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EXPERIENCE MAKETH THE MIND? TOP MANAGEMENT TEAMS' EXPERIENTIAL BACKGROUND AND COGNITIVE SEARCH FOR ADAPTIVE SOLUTIONS

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ABSTRACT

The adaptive strategies of firms depend on executives' forward-looking cognitive search. We examine in this article how cognitive search is affected by the formative experiences of the executives making up a firm's top management team (TMT). Drawing on research on adaptive search, cognition, and the upper echelons of management, we propose that the educational level, diversity of functional expertise, and the length of industry tenure of TMT members will be associated with whether cognitive search centers more on proximal or on distal solutions. Analysis of ten years of panel-data from U.S. companies shows that whereas a TMT's educational level does not seem to affect cognitive search, diversity of functional expertise does as predicted, and industry tenure does so in a manner we had not fully anticipated. Additional analysis also shows that whether cognitive search is proximal or distal predicts whether firms enter into related or unrelated new product-markets. The article discusses the implications of these findings.

Keywords: *Bounded rationality; cognition; search*; *top management teams; letters to shareholders*.

INTRODUCTION

The ideas of bounded rationality and limited human ability to gather and process all pertinent information (Cyert & March 1963; Simon 1947) are integral to an impressive body of work examining the adaptive behavior of firms. One set of ideas in this literature focuses on how bounded rationality can affect adaptive behavior in two distinct ways: through choice and action guided by backward-looking experiential wisdom encapsulated in routines, and through choice and action based on forward-looking cognitive search anchored in imperfect mental models of action-outcome linkages (Bingham & Eisenhardt 2011; Gavetti & Levinthal 2000). Whereas the effect of experience-based learning and routines on adaptive behavior has been analyzed extensively (Levitt & March 1988; Nelson & Winter 1982), the influence of forward-looking cognitive search (from here onwards, cognitive search) has received relatively less scrutiny. Given that simulation and experimental studies suggest that adaptive strategies depend on cognitive search (Csaszar & Levinthal 2016; Gavetti 2005), additional research, particularly in the form of field-based studies, seems warranted.

Therefore, to foster understanding of the cognitive underpinnings of firms' adaptive behavior, this article investigates how the formative experiences of those making up a firm's top management team (TMT) (Hambrick & Mason 1984) affect the team's cognitive search for solutions. In line with earlier work (Gavetti 2005; Gavetti & Levinthal 2000), the notion of cognitive search captures how executives examine the opportunity-space of potential solutions in their mental model of action-outcome linkages. We, therefore, view a mental model to contain a rough template of the range of possible solutions that collectively demarcate the boundaries of cognitive search. Given a template of solutions, a key axis along which cognitive search can vary is solutions' nearness-farness to the firm's existing configuration of structure and strategy. Whereas near or proximal solutions are given by viable new configurations of the firm in the neighborhood of the existing one, configurations involving a more extensive alteration of the firm represent distal solutions.

Building on the upper-echelons literature, which maintains that executives' experiences form the personalized cognitive lens that determines how they make sense of and respond to the world (Cannella et al. 2008; Hambrick & Mason 1984), we submit that the experiential background of TMTs will influence their cognitive search. In particular, we argue that TMTs' formative experiences vis-à-vis education, functional expertise and industry tenure will determine whether cognitive search centers more on proximal or on distal solutions. To test our formal hypotheses, we use ten-year panel data from companies manufacturing industrial and commercial machinery. Interestingly, we find that although TMTs with greater diversity of functional experiences and shorter average tenure in the industry tend to search more through distal solutions, team members' level of education has no discernable impact on cognitive search. Ex-post analysis also indicates that when there is greater volatility of sales, which usually presses TMTs to look for a solution to the problem of fluctuating income, the effect of TMT functional and industry experiences on cognitive search is more pronounced. Furthermore, additional analysis shows that TMTs' cognitive search has bearing on entry into new product-markets, such that, greater focus on searching through proximal solutions predicts related diversification by firms, and greater focus on searching through distal solutions predicts unrelated diversification.

This study complements research examining the effect of decision-makers' cognition on firms' actions (Eggers & Kaplan 2009; Kaplan 2008). It adds to the strikingly thin stock of findings on how TMT cognition is affected by the experiences, personalities and values of team members (Cho & Hambrick 2006; Gerstner et al. 2013). The gap in the literature the study fills is surprising because experiences, personalities, and values are often assumed to operate as perceptual filters that affect strategic choices (Buyl et al. 2019; Chin et al. 2013; Sambharya 1996). By showing that functional and industry experiences of TMT members determine whether the team searches through proximal and distal solutions, the article sheds light on the antecedents of cognitive search. It also suggests that the micro-foundations of firms' exploration and exploitation behavior[2] are likely to be, at least partly, a function of the experiential background of those in the upper echelons of management. Supporting this idea, we observed that TMTs' search focus was linked to firms' diversification into related and unrelated business domains, entry strategies that plausibly reflect an exploitation orientation and an exploration orientation respectively.

LITERATURE AND THEORY DEVELOPMENT

TMT cognitive search and strategic choice and action

Bounded rationality as the foundation of strategic choice and action is an idea traceable to researchers affiliated to the Carnegie School (March & Simon 1958; Simon 1947). It is central to two complementary models of adaptive search by firms. The first one casts light on organizational routines, which encapsulate a firm's past learning and experiences, as the key determinants of choice and action (Levitt & March 1988; Nelson & Winter 1982). They are viewed to constitute an expedient, experience-based guide when information processing is constrained due to bounded rationality. Furthermore, because of dynamics of local, semi-automatic search, organizational routines are said to impart path-dependent continuity by facilitating incremental development of a firm's competences (Nelson & Winter 1982). This backward-looking experience-action account of adaptive search contrasts with the forward-looking logic of the second model, in which, mental frames and cognitive search for problem-solving solutions take center-stage (March & Olsen 1976; Simon 1991). Thus, instead of actual trial-and-error experience, the mental evaluation of possible solutions without physical experimentation lies at the heart of the forward-looking model of adaptive search (Gavetti

[2] The terms proximal and distal search are often used to refer respectively to firms' exploitation and exploration behavior/actions (e.g., Nerkar & Roberts 2004). In this article, proximal and distal search refer exclusively to search that is cognitive or "offline", and exploitation and exploration refer to physical or "online" search entailing actual trial-and-error experimentation and R&D (e.g., Gavetti & Levinthal 2000). The distinctive use of terminology here is to capture and communicate focus on a search mode that is cognitive/offline versus a search mode that is physical/online.

2005; Gavetti & Levinthal 2000).

Besides the difference in the mode of search (physical versus cognitive) in the two models, the forward-looking model also differs from the experiential one with respect to the range of solutions considered and the solutions' closeness to existing routines and the corresponding structure and strategy of the firm (Gavetti 2005; Gavetti & Levinthal 2000). In particular, cognitive search, unlike experience-based search, need not be limited to the evaluation of one or a few solutions at a time and to the evaluation of solutions that are in the neighborhood of the firm's existing configuration. Because cognitive search allows examination of a variety of possible solutions, it can be the wellspring of path-breaking choice and action (Gavetti & Levinthal 2000). Formally, cognitive search may be defined as the mental evaluation of potential solutions to the problem of maintaining an adaptive fit between the firm and its environment. One can expect the solutions cognitive search focuses on to be a function of the complete set of solutions in TMTs' mental model of possible alternative configurations of the firm and the risks and rewards associated with these (Baumann & Siggelkow 2013; Gavetti & Levinthal 2000). On account of bounded rationality, mental models are simplified, rough representations of the world that affect choice and action (Simon 1991; Walsh 1995).

Experiments and simulations suggest that differences in mental models lead to different decisions and outcomes (Gary & Wood 2011; Gavetti 2005). Whether executives' mental models differ, or whether as a socially constructed category a mental model is shared by executives in an industry (Cattani et al. 2017; Porac et al. 1995), cognitive search through the rough template of solutions in TMTs' mental model may vary in one crucial respect. Namely, it could tend to concentrate more either on proximal solutions or on distal solutions. While proximal solutions are new configurations of the firm adjacent to the existing one, distal solutions are new configurations involving a more extensive alteration of the firm. Because of bounded rationality and limits on time, instead of searching through both proximal and distal solutions, TMTs plausibly will have a greater predisposition to search through one of these two solution types. Lacking full information about the technical and financial feasibility of all solutions and the ability to comprehensively process the information, a systematic evaluation of the entire set of solutions in the mental model is unlikely. Rather, as we contend below, TMTs are likely to exhibit a greater tendency to focus either on proximal or on distal solutions depending on team members' formative experiences connected to functional specialization, level of education, and intra and extra-industry tenure (Boone & Hendriks 2009; Cannella et al. 2008; Heyden et al. 2012; Hambrick et al. 1996).

TMT experiences and cognitive search

TMT functional experience. Functional experiences operate as filters affecting the information managers have access to and how this information is processed mentally (Bantel & Jackson 1989; Hambrick & Mason 1984). Thus, whether one's career has evolved within the accounting, marketing, production, strategy, or some other function can determine not only the specific information available to the person but also how s(he) will analyze it to reach a decision (Barker & Mueller 2002; Chattopadhyay et al. 1999). In the light of this, we predict that TMTs' cognitive search is more likely to focus on distal solutions if team members have different functional backgrounds. Our prediction is informed by studies of diversity in the upper echelons of corporate leadership, which indicate that functional diversity is associated with the use of greater variety of information in decision-making (Buyl et al., 2011; Wiersema & Bantel, 1992). As compared to a functionally homogenous TMT, a diverse team has multiple information gateways that provide access to varied data and experiences stored in member' memory or reachable through their different professional networks (e.g. Bunderson & Sutcliffe 2002; Lovelace et al. 2001). This enables complementary interpretations and analyses when decision-makers weigh a situation and the potential solutions to deal with it (Cannella et al. 2008; Hambrick et al. 1996). Tuggle, Schnatterly and Johnson (2010, p. 553) write, for example, “heterogeneous functional backgrounds can bring a greater breadth of knowledge and different approaches to problem solving” (see also Boone & Hendriks, 2009), which can influence cognitive search. The availability of non-overlapping information and insights because of team members’ different functional histories should particularly encourage the evaluation of distal solutions involving significant alterations in firm’s structure and strategy. This is the case because with greater variety of information a TMT is better equipped to gauge the viability of distal solutions’ extensive re-assembly of the firm’s functions and operations. If such informational variety is lacking, plausibly, a TMT would be disinclined to search through distal solutions because team members would not have the requisite range of knowledge and experience to assess the solutions’ practicability. Given a narrower band of information, it would in fact make sense for the TMT to focus effort on searching through proximal solutions that involve limited adjustments in structure and strategy, and for which a limited information range suffices to determine solution viability. In view of this discussion, we formally propose the following hypothesis:

HYPOTHESIS 1: *The higher (lower) the TMT functional-background diversity, the more the team’s cognitive search will center on distal (proximal) solutions.*

TMT educational experience. The level of someone’s education captures both a specific and a general proficiency. The former covers the depth of understanding of the concepts and cause-effect models of a particular field. The latter, which is of interest here, pertains to mental experience and expertise for evaluating complex issues and for tolerating ambiguity (Dollinger 1984; Wiersema & Bantel 1992). The lower the level of education, the less one’s proficiency in thinking through multifaceted and multilayered issues and data. In the light of this, the lower a TMT’s education level, the less likely it is that cognitive search will focus on distal solutions, which, because of substantial change in firm's structure and strategy, entail a higher order of complexity and greater outcome uncertainty than proximal ones. Given solution complexity and payoff uncertainty, disregarding distal solutions allows TMTs with lower education a check on cognitive burden, such that, attention can be focused on proximal solutions (cf. Wiersema & Bantel 1992). Further, systematic search through the less intricate proximal solutions affords TMTs with lower education an expedient search rule for finding an adaptive response to changes in the environment. When a team's education level is higher, however, cognitive search is more likely to focus on distal solutions due to team's greater mental proficiency in processing complexity and uncertainty. Additionally, inasmuch as higher education promotes a sense of self-efficacy (Bandura 1997; Sherer et al. 1982), the resulting confidence and motivation (Kirk & Brown 2003; Kuhl 1985) should also encourage a TMT to search through distal solutions. Based on these considerations, we propose the following hypothesis:

HYPOTHESIS 2: *The higher (lower) the TMT education level, the more the team's cognitive search will center on distal (proximal) solutions.*

TMT industry experience. Whether one's career experience has been limited to a specific industry or whether it has spanned multiple industries is said to influence information availability, cognitive knowledge-structures and decision-making perspective (Hambrick & Mason 1984). We anticipate, therefore, that cognitive search is more likely to focus on distal solutions if TMT members have worked in a range of industries, and it is more likely to focus on proximal solutions if members' careers have developed within the same or a narrow range of businesses. Longer TMT tenure in a single line of business implies greater domain expertise and an informational advantage stemming from an established network of ties with customers, suppliers, and other industry actors (Hambrick et al. 1993; Kor 2003). It should also mean more time for a deeper imprint of the field on the team's mental model of action-outcome linkages (Boeker & Wiltbank 2005; Michel & Hambrick 1992). These factors should promote focus on and confidence in finding an adaptive fit through relatively minor reconfigurations of the firm, thus encouraging cognitive search centered on proximal solutions. Moreover, longer TMT tenure in one industry is unlikely to confer a sophisticated understanding of the administrative, market and technical issues connected to a very different configuration of the firm. This limited perspective should discourage searching through distal solutions (cf. Hambrick et al., 1993). In contrast, if TMT tenure in an industry is shorter because team members have worked in many industries, the team will have access to multiple information streams and perspectives that reflect familiarity with and understanding of different domains. This should facilitate the analysis and interpretation of distant data and options, enhancing TMT's inclination to weigh solutions that are not in the neighborhood of firm's present configuration (see also Finkelstein & Hambrick 1990b). Accordingly:

HYPOTHESIS 3: *The shorter (longer) the TMT tenure in an industry, the more the team's cognitive search will center on distal (proximal) solutions.*

METHODS

Sample and data collection

For the testing of hypotheses, we used different sources to assemble ten years of data (1997-2008) for SIC (Standard Industrial Classification) 35 companies producing industrial and commercial machinery. The companies operate in eight separate sub-sectors (see Table 1) and while comparable as regards manufacturing orientation and exposure to unobserved macro-economic and industry variables, they also experience different levels of sales volatility (Cuñat

& Melitz 2012). This made the firms a suitable population for the study as we could expect to observe variance in the variables of interest across firms and over time. We relied on Compustat to identify firms to include in the sample. Further, to ensure comparability of firms' financial data, we restricted the sample to publicly traded firms in the U.S., which are obliged to adhere to the mandatory prescriptions of the Securities and Exchange Commission (SEC) regarding the maintenance of standardized financial records. In addition, with a view to have a balanced panel, we included only those firms in the sample that were in active operation for all observation years (Verbeek 2008). These procedures led to annual repeated measures for a ten-year period for 181 firms.

Insert Table 1 about here

In line with earlier research (Carpenter 2002; Geletkanycz & Hambrick 1997), firms' TMTs were identified as executives in the upper two tiers of corporate management. Thus, executives shown in SEC filings as having the title of *president* or *vice-president* were considered as TMT members. We collected three types of data. First, data on the educational, functional, and industry background of TMT members was gathered from 10-K SEC forms, Dun and Bradstreet Reference Book of corporate management, and the Hoover's database. In case of missing data, we looked up mainstream business-press sources such as Forbes and Business Week. Second, against the backdrop of growing acceptance of written and verbal statements as legitimate sources of insight into managerial cognition (Osborne et al. 2001; Pennebaker et al. 2003), we examined the content of Letters to Shareholders (LtS) in companies' Annual Reports to establish whether TMTs' cognitive search centered more on proximal or on distal solutions. While the details of the analysis are reported in the measurement section, in general, the content analysis is consistent with earlier studies in the strategy field that have used the approach to operationalize aspects of managerial cognition that are otherwise hard to observe and record (Cho & Hambrick 2006; Nadkarni & Barr 2008). Third, we collected companies' financial data from Compustat and Thompson Worldscope.

Measurement of independent variables

TMT education level. To measure a TMT's education level, we used a binary scheme to first record whether individual team members had a postgraduate degree or not (Heyden et al. 2017). We took the average of this binary scheme as the education level of the TMT. *TMT functional diversity* was established using Blau's index, ($1-\Sigma p_k^2$), where *p* is the proportion of team members in the *k*th functional category (e.g. Marcel 2009). Six functional categories were considered: administrative, engineering/R&D, finance/accounting, legal, marketing/sales and production/operations (e.g. Bantel & Jackson 1989). Lastly, we measured the length of *TMT industry tenure* as the mean number of years a team's members had worked in a specific three-digit sub-sector of SIC scheme's sector 35.

Measurement of the dependent variable

Cognitive search. Analysis of LtS has gained currency for studying TMT cognition (Cho & Hambrick 2006; Nadkarni & Barr 2008). We also followed this approach because TMTs' cognitive search is not something that can be observed readily otherwise. Specifically, we used QSR NVivo 8 package to execute a computer-aided textual analysis (CATA) of LtS. The analysis centered on determining a score for TMTs' search focus on proximal and distal solutions by looking at the pronouncements in LtS about a company's likely foci for the next year. The articulation of likely future foci identifies solutions decision-makers think will enable the maintenance of an adaptive fit with the environment for better performance. As letters to shareholders contain a CEO-approved summary of the TMT's collective stance, it is a valuable information source for insight into TMT's search focus. It is worth noting that not only the content of LtS but also their phrasing tends to be shaped by the input of different TMT members as draft versions move towards finalization (Cho & Hambrick 2006; Nadkarni & Barr 2008).

Nevertheless, some have expressed concern that LtS may not be suitable for examining TMT cognition as companies may have engaged professional writers or because LtS may reflect impression management. However, exhaustive arguments are available that alleviate this worry (e.g. Cho & Hambrick 2006; Nadkarni & Barr 2008). In addition, the discussion in the next paragraph should also mitigate concern regarding the use of LtS for our investigation.

Because our measurement of TMTs' focus on proximal and distal solutions is based on the factual pronouncements concerning next year's foci, how professional writers may have crafted individual statements in LtS should generally not be of worry. Still, professional writers could communicate a company's foci differently than a TMT because of their specific style and terminology. More generally, different TMTs may also use different styles and vocabulary. Therefore, we took steps to ensure that differences in language usage across companies would not affect measurement. Particularly, besides analyzing LtS with a list of key search terms, we also examined them using a comprehensive list of synonyms of the key terms. To develop valid and reliable lists, we followed the elaborate procedures we report next. In view of these, we are confident that our measurement captures actual differences across TMTs and not just differences that are an artefact of varying language preferences across TMTs. Furthermore, as regards the concern that LtS may reflect impression management, this is primarily a matter of concern when it comes to the attributions of firm performance by executives (Clapham & Schwenk 1991; Tsang 2002). Executives' performance-related and other evaluative statements aside, a high degree of correlation has been reported between measures of managerial cognition based on LtS and those based on other data sources (D'Aveni & MacMillan 1990; Nadkarni & Barr 2008). As our measurement is not based on evaluative statements but rather on factual declarations about imminent company foci, which LtS communicate customarily, we believe that the risk of impression management affecting our measurement is nominal.

To arrive at a score for a TMT's search focus on proximal and distal solutions, we decided to identify all distinct future foci relayed in a letter, and to distinguish them in terms of whether or not they involved a reconfiguration of the firm in the neighborhood of its existing structure and strategy. Surmising that a TMT's inclination to search through either proximal solutions or distal solutions could be inferred from whether more of the future foci entailed a relatively small alteration of the firm or a substantial one, we proceeded to count the number of foci that could be included in the two categories. For the categorization, we developed a search dictionary (SD) of pertinent terms with which to search through the LtS. In order to produce a valid SD, our starting point was a list of terms suggested by March (1991) that has considerable stature (e.g. Sidhu et al. 2007; Uotila et al. 2009). March's (1991) list includes a varied, extensive set of descriptors proposed to help distinguish between firms' exploitation and exploration activities, which constitute the physical (or, online) search counterpart to respectively, proximal and distal cognitive (or, offline) search. As such, the list is particularly appropriate for the purpose of our categorization.

In line with March (1991), we used the following terms as textual markers identifying future foci that could be classified as being indicative of a substantial reconfiguration of the firm: *discovery*, *experimentation*, *flexibility*, *innovation*, *play*, *risk* and *variation*. Similarly, we used the following terms as textual markers identifying future foci that were indicative of a minor reconfiguration: *efficiency*, *implementation*, *production*, *refinement* and *selection* (March 1991). Following this, we expanded the initial set of terms by treating March's descriptors as basic conceptual nodes for identifying additional branches to linked everyday words – synonyms, associates, and members of word families – in the Merriam-Webster dictionary (Krippendorff 2004). This expansion meant that our SD was broad and would not be biased vis-à-vis the usage of particular vocabulary in LtS. To establish the face validity of the nodes and branches of the expanded SD, we asked six colleagues with subject expertise to evaluate the list to see whether the markers used were appropriate or needed amendment

(Krippendorff 2004). Their suggestions were incorporated and the refined SD with an even set of 25 markers each for identifying proximal and distal future foci was reviewed by two more colleagues with domain expertise. They did not recommend further changes.

Insert Table 2 about here

Confident in the face validity of the revised SD (see Table 2), we next took steps to ensure that CATA using our markers would result in a reliable classification and counting of proximal and distal foci. First, we performed a key-word-in-context (KWIC) analysis (Krippendorff 2004). Specifically, we used the NVivo 8 package to run initial queries to extract all instances of use of a marker in its broader textual context (specified as the preceding and subsequent 25 words in LtS). Random samples of 25 broad-context extractions of all markers were then reviewed. All usages and forms of a marker which located text passages that were unrelated to proximal or distal foci were noted, and action taken to prevent wrong identification and counting by the automated analysis. To illustrate, a pilot query with the marker "invent", which could possibly identify instances of distal foci, led to the identification of inappropriate text passages containing the word "inventories". In such cases, to prevent count distortion, we used the "NOT" operator available in NVivo 8 to exclude usage of specific marker forms such as "inventories". As another example, an initial query with the marker "risk", potentially related to instances of distal foci, identified the following text that was irrelevant for our analysis: *"...[a]nd of course, weather is a constant risk factor in the markets that we serve*". In such cases, we made use of "NOT" and "NEAR" operators to specify our query in another form – we instructed the program to NOT select "risk" if NEAR (+/- 15 words) to the word "weather". Moreover, initial query also identified the following text containing "risk": "*Given this prognosis, we will avoid taking risk in the coming period…*". Rather than being indicative of a distal focus, this usage of the word "risk" implies a low risk-propensity, which generally means a proximal focus. We therefore instructed the program to NOT select “risk” if NEAR (+/- 10 words) the word “avoid”. After this initial KWIC analysis phase, we repeated the analysis by re-running our modified queries and examining ten random broad-context extractions of markers that had been associated with identification of irrelevant texts in the previous round of analysis. We again made the requisite query changes and kept repeating the KWIC analysis until no more inappropriate text extractions were observed. Table 3 shows some CATA-based excerpts.

Insert Table 3 about here

We next used Krippendorff’s alpha to formally assess the reliability of CATA-based automated classification. The aim was to have confidence that the automated counting of proximal and distal foci would match counts produced by human coders. We computed three sets of reliability coefficients that reflect the extent of agreement on the counts of proximal and distal foci. The first set of coefficients is based on the counts produced by CATA and two naïve coders – M.Sc. students in a Research Methods course, who were provided full details of the research but had no prior related experience. The coders were instructed to set aside cases they could not classify as being either in the proximal or in the distal category. The cases to be classified were extracted from texts of 250 randomly selected LtS (with 25 LtS per observation year). The second set of coefficients was based on counts by CATA and two expert coders, namely, two of the paper’s authors. Cases were again derived from 250 LtS; 100 LtS were selected randomly from the set used previously and 100 fresh LtS were used. Finally, the last set of coefficients reflects agreement among expert and naïve coders. As all six reliability coefficients were near or above the 0.80 mark (Krippendorff 2004), we could be confident in CATA’s classification and the final counts of proximal and distal foci. However, as the length of LtS could affect the counts, for cognitive search scores comparable across firms and years, we normalized the counts by dividing them by a letter's word length. Next, for each firm-year, we divided the normalized count for distal foci by the sum of the normalized count for proximal and distal foci. By construction, whereas higher cognitive search scores can be interpreted to reflect search centering more on distal solutions, lower scores reflect search centering more on proximal solutions.

Measurement of control variables

We included a range of pertinent control variables in our analysis. Thus, as the slack a firm has may direct cognitive search, we controlled for absorbed slack (i.e., the ratio of selling, general and administrative expenses to sales), unabsorbed slack (i.e., the ratio of cash and marketable securities to liabilities) and potential slack (i.e., the ratio of debt to equity) (George 2005; Greve 2003). Furthermore, as aspiration may affect cognitive search for solutions, we controlled for it. Following Greve (2003), we measured it as the discrepancy between the focal firm's ROA and the average ROA of other firms in the industry. Past research suggests that if a firm's aspiration is close to or above the performance of others, a TMT may be less inclined to weigh distal solutions due to the greater uncertainty and risk they entail. Should firm aspiration be below the industry average, however, the opposite should be the case (cf. Kahneman & Tversky 1979; March & Shapira 1987). Furthermore, because managers keep a close watch on sales, we controlled for a potential effect of *sales volatility*. We constructed five-year windows to determine sales volatility using annual sales data. To illustrate, using a standard linear equation $y_t = \alpha + b_1 x_t + e_t$, where y_t stands for sales in the years 1996 to 2000, x_t is the time dummy, and e is the residual, sales volatility for the year 2000 was the standard error of the regression slope coefficient divided by average sales (Li & Tang 2010; Nadkarni & Barr 2008).

In addition to the above, because firms' inclusion in the balanced panel was not contingent on the value of the dependent variable, sample-selection bias should not be a concern (Winship

& Mare 1992). However, one cannot rule out survival bias. Therefore, we computed a hazard-rate coefficient to control for it. The coefficient was calculated over the period 1990-2008 based on a Cox regression model of all firms in the SIC class 35 as listed in Compustat. Because prior work suggests that older and larger firms are more likely to survive and that competitive intensity varies across industries (Amburgey et al. 1993), based on firms' age, size, and their three-digit SIC 35 classification we estimated the likelihood of firm *i* being active after a discrete identifiable event affecting all firms. Specifically, for the universe of firms in SIC class 35, we estimated the probability of survival since a firm's initial public offering, a strategically important event comparable across firms and over time. The *survival bias coefficient* given by the probability of survival was included as a control variable in all models.

We also controlled for a possible effect of the level of *product-market diversification* by developing an entropy measure based on sales in different four-digit segments within a firm's three-digit sub-sector (Jacquemin & Berry 1979; Palepu 1985). The diversification level was computed as $\Sigma[p_k \cdot \ln(1/p_k)]$, where p stands for the fraction of sales in *kth* segment and $\ln(1/p_k)$ represents the weight per segment. Besides accounting for the above firm-level differences, we controlled for difference in TMT size because availability of information and the capacity to analyze it may increase with team size, thus affecting cognitive search. Furthermore, as a change in the CEO could affect priorities and direction, we controlled for CEO turnover (Fitza 2014). Lastly, we controlled for unobserved time effects and unobserved heterogeneity across industry sub-sectors by including year and industry dummies in our models.

ANALYSIS AND RESULTS

Because our sample includes repeated observations from the same set of firms over several years, we used the method of Generalized Estimating Equations (GEE) to analyze the data (Ballinger 2004). As an extension of the generalized linear model, GEE was most appropriate because it can handle non-independent observations by allowing estimation of the correlation structure of the error terms (Liang & Zeger 1986). We did not use a fixed-effects model, as it would not have allowed controlling for time-invariant industry effects. Additionally, as compared to a random-effects model, GEE estimates a population-averaged model, which was consistent with our objective of examining the average effect of TMTs' formative experiences on cognitive search. In addition, GEE has proven useful for the data structures common in studying TMTs and CEOs (e.g., Chatterjee & Hambrick 2007; Chin & Semadeni 2017).

For our model estimations, we employed the "xtgee" command in STATA 14. Furthermore, as our dependent variable was distributed normally, estimations were based on a Gaussian (i.e., normal) distribution with an identity link function. With respect to the error terms, as the outcomes of adjacent periods were likely to be correlated most strongly with one another, we specified an autoregressive correlation structure of order 1 (AR1). Inasmuch as repeated observations may result in the under-estimation of standard errors, we obtained robust standard errors clustered at the firm level by opting for the Huber-White "sandwich" variance estimators, which are appropriate for large samples and a balanced panel such as ours (Liang & Zeger 1986; Wang et al. 2016).

Insert Tables 4 and 5 about here

Estimation of models was stepwise. We first included only the control variables as predictors of variance in cognitive search, the dependent variable, and followed this up with the sequential inclusion of the three TMT predictors to test Hypotheses 1, 2, and 3. To assess the models we looked at the significance level of the Wald X^2 statistic as well as the quasi-likelihood information criterion (QIC), which accounts for model complexity and provides a statistic comparable across models (Pan 2001). The descriptive statistics and correlations are shown in Table 4 and the GEE results in Table 5. Looking at Model 1 in Table 5, we see a significant effect of TMT size on cognitive search. Larger teams appear to focus more on proximal solutions, possibly because team members expect it to be difficult to reach decisions involving distal solutions. Model 1 also indicates that with more diversification at the four-digit level, there is greater focus on proximal solutions rather than on distal solutions. Turning to Model 2, which includes TMT functional diversity as a predictor, there is support for H1. With greater TMT functional diversity, cognitive search tends to center more on distal solutions ($b = .027$; $p < .05$). Notably, the inclusion of TMT educational level in Model 3 does not show support for H2. The coefficient of the variable is not significant, leading us to reject the hypothesis. Surprisingly, in Model 4, contrary to H3, greater length of TMT industry tenure is associated with distal search rather than with proximal search ($b = .003$; $p < .05$). Overall, this mixed set of results underscores the complexity of the issue under examination.

Ancillary analysis and results

In addition to the main analysis above, we did some additional ex-post analysis that yielded interesting results worth reporting here briefly. Specifically, because increase in sales volatility could affect TMT cognitive search, we examined whether it shaped the effect of TMT functional diversity, educational level, and industry tenure. Towards this end, we created a dummy variable to record if sales volatility had increased relative to the year before. Inclusion of interaction terms based on this dummy variable indicated that increase in sales volatility moderated negatively the effect of TMT functional diversity ($b = -.19$; $p < .05$) and industry tenure ($b = -.11$; $p < .01$) on cognitive search. These results suggest that teams that would otherwise be inclined towards distal cognitive search become more inclined towards proximal cognitive search under the pressure of sales volatility, presumably guided by a desire to find a solution that would be relatively easy to implement by virtue of being in the neighborhood of firm's existing structure and strategy configuration.

Furthermore, we also examined whether TMTs' cognitive search, as indicated by the content of LtS, showed association with firms' actual behaviors. To study this, we developed two sets of measures of related and unrelated diversification that capture new product-market entry through the acquisition of independent companies and through internal growth (Lee & Lieberman 2010). The first set was based on a simple count of related acquisitions (i.e, those within a firm's three-digit SIC sub-sector) and unrelated acquisitions (Krishnan et al. 1997) using data from Thompson One Banker. The second set was based on sales in different four-digit segments within a firm's three-digit sub-sector to operationalize related diversification, and sales from operations in different three-digit and two-digit sub-sectors to operationalize unrelated diversification. To compute the levels of related and unrelated diversification we used an entropy formula: $\Sigma[p_k \cdot \ln(1/p_k)]$, where p represents the fraction of sales in *kth* segment and $\ln(1/p_k)$ depicts the weight per segment. GEE models that included the control variables reported above and one-year time lags between TMT cognitive search and the dependent variable showed a consistent pattern of results across the two sets of measures. Whereas proximal TMT cognitive search was connected to related acquisitions ($b = -.55$; $p < .01$), distal TMT cognitive search was associated with unrelated acquisitions ($b = .43$; $p < .01$). Similarly, proximal search was linked to sales in related product-markets ($b = -.22$; $p < .05$) and distal search to sales in unrelated product-markets ($b = .04$; $p < .05$). These empirical results resonate with theoretical intuition regarding the link between TMT cognition and firms' adaptive behavior.

In addition, we also tested for endogeneity because TMT differences in functional diversity, educational level, and industry tenure may not be random and could reflect self-selection that coincides with other TMT, firm, and industry characteristics (Hambrick 2007). In line with recent upper-echelons research (Chin et al. 2013; Tang et al. 2018), we used a two-stage control function (CF) approach to address potential endogeneity (Wooldridge 2010). The approach is suitable for models that are linear-in-parameters, such as ours, and it is popular because the presence of a single excluded exogenous variable in the first-stage of estimation allows consistent estimates of second-stage parameters.

In line with earlier work (Chin et al. 2013; Tang et al. 2018), we first regressed our three explanatory variables, separately, on a broad set of possible predictors at the TMT, firm, and industry levels and on an exogenous variable not included in the second-stage estimation. At the TMT level, the predictors included TMT size, which may prompt individuals with a specific background to join a team, and CEO turnover, which is often associated with changes in TMT composition. At the firm level, the predictors included a firm's size, aspirations, and slack. Furthermore, because certain industries may be more attractive for certain individuals, we included firm's three-digit SIC membership as a predictor. Lastly, we included *strategic change* as the exogenous variable, because TMT composition might reflect past resource allocation patterns aimed at adapting the firm to changes in the environment (Boone et al. 2004; Nielsen 2009). We calculated *strategic change* as the sum of variances in a firm's financial leverage, inventory levels, advertising intensity, R&D intensity, and plant and equipment upgrades over the preceding three-year period (Finkelstein & Hambrick 1990a; Haynes & Hillman 2010).

The three sets of residuals (i.e., predicted scores) from the first-stage estimations were then included as control functions in the second-stage model predicting cognitive search. The results with the inclusion of the control functions and without their inclusion (the latter are shown in Table 5) did not differ appreciably. We should note that the CF correction for endogeneity notwithstanding, it is perhaps prudent not to interpret the present results as conclusive evidence of causality, but as a robust indication of association. Additional studies that control for endogeneity using other approaches, for example, instrumental variables analysis and matching based on propensity scores (e.g., Heckman & Navarro-Lozano, 2004), would be very help helpful in providing complementary evidence for more definitive causal conclusions.

DISCUSSION AND CONCLUSION

There is tremendous interest in understanding how firms' adaptive behavior and performance are affected by online experience-based search and by offline cognitive search anchored in decision-makers' coarse-grained mental model of the range of possible solutions (Gavetti & Levinthal 2000; Levitt & March 1988). This interest notwithstanding, we know little thus far about how experiential and cognitive search are impacted by a firm's TMT, the decision-making group with the authority and power to direct a firm's strategic course (Hambrick & Mason 1984). In the sizeable literature on factors affecting search (e.g., Chen 2008; Hohberger 2014), although a few studies have examined linkages between TMT characteristics and online search involving exploitation and exploration (Koryak et al. 2018; Walrave et al. 2017), research on TMT attributes and cognitive search is essentially non-existent. Therefore, by investigating the effect of TMT's diversity of functional experiences, level of education, and length of industry tenure on proximal versus distal cognitive search, this article addresses a significant gap in the literature. By showing that TMTs' functional diversity and industry tenure influence cognitive search, and thus presumably TMTs' strategic decisions, it provides rare insight into the micro-foundations of firms' adaptive behavior. The findings reported in the article echo recent research indicating that the formative experiences, personalities, and values of those in the upper echelons of management play a crucial role in guiding firms' strategies (Buyl et al. 2019; Gupta et al. 2018).

The predominant focus in upper-echelons research has been on how executives' backgrounds affect strategy and outcomes (Díaz-Fernández et al. 2018; Kaplan 2011). This study, in contrast, looked at the effect of TMTs' experiential makeup on the cognitive search that precedes strategy and outcomes. The study moreover found that distal and proximal search predict product-market entry strategy – through the acquisition of independent firms and through internal growth – into, respectively, unrelated and related business fields. The study's findings partly uphold the received view regarding TMTs' likely influence on strategic decisions, while raising questions in need of further research. As predicted, we observed a positive effect of TMT functional diversity on distal search. The effect can be ascribed to the greater variety of information a diverse team has (e.g., Bunderson & Sutcliffe, 2002; Buyl et al., 2011), which enables appraisal of the viability of distal solutions that entail extensive alterations in the firm's set up. The upshot is greater TMT inclination to search through distal solutions. In contrast to the behavioral mechanisms that have received attention in past research on the effects of TMT functional diversity (Boone & Hendrik, 2009; Qian et al. 2013), the relationship this study identifies between TMT functional diversity and distal search brings to light a cognitive mechanism by which team heterogeneity influences strategic decisions and outcomes. Furthermore, inasmuch as the pursuit of path-breaking, disruptive solutions, which tend to have higher expected returns, is made more likely by distal search, our work supports studies reporting a positive effect of TMT functional diversity on firms' bottom-line performance (e.g., Buyl et al., 2011; Cannella et al., 2008).

Notably, we did not find support for the prediction that TMTs with a higher educational level will show greater inclination towards distal search. This non-finding does not rule out the possibility, however, that the substantive content of TMTs' education may matter for cognitive search. For example, TMTs composed of members who have followed a generalist education (e.g., business administration) may differ in their cognitive search from TMTs whose members have followed a specialist education (e.g., mechanical engineering). The consequences of the level and content of TMTs' education have been theorized separately in the past (Bantel & Jackson 1989; Serra et al. 2016; Wiersema & Bantel 1992). We focused on the former because we reasoned that exposure to more complicated material that a higher level of education brings would affect TMT's inclination to evaluate distal solutions entailing complexity and uncertainty. That we did not find this to be the case is a bit puzzling because some studies have found more educated TMTs to show greater receptivity to innovation and strategic change

(Bantel & Jackson 1989; Wiersema & Bantel 1992), variables that nominally seem closer to the major reconfigurations implied by the notion of distal solutions rather than the smaller reconfigurations captured by the notion of proximal solutions. An explanation for why we did not find the predicted effect might be that education is not the sole source of experience that prepares one for dealing with complicated problems involving ambiguity. The explanation chimes well with the observation of many instances of complex, uncertain entrepreneurial ventures that were initiated and led successfully by executives who did not have a higher-education degree. It is also plausible that TMTs' level of education may matter more in some fields (e.g., banking and biotechnology) than in others. In the light of this, it would be wise to re-examine the effect of TMT education level using a different sample of firms in future research, and to look into the effect of education's content (e.g., generalist versus specialist) as well. Examination of both the level and content of education to determine their distinct impact could help us develop a more refined understanding of the relationship between TMT's education and cognitive search.

Interestingly, contrary to what we had predicted, we discovered that longer TMT tenure in an industry is associated with distal search rather than with proximal search. We had expected the relationship to be different based on the implications longer tenure usually has for the information, knowledge and perspective available to a TMT for decision-making (Finkelstein & Hambrick, 1990; Hambrick et al., 1993). In addition, our finding does not coincide with the positive association reported in earlier work between longer tenure and commitment to the status quo (CSQ). As CSQ implies adhering to "current organizational strategies and profiles" (Hambrick et al., 1993), it suggests a TMT focus on proximal solutions. Notably, though, the literature contains opposing results as well – for example, longer tenure led, unexpectedly, to a greater change in strategy (Wiersema & Bantel, 1992). An explanation for these mixed results and for what we found may lie in the fact that the studies did not consider the possible impact of psychological factors such as emotions and mood on TMTs' search orientation. For instance, ennui generated by the long time spent in one industry could incline TMT members to weigh new and challenging pastures that are further afield. This possibility tallies with the observation that, psychological factors will ultimately have to be taken into account for definitive conclusions about the effect of executives' experiential backgrounds on strategic choices (Hambrick et al., 1993). It is also worth noting that there is work which suggests that contextual factors, such as, executives' extra-industry ties, could also encourage TMTs with longer tenure to evaluate boundary-spanning opportunities encapsulated in distal solutions (Geletkanycz & Hambrick 1997). Clearly, additional research is needed for a fuller understanding of the effect of TMTs' tenure. In this respect, future studies would do well to expand our initial model to incorporate psychological and contextual factors (see also Carpenter et al. 2004) that might have bearing on TMT's search orientation.

Our study also makes a methodological contribution by offering a rigorously developed search dictionary (SD) for measuring TMTs' focus on proximal and distal cognitive search. In general, the operationalization of managerial cognitive search to study differences across firms and over time is not without challenges – self-report surveys, direct observation and interviews are typically not very practical options. Under the circumstances, our SD could facilitate further empirical research that operationalizes cognitive search by analyzing textual materials, resulting in the buildup of a richer body of findings. Because the SD is not specific to one industry or period, researchers can readily use it in varied settings to develop a more comprehensive understanding of the antecedents and consequences of cognitive search.

If TMTs' formative experiences are important for cognitive search as highlighted by this study, the question arises whether given a particular TMT, cognitive search can be managed to influence strategic choices and action. One way to channel a TMT towards either more of proximal search or distal search would be to change the team's composition to alter its profile vis-à-vis functional expertise and industry tenure, but this may not always be practical or possible. Alternatively, building self-awareness, so that the team is aware of its predisposition to focus more on either proximal or distal solutions because of members' functional expertise and industry tenure, could help regulate the locus of cognitive search. Corporate boards can also explore executive-compensation plans (see e.g. Balkin & Gomez-Mejia 1987; Miller et al. 2002) likely to stimulate greater focus on either proximal or distal solutions.

Limitations and further research

Operationalizing the notion of cognitive search for empirical investigation is challenging, especially as the variable is not amenable to measurement through direct observation. The challenge becomes more pronounced when a consistent basis of measurement is needed to enable cross-sectional and longitudinal comparisons. In the absence of any other realistic option of getting at TMT cognitive search over a ten-year period, we relied on the analysis of LtS. Even though this approach enjoys the scientific community's approval, it would be of value to cross-check our findings using a supplementary method. For instance, advances in neuroscience might afford opportunities to researchers to measure cognitive search by recording patterns of brain activity using functional magnetic resonance imaging (see e.g. Powell et al. 2011).

The data sample for this study included only companies manufacturing industrial and commercial machinery. Even though the companies in the sample span eight distinct lines of business, replication of the results in other industries would enhance confidence in the present findings. It should also be recognized that different industries afford incumbents different possibilities and constraints. A proximal solution such as entry into a related product-market might not exist when there is already a high degree of vertical integration as in the case of oil extraction, refining and distribution. Or, as exemplified by the case of Remington Rand and advent of computers, proximal solutions might not amount to a viable option in the face of discontinuous technological change. Thus, an opportunity for future research is to study the effect of industry context on TMT cognitive search.

This study focused on proximal versus distal cognitive search without delving into whether decision-makers' mental models of the industry were similar or dissimilar (cf. Cattani et al. 2017; Porac et al. 1995). Future research can therefore try to refine our findings by taking the dis(similarity) of decision-makers' mental models into account. Furthermore, researchers may want to explore the effects of TMT age, nationality, and gender on cognitive search. Also, research that examines how cognitive search is influenced by personality variables (e.g. narcissism) (see also Chatterjee & Hambrick 2011) and the social dynamics stemming from the varied personalities of TMT members would be very useful. Such work could also shed light on the processes and mechanisms of change in TMT cognitive search. Beyond intra-TMT interactions, TMT interactions with boards of directors and with middle-managers are said to affect strategy (e.g., Heyden et al. 2018). Hence, two other fertile lines of enquiry would be the part boards and middle-management play in influencing TMT cognitive search and its effect on strategy.

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APPENDIX

Table 1 Distribution of sample SIC-35 firms across sub-sectors

Sub-sector description	Sample %
351 – Steam, gas & hydraulic turbines	0.00
352 - Farm & garden machinery	4.40
353 - Construction, mining, materials handling	12.5
354 - Metalworking machinery & equipment	4.40
355 - Special industry machinery	17.3
356 - General industry machinery & equipment	13.9
357 - Computer & office equipment	42.3
358 - Refrigeration & service industry machinery	4.00
359 - Miscellaneous industrial & commercial	1.00

Table 2 Search dictionary for CATA of letters to shareholders

Markers to identify proximal company foci		Markers to identify distal company foci	
Conceptual Node	Branches	*Conceptual Node*	Branches
Selection	Emphasiz* Focus Select* Specializ*	*Discovery*	Detect*! Discover*! Identif*! Uncover*!
Efficiency	Downsiz* Economiz* Low*$ Reduc$	*Experimentation*	Attempt Test Try
Implementation	Apply Align* Control* Implement* Operat* Organiz*	*Flexibility*	Chang* Modif* Transform* Versatil*
Production	Boost~# Enlarg*# Expand # Increas*# Produce*	*Innovation*	Conceiv* Creat* Novel* Pioneer*
Refinement	Continu* Elaborat* Enhanc* Improve* Refin* Updat*	*Risk*	Start_up Tak*chance/risk Ventur*
		Play	Explore ! Invent ! Probe ! Seek !
		Variation	Deviate* Divers* Differentiat* Vary*

"*"All suffixes following the marker root were extracted.
"!" Marker extracted in conjunction with: new; idea; techn*; market*; product*; process*; partner*; service; opportunit*; solution.
"#" Marker extracted in conjunction with: capacity; capability; production; productivity; margin; output; efficienc*.
"$" Marker extracted in conjunction with: cost; expense.

Table 3. CATA-based illustrative excerpts of distal and proximal company foci

Proximal	Distal
"Our attention to *controlling operating* expenses remains relentless, and we intend to fulfill the tremendous opportunity for additional *efficiency*."	". . .high priority on striving to become a more innovative company with more highly *differentiated* products."
". . .we worked in partnership with these early customers to *refine* our product and *implementation* procedures to prepare for full-scale. . ."	These financial accomplishments validate the purposeful transformation of [company] from a cyclical machinery company to a global *diversified* industrial enterprise. . ."
". . .several major projects are underway to *enhance* the performance of our products and *expand* the *applications* for our equipment within our *existing* markets."	"We are currently *exploring* sourcing materials, components and products from China in the near future. . ."

Table 4. Descriptive statistics and correlations †

	Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1	TMT cognitive search	0.20	0.20													
2	TMT functional diversity	0.34	0.33	.112**												
3	TMT education level	0.42	0.49	-.100**	-0.02											
4	TMT industry tenure	9.21	4.87	.089**	-0.02	-.094**										
5	TMT size	7.05	3.14	-.165**	-.197**	-.168**	0.04									
6	Firm size	0.34	2.02	-.068**	-.100**	-.081**	.118**	.577**								
7	Absorbed slack	0.56	3.14	0.02	0.00	0.02	-.063*	-.054*	-.151**							
8	Unabsorbed slack	2.20	2.39	0.02	0.01	.129**	-0.04	-.176**	-.361**	0.03						
9	Potential slack	0.18	0.20	-0.01	-0.03	-.069**	-0.01	.063*	.186**	-0.01	-.286**					
10	Firm aspirations	0.03	0.33	-.055*	-0.01	-0.05	.223**	.136**	.307**	-.360**	0.03	0.02				
11	CEO turnover	0.11	0.32	-0.05	.074**	-.090**	-0.02	0.01	-.056*	0.01	-0.01	0.03	-.070**			
12	Product-market diversification	0.08	3.30	-0.01	-0.03	0.01	.061*	.104**	.173**	-.323**	-.052*	.052*	.125**	-0.03		
13	Survival bias coefficient	0.94	0.04	.154**	-0.01	-.274**	0.02	.223**	.346**	0.00	-.066*	.171**	.144**	-0.02	.069**	
14	Sales volatility	4.52	3.22	.089**	0.03	-0.02	-.157**	-.136**	-.208**	.147**	.249**	-.128**	-.118**	-0.01	-.101**	.306**

† Coefficients larger than |.06| are significant at the $p < 0.05$ level; correlations above |.07| at $p < 0.01$.

Table 5 GEE results for TMT cognitive search

	Model 1			Model 2			Model 3			Model 4			Model 5		
	b	**(s.e.)**		**b**	**(s.e.)**		**b**	**(s.e.)**		**b**	**(s.e.)**		**b**	**(s.e.)**	
Intercept	-.570	(.35)	†	-.590	(.34)	†	-.502	(.35)		-.662	(.35)	†	-.622	(.34)	†
Survival bias coefficient	.903	(.38)	*	.908	(.38)	*	.844	(.38)	*	.968	(.38)	*	.921	(.37)	**
Sales volatility	.000	(.00)		.000	(.00)		-.001	(.00)		.000	(.00)		-.001	(.00)	
TMT size	-.010	(.00)	***	-.009	(.00)	***	-.010	(.00)	***	-.010	(.00)	***	-.009	(.00)	***
Firm size	-.002	(.01)		-.003	(.01)		-.001	(.01)		-.003	(.01)		-.003	(.01)	
Absorbed slack	-.001	(.00)		-.001	(.00)		-.001	(.00)		-.001	(.00)		.000	(.00)	
Unabsorbed slack	.000	(.00)		.000	(.00)		.000	(.00)		.000	(.00)		.000	(.00)	
Potential slack	-.018	(.02)		-.016	(.02)		-.017	(.02)		-.016	(.02)		-.014	(.02)	
Firm aspirations	-.012	(.01)		-.011	(.01)		-.012	(.01)		-.013	(.01)	†	-.014	(.01)	†
CEO turnover	-.050	(.04)		-.052	(.04)		-.052	(.04)		-.050	(.04)		-.054	(.04)	
Product-market diversif.	-.001	(.00)	*	-.001	(.00)	†	-.001	(.00)	*	-.001	(.00)	†	-.001	(.00)	†
TMT functional diversity				.027	(.01)	*							.028	(.01)	*
TMT education level							-.017	(.01)					-.015	(.01)	
TMT industry tenure										.003	(.00)	*	.003	(.00)	*
Wald's X^2	101.80			102.86			100.20			109.39			109.69		
QICC	113.87			110.66			110.66			110.34			113.87		

N = 1,443. Year and sub-sector dummies estimated but not displayed to simplify presentation.

†$p < 0.10$; *$p < 0.05$; **$p < 0.01$