

Manuscript Details

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Abstract

In this paper, we challenge the consensual view of ambidextrous search as a superior approach to addressing performance problems by offering a microfoundational perspective. We characterize the nature of search as both ostensive and agentic and suggest that search performance is idiosyncratic across individuals and highly dependent on the decision makers' cognitive frameworks and social contexts. To test our theory, we develop a mathematical simulation model that formalizes the mechanisms regulating the search behaviors of senior leaders in both family and non-family firms, thus highlighting the relevance of socio-cognitive factors. Our results suggest that a search approach that is conducive to superior performance in non-family firms may yield inferior performance in family firms depending on the senior leader's membership in the family and her/his history of positioning in the firm (i.e., non-family, founder, later generation). Moreover, we reveal that while ambidexterity represents a superior search approach for family firms with founder CEOs, those with non-family or later generation CEOs seem to benefit from specialization.

Taxonomy	Organizational Ambidexterity, Family Business, Search
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Submission Files Included in this PDF

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Kuala Lumpur, 1st October 2018

Dear Professor Thomas C. Lawton,
Managing Guest Editor, *Long Range Planning*

My coauthors and I are pleased to re-submit the manuscript, now titled, “Behind Ambidextrous Search: The Microfoundations of Search in Family and Non-family Firms” (LRP_2018_43_R1) for consideration and possible publication in the *Long Range Planning* Special Issue on *The Microfoundations of Organizational Ambidexterity*.

In this version, we have sought to meet the conditions for publication outlined in your recent decision letter. Specifically, we have refined the clarity of our logic, revised the paper structure to make our story less muddled and fragmented, and edited once more for readability and grammar. We sincerely appreciate your guidance and believe that it has led to a much improved manuscript. We hope you will agree.

If you require any additional information, please do not hesitate to contact us. We appreciate your time and consideration, and look forward to hearing from you regarding the result of the review process.

Sincerely,

Ambra Mazzelli
Corresponding author

Assistant Professor of Management
Asia School of Business
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LETTER TO THE EDITOR

Thank you for the opportunity to revise and resubmit our manuscript now titled “BEHIND AMBIDEXTROUS SEARCH: THE MICROFOUNDATIONS OF SEARCH IN FAMILY AND NON-FAMILY FIRMS” (LRP_2018_43_R1).

This document contains our point-by-point responses to your and the reviewers’ comments on our paper. The original comments are in bolded text followed by our separate responses. For brevity, we use abbreviations “E” and “R” in place of “editor” and “reviewer”.

Dear XXX,

Thank you for submitting your manuscript to our Long Range Planning special issue on the Microfoundations of Organizational Ambidexterity. I have received comments from reviewers on your manuscript. They remain broadly supportive and I believe that your paper should become acceptable for publication, pending suitable minor revisions and modification of the article in light of the appended reviewer comments.

In particular, the paper is disjointed in places and I urge you to review your paper thoroughly once more, ensuring that you enrich the argument by continually interrelating and interweaving the three key concerns of ambidexterity, search, and leaders of family/non-family firms.

I look forward to receiving your revised manuscript as soon as possible.

Thank you for the positive feedback. We appreciate the opportunity to revise our manuscript for further consideration for publication in the Long Range Planning special issue on the Microfoundations of Organizational Ambidexterity. Once again, the reviewers’ comments were extremely constructive, and we believe they have allowed us to clarify some important points and make some of the arguments more consistent. Specifically, we realized that some sections were misplaced in the previous version of the manuscript. As you will see, we have made every effort to make it as easy as possible for readers to follow the manuscript’s narrative. We sincerely appreciate your guidance and believe that it has led to a much improved manuscript.

Comments from Reviewer 1

Thank you very much for the revisions you have conducted on this paper. I think overall the paper is now seeming more unified and holistic.

Many thanks for your appreciation and valuable suggestions.

1. I still think there is some scope to foreground the fact that this paper is about search behaviour by leaders of family/non-family firms. While the 'family' aspect is sown throughout the paper the thrust of the argument centres on Search and Organizational Ambidexterity. In reality in your argument the key differentiator on which you build your argument is the particular organizational cultural facets of 'family' firms (as opposed to non-family units). So as a suport I think the best way to do this is to profile the 'family (firm)' in your sections on 'search. This currently reads like a long technical preamble before we then get to relate this to family firms. And this application is relatively brief. The point here echoes one of my earlier points that the various parts/aspects of the paper seem dislocated from each other to some extent and this is a shame because the paper does have a contribution to make. Good luck with these final revisions.

R1.1. We are grateful for this comment, which allowed us to streamline the main message of the paper and improve its flow. Indeed, we have carefully revised the structure and content of the theory sections to better and more directly highlight the core arguments of the paper.

Comments from Reviewer 3

I have enjoyed reading the revised manuscript, and indeed following the suggestions for improving the paper by reviewers you have been able to submit a clear article. Despite my lack of knowledge of your particular methodology adopted within this study, I appreciate the effort in development and advancement of theory which reveals the importance of micro-foundations in capturing and understanding performance in relation to search.

You are arguing that individuals are idiosyncratic, and proposing certain caveats around idiosyncrasy of search performance across family and non-family firms. The use and adoption of ambidexterity lens is welcome here, and I think after the revisions the paper makes a very clear argument about why organisations which operate in similar contexts may achieve different outcomes through micro-level individual focused analysis.

I can see that you have made a considerable effort to offer clarity within the work. Overall this is very strong article despite it being long, and I look forward to seeing it in print.

Many thanks for your appreciation and valuable suggestions that have been extremely relevant for improving the overall contribution of the study.

Comments from Reviewer 4

The paper is very original and of value. I think that the paper has some good points that are valuable for the publication in this important journal. So, the comments below are only directed to improve the relevance, communication and clearness of the manuscript and to achieve a very good level of quality.

Many thanks for your appreciation and valuable suggestions. We did our best to make justice to your comments, and we hope that you will be pleased with our revisions.

1. Abstract may be really improved. For example, methodology (simulation) and main findings are not very well communicated in this part of the paper. Please, avoid redundant and less important (or generic) sentences and focus more on real value added elements. For example, this is an important result that you should included “While ambidexterity represents a superior search approach for family firms with founder CEOs, those with non-family or later generation CEOs seem to benefit from specialization”

R4.1. We have revised the abstract following your recommendations. We hope you will agree that the revised version better reflects the main aim, approach, and results of the study.

2. I can understand that the “open” aspects of search are a bit out of the primary focus of the paper but in the era of open innovation I think that you should may at least cite the opportunities related

to the openness of search (e.g. Bresciani, S., Ferraris, A., & Del Giudice, M. (2017). The management of organizational ambidexterity through alliances in a new context of analysis: Internet of Things (IoT) smart city projects. *Technological Forecasting and Social Change* or see below for further reading on this) maybe in the conclusion or somewhere in the manuscript. This topic may be also related to the behaviors of top managers with differences between family and non family firms, that is the real focus of your paper.

R4.2. Many thanks for highlighting this potential connection, which we now mention in the discussion section.

3. Introduction is really important and crucial for the future potential readers of this paper. I suggest that at the very beginning of the paper you should clearly stated why this paper is important and what the authors should really expect from it. The paper has some contributions but in this section they should be more "sold" in order to increase the appeal. Moreover, better explaining the motivation that moved this research and the related prior unsolved problems may help you in delivering the value of this paper.

R4.3. We are grateful for this comment. We have revised the introduction by better stressing the study's main contribution and motivations.

4. Please, avoid to begin a section (the literature review) with this "Here, search is conceived as...". More elaboration will make the reading more linear and comprehensive.

R4.4. We have revised the language to improve readability.

5. With some few exceptions (e.g. Posen et al., 2018) references used in the literature review are not so updated (very old in some cases). Moreover, you based a great part of your rationale on the paper Posen et al., 2018, I suggest to add more recent studies on this topic (maybe connecting with some concepts in the open innovation landscape that address similar problems in order to give alternative lens of analysis or theoretical rationales).

Some examples may be:

Criscuolo, P., Laursen, K., Reichstein, T., & Salter, A. (2018). Winning combinations: search strategies and innovativeness in the UK. *Industry and Innovation*, 25(2), 115-143.

Brinkerink, J. (2018). Broad Search, Deep Search, and the Absorptive Capacity Performance of Family and Nonfamily Firm R&D. *Family Business Review*, 0894486518775187.

Chiang, Y. H., & Hung, K. P. (2010). Exploring open search strategies and perceived innovation performance from the perspective of inter-organizational knowledge flows. *R&d Management*, 40(3), 292-299.

Flor, M. L., Cooper, S. Y., & Oltra, M. J. (2018). External knowledge search, absorptive capacity and radical innovation in high-technology firms. *European Management Journal*, 36(2), 183-194.

R4.5. Many thanks for suggesting us these papers, which have been extremely useful for further elaborating our arguments.

6. Literature. The final part of the section “The agentic nature of search” is more a research gap than an explanation of the concepts that I expect from the title of the section. I suggest to relocate it in the introduction (or create a subsection in the literature review part).

R4.6. We have revised and relocated this part in the introduction.

7. I suggest to create sub sections in the “discussion” part in order to be more schematic and clear.

R4.7. Many thanks, we have implemented your suggestion.

Behind Ambidextrous Search: The Microfoundations of Search in Family and Non-family Firms

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Behind Ambidextrous Search: The Microfoundations of Search in Family and Non-family Firms

Abstract

In this paper, we challenge the consensual view of ambidextrous search as a superior approach to addressing performance problems by offering a microfoundational perspective. We characterize the nature of search as both ostensive and agentic and suggest that search performance is idiosyncratic across individuals and highly dependent on the decision makers' cognitive frameworks and social contexts. To test our theory, we develop a mathematical simulation model that formalizes the mechanisms regulating the search behaviors of senior leaders in both family and non-family firms, thus highlighting the relevance of socio-cognitive factors. Our results suggest that a search approach that is conducive to superior performance in non-family firms may yield inferior performance in family firms depending on the senior leader's membership in the family and her/his history of positioning in the firm (i.e., non-family, founder, later generation). Moreover, we reveal that while ambidexterity represents a superior search approach for family firms with founder CEOs, those with non-family or later generation CEOs seem to benefit from specialization.

Keywords: Search, family firms, microfoundations, ambidexterity, exploitation, exploration, social context

Introduction

In his pioneering article on organizational search, James March (1991) outlines two fundamental search approaches, namely exploitation and exploration. The central thesis of March's paper is that "*maintaining an appropriate balance between exploration and exploitation is a primary factor in system survival and prosperity*" (1991:71). Subsequent research would seem to have reached a consensus on the fact that successful organizations are *ambidextrous* – capable of pursuing "*exploration and exploitation synchronously via loosely coupled and differentiated subunits or individuals, each of which specializes in either exploration or exploitation*" (Gupta et al., 2006:693; Raisch and Birkinshaw, 2008; Raisch et al., 2009; Luger et al., 2018). Even if there is a near-consensus in the literature that ambidexterity represents a superior search approach (Gibson and Birkinshaw 2004; He and Wong, 2004; O'Reilly and Tushman, 2013; Raisch and Birkinshaw, 2008; Raisch et al., 2009), our concern is with the generalizability of this claim.

Indeed, our understanding of why organizations that operate under similar circumstances and adopt similar search approaches may experience heterogeneous performance outcomes is limited. These limited insights may be due to prior studies defining organizational heterogeneity based on the particular search approach adopted (the 'how'), rather than on the organizational actors who are directly involved and have the power to influence strategic decisions (Criscuolo, Laursen, Reichstein, and Salter, 2018). In particular, although the role of individuals is central to March's original model, research has tended to underestimate the 'who' in the search process (Li et al., 2013) and has rarely applied microfoundational approaches to understand how and with what consequences organizations can balance exploitation and exploration (e.g., Eisenhardt et al., 2010; Abell et al., 2008; Foss, 2011; Felin et al., 2012). In particular, as the search process and its outcomes are highly intertwined, those actors who espouse ambidexterity might obtain substantially different performance outcomes due to the heterogeneity found in the social contexts in which they operate and, consequently, in their cognitive frameworks (cf. Eisenhardt et al., 2010).

A critical role played by these socio-cognitive factors has been emphasized in the family business setting, where prior research has revealed how family involvement in the firm entails unique cognitive frameworks that affect how family owners and managers filter, interpret, and react to external stimuli and

feedback (Nason, Mazzelli, and Carney, 2018), thereby influencing their search strategies (Brinkerink, 2018). For example, Chrisman and Patel (2012) and Patel and Chrisman (2014) have shown that family firm decision makers increase (decrease) search intensity to a greater extent than non-family firms when facing negative (positive) performance feedback. De Massis et al. (2016) have recently suggested that family firm decision makers manifest a strong tendency to look back for guidance and integrate knowledge from the past into their search efforts. Although reliance on the past can induce rigidity and stall adaptation, the longevity of multi-generation family firms may result in extremely rich collective memories that, in turn, facilitate the identification of viable alternatives. Taken together, these studies point to the possibility that, over time, search may unfold differently not only between family and non-family firms, but also across family firms. This provides us with an opportunity to draw insights from family business studies to extend the search literature by incorporating the role of agency and cognitive frameworks, thus offering a more fine-grained view of the microfoundational processes underpinning ambidextrous and other search approaches.

We explore these ideas through a mathematical simulation model based upon Levinthal and March's (1981) model of adaptive search, which we extend by integrating assumptions drawn from recent theory and empirical evidence coming from both the search and family business literatures. In particular, in our model search is conceived of as an iterative and highly routinized sequence of activities that range from envisioning a set of viable alternatives, randomly selecting a course of action (blind selection), evaluating it (on-line evaluation), and obtaining feedback for adjustments (i.e., ostensive element of search). However, by considering the implications for the search process and outcomes of socio-cognitive factors across family and non-family firms, our model leads us to question some commonly held beliefs in the search literature. More specifically, we show that search is idiosyncratic across firms and their senior leaders. For instance, while ambidexterity represents a superior search approach for family firms with founder CEOs, those with non-family or later generation CEOs seem to benefit from specialization.

We believe the paper makes several important contributions. First, it extends the scope of traditional approaches to the study of search by unveiling some micro-level mechanisms which may help to explain

heterogeneity in the outcomes of distinct firms' search approaches. By doing so, it sets the stage for a more sophisticated assessment of why heterogeneity occurs in organizational responses to negative performance feedback, which accounts for the substantial latitude that, even in routinized settings, is afforded to senior leaders in their actions. Moreover, our findings offer important contributions to family business theory and practice highlighting the search approaches that potentially facilitate or hamper family firm performance and responding to recent calls to adopt a microfoundational lens to build more sophisticated and robust theories of family firm behavior (De Massis and Foss, 2018).

We proceed in four steps. First, we characterize the nature of search as both ostensive and agentic. While the ostensive element relates to the automatic and routinized nature of search, the agentic one refers to the actual performance of search activities that decision makers conduct based on their understandings and interpretations of the present situation (Feldman and Pentland, 2003). Second, we discuss the ostensive and agentic elements of search in relation to family firms. Third, we present our model of search and its underlying assumptions. Finally, we illustrate and interpret the results and explore the implications of our theory for research on search, learning, performance, and family business.

Search as both ostensive and agentic

The ostensive nature of search

We define search as the activity undertaken by decision makers in order to identify, examine, and evaluate any knowledge and information that could potentially help in resolving an organizational problem highlighted by unsatisfactory performance feedback. The original conceptualization of search offered by Cyert and March (1963) assumes the existence of a *“high degree of automaticity in firms' response to performance feedback and an overly routinized process of search”* (Posen et al., 2018:231). Performance feedback is defined as *“a diagnostic tool that managers use to discover problems in the organization and initiate search and decision-making activities”* (Greve, 2003b:7), enabling decision makers to almost instantaneously move from the recognition of a performance shortfall to the search for a solution (Posen et al., 2018). For instance, *“managers may find it relatively straightforward to identify the problems associated*

with a decline in the innovation performance relative to the aspiration and, in an attempt to resolve the performance discrepancy, may search for new modes (e.g., CVC units) to conduct R&D” (Gaba and Bhattacharya, 2012:181). Hence, the ostensive nature of search manifests itself as a number of standard operating procedures or performance programs that enable decision makers to move from performance feedback to a repertoire of possibilities (Feldman and Pentland, 2003; March and Simon, 1958).

In its traditional conceptualization, search is *situated*: decision makers are likely to initiate search in the neighborhood of a problem symptom, allocating resources to the functional unit deemed responsible for the problem and/or having access to specific information and knowledge (Desai, 2016; Ethiraj and Levinthal, 2004; Sheremata, 2000). Furthermore, search is assumed to be *satisficing* and *backward-looking*, continuing until an alternative is found that satisfies some minimum performance criteria (Caplin, Dean, and Martin, 2011; Cyert and March, 1963; Simon, 1955). The evaluation of alternatives is conducted *on-line*: the selected alternative needs to be implemented to assess its performance implications, whereby superior trials are no more likely to be implemented than inferior ones (Levinthal and Posen, 2007; Levitt and March, 1988). Finally, because bounded rationality leads decision makers to rely on *path-dependent* search routines, search is guided by the memory of past choices (Cyert and March, 1963; Greve, 2003b). This highly mechanistic view of search is purposely devoid of a substantial cognitive component, which results in severely limiting the role played by human agency (Posen et al., 2018). However, there is theoretical research that points to a variety of mechanisms demanding higher level cognitive abilities to make decision makers aware of and able to identify specific alternatives (Gavetti, 2012; Gavetti and Levinthal, 2000). There is good reason to believe that the search process inherently incorporates the subjective understandings and viewpoints of the individuals involved (cf. Feldman and Pentland, 2003).

The agentic nature of search

Even if highly routinized and regulated by specific rules and procedures, search in response to performance feedback “*requires actors to recognize specific situations and choose appropriate behaviors from an almost infinite repertoire*” (cf. Smets and Jarzabkowski, 2013:1281)—a capability that is far from mindless. Accordingly, individual agency can play in fact an important role in the search process (Li

et al., 2013; Posen et al., 2018), involving “*the individual ability to remember the past, imagine the future, and respond to present circumstances*” (cf. Feldman and Pentland, 2003: 95).

Cardinale (2018) recently distinguished between two dimensions of agency: reflective and pre-reflective. While the reflective dimension is associated with means-end reasoning, the pre-reflective one involves a “*creative (improvisational) mobilization of skills, developed through past experience, to tackle unfolding situations*” (Cardinale, 2018:133). In the context of search, the two dimensions are highly intertwined: the reflective dimension leads an actor to posit means and ends, to direct her/his attention towards particular alternatives and perform her/his search activities in view of ends; the pre-reflective dimension acts instead on individual propensities toward searching in the proximity of some courses of action—rather than of others—because they present themselves as self-evident, without any alternative being explicitly articulated and purposely chosen. “*It reflects a generative process through which actors tackle the present by activating the flexible schemes acquired during the past. More specifically, the mechanism lies in the extraction of pertinent schemes from the habitus and their application to novel situations*” (Cardinale, 2018:136). Accordingly, the agentic nature of search can be best understood as being inherently embedded and situated in the specific context in which an actor currently operates and has operated in the past. Means and ends are not only influenced by the actors’ individual beliefs and viewpoints, but also by how such viewpoints aggregate at the organizational-level in collective cognitive frameworks, achieving an established and value-impregnated status (Selznick, 1949:256). In general, embeddedness in a particular social context is likely to affect the ways in which actors posit means and ends, and therefore the ways in which they adapt their search behaviors in response to performance feedback (Kotlar et al., 2018; Maggitti et al., 2013). In parallel, cognitive frameworks shape the “*preconscious understanding that organizational actors share*” (DiMaggio, 1988:3), thus influencing their pre-reflective orientation towards specific alternatives. As a consequence, it is reasonable to expect that the mechanisms underlying search and its outcomes will differ as a function of the actors’ cognitive frameworks and of the social contexts in which they operate.

Yet, the search literature falls short of capturing the role played by human agency in the search process as well as of examining its socio-cognitive underpinnings (Li et al., 2013). It remains unclear whether and to what extent search outcomes are influenced by micro-level cognitive mechanisms or whether they are purely based on the search approach adopted and the background rules regulating it. In the following section, we describe how the family social context and senior leaders' current and historical positioning in such context may affect the agentic element of search.

The search process in family firms: The role of socially contextualized agency

“Although comparable industry conditions and firm resources could lead to similar cognitive frameworks among non-family managers, additional socio-cognitive factors that accompany the pursuit of family goals appear to lead to divergent and more complex cognitive frameworks among owners and managers in family firms” (Chrisman and Patel, 2012:993). Family business research indicates that *“families develop idiosyncratic cognitive frameworks based on socio-cognitive bonds engendered through social interactions, communication, shared experience, and the recalling of family stories and traditions”* (Nason et al., 2018). Regardless of the legal and biological ties that connect decision makers within family firms, a shared history and a shared future among family firm workers generate a sense of connection and group identity that opens up the boundaries of the family to different actors (Gomez-Mejia et al., 2001).

Insert Table 1 about here

The pre-reflective element of search in family firms

By recalling and commemorating past events through family stories and narratives, the interrelations among family members produce the content of memory, foster collective consciousness, and shape the configuration of a more general collective cognitive framework that directs the attention of decision makers towards certain memories in the present and, thus, influences how search is performed (De Massis et al., 2016). This is likely to occur at a pre-reflective level (see Table 1). The social context of family firms and the socio-material representations related to family history predispose actors towards some courses of action

that appear to be endowed with a sense of inevitability (cf. Cardinale, 2018:141). For example, De Massis et al. (2016) highlighted how decision makers in family firms have a unique propensity to identify solutions and generate new knowledge by retrieving and reinterpreting the past to fit the present and shape the construction of the future. On the one hand, the reliance on internal knowledge and family tradition may prevent family firm decision makers from using external knowledge sources. On the other hand, the long temporal span of socio-material representations related to family histories increases the richness and exhaustiveness of local search, enabling family firm decision makers to retrieve and recombine temporally distant knowledge components (Petruzzelli and Savino, 2014). Furthermore, the importance of past and historical occurrences protects decision makers against recency biases—the tendency to search in the vicinity of choices resulting from the most proximate prior searches (Baum et al., 2000; Levitt and March, 1988)—and enables them to retrieve valuable solutions the time for which had not yet come (Nerkar, 2003; Capaldo, Lavie, and Messeni Petruzzelli, 2017).

However, this pre-reflective activation and transposition of schemes and solutions from the past to tackle the present also depends on the history of positioning of actors in the social context of the family business. *“The history of positioning generates the experience that actors systematize by developing dispositions attuned to acting appropriately in those positions. Experience is, to some extent, specific to each individual because of the different positions occupied. Therefore, depending on their history of positioning, different actors have a protention toward different courses of action”* (Cardinale, 2018:142). For example, occupying the position of founder-CEO in a family business is likely to facilitate a disposition towards the retrieval of past solutions, rather than of alternatives involving knowledge from distant domains; this is consistent with the view that organizations with a founding CEO present lower information exchange and integration (Buyl et al., 2011). Information is retained in individual and organizational memory based on the founder-CEO’s direct experience. The vividness of the information associated with personal experience may draw a founder-CEO away from external knowledge. This effect is reinforced by the CEO’s identity as founder. As Stryker stated, *“When one’s relationships depend on being a particular kind of person and playing out particular roles, one is committed to being that kind of person”* (2008:20). The pre-

reflective component of search will thus reflect the internalization of those social expectations attached to the position of the actor as founder and will result in the use of distinctive knowledge consistent with its enactment (Benet-Martinez, Lee, and Leu, 2006; Cardinale, 2018). Illustrating this case in an informal conversation with one of the authors, Maria Niederstaetter—the owner and founder CEO of Niederstaetter, a South Tyrolean family firm established in 1975 and operating in the wholesale distribution of construction and mining cranes and excavating machinery and equipment—reported the following:

“Of course, I cannot forget that I am the founding leader of this family firm, which led me to experience similar issues in the past [...] drawing on such experience and my recall of the solutions that we found in the past puts me in a privileged position to preserve knowledge about past solutions and identify internally solutions to current problems.”

When the firm CEO is a descendent of the founding family, pre-reflective dispositions towards particular alternatives will emerge, with both direct and indirect experiences from observation, storytelling, and material artifacts serving as touchstones for remembrance (Ocasio, Mauskapf, and Steele, 2016). Hence, it is likely that the dispositions of later generation CEOs’ will reflect the richness of the socio-materials accumulated to commemorate family deeds throughout generations. At the same time, the fact that later generation CEOs had played the role of ‘observers’ before taking over a controlling position in the firm is likely to make them more dispositionally attuned than founder CEOs to external information. For example, during a meeting with the second and third authors, Massimo Mercati, the second generation leader of Aboca, an Italian family-owned pharmaceutical firm, emphasized that:

“Blending past knowledge coming from our family firm’s tradition with external technological knowledge spread across disparate industries and domains is typical of my approach to problem-solving.”

Finally, by virtue of their prior professional expertise, non-family CEOs may exhibit particular dispositions towards courses of action that reflect their own training and knowledge of a domain rather than the family firm’s past experience. In particular, professional CEOs are likely to exhibit a greater propensity to make holistic associations and a pre-reflective orientation towards alternatives that involve domain-

specific knowledge, which may reside beyond the boundaries of the family firm. This is clearly visible, for example, in the case of Airaldo Piva—CEO of Hengdian Group Europe, a family firm established in Milan in 2007, now owned by the Chinese Wenrong family and belonging to the family-controlled Hengdian Group conglomerate, focusing on electronics, pharmaceutical and chemical, film and entertainment, and retail trade activities—when he noted:

“The outside experience I had in different industries before I took a leading role in Hengdian Group Europe has oftentimes played a key role in finding solutions to problems with new approaches that diverged from traditional ones.”

The reflective element of search in family firms

Family idiosyncrasies and histories fossilize into an organized and socially-shared set of family-centered goals, values, and beliefs, which influence how decision makers regulate their search behaviors (Nason et al., 2018; Patel and Fiet, 2011). At the firm level, family ownership is associated with a broad spectrum of goals—comprising both financial and nonfinancial ones—that reflect the desire of family owners to preserve the stock of affect-related value the family has invested in the firm; i.e., the family’s socioemotional wealth (Gomez-Mejia et al., 2007; Kotlar and De Massis, 2013). As a result, family firms often require more cognitive effort than non-family ones, because they involve a wider range of actors and interests that create more cues to capture and integrate (De Massis et al., 2018a; Strike and Rerup, 2016).

Much of the work reported in the family business literature suggests that, when there is strong concentration of control, power, and authority in the hands of family members, family ownership and leadership lead to giving higher priority to meeting family-centered, non-economic needs than to accomplishing financial objectives (Berrone et al., 2012; Chrisman et al., 2012; Gomez-Mejia et al., 2007). By applying this logic to predict the family leaders’ search behavior in response to performance feedback, scholars have suggested that, when performance exceeds aspirations, senior family leaders are less motivated than their non-family counterparts to allocate capital to search activities (Brinkerink, 2018), as they are more concerned with limiting the chances of socioemotional wealth losses than with enhancing satisfactory performance (Chrisman and Patel, 2012; Patel and Chrisman, 2014). By contrast,

when faced with negative performance feedback, family senior leaders are more willing than their non-family counterparts to increase their search efforts due to the intertwined nature of economic and affective considerations elicited by poor performance; as performance declines, the risk of firm failure increases and, along with it, the threat of losing all the socioemotional wealth associated with the family's control of the firm (e.g., Chrisman and Patel, 2012; Gomez-Mejia et al., 2017). This, in turn, results in increased effort aimed at targeting solutions with upside performance potential, but also higher variability (Patel and Chrisman, 2014).

However, senior leaders' history of positioning in the social context of the family business may cause heterogeneity in the ways and extent to which resources are allocated to search activities. Despite the sense of community and shared identity that the family is likely to create through socio-material representations, narratives, and affective relationships between and across family and non-family members in the firm, it is likely that kinship will foster the CEO's commitment to the family's noneconomic preferences, thus tempering self-interest and instigating altruism (Schulze et al., 2003). As a consequence, the effects of family ownership on search direction and intensity will be stronger under the leadership of a family CEO than of a professional executive, who will likely have to compromise between self-interest, the family's non-economic agenda, and the firm's financial goals (e.g., Chrisman and Patel, 2012).

Furthermore, lone-founder firms and those owned and managed by extended families are likely to have different goals and priorities (e.g., Cannella et al., 2015; Miller et al., 2011). In the former, CEOs could be more concerned about maintaining their independence and discretion. They may focus on their individuality and have little tolerance for family issues, often acting in isolation from the family (Carlock and Ward, 2010; Strike and Rerup, 2016). By contrast, in the latter, decision-making is typically inclusive of family members' interests, reflecting their collective focus on harmony, conflict avoidance, and interdependence to maximize the family's socioemotional wealth (Chrisman et al., 2005). Taken together, these arguments suggest that, by virtue of its agentic nature, the search process is likely to follow paths and produce outcomes that differ not only between family and non-family firms, but also across family firms with different firm-controlling configurations (i.e., non-family, founder, and later generation CEO).

In the following section, we develop a mathematical model suited to illustrate how different CEOs in family and non-family firms search for solutions in response to performance feedback, and examine the systematic differences in performance outcomes elicited by a set of search approaches across different firm-controlling configurations. Although theorizing about dynamic processes by means of mathematical models inevitably reduces the richness of the theory, it does create a virtual laboratory that enables “capturing reality in flight” and explicitly accounting for sequences of events, actions, and activities unfolding over time and their relationships (Davis et al., 2007; Harrison et al., 2007) as well as detecting the subtle or non-intuitive implications of the theory’s underlying assumptions, which can then be developed into testable hypotheses (Anderson and Lewis, 2013).

A formal model of search in family and non-family firms

Figure 1 depicts the search process over repeated feedback loops. Triggered by a problem, search is initiated in either a single or multiple strategic domain(s) or department(s). The simplest case involves decision makers structuring search in an integrated manner or allocating resources to a single business unit (Levinthal and Posen, 2007). On the other hand, allocating resources across different strategic domains involves multiple functional units or departments searching in parallel for solutions targeting their specific operations or product/market activities (Gaba and Joseph 2013; Rivkin and Siggelkow, 2003). One of the main advantages of structuring search in parallel is the potential for relatively autonomous search to be carried out within the designated units or departments, and thus for the more rapid identification of a greater number of alternatives and of a viable solution (Ethiraj and Levinthal, 2004; Levinthal and Posen, 2007). Moreover, a parallel search structure across loosely coupled domains may enable exploration and exploitation to co-occur; i.e., that exploration or exploitation in one domain may coexist with exploitation or exploration in another, thereby making ambidexterity feasible (Gupta et al., 2006; Lavie et al., 2010). In loosely coupled systems, any previously found and applied solutions can be retained in the domain memory and retrieved as needed (Weick, 1976). At the same time, due to a lack of coordination in information exchange between the CEO and the functional units, performing search across loosely coupled domains may

lead to the premature selection of suboptimal solutions (Rivkin and Siggelkow, 2003) and to significant attention and resource costs when the two systems cannot easily identify viable alternatives.

As decision makers pursue solutions, the feedback from selected courses of action generates information cues, thus driving search and decision-making. Here, feedback is broadly conceived as the information that comes from implementing a selected alternative with the intent of evaluating and improving it (Cyert and March, 1963; Harrison and Rouse, 2015). Hence, decision makers evaluate feedback and decide whether or not to discard a selected domain of action, which corresponds to either continuing or stopping search in a given department. Since they are boundedly rational and inherently satisficing, decision makers continue search in the current strategic domain(s) as long as they are able to obtain acceptable outcomes. In doing so, they construct relatively precise beliefs about what works and why (Levitt and March, 1988), which, in turn, yields results that remain available for retrieval from memory.

Search in a strategic domain ends either when decision makers receive unacceptable feedback from a solution or when they face the risk that the pool of resources available for searching will not be sufficient to identify and implement a new course of action without discarding the current domain. If no other strategic domain is being explored, unacceptable performance feedback induces managers to discard any existing strategies and to move to strategic domains deemed more appropriate to the present situation (Levinthal and March, 1981; Madsen and Desai, 2010). Similarly, as resource allocation to a specific strategic domain is constrained, decision makers will abandon a given domain of action when continuing search in that domain becomes critical. When search fails in a given domain, the accumulated capital that senior leaders have allocated to search in such domain is stored as a sunk cost.

When no other strategic domain is being explored, decision makers use memory to identify a past solution from which to re-initiate search (otherwise, search simply continues in the other strategic domain). For decision makers in non-family firms, we assume that it corresponds to the solution yielding the highest performance across the latest three trials in the most recently explored strategic domain. However, as family firm decision makers are likely to have richer memories and access to temporally distant knowledge, we further assume that they are able to initiate search from the alternative that yielded the highest performance

in the most recently explored strategic domain, regardless of its temporal distance. Generally, search ends when a solution that exceeds a target performance or aspiration level is found. If two satisfactory courses of action are simultaneously identified across two domains or departments, the CEO evaluates them and selects the one that best serves the firm (Rivkin and Siggelkow, 2003).

Insert Figure1 about here

Search attributes and approaches

As our model is intended to reflect current understanding of the search process and behavioral decision-making rather than deducing a formal model from general principles, we build on the search literature and available empirical findings as an ideal foundation for its formulation and output evaluation (Rudolph et al., 2009). More specifically, the search literature guides us in distilling five attributes that represent the main variables in our model and to which we refer as *search scale*, *search density*, *search distance*, *search effort*, and *search structure*.

Search scale. Search scale refers to the amount of change in an organization's knowledge base induced by search, including creating or absorbing new knowledge, refining and recombining existing knowledge, or reducing an organization's stock of knowledge (e.g., Cohen and Levinthal, 1990; Levinthal and March, 1981; Nelson and Winter, 1978). For instance, minor variations in existing products, incremental innovations that do not require new technologies (Greve, 2007), new marketing campaigns, and cost cutting activities (Bromiley and Washburn, 2011; Lant and Montgomery, 1987) are examples of solutions arising from low-scale search. On the other hand, high-scale search can be associated with alternatives such as designing and manufacturing new products that involve new skills (Greve, 2007; Martin and Mitchell, 1998), or developing non-local organizational partnerships (Baum et al., 2005; Iyer and Miller, 2008).

Search density. Decision makers typically generate and maintain multiple options over the search process (Eisenhardt, 1989). Search density describes the number of potential alternatives that decision makers are able to envision at a certain point in time, and from among which they select a solution. In this sense, search density has an agentic nature since it depends on the decision makers' cognitive frameworks

and inherent limitations, which affect their awareness of alternative solutions (Knudsen and Levinthal, 2007). We assume that decision makers are able to reduce environmental complexity by creating more or less dense solution spaces that reflect their motivation and effort to search for new information and knowledge from both the internal and the external environment (Gavetti and Levinthal, 2000).

Search distance. Search distance (local vs. distant) describes how far decision makers figuratively go in their search for new information and knowledge (Li et al., 2013). Specifically, it differentiates between the types of knowledge that decision makers use to identify and implement a viable solution: while local search relies on the organization's existing knowledge base, distant search relies on the absorption of knowledge from external sources beyond the organization's boundaries (e.g., Li et al., 2013; Martin and Mitchell, 1998; Rosenkopf and Nerkar, 2001; Flor, Cooper, and Oltra, 2018). A key insight of these studies is that distant search is typically more challenging due to attention allocation constraints, cognitive biases that reinforce lessons learned from the past, and managerial entrenchment (Levitt and March, 1988; Martin and Mitchell, 1998; Sørensen and Stuart, 2000). Accordingly, local search may be preferred because it may produce more reliable performance and avoid the costs of knowledge integration (Denrell and March 2001; Laursen, 2012). However, distant search can potentially be more productive; it can embody the variety required to solve novel problems and to generate innovative radical solutions, thus affecting search scale to a greater extent than local search (Fleming and Sorenson, 2004; Katila, 2002; Rosenkopf and Nerkar, 2001). Akin to search density, the agentic element manifests itself in both its reflective and pre-reflective forms in search distance. For instance, in responding to performance problems, decision makers in those organizations that have developed routines to access solutions from disparate industries and store this knowledge in their organizational memory may use analogies between current problems and past courses of action to generate a range of possible alternatives (Hargadon and Sutton, 1997). The reflexivity lies in the fact that the retrieval of knowledge from distant domains is perceived as a means to solve a current problem. The pre-reflective element consists of the application of schemes leading to any similarities between old solutions from distant domains and current problems becoming self-evident (Gavetti et al., 2005).

Search effort. Search effort, defined as the amount of resources that senior leaders allocate to search activities, is predominantly related to the reflective dimension of agency. A central notion of performance feedback theory is that negative performance feedback acts as a hook that captures decision makers' attention, increasing both their motivation to search for viable solutions and their effort in search endeavors (e.g., Chen, 2008; Chen and Miller, 2007; Greve, 2003a; Vissa et al., 2010). Indeed, irrespective of the particular locus in which search is performed, decision makers involved in search activities will feel empowered by management to search more boldly and actively and, thus, to consider a higher number of alternatives (Li et al., 2013).

Search structure. As aforementioned, search structure reflects the ways in which senior leaders structure their efforts via choices pertaining to the allocation of resources across their organizations' functional units or departments (Arrfelt et al., 2013; Levinthal and Posen, 2007).

To graphically represent search attributes, we build on metric space theory (Kelley, 1955), at the core of which lies the idea that notions of convergence and continuity can be formulated in terms of the Euclidean *distance* between elements in a space, such as points, vectors, or more complicated objects (Kelley 1955). To enable organizations to simultaneously search for solutions across functional subunits, we propose that strategic domains of action form non-empty subsets in the Euclidean space defined by search effort (E) and scale (K), as illustrated in Figure 2.

Insert Figure 2 about here

In Figure 2, i and j represent two different domains or functional units (e.g., (i) manufacturing and inventory management, (j) product research and development). Each strategic domain forms a subset of solutions in the Euclidean space; these can be thought of as a circle: the number of alternatives (grey points) that a decision maker can envision in the subset at a given point in time represents search density. S_{i1} and S_{j1} are the solutions implemented at time 1 in domains i and j , respectively. We assume that a decision maker can potentially 'move' a small positive distance away from any alternative in a subset without moving outside the subset itself, and thus without discarding a selected strategy. In other words, search can vary in

scale and effort although the strategic domain remains the same. The variation of search scale from trial 1 to trial 2 ($K_{j2} - K_{j1}$) represents the amount of knowledge change elicited in an organization's knowledge base by local and distant search.

Furthermore search scale, effort, and structure univocally identify five different search approaches, which are graphically represented in Figure 3.

Insert Figure 3 about here

Senior leaders embracing *narrow exploitation* tend to save on search costs by allocating resources to a single department specialized in knowledge refinement and efficiency, or by performing search in an integrated fashion steadily close to the organization's current state (Nonaka, 1994). Senior leaders espousing *narrow exploration* allocate resources to a single domain or to domains in which search proceeds sequentially, but at a considerable distance from the organization's current state. Hence, senior leaders concentrate their search effort in a single strategic domain to create organizationally pervasive responses to problems involving experimentation and the creation of new knowledge. Unlike in narrow exploitation, in *broad exploitation*, search is decentralized and performed simultaneously across multiple strategic domains, with each organizational subunit searching for its own solutions. Under conditions of initial low-scale search, a parallel search structure is thought to help the organization capitalize on the diversity of information and recognize a higher number of potentially viable alternatives to refine its existing knowledge (March, 1991). Senior leaders adopting an ambidextrous search approach (*ambidexterity*) allocate resources to loosely decoupled domains or functional units, each of which embraces either narrow exploitation or narrow exploration. The unit that specializes in exploitation focuses on maximizing efficiency and control. By contrast, the unit that specializes in exploration focuses on experimentation—often creating larger wins or losses (Benner and Tushman, 2003). Finally, senior leaders espousing *broad exploration* focus on creativity and experimentation; they are often intrinsically motivated to search for innovative solutions (Amabile, 1996) and are thus particularly likely to engage in effortful search by allocating resources to loosely coupled functional units that specialize in exploration.

Model specifications

To define the functions and set the parameters in our model, we build on the studies of Levinthal and March (1981) and Chrisman and Patel (2012), respectively. In specifying each function, we aim to represent both the ostensive and agentic forces leading to the ongoing identification and adjustment of search enacted in response to performance feedback across different firm-controlling configurations in family and non-family firms, and across different search approaches. Table 2 reports the parameters we used to represent the different search approaches in the Euclidean search space.

Insert Table 2 about here

K_i and E_i represent the ‘typical’ search scale and effort at the beginning of the search process in a particular domain i and define both the centre of this domain and the course of action evaluated by decision makers at time zero: $S_{i0}(E_i, K_i)$; r_i represents the radius of domain i . At a given point in time t , we specify the search scale in domain i as follows:

$$K_{it} = \delta_1 K_{it-1} + k_{it}$$

where K_{it-1} is the search scale—or change in knowledge base—in domain i at time $t-1$, δ_1 is a factor reflecting the temporal decay or depreciation of past knowledge (see Levinthal and March, 1981), and k_{it} is the increase or decrease in search scale induced by current performance feedback FB_{it} in domain i . Similarly, the formula for search effort in domain i at time t is:

$$E_{it} = (1 + \delta_2) E_{it-1} + e_{it}$$

where E_{it-1} is the search effort at time $t-1$, δ_2 is a parameter reflecting momentum in capital allocation decisions (e.g., Greve, 2003a; Baum et al., 2000), and e_{it} is the increase or decrease in search effort induced by current performance feedback FB_{it} in domain i .

Search in domain i is stopped at time t if $(r_i - \sqrt{(K_{it-1} - K_i)^2 + (E_{it-1} - E_i)^2}) < \varepsilon$, which corresponds to the situation in which the decision makers in department i feel they do not possess and cannot obtain the resources necessary to continue search; or if $FB_{it} \leq -1$, meaning that current feedback is unacceptable.

For the sake of simplicity, we assume that, at each t , decision makers set aspiration levels equal to prior period performance (Cyert and March, 1963; Greve, 2003b). Hence, we let

$$FB_{it} = P_{it-1} - P_{it-2}$$

where FB_{it} represents the performance feedback the decision makers in department i receive at the beginning of time t from solution $S_{it}(E_{it}, K_{it})$, while P_{it-1} and P_{it-2} represent the level of performance in domain i at times $t-1$ and $t-2$, respectively. Building on Levinthal and March's (1981) model of adaptive search, performance in a given domain i at time t , P_{it} is defined as the difference between the increase/decrease in search scale k_{it} —multiplied by an exogenous environmental variable en_t randomly varying between -0.5 and 0.5—and the increase/decrease in search effort e_{it} as follows:

$$P_{it} = (1 + en_t) k_{it} - e_{it}$$

Based on prior theory and research on search in response to performance feedback (e.g., Arrfelt et al., 2013; Chen, 2008; Greve, 2003a), decision makers, by virtue of means-end considerations, are assumed to increase search effort and resource allocation to a given strategic domain i at a constant rate with the distance of performance below aspiration level, i.e., when the absolute value of $FB_{it} \leq 0$ increases. Hence:

$$\frac{de_{it}}{dFB_{it}} = v + \omega * Familyfirm$$

As Table 3 shows, we assume $v = 0.2$ and that ω varies across different controlling configurations in family firms. Specifically, since socioemotional wealth preferences and family-centred priorities are expected to be weaker among founding-family-controlled firms with founder CEOs than they are among extended-family-controlled firms with later generation CEOs, and to be even weaker among professionally managed family-owned firms, we set $|\omega|$ equal to 0.05 for family-owned firms with non-family CEOs, 0.10 for founding-family-controlled firms with founder CEOs, and 0.15 for extended-family-controlled firms with later generation CEOs. This range of values is in line with the findings of Chrisman and Patel (2012).

 Insert Table 3 about here

The increase/decrease in search scale at time t in a given domain is assumed to depend on the change in the firm's knowledge base elicited by the decision makers' pre-reflective disposition towards information from within and beyond organizational boundaries. Building on the studies conducted by Baum and Dahlin (2007) and by Posen and Chen (2013), showing that decision makers' propensity to use external knowledge increases with performance distance below aspirations, we specify the decision makers' focus on local vs. distant knowledge as a linear function of performance feedback, as follows:

$$k_{it} = (1 - FB_{It}) k_{it}^L - FB_{It} k_{it}^D$$

where k_{it}^L represents the change in domain i 's knowledge base (or search scale) elicited by the reinterpretation and recombination of existing knowledge, and k_{it}^D denotes the amount of knowledge generated by distant search in domain i at time t . Decision makers are assumed to search locally and distantly by sampling a number of alternatives—which represents search density—and by selecting a course of action from among such alternatives. However, unlike Levinthal and March (1981), we assume that decision makers are unable to evaluate alternatives off-line; rather, that a selected alternative needs to be implemented to assess its performance implications. As a result, superior trials are no more likely to be implemented than inferior ones.

The effect on search scale and the number of alternatives that decision makers are able to envision are assumed to differ for the two types of search (Levinthal and March, 1981). For both local and distant search, it is assumed that search scale increase/decrease follows a normal distribution with mean 0 and a standard deviation proportional to the value of the search scale associated with the current solution. Specifically, $k_{it}^L \sim N(0, \theta_1 K_{it-1})$ and $k_{it}^D \sim N(0, \theta_2 K_{it-1})$, with $\theta_2 > \theta_1$. The density of local and distant searches, corresponding to the sample size for k_{it}^L and k_{it}^D , is defined as a function of search effort, search proficiency, and decision makers' propensity towards alternatives that make use of either knowledge internal to the firm or boundary-spanning knowledge. Thus, if we let PR_{it} be search proficiency in domain i at time t , the sample sizes for k_{it}^L and k_{it}^D are given by the integer values:

$$N_{it}^L = E_{it-1}PR_{it}\gamma_1$$

$$N_{it}^D = E_{it-1}PR_{it}\gamma_2$$

In line with previous studies, we assume that search proficiency increases with the number of trials, albeit at a decreasing rate (Argote 1999; Levinthal and March, 1981). As described earlier, the decision makers' pre-reflective disposition towards alternatives involving internal vs. external knowledge, γ_1 and γ_2 , will depend on who owns and manages the firm, as shown in Table 3. In particular, the cognitive frameworks of decision makers in family firms will lead them to focus on reinterpreting and using knowledge anchored in the family tradition more than external knowledge, thereby sampling more alternatives from local search and fewer from distant search compared to their non-family counterparts. Furthermore, compared to family firms owned and led by founder CEOs, firms owned and managed by extended families involving multiple generations are likely to possess richer sociomaterial representations, which play an important role in contributing to the creation and sustenance of identity and activity across generations, while also providing a broader set of components for recombination (De Massis et al., 2016). Finally, the presence of multiple voices from different family members belonging to different generations enriches the cognitive framework of the collective family business with elements reflecting experiences and interests that go beyond those of the family and of the business (Kotlar and De Massis, 2013; Nason et al., 2018), thereby providing decision makers with distant information upon which to rely to identify viable alternatives.

Simulations and computational experiments

We constructed our simulation model using MATLAB. The model generates a time series of decisions and outcomes that depend both on a number of initial conditions and parameters¹ and on stochastic variation. For each firm-controlling configuration, we evaluated the simulated search process by tracking the average level and cross-sectional variation (standard deviation) of performance of all firms across the five

¹ Default values for the model are $\delta_1 = 0.99$, $\delta_2 = 0.20$, $\theta_1 = 0.125$, $\theta_2 = 0.250$, $\varepsilon = 0.05$, $FB_1 = -0.5$. Unless otherwise noted, these values are used in all the results reported here. Supplementary material reporting the simulation model script can be obtained from the authors.

search approaches at each time period t and at the end of the search process. All the results presented in this section are based upon 100 runs of each search approach for each firm-controlling configuration, resulting in 2,000 organizations in the simulation ².

Static environment. We first simulated the model in an unchanging environment, fixing the environmental variable at zero and speculating that some interesting features would emerge from considering the socio-cognitive characteristics of the senior leaders involved in the search activity. To assess the significance of the differences in performance average and variance at the end of the search process, contingent on search success, we conducted Leven's test for equality of variances to check for the homogeneity of performance variance across the samples represented by different firm-controlling configurations (Table 4). As expected, the assumption of homogeneity of variance was violated; hence, we conducted Satterthwaite's modified t-tests of mean performance across each search approach within each firm-controlling configuration at success. Table 5 presents the results of these tests.

Insert Tables 4, 5, and 6 about here

First, we found narrow exploitation to be significantly less effective than the alternative search approaches across all the various firm-controlling configurations. Narrow exploration appeared to be inferior to broad exploration and ambidexterity among non-family firms, family firms with non-family CEOs, and family firms with founder CEOs, whereas no statistically significant differences emerged from the comparison between narrow exploration and the other search approaches (except for narrow exploitation) in family firms with later generation CEOs. Furthermore, narrow exploration was significantly more effective than broad exploitation across professionally managed family firms (difference = 0.25, $p < .05$). In this particular firm-controlling configuration, broad exploration was significantly more effective than all the other search approaches examined. Broad exploration was also conducive to high performance in non-family firms, although no statistically significant difference emerged when comparing mean

² = 100 runs x 5 search approaches x 4 firm-controlling configurations.

performance between broad exploration and ambidexterity. Conversely, family firms with founder CEOs seemed to benefit from ambidexterity. Finally, the results appeared to be less conclusive across family firms with later generation CEOs, providing only marginal support for the superiority of broad exploration over the other search approaches.

Additionally, we compared the mean search performance across the various firm-controlling configurations to detect the superiority of a particular actor in performing the search activity in general, or adopting a given search approach in particular. A marginally significant difference in overall performance was detected between a CEO in a non-family firm and a founder CEO in a family one; the former exhibited a higher performance than the latter (difference = 0.10, $p < .10$). The overall search performance of founder-led family firms was significantly inferior to both the mean search performance of family firms led by non-family CEOs (difference = -0.13, $p < .05$) and the mean performance of family firms led by later generation CEOs (difference = -0.10, $p < .05$). Overall, these results indicate that, in stable environments, founder CEOs are less performative in their search activities compared to other senior leaders.

Table 6 presents the results of Satterthwaite's modified t-tests of mean performance conducted across each firm-controlling configuration for each search approach. These results help to shed further light onto the drivers of inferior search performance in founder-led family firms. Compared to their counterparts, founder CEOs appeared to be less attuned to and capable of performing explorative search. Specifically, narrow exploration was associated with higher performance in non-family firms (difference = 0.26, $p < .05$), in family firms led by non-family CEOs (difference = 0.35, $p < .01$), and in family firms led by later generation CEOs (difference (reversed) = 0.34, $p < .05$). Similar results were observed for broad exploration, with both non-family firm CEOs (difference = 0.27, $p < .05$) and non-family CEOs in family firms (difference = 0.38, $p < .05$) showing greater search performance than founder CEOs. By contrast, the latter seemed to possess the cognitive frameworks that may have potentially enabled them to achieve superior search performance by embracing ambidexterity. As shown in Table 6, ambidextrous search performance in founder-led family firms was never inferior to the performances of other firm-controlling configurations embracing ambidexterity, and was superior to the performance achieved by family firms with later

generation CEOs (difference=0.19, $p < .10$). These findings, combined with the results presented in Table 5, highlight the important role that ambidexterity may play in founder-led family firms operating in stable environments: not only does ambidexterity represent a superior search approach, but founder CEOs seem to possess the “ingredients” to excel in performing ambidextrous search. For example, the founder CEO of Niederstaetter, who we mentioned earlier, pointed out that her family firm substantially benefited from the simultaneous adoption of radical solutions in a specific strategic domain, such as special transportation solutions for construction cranes, and of incremental solutions in other domains, such as training and consulting for the use of excavating machinery, strongly relying, in both circumstances, on the family’s tradition and past knowledge accumulated during the family firm evolution.

In addition to benefiting from broad exploration (Table 5), professionally managed family firms seem to be particularly attuned to perform explorative search, always exhibiting either superior or non-inferior performance in both narrow and broad exploration compared to other firm-controlling configurations (Table 6). For example, Ailraldo Piva, the non-family CEO of the family-owned firm Hengdian Group Europe, emphasized in a recent workshop how the transition from a founder-led to a professional-led family firm typically leads to the implementation of radical solutions to management problems, and this becomes particularly beneficial to professionally managed family firms. Moreover, he stressed that the industry knowledge and experience accumulated in his career outside the family firm was crucial to his ability to identify such solutions.

Finally, although family firms led by later generation CEOs tend to benefit more from broad exploration than from other search approaches (Table 5), later generation CEOs are not equipped with cognitive frameworks and dispositions suited to enable them to outperform their counterparts when embracing broad exploration. Rather, they seem to excel in broad exploitation (Table 6).

Dynamic environment. We then tested whether our results generalize to systematic exogenous change; we did this by randomly drawing the environmental variable from a given range (-0.50; 0.50) in each iteration (March 1991). Tables 7 and 8 show that performance linked to different search approaches is sensitive to the rate of change in the environment in family-owned firms. In particular, while, in non-family

firms, broad exploration and ambidexterity seemed to be conducive to superior performance, with no significant difference found between the two, broad exploration was significantly more effective than the alternative search approaches across all the different firm-controlling configurations involving family ownership.

Insert Tables 7, 8, and 9 about here

No statistically significant differences in overall search performance emerged across the four different firm-controlling configurations. Similarly, we did not find any statistically significant differences in search performance across the five different search approaches when comparing family firms led by non-family CEOs, founder CEOs, and later generation CEOs.

However, as shown in Table 9, significant differences emerged when comparing family and non-family firms. In particular, in dynamic environments, non-family firms were superior in narrow exploitation compared to both founder-led (difference = 0.47, $p < .05$) and later generation-led (difference = 0.46, $p < .05$) family firms. This finding highlights the importance of relying on external knowledge sources when performing exploitative search in dynamic environments (Foss, Lyngsie, & Zahra, 2013). By contrast, non-family firms appeared to be less performative than their family counterparts in conducting broad exploration (difference vs. professionalized family firms = -0.67, $p < .05$; difference vs. founder-led family firms = -0.70, $p < .10$; difference vs. later generation-led family firms = -0.60, $p < .10$). Combined with the results presented in Table 8, these results indicate that, while family firms operating in dynamic environments benefit more if they embrace broad exploration, ambidexterity may represent a more viable approach for non-family firms.

Discussion

This study has sought to advance search and family business literatures by exploring how and to what extent different search approaches—involving either specialization or ambidexterity—may lead to heterogeneous performance outcomes across family and non-family firms with different firm-controlling

configurations (e.g., Andriopoulos and Lewis, 2009). By taking a first step towards accounting for the agentic nature of search as being both reflective and pre-reflective, our model responds to Posen et al.'s (2018) recent call for a theory of search that incorporates a more cognitively rich role for the participants in the search process as well as to quests to establish the microfoundations of ambidexterity (Felin, Foss, and Ployhart, 2015; Rogan and Mors, 2014), and to apply a microfoundational lens to theorize family firms' behavior and outcomes (De Massis and Foss, 2018).

While there is largely unanimous support in the search literature for the contention that ambidexterity is a superior search approach (e.g., He and Wong, 2004; March, 1991), in this study, we developed a microfoundational perspective that challenges this prevailing view. First, we identified a limited focus in the search literature on the organizational level and an overall depiction of search as a highly mechanistic, nearly automatic activity (Li et al., 2013). Prior studies rarely take into account the active involvement of organizational actors in the operating procedures regulating the search process—i.e., their agency—and the actors' embeddedness in the social context in which they operate (Miron-Spektor et al., 2017; Rogan and Mors, 2014). However, agency is apparent in every choice made by senior leaders in relation to resource allocation and to the courses of action around which to orient the search activity. Hence, taking into account microfoundational aspects—the individual behaviors and cognitive mechanisms that underlie the way in which search is performed—is the first step towards predicting and explaining the outcomes of search and ambidexterity.

Second, we developed a mathematical model and compared different search approaches across family and non-family firms led by different senior leaders to understand how decision makers' cognitive frameworks—which reflect the positions they currently occupy and have historically occupied within a particular social context—may render some particular search approaches more effective than others. Taken together, our simulation results confirm our original contention: search is idiosyncratic across firms and their senior leaders. While balancing exploitation and exploration represents a superior search approach for family firms with founder CEOs (e.g., Chrisman and Patel, 2012), family firms led by non-family CEOs seem to benefit from specialization—and especially from broad exploration. What is more, when operating

in dynamic environments, unlike non-family firms, which appear to benefit from ambidexterity, family firms seem to achieve superior performance through high-variance search approaches based on broad exploration. In particular, the richness and extended temporal span of families' collective memories and socio-material representations translate into their senior leaders' idiosyncratic abilities to cope with performance variability and restore acceptable performance by retrieving past solutions to fit the present situation.

Implications for theory

The microfoundational approach proposed in this article has important theoretical implications for the search, ambidexterity, and family business literatures. Our study highlights the importance of agency in explaining search in response to performance feedback and in managing the ambidexterity paradox (e.g., Andriopoulos and Lewis, 2010; Smith and Lewis, 2011). Specifically, we theorize the role played by the social context in which senior leaders operate (i.e., family vs. non-family firms) and by the specificity of their position (i.e., professional, founder, or later generation CEO) in influencing search attributes both reflectively and pre-reflectively. While we relate the reflective element to the ways in which senior leaders regulate their resource allocation decisions in a means-end fashion, we link the pre-reflective dimension to the senior leaders' propensities towards some knowledge sources rather than others. By integrating these micro-level mechanisms, we provide novel insights into the ambidexterity dilemma at the micro-level (Abell et al., 2008; Eisenhardt et al., 2010; Felin et al., 2012, 2015; O'Reilly and Tushman, 2013). Our simulation results indicate that, if their senior leaders are either willing to or pre-reflectively oriented towards undertaking high-scale search across multiple domains simultaneously, both professional-led and later generation-led family firms may potentially be exempt from the need to 'work through paradox' when searching for solutions to performance problems. When such orientation is lacking, family firms may face a new paradox that manifests itself in decision makers' undertaking inferior search approaches (e.g., narrow exploitation) despite having the ability to achieve superior returns from broad exploration (Chrisman et al., 2015).

Furthermore, by modelling the search behaviors and related cognitive mechanisms of senior leaders in both family and non-family firms, our study extends the scope of traditional approaches to the study of search and of the tensions arising from the simultaneous pursuit of exploitation and exploration (Raisch and Birkinshaw, 2008; Raisch et al., 2009; Smith and Lewis, 2011). Specifying the search process in its entirety in a mathematical form is a contribution in and of itself. In particular, our fine-grained and comprehensive characterization of the search process as an integrated set of attributes goes beyond prior thinking on feedback-induced organizational change (e.g., Chen, 2008; Greve 2003a, 2007; Madsen and Desai, 2010; Vissa et al., 2010) and offers a broader view of this process by integrating insights from qualitative, process-oriented descriptions of search while simultaneously offering a precise conceptual and mathematical representation that accounts for the dual nature of search as both ostensive and agentic. Specifically, by identifying search outcomes across different search approaches, and documenting the mechanisms regulating the behaviors of the key decision makers involved in the search process for exploitation and exploration, this article enhances our understanding of how and with what performance outcomes socially-embedded senior leaders respond to performance feedback in static versus dynamic environments.

The new microfoundational view developed in this study also enriches the family business literature by pointing to the micro-level origins of family firm heterogeneity. Although embeddedness in the family social context provides rich socio-material artefacts and goals that enable, constraint, and orient the search process, the results of our simulation reveal the importance of also considering the history of positioning of senior leaders in this context. For instance, although a founder CEO and a later generation CEO may play the same role in their current position as CEOs of family firms, they differ in terms of their past roles and responsibilities, and this directs their dispositions and propensities along different paths (cf. Cardinale, 2018). Specifically, our results suggest that the dispositional orientations of later generation CEOs tend to transmute into a superior ability to perform broad exploitation and narrow exploration; this is in contrast to founder CEOs, who seem to be more capable of performing ambidextrous search.

Finally, our findings indicate that the performance resulting from different search approaches is sensitive to the rate of change in the external environment. For instance, while founder-led family firms are

likely to benefit from ambidexterity in stable environments, environmental dynamism makes broad exploration more viable. In this respect, a contextualized analysis is fundamental to understand search and organizational responses to feedback and, more generally, to achieve theoretical validity and empirical generalizability in the study of the behaviors of organizations and their senior leaders (De Massis et al, 2018b).

Implications for practice

This article also has direct managerial implications. The insights provided by our study can inform family firm decision makers on the idiosyncratic characteristics of family firms, which have an impact on the cognitive mechanisms of their key decision makers and their related behaviors. Family firm decision makers operating in dynamic environments could improve the performance of their search approaches by undertaking broad exploration. Thus, our study highlights the importance of motivating and educating family firm decision makers to focus on creativity and experimentation by both decentralizing and performing search activities simultaneously across multiple strategic domains, with each organizational subunit searching for its own solutions. Particularly, family firm decision makers should be motivated and trained to engage in effortful search by allocating resources to loosely coupled functional units that specialize in exploration—as opposed to saving on search costs by allocating resources to a single department specialized in knowledge refinement and efficiency or simultaneously searching for solutions close to and far from an organization’s current knowledge base. Conversely, founder CEOs in family firms operating in stable environments should be educated to act ambidextrously by allocating resources to organizational units that specialize in explorative and exploitative search simultaneously, and to serve as a point of integration between them.

Limitations and future directions

As with any theory, our work builds on a series of assumptions that serve as boundary conditions and deserve further consideration. First, it is important to point out that our simulation results do not prove or disprove anything; what they do is reproduce search performance outcomes in a way that is sufficiently realistic to provide insights into theory. The inclusion of a few illustrative examples is intended to

complement our theoretical development by exemplifying the simulation results in more concrete terms. Nevertheless, it is likely that the results may differ depending on the problem faced by decision makers and on their prior accumulated experience in regard to it. By unpacking and articulating the components of the search process in a stylized way, we have suggested some constructs and relationships that could guide future research.

Second, in our model, search is triggered by and focuses on a single objective related to the focal performance problem. Although this assumption is not uncommon in the literature, in which the terms ‘search’, ‘problemistic search’, and ‘problem-solving’ are often used interchangeably to indicate a form of search that is goal-oriented (Greve, 2003b: 55; Katila and Ahuja, 2002; Sheremata, 2000), search can occur independently of specific problem triggers (Posen et al., 2018). For instance, slack or institutionalized search—two alternative types of search processes proposed in the behavioral theory of the firm—can start or continue upon reaching a satisfactory performance feedback. While slack search stems from any extra time and resources that can be used for experimentation and is not deliberately managed (Cyert and March, 1963; Greve, 2003b), institutionalized search is conducted within periodical planning and budgeting cycles (Greve, 2003b). Because slack and institutionalized search processes are not goal-oriented, it is likely that the pre-reflective dimension of agency—rather than means-end considerations—will play a central role in determining the outcomes of these alternative search types. Investigating the mechanisms through which the pre-reflective element of agency shapes these search processes represents an important theoretical and empirical question for future research.

Third, there is a need for research to integrate the attention-based view with the ambidexterity literature and to investigate not only the antecedents of ambidexterity in both family and non-family firms, but also how these firms manage the organizational tensions associated with exploitation and exploration. For instance, we have assumed that, by recalling and commemorating past events through family stories and narratives, later generation CEOs or successors have access to the family memory accumulated by their predecessors across generations. Nevertheless, family business successors are not always inclined to use such family memory (e.g., Miller et al., 2003), and their inclination may depend on how they perceive the

behavior of their parents (Garcia et al., 2018). Thus, future research could investigate whether there is any difference between conservative succession—in which successors take a more conservative approach and emphasize continuity with the previous leader—*versus* non-conservative succession—in which successors follow policies that are diametrically opposed to those of their predecessors (e.g., Miller et al., 2003). The literature on family business succession emphasizes the importance of intra-family succession as a potentially disruptive period in the lifecycle of a family firm (e.g., Gersick et al., 1997; Kotlar and De Massis, 2013)—one that can unsettle the mechanisms regulating the behaviors of the decision makers involved in the search process—and we would welcome future studies on this topic. More generally, we raise the need to understand how succession from the founder to later generation CEOs influences the development of ambidexterity in family firms, and how search approaches may change during the succession process.

Fourth, in our model, the agentic element of search is associated with the actor who ‘designs’ and ‘influences’ the search process—namely, the firm CEO—rather than with those who execute it. Specifically, an assumption underlying our model is that the CEO’s personal beliefs, goals, and dispositions wield a strong influence over the formation and alteration of collective interpretations. We assume that it is the CEO who orients the process of search around potentially viable trials, or courses of action, to initiate an experiential and more refined process of search. However, other actors could also exert a strong influence on collective interpretation, and thus affect the dispositions of both CEOs and search participants towards particular courses of action (Nason et al., 2018). Moreover, the family business literature has recently questioned the assumption that, once strategy is designed, its execution follows (Chrisman et al., 2016). Future studies could investigate how the CEOs’ networks of ties and the individual identities of top management team members may influence such dispositions. Theories of coalitions, heed communication, and political behavior can help address similar questions (e.g., Lubatkin et al., 2006; Rogan and Mors, 2014).

Fifth, different firm-controlling configurations may affect the decision makers’ willingness and/or pre-reflective dispositions to undertake particular approaches in the Euclidean space, which is another aspect

that warrants future investigation. In the context of search, researchers could investigate the contingencies and boundary conditions that lead different decision makers across family and non-family firms to adopt a specific search approach and, more specifically, influence their initial positioning in the Euclidean search space. By doing so, future research would offer new insights into how the context shapes the ways in which organizations solve problems and, more generally, the ways in which organizational decision makers turn present perceptions of failure into future choices of action. For example, this is the case of the open innovation aptitude of firms, which has been proved to influence how organizations search for knowledge and information across their boundaries (e.g., Chiang and Hung, 2010; Laursen and Salter, 2014; Bresciani, Ferraris, and Del Giudice, 2017). In this vein, exploratory studies on open innovation in the family firm setting have indicated that specific contingencies associated with family firm idiosyncrasies affect the way they execute open innovation strategies (e.g., Casprini et al., 2017; Kotlar et al., 2013). Additionally, integrating dynamic managerial capabilities perspectives (cf. Helfat and Martin, 2015; Teece, 2007) and linking these with the different search approaches undertaken by family and non-family firms would provide further important insights into the search behaviors of organizational actors. Examining additional dimensions of search—such as knowledge temporality, complexity, and centrality—is another direction that future research could take. Finally, in our model we assume that problems are always decomposable. As a number of studies have pointed out, this is not always the case (Levinthal and March, 1993). Whether search inputs and outputs are characterized by clarity or ambiguity, the search process is highly intertwined with sense-making and interpretation processes (Rudolph et al., 2009), and presents both knowledge-transfer and knowledge-formation hazards (Nickerson and Zenger, 2004). Scholars could easily extend our conceptual framework by applying it to situations of varying problem complexity and feedback ambiguity across different industry contexts.

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Table 1

The agentic nature of search in family firms

<i>Individual position</i>	<i>Pre-reflective element</i>	<i>Reflective element</i>
	The social context of family firms and the socio-material representations related to family histories predispose actors towards some courses of action that appear to be endowed with a sense of inevitability.	The intertwined nature of economic and affective goals affects the way in which family firms regulate their search behavior as a means to preserve family socioemotional wealth
Founder CEO	The vividness of information associated with direct experience tends to draw founder-CEOs towards alternatives that involve internal, rather than external, knowledge.	Search behavior reflect the founder's intentional pursuit of independence and discretion.
Later generation CEO	The habitus of "observing", together with the richness of the socio-material representations accumulated over generations, makes later generation CEOs dispositionally attuned to both internal and external knowledge.	Search behavior reflects the focus on harmony and intentional conflict avoidance in relation to protecting the family's socioemotional wealth.
Non-family CEO	Complex cognitive frameworks reflecting individual training and domain-specific knowledge orient non-family CEOs towards alternatives that involve domain-relevant, rather than family-relevant, knowledge.	Search behavior reflects a balance between self-interest, the family's non-economic agenda, and the firm's financial goals.

Table 2

Parameter settings by search approach

Search Approach	Number of Domains	Example	E_i	K_i
Narrow exploitation	1	Manufacturing and inventory management	4	4
Narrow exploration	1	Product research and development	8	8
Broad exploitation	2	Manufacturing and inventory management	4	4
		Marketing and advertising	4	4
Broad exploration	2	Product research and development	8	8
		Finance	8	8
Ambidexterity	2	Manufacturing and inventory management	4	4
		Product research and development	8	8

Table 3

Parameter settings by firm-controlling configuration

Parameter	Non-family firms	Family firms with non-family CEOs	Family firms with founder CEOs	Family firms with later generation CEOs
ν	-0.20	-0.20	-0.20	-0.20
ω		-0.05	-0.10	-0.15
γ_1	3	3	3.5	4
γ_2	1.5	1.5	1	1.25

Table 4

Tests for equality of performance variances and means across search approaches at search end

Search approach	Non-family firms		Family firms with non-family CEOs		Family firms with founder CEOs		Family firms with later generation CEOs	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Narrow exploitation	0.81	0.70	0.87	0.77	0.82	0.65	0.87	0.76
Narrow exploration	1.11	1.06	1.20	1.04	0.84	0.97	1.18	1.09
Broad exploitation	0.97	0.71	0.95	0.73	1.00	0.82	1.10	0.67
Broad exploration	1.44	0.97	1.55	1.29	1.17	1.11	1.39	1.35
Ambidexterity	1.30	0.97	1.24	0.83	1.33	1.08	1.14	0.91
Total	1.13	0.92	1.16	0.98	1.03	0.96	1.14	1.00
Levene's test for equality of variances F(4, 495)	3.66**		7.74***		6.42***		8.70***	

Table 5Difference in mean performance across search approaches at search end^a

Non-family firms				
	Narrow exploitation	Narrow exploration	Broad exploitation	Broad exploration
Narrow exploration	-0.30 (0.13)*			
Broad exploitation	-0.16 (0.10)†	0.13 (0.13)		
Broad exploration	-0.63 (0.12)***	-0.33 (0.14)*	-0.47 (0.12)***	
Ambidexterity	-0.49 (0.12)***	-0.19 (0.14)†	-0.33 (0.12)**	0.14 (0.14)
Family firms with non-family CEOs				
	Narrow exploitation	Narrow exploration	Broad exploitation	Broad exploration
Narrow exploration	-0.33 (0.13)**			
Broad exploitation	-0.08 (0.11)	0.25 (0.13)*		
Broad exploration	-0.68 (0.15)***	-0.36 (0.17)*	-0.60 (0.15)***	
Ambidexterity	-0.37 (0.11)***	-0.04 (0.13)	-0.29 (0.11)**	0.31 (0.15)*
Family firms with founder CEOs				
	Narrow exploitation	Narrow exploration	Broad exploitation	Broad exploration
Narrow exploration	-0.02 (0.12)			
Broad exploitation	-0.18 (0.10)*	-0.16 (0.13)		
Broad exploration	-0.36 (0.13)**	-0.33 (0.15)*	-0.17 (0.14)	
Ambidexterity	-0.51 (0.13)***	-0.49 (0.14)***	-0.33 (0.14)**	-0.16 (0.15)
Family firms with later generation CEOs				
	Narrow exploitation	Narrow exploration	Broad exploitation	Broad exploration
Narrow exploration	-0.31 (0.13)**			
Broad exploitation	-0.23 (0.10)*	0.08 (0.13)		
Broad exploration	-0.52 (0.15)***	-0.21 (0.17)	-0.29 (0.15)*	
Ambidexterity	-0.28 (0.12)*	0.04 (0.14)	-0.05 (0.11)	0.25 (0.16)†

†p < .10; * p < .05; ** p < .01; ***p < .001.

^aStandard errors are in parentheses. The difference in performance is the average column performance less the average row performance, with a positive (negative) difference indicating greater column (row) performance.

Table 6Difference in mean performance across firm-controlling specifications at search end^b

Narrow exploitation			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	-0.06 (0.10)		
Founder CEO	-0.01 (0.10)	0.05 (0.10)	
Later generation CEO	-0.06 (0.10)	0.00 (0.10)	-0.05 (0.10)
Narrow exploration			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	-0.09 (0.15)		
Founder CEO	0.26 (0.14)*	0.35 (0.14)**	
Later generation CEO	-0.07 (0.15)	0.01 (0.15)	-0.34 (0.15)*
Broad exploitation			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	0.03 (0.10)		
Founder CEO	-0.03 (0.11)	-0.05 (0.11)	
Later generation CEO	-0.12 (0.10)	-0.15 (0.10)†	-0.10 (0.11)
Broad exploration			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	-0.11(0.16)		
Founder CEO	0.27 (0.15)*	0.38 (0.17)*	
Later generation CEO	0.05 (0.16)	0.16 (0.19)	-0.22 (0.18)
Ambidexterity			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	0.06 (0.16)		
Founder CEO	-0.03 (0.14)	-0.09 (0.13)	
Later generation CEO	0.16 (0.13)	0.09 (0.12)	0.19 (0.14)†

†p < .10; * p < .05; ** p < .01; ***p < .001.

^bStandard errors are in parentheses. The difference in performance is the average column performance less the average row performance, with a positive (negative) difference indicating greater column (row) performance.

Table 7

Tests for equality of performance variances and means across search approaches at search end under dynamic environmental conditions

Search approach	Non-family firms		Family firms with non-family CEOs		Family firms with founder CEOs		Family firms with later generation CEOs	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Narrow exploitation	1.65	1.74	1.43	1.70	1.18	1.82	1.18	1.49
Narrow exploration	1.95	3.49	1.61	2.69	1.68	2.31	1.43	2.53
Broad exploitation	1.86	1.53	1.72	1.79	1.81	1.83	1.80	1.74
Broad exploration	2.64	2.65	3.33	2.82	3.34	3.68	3.24	3.27
Ambidexterity	2.62	2.53	2.22	2.46	2.46	3.01	2.51	3.06
Total	2.14	2.51	2.06	2.43	2.10	2.72	2.03	2.62
Levene's test for equality of variances F(4, 495)	8.84***		7.38***		6.64***		11.75***	

Table 8

Difference in mean performance across search approaches at search end under dynamic environmental conditions^c

Non-family firms				
	Narrow exploitation	Narrow exploration	Broad exploitation	Broad exploration
Narrow exploration	-0.30 (0.39)			
Broad exploitation	-0.21 (0.23)	0.09 (0.38)		
Broad exploration	-0.99 (0.32)**	-0.70 (0.44)†	-0.78 (0.31)*	
Ambidexterity	-0.97 (0.31)***	-0.68 (0.43)†	-0.76 (0.30)*	0.02 (0.37)
Family firms with non-family CEOs				
	Narrow exploitation	Narrow exploration	Broad exploitation	Broad exploration
Narrow exploration	-0.18 (0.32)			
Broad exploitation	-0.29 (0.25)	-0.11 (0.32)		
Broad exploration	-1.90 (0.33)***	-1.72 (0.39)***	-1.60 (0.33)***	
Ambidexterity	-0.79 (0.30)**	-0.61 (0.36)*	-0.50 (0.30)†	1.11 (0.37)**
Family firms with founder CEOs				
	Narrow exploitation	Narrow exploration	Broad exploitation	Broad exploration
Narrow exploration	-0.50 (0.29)*			
Broad exploitation	-0.62 (0.29)*	-0.12 (0.29)		
Broad exploration	-2.16 (0.41)***	-1.66 (0.43)***	-1.54 (0.41)***	
Ambidexterity	-1.28 (0.35)***	-0.78 (0.38)*	-0.66 (0.35)*	0.88 (0.48)*
Family firms with later generation CEOs				
	Narrow exploitation	Narrow exploration	Broad exploitation	Broad exploration
Narrow exploration	-0.24 (0.29)			
Broad exploitation	-0.62 (0.23)**	-0.37 (0.31)		
Broad exploration	-2.06 (0.36)***	-1.81 (0.41)***	-1.43 (0.37)***	
Ambidexterity	-1.32 (0.34)***	-1.08 (0.40)**	-0.70 (0.35)*	0.73 (0.45)†

†p < .10; * p < .05; ** p < .01; ***p < .001.

^cStandard errors are in parentheses. The difference in performance is the average column performance less the average row performance, with a positive (negative) difference indicating greater column (row) performance.

Table 9

Difference in mean performance across firm-controlling configurations at search end under dynamic environmental conditions^d

Narrow exploitation			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	0.21 (0.24)		
Founder CEO	0.47 (0.25)*	0.25 (0.25)	
Later generation CEO	0.46 (0.23)*	0.25 (0.23)	-0.00 (0.23)
Narrow exploration			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	0.33 (0.34)		
Founder CEO	0.26 (0.42)	-0.07 (0.35)	
Later generation CEO	0.52 (0.43)	0.18 (0.40)	0.25 (0.34)
Broad exploitation			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	0.14 (0.23)		
Founder CEO	0.05 (0.24)	-0.08 (0.26)	
Later generation CEO	0.06 (0.23)	-0.08 (0.25)	0.00 (0.25)
Broad exploration			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	-0.69 (0.39)*		
Founder CEO	-0.70 (0.45)†	-0.01 (0.46)	
Later generation CEO	-0.60 (0.42)†	0.09 (0.43)	0.10 (0.49)
Ambidexterity			
	Non-family firm	Non-family CEO	Founder CEO
Non-family CEO	0.40 (0.35)		
Founder CEO	0.16 (0.39)	-0.24 (0.38)	
Later generation CEO	0.12 (0.40)	-0.28 (0.39)	-0.04 (0.43)

†p < .10; * p < .05; ** p < .01; ***p < .001.

^dStandard errors are in parentheses. The difference in performance is the average column performance less the average row performance, with a positive (negative) difference indicating greater column (row) performance.

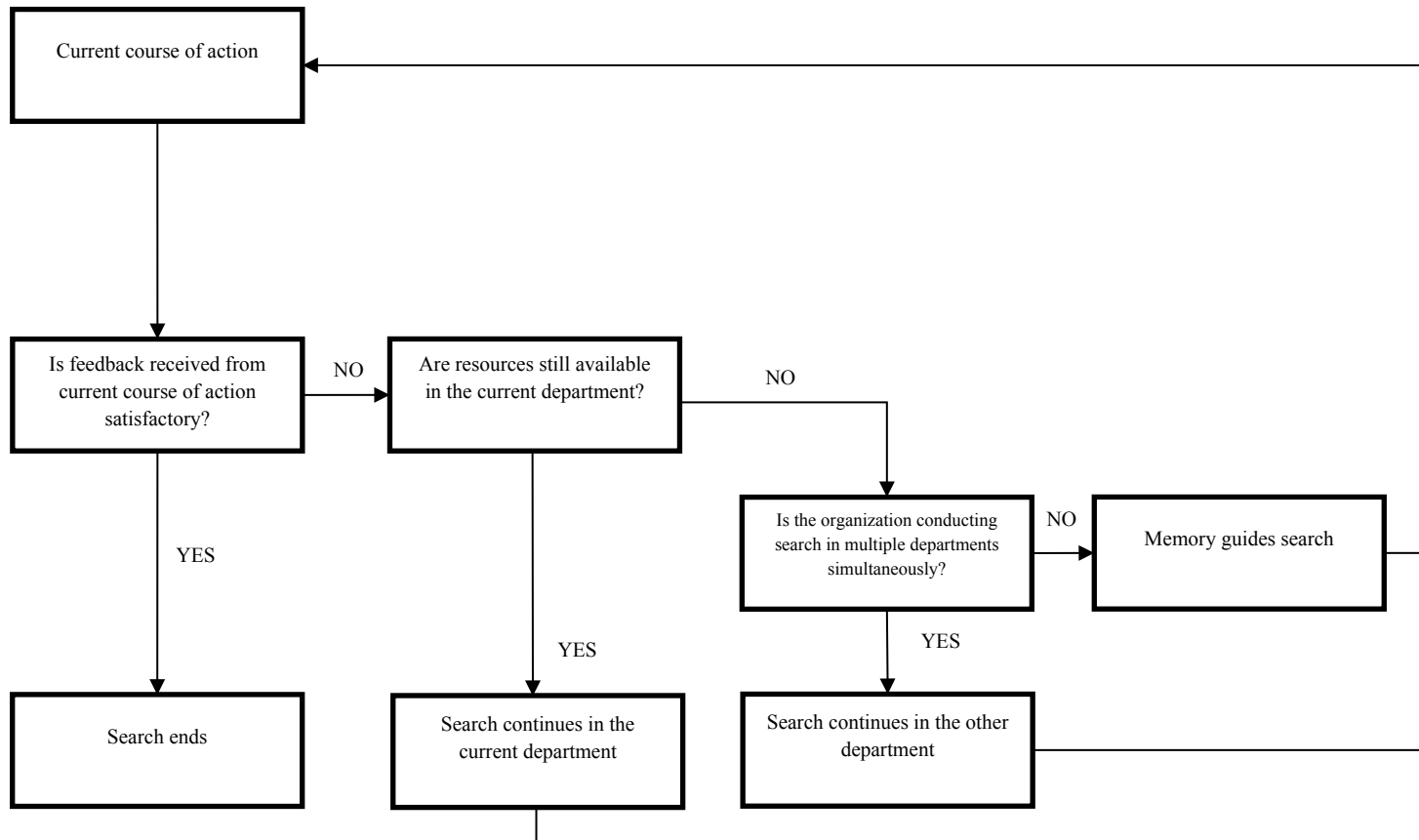


Figure 1. Search process: flow diagram

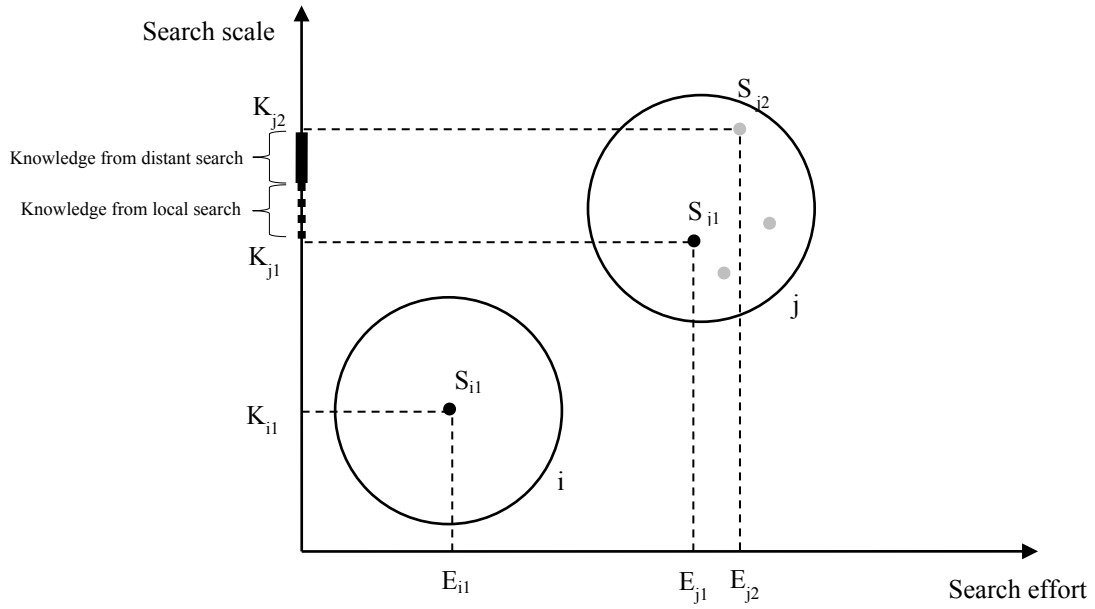


Figure 2. Search attributes in the Euclidean search space

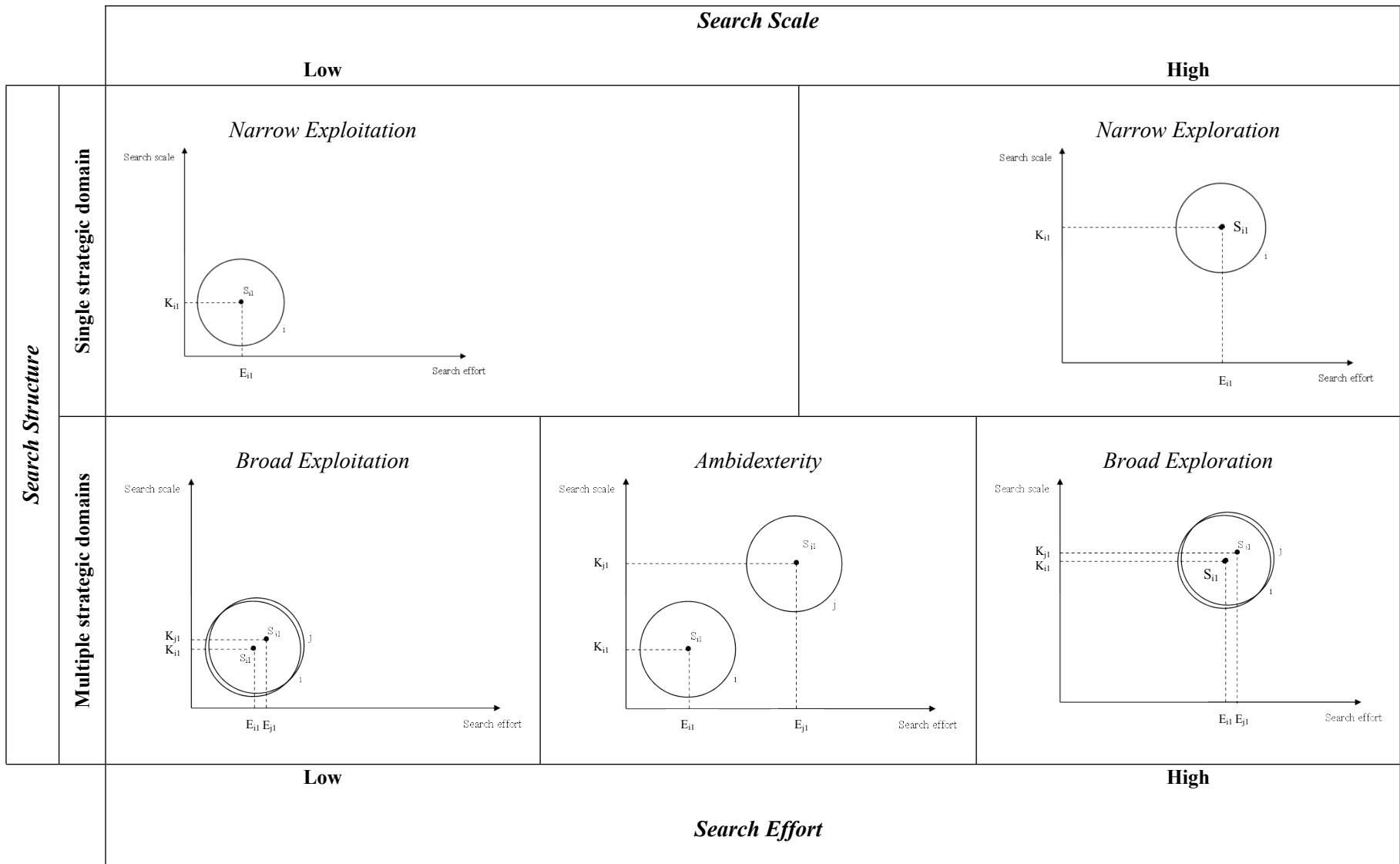


Figure 3. Search approaches in the Euclidean search space



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