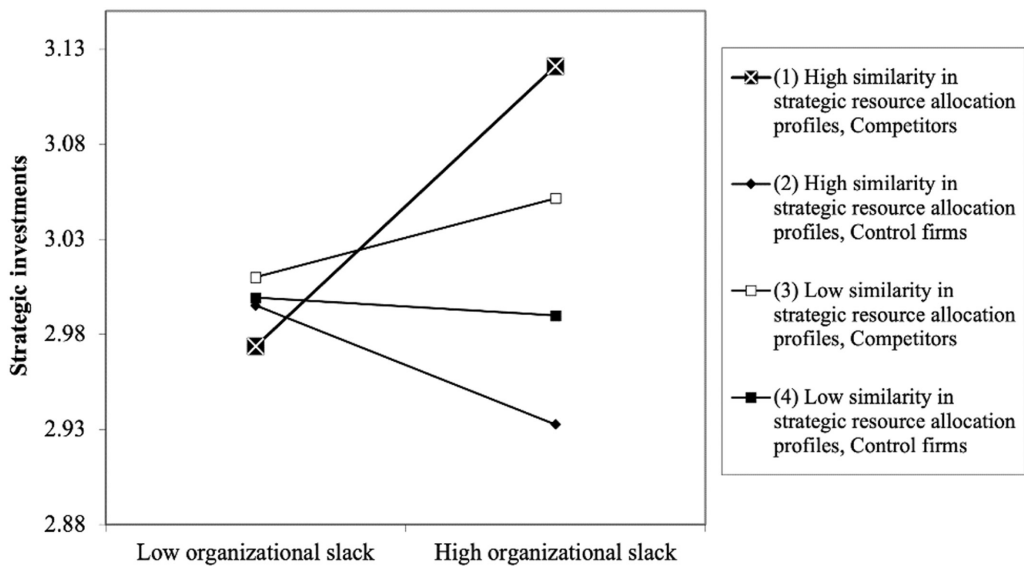

Figure 5. Three-way interaction effect of competitors, similarity in strategic resource allocation profiles, and organizational slack

competitor *reduces* its strategic investments, given similar demographic attributes between a deceased CEO and a competitor CEO (n = 2234, β = −0.022, p = 0.089). Similar to recent studies that have shown that the death of a director induces CEOs to become less acquisitive (Shi et al., 2017a) and increase CSR activities (Chen et al., 2020), competitor CEOs may take the death of a demographically similar CEO more personally and exhibit death anxiety and death reflection. The finding suggests that competitor CEOs'

Table VI. Negative binomial regression for the effect of CEO sudden death on competitors' competitive action intensity

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Competitive actions		Strategic actions		Tactical actions	
Competitors in post-death period		0.250***		0.421***		0.071
		(0.002)		(0.000)		(0.441)
		[0.079]		[0.104]		[0.092]
Firm size	0.212***	0.201***	0.265***	0.254***	0.175***	0.169***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
	[0.046]	[0.046]	[0.056]	[0.056]	[0.055]	[0.056]
Firm performance	−1.267***	−1.277***	−1.641***	−1.669***	−0.808*	−0.822*
	(0.002)	(0.002)	(0.005)	(0.004)	(0.082)	(0.077)
	[0.404]	[0.403]	[0.581]	[0.582]	[0.464]	[0.465]
Debt-to-equity ratio	−0.030*	−0.028	−0.083***	−0.081***	0.016	0.016
	(0.097)	(0.123)	(0.004)	(0.005)	(0.336)	(0.310)
	[0.018]	[0.018]	[0.029]	[0.029]	[0.016]	[0.016]
Organizational slack	0.031	0.024	0.025	0.016	0.034	0.031
	(0.110)	(0.221)	(0.336)	(0.531)	(0.150)	(0.184)
	[0.019]	[0.019]	[0.026]	[0.026]	[0.023]	[0.024]
CEO age	−0.004	−0.005	0.005	0.004	−0.024**	−0.024**
	(0.575)	(0.517)	(0.630)	(0.685)	(0.027)	(0.027)
	[0.008]	[0.008]	[0.009]	[0.010]	[0.011]	[0.011]
CEO ownership	0.001	−0.000	−0.001	0.000	0.004	0.004
	(0.960)	(0.993)	(0.969)	(0.988)	(0.724)	(0.746)
	[0.011]	[0.011]	[0.015]	[0.015]	[0.012]	[0.012]

(Continues)

Table VI.   (Continued)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Competitive actions		Strategic actions		Tactical actions	
CEO duality	0.014	0.001	0.012	−0.011	−0.056	−0.055
	(0.865)	(0.987)	(0.909)	(0.916)	(0.551)	(0.558)
	[0.080]	[0.080]	[0.107]	[0.107]	[0.094]	[0.094]
CEO tenure	0.016*	0.014	0.027***	0.023**	0.030***	0.029**
	(0.056)	(0.101)	(0.007)	(0.023)	(0.008)	(0.012)
	[0.008]	[0.008]	[0.010]	[0.010]	[0.011]	[0.011]
CEO in the money	0.011	0.012	0.010	0.011	0.009	0.010
	(0.230)	(0.208)	(0.425)	(0.361)	(0.391)	(0.373)
	[0.009]	[0.009]	[0.012]	[0.012]	[0.011]	[0.011]
CEO gender	0.704**	0.695**	0.237	0.278	0.446	0.443
	(0.040)	(0.043)	(0.674)	(0.619)	(0.367)	(0.373)
	[0.343]	[0.344]	[0.563]	[0.559]	[0.495]	[0.497]
Analyst coverage	0.230***	0.232***	0.138***	0.147***	0.305***	0.306***
	(0.000)	(0.000)	(0.009)	(0.005)	(0.000)	(0.000)
	[0.041]	[0.041]	[0.052]	[0.053]	[0.050]	[0.050]
Industry competitive actions	0.033*	0.029	0.176***	0.174***	0.050***	0.048***
	(0.070)	(0.126)	(0.000)	(0.000)	(0.001)	(0.001)
	[0.018]	[0.019]	[0.048]	[0.048]	[0.015]	[0.015]
Constant	−2.231***	−2.062***	−2.988***	−2.894***	−1.160	−1.100
	(0.000)	(0.000)	(0.000)	(0.000)	(0.136)	(0.161)
	[0.570]	[0.575]	[0.811]	[0.812]	[0.777]	[0.785]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

(Continues)

Table VI. (Continued)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Competitive actions		Strategic actions		Tactical actions	
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1548	1548	1440	1440	1352	1352
Chi-square	172.5	182.4	100.8	117.76	183.71	183.29

Note: p-value in parentheses; standard errors in brackets; standard errors are clustered at firm-level; sample sizes are smaller than that of main analyses since RavenPack data set starts in 2000. Also, negative binomial regressions drop firms without any competitive actions during the sample period such that the sample sizes across models with different dependent variables are also different. Industry competitive action intensity variable is measured as the industry median of the dependent variable of each model.
***p < 0.01;
**p < 0.05;
*p < 0.1, two-tailed test.

high self-relevance to the deceased CEO may induce them to be compassionate about the late CEO or dampen their self-interests-driven motivation to exploit any vulnerability exposed by the CEO death. Thus, our core argument is supported by the additional finding.

Although acquisitions, R&D, and capital expenditures share some common characteristics, we acknowledge that there are also some differences among these dimensions. For instance, an acquisition would be much more offensive than R&D. To address any potential concern that our results were driven by one strategic investment in particular rather than the overall strategic investments of competitors, we split our dependent variable into three variables including acquisition (acquisition expenditure/revenue), R&D (R&D/revenue), and capital expenditures (capital expenditure/revenue). As Table VII shows, the coefficients for *competitors in post-death period* in Model 1 (acquisition, $\beta = 0.015$, $p = 0.090$) and Model 2 (R&D, $\beta = 0.009$, $p = 0.001$) are positive and significant. Although the coefficient for *competitors in post-death period* in Model 3 (capital expenditures, $\beta = 0.005$, $p = 0.319$) is positive but not significant. Overall, these findings show that our results were not driven by one particular strategic investment by competitors.

Strategic investments was measured as the sum of acquisitions, R&D, and capital expenditures scaled by revenue. We conducted regression analyses with alternative measures of the dependent variable. When we used the natural logarithm of the sum of three expenses (Sanders and Hambrick, 2007) in Model 4 of Table VII, and the results remained the same ($\beta = 0.096$, $p = 0.044$). As shown in Model 5, we replaced acquisition with long-term debt and scaled each expense and standardized them before adding them together (Lim and McCann, 2013); the results remained similar ($\beta = 0.097$, $p = 0.049$).

DISCUSSION

We examined how and why the unexpected death of a CEO at a peer firm influences a competitor's competitive behaviour. Using a DiD approach, we found that a competitor increases its strategic investments after the sudden death of a CEO at a peer firm. This tendency is stronger when a competitor shares similar resource allocation profiles with its peer firm or a competitor possesses greater organizational slack. Further, we found that competitors' strategic investments are greatest when both similarity in strategic resource allocation profiles between a competitor and its peer firm and organizational slack are higher. Our supplementary analyses confirmed our core argument by showing how a competitor increases its strategic action intensity following a CEO's sudden death of an industry peer. Overall, these findings support our prediction that a CEO's sudden death affecting the cognitive base and values of strategic leaders can expose strategic weaknesses and evoke competitors' competitive actions taken in response.

This study contributes to the literature in two ways. First, it advances the literature on competitive dynamics. The extant literature has extensively examined and identified various antecedents that elicit competitive responses when a firm is attacked by its rival (Chen and MacMillan, 1992; Chen and Miller, 1994; Hambrick et al., 1996;

Table VII. Difference-in-differences analyses for the effect of CEO sudden death on alternative operationalizations of competitors' strategic investments

Variables	(1) Acquisition	(2) R&D expenditure	(3) Capital expenditure	(4) ln(1 + strategic investments)	(5) Standardized strategic investments
Competitors in post-death period	0.015*	0.009***	0.005	0.095**	0.097**
	(0.090)	(0.001)	(0.313)	(0.045)	(0.048)
	[0.009]	[0.003]	[0.005]	[0.047]	[0.049]
Firm size	0.056***	−0.006**	0.012**	0.900***	0.217***
	(0.000)	(0.028)	(0.043)	(0.000)	(0.001)
	[0.013]	[0.003]	[0.006]	[0.052]	[0.065]
Firm performance	−0.047	−0.172***	−0.054	0.746**	−0.941**
	(0.452)	(0.000)	(0.206)	(0.014)	(0.042)
	[0.062]	[0.029]	[0.043]	[0.302]	[0.461]
Debt-to-equity ratio	−0.001	0.001	−0.002**	−0.011	−0.012
	(0.678)	(0.290)	(0.027)	(0.208)	(0.181)
	[0.002]	[0.001]	[0.001]	[0.009]	[0.009]
Organizational slack	0.003	−0.001	−0.002	−0.042**	−0.002
	(0.473)	(0.686)	(0.297)	(0.012)	(0.932)
	[0.004]	[0.001]	[0.002]	[0.017]	[0.021]
CEO age	−0.001	−0.001**	−0.000	−0.007	−0.007
	(0.272)	(0.021)	(0.291)	(0.160)	(0.121)
	[0.001]	[0.000]	[0.000]	[0.005]	[0.004]
CEO ownership	0.001*	−0.000	−0.000	0.005**	−0.001
	(0.097)	(0.710)	(0.317)	(0.017)	(0.790)
	[0.001]	[0.000]	[0.000]	[0.002]	[0.003]

(Continues)

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Table VII.   (Continued)

Variables	(1) Acquisition	(2) R&D expenditure	(3) Capital expenditure	(4) ln(1 + strategic investments)	(5) Standardized strategic investments
CEO duality	0.010	0.006**	0.005	0.071	0.114*
	(0.470)	(0.035)	(0.346)	(0.168)	(0.082)
	[0.013]	[0.003]	[0.005]	[0.051]	[0.066]
CEO tenure	0.001	0.000**	0.000	0.006	0.006
	(0.161)	(0.047)	(0.608)	(0.245)	(0.215)
	[0.001]	[0.000]	[0.001]	[0.005]	[0.005]
CEO in the money	0.002*	−0.000	−0.000	0.013**	0.006
	(0.062)	(0.249)	(0.761)	(0.024)	(0.265)
	[0.001]	[0.000]	[0.001]	[0.006]	[0.006]
CEO gender	−0.004	0.002	−0.027*	0.131	−0.130
	(0.932)	(0.698)	(0.070)	(0.559)	(0.544)
	[0.048]	[0.006]	[0.015]	[0.225]	[0.215]
Analyst coverage	−0.009	0.000	0.000	0.018	−0.029
	(0.168)	(0.980)	(0.975)	(0.568)	(0.524)
	[0.007]	[0.002]	[0.005]	[0.032]	[0.046]
Industry strategic investments	0.009	0.062**	0.205***	1.134***	1.869***
	(0.929)	(0.012)	(0.006)	(0.002)	(0.002)
	[0.101]	[0.025]	[0.075]	[0.372]	[0.607]
Constant	−0.343***	0.121***	0.061	−1.975***	−1.212**
	(0.001)	(0.000)	(0.241)	(0.000)	(0.019)
	[0.102]	[0.024]	[0.052]	[0.556]	[0.515]

(Continues)

Table VII. (Continued)

Variables	(1) Acquisition	(2) R&D expenditure	(3) Capital expenditure	(4) ln(1 + strategic investments)	(5) Standardized strategic investments
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	3250	3250	3250	3250	3250
R-squared	0.287	0.937	0.786	0.899	0.662

Note: p-value in parentheses; standard errors in brackets; standard errors are clustered at firm-level; dependent variables in Model 1, Model 2, and Model 3 are acquisition scaled by revenue, R&D expenditure scaled by revenue, and capital expenditure scaled by revenue, respectively; dependent variable in Model 4 is measured as the natural log of the sum of acquisition, R&D, and capital expenditures; dependent variable in Model 5 as the sum of standardized acquisition, R&D, and capital expenditures, each scaled by revenue, following prior studies.
***p < 0.01;
**p < 0.05;
*p < 0.1, two-tailed test.

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Smith et al., 1991; Yu and Cannella, 2007). However, research has been silent on how and why critical events not involving attacks but shaping the cognitive base and values of top managers lead competitors to take competitive moves. This study contributes to this stream of literature by delineating a psychological mechanism of how the sudden death of a CEO at a peer firm exposes strategic vulnerability and in turn triggers competitive actions taken by competitors. A CEO's sudden death at a peer firm appears to demotivate top executives at the peer firm to respond to attacks by its rivals, but motivate competitor CEOs to take an action to take advantage of the peer firm's vulnerability. Thus, it advances the literature by identifying how a critical event affecting the psychology of strategic leaders can act as an antecedent that evokes competitive responses.

Second, this study enriches recent studies on how the death of a corporate leader can affect strategic decisions. Anchoring post-traumatic growth theory, recent studies have shown that the death of a director induces CEOs to become less acquisitive (Shi et al., 2017a) and increase CSR activities (Chen et al., 2020). These studies have focused on a firm undergoing a director's death itself, whereas this study examines how and why a competitor reacts to the sudden death of a CEO at a rival. Drawing on the literature on death awareness and the expectancy-valence model, this study advances the literature by shedding light on the psychological processes of how a CEO's sudden death influences not only top executives who have experienced a CEO's sudden death but also competitor CEOs who have witnessed the critical event. Thus, this study shows a CEO's sudden death can go beyond the boundaries of a firm undergoing the sudden death and influence inter-firm rivalries by shaping the cognitive base and values of top executives of firms involved in rivalries.

Limitations and Directions for Future Research

This study presents several opportunities for future research. First, we show that a competitor increases its strategic investments to benefit from the sudden death of a CEO at a peer firm, suggesting that critical events affecting the cognitive base and values of strategic leaders lead competitors to engage in competitive actions. Future work could examine the competitive actions taken when firms are caught engaging in corporate illegal activities such as financial fraud and environmental violations. Since such activities can damage a firm's market values and reputation (Mishina et al., 2010) and result in executive and director turnover (Arthaud-Day et al., 2006), being caught engaging in such activities is a significant threat to top executives. In this case, top executives may experience fear of loss and psychological stress suggested by threat rigidity theory (Staw et al., 1981). As a result, they may show rigid responses and become slow to respond to competitive actions taken by their rivals. We expect that competitors may make competitive moves to take advantage of such detrimental events shaping the psychological processes of strategic leaders. Future studies could also explore the competitive actions taken by competitors when a firm engages in large-scale manufacturing ramp, complex acquisitions, and unrelated diversification. We speculate that such activities can take away strategic leaders' cognitive capacity and expose a firm's vulnerability to its competitors, giving rise to competitors'

competitive actions taken.[11] We also conjecture that competitors' competitive actions may become strengthened when similarity in strategic allocation profiles between competitors and the firm is higher.

Second, our supplementary analysis found that a competitor reduces its strategic investments, given similar demographic profiles between a deceased CEO and a competitor CEO. Similar to other recent studies (Chen et al., 2020; Shi et al., 2017a), this study indicates that competitor CEOs may take the death of a demographically similar peer more personally to reflect on the meaning and purpose of their own lives. Future work could examine how such personal characteristics as narcissism (Chatterjee and Hambrick, 2011; Chen et al., 2016) and overconfidence (Li and Tang, 2010) either accentuate or attenuate competitor CEOs' motivation to exploit any vulnerability associated with the death of a CEO at a peer firm. For instance, a narcissistic personality might shape competitor CEOs' attitudes towards a deceased CEO, making them engage in more competitive actions because the narcissistic personality would blunt the compassion that a CEO might feel. A hubristic personality might strengthen competitor CEOs' confidence in their ability to formulate and implement competitive actions, making them more aggressive to exploit the weakness arising from the sudden demise of a CEO at a peer firm.

Third, it would be fruitful to examine how competitor CEOs' regulatory focus influences the relationship between a CEO's sudden death and strategic and tactical actions taken by competitors. Our supplementary analysis shows that competitors increase their strategic action intensity but not tactical action intensity. We conjecture that CEOs' regulatory focus may influence the way competitor CEOs respond to a CEO's sudden death at a peer firm. A study has shown that CEOs' regulatory focus has an impact on both the number and size of acquisitions made by a firm (Gamache et al., 2015). Consistent with the literature on CEO regulatory focus, we speculate that competitor CEOs with a promotion focus may be strongly motivated to exploit an opportunity arising from the unexpected sudden demise of a CEO at a peer firm and thus engage in strategic actions. By contrast, competitor CEOs with a prevention focus may take tactical competitive actions that do not require high resource commitment because such competitor CEOs are likely to focus on potential losses, stability, and security.

Fourth, this study suggests that a CEO's sudden death can go beyond the boundaries of a firm undergoing the sudden death and influence interfirm rivalry. Future research could examine how a CEO's sudden death influences an independent director's strategic decisions at different firms on which they sit as a member of the board of directors. In line with prior studies (Chen et al., 2020; Shi et al., 2017a), we conjecture that independent directors who have experienced a CEO's sudden death may become compassionate about the deceased CEO and engage in death awareness. As a result, they may withdraw from full participation in their work in the short term. For instance, we expect that such independent directors may miss a board meeting, weakening the monitoring function of the board of directors and leading to poor strategic decisions of the firms they serve. We also expect that the tendency may become stronger when the independent directors have a personal relationship with the deceased CEO.

Finally, this study focuses on micro-level mechanisms influencing both top executives who have experienced a CEO's sudden death and competitor CEOs who have witnessed the

sudden death. Specifically, drawing on death awareness and expectancy-valence theory, we developed arguments to delineate psychological mechanisms of why competitor CEOs are motivated to engage in competitive actions to exploit the sudden death of a CEO. Although our findings support our core theoretical logics, we were unable to measure how much death awareness the top executives experience and how much the competitor CEOs are motivated to engage in competitive moves. Recent studies used innovative methodologies to measure the cognition and values of top executives (e.g., Chatterjee and Hambrick, 2011; Petrenko et al., 2016; Resick et al., 2009). Future research could use such methodologies to measure the degree of death awareness and motivation of decision-makers to delve into the micro-level mechanisms that explain how the unexpected death of a CEO can affect cognitive base and values of strategic leaders and trigger competitive behaviour. In addition, following research conducting an experimental design (e.g., Cerar et al., 2022; Jorgenson et al., 1973), future studies could manipulate valence and expectancy caused by a CEO's sudden death to unpack the psychological processes through which a CEO's sudden demise can influence competitor CEOs' motivation to exploit strategic vulnerability. We look forward to future research on these topics.

ACKNOWLEDGMENTS

NOTES

[1] As a tribute to the late Apple co-founder and former CEO Steve Jobs, Microsoft is flying flags at its offices worldwide at half-mast for two days. The source of this quote is https://www.networkworld.com/article/2220818/microsoft-lowers-flags-to-half-staff-in-tribute-to-steve-jobs.html.

[2] Samsung executives discussed Steve Jobs' passing as 'unfortunately' having an 'unintended benefit for Apple', and at the same time, 'our best opportunity to attack iPhone', in internal memos marked 'highly confidential', presented in the Apple vs. Samsung trial. The source of this quote is https://appleinsider.com/articles/14/04/16/samsung-email-targeted-steve-jobs-death-as-our-best-opportunity-to-attack-iphone.

[3] Our core theoretical argument indicates that competitor CEOs are reminded of their own mortality when they have high self-relevance to a deceased CEO. In such a case, competitor CEOs may undergo death anxiety and death reflection. To verify our argument, we analysed how similar demographic profiles between a deceased CEO and a competitor CEO affect competitors' strategic investments. (Please see our discussion on robustness tests and supplementary analyses.)

[4] Building on the expectancy-valence model, Chen and Miller (1994) developed the awareness–motivation–capability framework to predict a firm's actions and its rival's responses. Since our study focuses on the cognitive base and values of top executives to predict the proclivity of competitive actions taken by competitor CEOs, it uses the expectancy-valence model to develop micro-level theoretical arguments to examine the effects of a CEO's sudden death at a peer firm on the strategic investments made by competitor CEOs.

[5] Admiral Yi Sun-Shin was a Korean admiral and national hero famed for his naval victories against the Japanese navy during the Imjin War that took place in the 16th-century Joseon Dynasty. The source of this quote is https://en.wikipedia.org/wiki/Yi_Sun-sin.

[6] We are grateful to Quigley, Crossland, and Campbell for providing the data on CEO deaths, 1950–2009. We identified seven CEO sudden deaths between 2010 and 2016 from the CEO Dismissal Database.

[7] Prior studies that use the data of independent director death also show a low rate of sudden death cases. For instance, Chen et al. (2020) report 12 sudden deaths out of 89 death cases, and Shi et al. (2017a) report 71 sudden deaths out of 296 deaths.

[8] RavenPack has advantages in identifying competitive actions: (1) It uses patented taxonomic recognition algorithms to accurately identify competitive actions, and such automated approaches reduce

mistakes that may occur during manual data collection given the increasing volume of news sources. (2) RavenPack not only identifies competitive actions and entities mentioned in an article but also determines the role played by the entity and assigns a relevance score – ranging from 0 (irrelevant) to 100 (very relevant) – to indicate the degree to which the entity was the focus of the article. (3) It provides the event novelty score – also ranging from 0 (not novel) to 100 (very novel) – that shows the extent to which an article is novel within a 24-hour time window for the same event with the same entities involved. Thus, this score helps avoid duplicate counts of the same event. We require both relevance score and event novelty score to be 100 in our analyses.

[9] The mean and standard deviation of competitive action is 7.57 and 15.98, respectively. The mean and standard deviation of strategic action is 3.45 and 5.52, respectively. The mean and standard deviation of tactical action is 4.97 and 12.88, respectively.

[10] We measured *similarity in demographic attributes* between a competitor CEO and the deceased CEO according to seven background characteristics, including age, gender, ethnicity, tenure, education degree, Ivy League educational background, and functional background following prior studies (Westphal and Zajac, 1995; Zhu and Westphal, 2014). These characteristics are often used to compare similarity between executives. We created seven measures of similarity and conducted the principal component analysis of the standardized similarity measures to create an overall similarity index of a competitor CEO and the deceased CEO (Zhu and Westphal, 2014). A competitor CEO and the late CEO are considered similar when they shared a category, and zero otherwise.

[11] Recent anecdotal evidence supports our speculation. Volkswagen Group CEO Herbert explains how ramping up production at Giga Berlin and Giga Texas, while also expanding production at Giga Shanghai, will weaken Tesla and give them the chance of overtaking Tesla by 2025. The source of this quote is https://driveteslacanada.ca/news/herbert-diess-gigafactory-ramp-weaken-tesla/.

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