Mazzelli, Ambra, De Massis, Alfredo, Petruzzelli, Antonio Messeni, Del Giudice, Manlio and Khan, Zaheer (2019) *Behind Ambidextrous Search: The micro-foundation of Search in Family and Non-family Firms.* Long Range Planning . ISSN 0024-6301.

Behind ambidextrous search: The microfoundations of search in family and non-family firms

Ambra Mazzelli
Corresponding author
Sloan School of Management, Massachusetts Institute of Technology
Cambridge, Massachusetts, 02142, United States
mazzelli@mit.edu
and
Asia School of Business
Kuala Lumpur, 50480, Malaysia
ambra.mazzelli@asb.edu.my

Alfredo De Massis
Free University of Bozen-Bolzano
Bolzano, 39100, Italy
alfredo.demassis@unibz.it
and
Lancaster University Management School
Lancaster, LA1 4YX, United Kingdom
a.demassis@lancaster.ac.uk

Antonio Messeni Petruzzelli
Polytechnic University of Bari
Bari, 70126, Italy
antonio.messenipetruzzelli@poliba.it

Manlio Del Giudice
University of Rome "Link Campus"
00197 Rome, Italy
and
Paris School of Business
75013 Paris, France
m.delgiudice@unilink.it

Zaheer Khan
Kent Business School
Canterbury, CT2 7FS, UK
z.a.khan@kent.ac.uk

1

Abstract

In this paper, we offer a microfoundational perspective to challenge the consensual view of ambidextrous search as a superior approach to addressing performance problems. We characterize the nature of search as both ostensive and agentic, and suggest that search performance is idiosyncratic across individuals and highly dependent on 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 family membership and her/his positional history in the firm (i.e., non-family, founder, later-generation). Moreover, we reveal that while ambidexterity constitutes a superior search approach for family firms with founder CEOs, those with non-family or later-generation CEOs would seem to benefit from specialization.

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

Introduction

Understanding how organizations search for solutions to problems signaled by negative performance feedback—i.e., how they identify, examine, and evaluate any knowledge and information that can potentially help close a performance gap—has been on the agenda of organizational researchers since the very first formulation of the behavioral theory of the firm (Cyert and March, 1963). However, it was James March's (1991) pioneering article that introduced the first conceptual characterization of search. At the heart of March's (1991) article is the trade-off between two fundamental search approaches, namely, exploitation and exploration, and the contention that "maintaining an appropriate balance between exploration and exploitation is a primary factor in system survival and prosperity" (1991, p. 71). Subsequent empirical research provides extensive evidence that, on average, 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" (Gibson and Birkinshaw 2004; Gupta et al., 2006, p. 693; Luger et al., 2018; 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 is still limited of why organizations that operate under similar circumstances and adopt similar search approaches experience heterogeneous performance outcomes (Andriopoulos and Lewis, 2009).

These limited insights may be due to prior studies defining organizational heterogeneity according to the particular search approach adopted (the "how"), rather than the organizational actors who are directly involved in, and have the power to influence, strategic decisions (Criscuolo et al., 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 (Banerjee et al., 2018; Li et al., 2013), rarely applying microfoundational approaches to understand how organizations can balance exploitation and exploration, and the consequences thereof (e.g., Abell et al., 2008; Eisenhardt et al., 2010; Felin et al., 2012; Foss, 2011). The burgeoning interest in microfoundations for organization and strategy endorses the relevance of individual-level considerations to explain macro-level phenomena (Felin et al., 2015). As Selznick (1996) argued, "no social process can be understood save as it is located in the behavior of individuals" (p. 274). Likewise, at the macro-level, organizations adopting similar search approaches might obtain divergent performance outcomes due to the heterogeneity of organizational actors' reactions to performance feedback and the underlying socio-cognitive factors (Banerjee et al., 2018).

The critical role that these socio-cognitive factors play has been emphasized in the family business setting, where prior research has revealed that family involvement in the firm entails unique cognitive frameworks that affect how family owners and managers interpret and react to performance feedback (Nason et al., 2018), thereby influencing their search strategies (Brinkerink, 2018). For example, Chrisman and Patel (2012) and Patel and Chrisman (2014) show that family firm decision makers increase (decrease) search intensity to a greater extent than their counterparts in non-family firms when facing negative (positive) performance feedback. De Massis et al. (2016) recently suggested that family firm decision makers manifest a strong tendency to integrate past knowledge 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 facilitate the identification of viable alternatives. Taken together,

these studies point to the possibility that search may unfold differently over time, not only across family and non-family firms, but also among family firms. Drawing on these insights provides us with an opportunity to extend the search literature and offer a more fine-grained view of the microfoundational processes underpinning ambidextrous and other search approaches.

We explore these ideas through a simulation model that extends Levinthal and March's (1981) classic model of adaptive search—the first to characterize search as local and distant—by integrating assumptions from recent theory and empirical evidence from the family business literature. Computer simulation is particularly appropriate to investigate the macro-level outcomes of micro-level processes and mechanisms, allowing circumventing the empirical problem of data availability (Harrison et al., 2007; Pentland et al., 2012). Similarly to Levinthal and March (1981), we model search 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. However, by adopting a microfoundational lens, we include distinctive micro-level factors that affect the search process. Indeed, we find that search outcomes are idiosyncratic across firms and their senior leaders, inducing us to question some commonly-held beliefs in the search literature. For instance, our simulation results indicate that while ambidexterity constitutes a superior search approach for family firms with founder CEOs, those with non-family or later-generation CEOs would seem to benefit from specialization.

Our paper makes two important contributions. First, it extends the scope of traditional approaches to the study of search by unveiling some micro-level mechanisms that may help explain the heterogeneity in the outcomes of distinct search approaches. By embracing a microfoundational perspective, 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. Second, 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 element refers to the actual performance of search activities that decision makers conduct based on their understanding and interpretation of the present situation (Feldman and Pentland, 2003). Second, we discuss the ostensive and agentic elements in relation to family firms. Third, we present our search model and its underlying assumptions. Finally, we illustrate and interpret the results, exploring 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

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, p. 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, p. 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, p. 181). Put differently, the ostensive nature of search manifests in 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 (Ethiraj and Levinthal, 2004; Sheremata, 2000). Furthermore, search is *satisficing* and *backward-looking*, continuing until an alternative

is found that satisfies some minimum performance criteria (Caplin et al., 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 enable identifying, 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 (Banerjee et al., 2018; 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, p. 1281)—a capability that is far from mindless. Individual agency can thus play an important role in the search process (Banerjee et al., 2018; Li et al., 2013; Posen et al., 2018), involving "the individual ability to remember the past, imagine the future, and respond to present circumstances" (Feldman and Pentland, 2003, p. 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 dimension involves a "creative (improvisational) mobilization of skills, developed through past experience, to tackle unfolding situations" (Cardinale, 2018, p. 133). In the context of search, the two dimensions are highly intertwined: the reflective dimension leads an actor to posit means and ends, direct attention toward particular alternatives, and perform 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 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, p. 136). Accordingly, the agentic nature of search can be best understood as 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, p. 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 (Maggitti et al., 2013). In parallel, cognitive frameworks shape the "preconscious understanding that organizational actors share" (DiMaggio, 1988, p. 3), thus influencing their pre-reflective orientation toward 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 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 and examining its socio-cognitive underpinnings (Banerjee et al., 2018; 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 positional history 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, p. 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, the shared history and 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 toward 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 toward some courses of action that appear to be endowed with a sense of inevitability (cf. Cardinale, 2018, p. 141). For example, De Massis et al. (2016) highlight 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, 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 search richness, 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 whose time has not yet come (Capaldo et al., 2017; Nerkar, 2003).

However, this pre-reflective activation and transposition of schemes and solutions from the past to tackle the present also depends on the positional history 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, p. 142). For example, occupying the position of founder-CEO in a family business is likely to facilitate a disposition toward the retrieval of past solutions rather than alternatives involving knowledge from distant domains, which 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 (2008) 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" (p. 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-Martínez et al., 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 CEO is a descendent of the founding family, pre-reflective dispositions toward particular alternatives will emerge, with both direct and indirect experiences from observation, storytelling, and material artifacts serving as touchstones for remembrance (Ocasio et al., 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 played the role of "observers" before taking over a controlling position in the firm is likely to make them more dispositionally attuned to external information than founder CEOs. 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 toward 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, with a pre-reflective orientation toward alternatives that involve domain-specific knowledge that may reside outside 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—both financial and nonfinancial—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; Kotlar et al., 2018). As a result, family firms often require more cognitive efforts than non-family firms, since 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 a strong concentration of control, power, and authority in the hands of family members, family ownership and leadership tend to prioritizing family-centered non-economic goals over financial goals (Chrisman et al., 2012; Gomez-Mejia et al., 2007). By applying this logic to predict 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, as they are more concerned with limiting the risk 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 (Chrisman and Patel, 2012); 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 (Gomez-Mejia et al., 2017). This, in turn, results in increased efforts aimed at targeting solutions with "upside" performance potential, but also higher variability (Patel and Chrisman, 2014).

However, the senior leaders' positional history in the family business social context 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 and affective relationships between and across family and non-family members in the firm, it is likely that kinship will temper CEO's self-interest, fostering commitment to the family's noneconomic preferences (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 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, goals and priorities of lone-founder firms are likely to differ from those of extended-family firms (e.g., Cannella et al., 2015; Miller et al., 2011). In the former, CEOs are likely to be more concerned with maintaining their independence and discretion, and as such, may focus on their individuality and have little tolerance for family issues, often acting in isolation from the family (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 control configurations (i.e., non-family, founder, and later-generation CEO). In the following section, we develop a mathematical model to illustrate how different CEOs 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-control configurations. Although theorizing about dynamic processes by means of mathematical models inevitably reduces the richness of the theory, it creates a virtual laboratory that allows "capturing reality in flight" and explicitly account 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 micro-level mechanisms (Anderson and Lewis, 2013).

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

Fig. 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 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., 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 the potential 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 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 so doing, they construct relatively precise beliefs about what works and why (Levitt and March, 1988), in turn yielding 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 search will not be sufficient to identify and implement a new course of action. When search fails in a given domain, the accumulated capital that senior leaders have allocated to search is stored as a sunk cost.

If no other strategic domain is being explored, unacceptable performance feedback induces managers to discard any existing strategies and move to strategic domains deemed more appropriate to the present situation (Levinthal and March, 1981). 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 this 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 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 Fig. 1 about here)

Search attributes and approaches

As our model is intended to reflect current understanding of the search process, 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). 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 that 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 efforts 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., Flor et al., 2018; Li et al., 2013; Martin and Mitchell, 1998; Rosenkopf and Nerkar, 2001). 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 embody the variety required to solve novel problems and 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 in both its reflective and pre-reflective forms in search distance. For instance, in responding to performance problems, decision makers in 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). 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 in 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, predominantly relates 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 efforts in search endeavors (e.g., Chen and Miller, 2007; Greve, 2003a; Vissa et al., 2010). Indeed, irrespective of the particular search locus, decision makers involved in search activities will feel empowered to search more boldly and actively, and thus consider a higher number of alternatives (Li et al., 2013).

Search structure. As mentioned, 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) whereby 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. 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 Fig. 2.

(Insert Fig. 2 about here)

In Fig. 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, which 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. 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, as graphically represented in Fig. 3.

(Insert Fig. 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 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 domains in which search proceeds sequentially, but at a considerable distance from the organization's current state. Hence, senior leaders concentrate their search efforts 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-control configurations in family and non-family firms, and across different search approaches. Table 2 reports the parameters we use 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 center 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 $\left(r_i - \sqrt{(K_{it-1} - K_i)^2 + (E_{it-1} - E_i)^2}\right) < \varepsilon$, 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, 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 time 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:

$$\frac{de_{it}}{dFB_{it}} = \upsilon + \omega\, Familyfirm$$

As Table 3 shows, we assume $\upsilon = 0.2$ and that ω varies across different controlling configurations in family firms. Specifically, since socioemotional wealth preferences and family-centered priorities are expected to be weaker among founding-family-controlled firms with founder CEOs than 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 toward information from within and beyond the organizational boundaries. Building on the studies conducted by Baum and Dahlin (2007) and 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—representing 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, and 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 toward alternatives that make use of either internal or boundary-spanning knowledge. Thus, if PR_{it} is 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 toward 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 more on reinterpreting and using knowledge anchored in the family tradition than on 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 the business (Kotlar and De

Massis, 2013; Nason et al., 2018), thereby providing decision makers with distant information on 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 on both a number of initial conditions and parameters[1] and stochastic variation. For each firm-control 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 search approaches in 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-control 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 of different firm-control 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-control 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 firm-control configurations. Narrow exploration appeared to be inferior to broad

---

[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 first author.

[2] =100 runs x 5 search approaches x 4 firm-control configurations.

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-control 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 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 mean search performance across the various firm-control 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 CEOs in non-family firms and founder CEOs in family firms; the former exhibiting 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 across each firm-control configuration for each search approach. These results shed further light on 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 seem to have the cognitive frameworks that may potentially enable 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-control 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 plays in founder-led family firms operating in stable environments: not only is ambidexterity a superior search approach, but founder CEOs seem to have 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 incremental solutions in other domains, such as training and consulting in the use of excavating machinery, strongly relying, in both cases, on the family's tradition and past knowledge accumulated.

In addition to benefiting from broad exploration (Table 5), professionally managed family firms seem to be particularly attuned to performing explorative search, always exhibiting either superior or non-inferior performance in both narrow and broad exploration compared to other firm-control 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 for 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.

24

Finally, although family firms led by later-generation CEOs tend to benefit more from broad exploration than other search approaches (Table 5), later-generation CEOs are not equipped with cognitive frameworks and dispositions that 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 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 seem to be conducive to superior performance, with no significant difference found between the two, broad exploration is found significantly more effective than the alternative search approaches across all the different firm-control 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-control 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 Table 9 shows, 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 et al., 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 those presented in Table 8, these results indicate that while family firms operating in dynamic environments

benefit more from embracing broad exploration, ambidexterity may be a more viable approach for non-family firms.

Discussion

This study has sought to advance the 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-control configurations. By taking a first step toward accounting for the agentic nature of search as 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 of participants in the search process, and the quest to establish the microfoundations of ambidexterity (Felin et al., 2015; Rogan and Mors, 2014).

While there is generally 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 the 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 senior leaders made 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 toward 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 their current and historical positioning 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 is 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. Moreover, 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 ability 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 managing the ambidexterity paradox (e.g., Andriopolous and Lewis, 2010; Smith and Lewis, 2011). Specifically, we theorize the role of the social context in which senior leaders operate (i.e., family vs. non-family firms) and 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 toward some knowledge sources above 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 senior leaders are either willing or pre-reflectively oriented toward simultaneously undertaking high-scale search across multiple domains, 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 in decision makers' undertaking inferior search approaches (e.g., narrow exploitation), despite their 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 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), proposing a broader view of this process by integrating insights from qualitative, process-oriented descriptions of search, and 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 study enhances our understanding of how and with which 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 positional history of senior leaders in this context. For instance, although founder CEOs and later-generation CEOs 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 toward 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 in contrast to founder CEOs who seem 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 study also has direct managerial implications, suggesting that specialization itself may not be detrimental to search performance. Although scholars and practitioners believe that firms must achieve a balanced mix of exploitation and exploration, ambidexterity is not always the optimal search approach to achieve superior performance. For instance, 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 decentralizing and performing search activities simultaneously across multiple strategic domains. 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 trained to act ambidextrously by allocating resources to organizational units that simultaneously specialize in explorative and exploitative search, serving as a point of integration between the two.

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, important to point out is 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, the results may differ depending on the problem faced by decision makers and their prior accumulated experience. 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 where the terms "search", "problemistic search", and "problem-solving" are often used interchangeably to indicate a form of search that is goal-oriented (Greve, 2003b, p. 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 satisfactory performance feedback. While slack search stems from any extra time and resources that can be used for experimentation without being deliberately managed (Cyert and March, 1963; Greve, 2003b), institutionalized search is conducted within periodical planning and budgeting cycles (Greve, 2003b). As 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 is 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 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—where successors take a more conservative approach and emphasize continuity with the previous leader— and non-conservative succession—where 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), potentially unsettling the mechanisms regulating the behaviors of the decision makers involved in the search process, and we welcome future studies on this topic. More generally, we advocate 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 CEO—rather than 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 search process around potentially viable trials or courses of action to initiate an experiential and more refined search process. However, other actors could also exert a strong influence on collective interpretation, and thus affect the dispositions of CEOs and search participants toward 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 may help address similar questions (e.g., Lubatkin et al., 2006; Rogan and Mors, 2014).

Fifth, different firm-control configurations may affect the decision makers' willingness and/or pre-reflective dispositions to undertake particular approaches in the Euclidean space, 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. In so doing, future research would offer new insights on 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 proven to influence how organizations search for knowledge and information across their boundaries (e.g., Bresciani, et al., 2017; Chiang and Hung, 2010; Laursen and Salter, 2014). 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 capability 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. Another potential direction for future research is examining additional dimensions of search, such as knowledge temporality, complexity, and centrality.

Finally, in our model we assume that problems are always decomposable, and 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), presenting 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 in different industries.

References

Abell, P., Felin, T., Foss, N., 2008. Building micro-foundations for the routines, capabilities, and performance links. *Managerial and Decision Economics*, 29 (6), 489–502.

Amabile, T. M., 1996. *Creativity in Context: Update to the Social Psychology of creativity.* Boulder, CO: Westview Press.

Anderson Jr, E.G., Lewis, K., 2013. A dynamic model of individual and collective learning amid disruption. *Organization Science,* 25 (2), 356–376.

Andriopoulos, C., Lewis, M.W., 2009. Exploitation-exploration tensions and organizational ambidexterity: managing paradoxes of innovation. *Organization Science*, 20 (4), 696–717.

Argote, L., 1999. *Organizational Learning: Creating, Retaining, and Transferring Knowledge*. Kluwer, Norwell, MA.

Arrfelt, M., Wiseman, R.M., Hult, G.T.M., 2013. Looking backward instead of forward: aspiration-driven influences on the efficiency of the capital allocation process. *Academy of Management Journal*, 56 (4), 1081–1103.

Banerjee, A., Lampel, J., Bhalla, A., 2018. Two cheers for diversity: an experimental study of micro-level heterogeneity in problemistic search. *Strategic Organization*, https://doi.org/10.1177/1476127018815467.

Baum, J.A., Dahlin, K.B., 2007. Aspiration performance and railroads' patterns of learning from train wrecks and crashes. *Organization Science*, 18 (3), 368–385.

Baum, J.A., Li, S.X., Usher, J.M., 2000. Making the next move: how experiential and vicarious learning shape the locations of chains' acquisitions. *Administrative Science Quarterly*, 45 (4), 766–801.

Baum, J.A., Rowley, T.J., Shipilov, A.V., Chuang, Y.T., 2005. Dancing with strangers: aspiration performance and the search for underwriting syndicate partners. *Administrative Science Quarterly*, 50 (4), 536–575.

Benet-Martínez, V., Lee, F., Leu, J., 2006. Biculturalism and cognitive complexity: expertise in cultural representations. *Journal of Cross-Cultural Psychology*, 37 (4), 386–407.

Benner, M.J., Tushman, M.L., 2003. Exploitation, exploration, and process management: the productivity dilemma revisited. *Academy of Management Review*, 28 (2), 238–256.

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,* 136, 331–338.

Brinkerink, J., 2018. Broad search, deep search, and the absorptive capacity performance of family and nonfamily firm R&D. *Family Business Review*, 31 (3), 295–317.

Bromiley, P., Washburn, M., 2011. Cost reduction vs innovative search in R&D. *Journal of Strategy and Management*, 4 (3), 196–214.

Buyl, T., Boone, C., Hendriks, W., Matthyssens, P., 2011. Top management team functional diversity and firm performance: the moderating role of CEO characteristics. *Journal of Management Studies*, 48 (1), 151–177.

Cannella, A. A., Jones, C. D., Withers, M. C., 2015. Family-versus lone-founder-controlled public corporations: social identity theory and boards of directors. *Academy of Management Journal,* 58 (2), 436–459.

Capaldo, A., Lavie, D., Messeni Petruzzelli, A., 2017. Knowledge maturity and the scientific value of innovations: the roles of knowledge distance and adoption. *Journal of Management*, 43, 503–533.

Caplin, A., Dean, M., Martin, D., 2011. Search and satisficing. *American Economic Review,* 101 (7), 2899–2922.

Cardinale, I., 2018. Beyond constraining and enabling: toward new microfoundations for institutional theory. *Academy of Management Review*, 43 (1), 132–155.

Casprini E., De Massis A., Di Minin A., Frattini F., Piccaluga A., 2017. How family firms execute open innovation strategies: the Loccioni case. *Journal of Knowledge Management*, 21 (6), 1459–1485.

Chen, W.R., 2008. Determinants of firms' backward-and forward-looking R&D search behavior. *Organization Science*, 19 (4), 609–622.

Chen, W.R., Miller, K.D., 2007. Situational and institutional determinants of firms' R&D search intensity. *Strategic Management Journal*, 28 (4), 369–381.

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.

Chrisman, J.J., Chua, J.H., De Massis, A., Frattini, F., Wright, M., 2015. The ability and willingness paradox in family firm innovation. *Journal of Product Innovation Management*, 32 (3), 310–318.

Chrisman, J.J., Chua, J.H., De Massis, A., Minola, M., Vismara S., 2016. Management processes and strategy execution in family firms: from "what" to "how". *Small Business Economics*, 47 (3), 719–734.

Chrisman J.J., Chua J.H., Pearson A.W., Barnett T., 2012. Family involvement, family influence, and family-centered non-economic goals in small firms. *Entrepreneurship Theory and Practice*, 36 (2), 267–293.

Chrisman, J.J., Chua, J.H., Steier, L., 2005. Sources and consequences of distinctive familiness: an introduction. *Entrepreneurship Theory and Practice*, 29 (3), 237–247.

Chrisman, J.J., Patel, P.C., 2012. Variations in R&D investments of family and nonfamily firms: behavioral agency and myopic loss aversion perspectives. *Academy of Management Journal*, 55 (4), 976–997.

Cohen, W.M., Levinthal, D.A., 1990. Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly,* 35 (1), 128–152.

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.

Cyert, R.M., March, J.G. 1963. *A Behavioral Theory of the Firm.* Englewood Cliffs, NJ: Prentice Hall.

Davis, J.P., Eisenhardt, K.M., Bingham, C.B., 2007. Developing theory through simulation methods. *Academy of Management Review*, 32 (2), 480–499.

De Massis, A., Foss, N.J., 2018. Advancing family business research: the promise of microfoundations. *Family Business Review*, 31(4), 386-396.

De Massis, A., Kotlar, J., Frattini, F., Chrisman, J.J., Nordqvist, M., 2016. Family governance at work: organizing for new product development in family SMEs. *Family Business Review*, 29 (2), 189–213.

De Massis, A., Kotlar, J., Mazzola, P., Minola, T., Sciascia, S., 2018a. Conflicting selves: family owners' multiple goals and self-control agency problems in private firms. *Entrepreneurship Theory & Practice*, 42 (4), 362–389.

De Massis, A., Kotlar, J., Wright, M., Kellermanns, F., 2018b. Sector-based entrepreneurial capabilities and the promise of sector studies in entrepreneurship. *Entrepreneurship Theory & Practice*, 42 (1), 3–23.

Denrell, J., March, J.G., 2001. Adaptation as information restriction: the hot stove effect. *Organization Science*, 12 (5), 523–538.

DiMaggio, P., 1988. Interest and agency in institutional theory. In L.G. Zucker (Ed.), *Institutional Patterns and Organizations: Culture and Environment*, pp. 3–21. Cambridge, MA: Ballinger.

Eisenhardt, K.M., 1989. Making fast strategic decisions in high-velocity environments. *Academy of Management Journal*, 32 (3), 543–576.

Eisenhardt, K.M., Furr, N.R., Bingham, C.B., 2010. Crossroads—microfoundations of performance: balancing efficiency and flexibility in dynamic environments. *Organization Science*, 21 (6), 1263–1273.

Ethiraj, S.K., Levinthal, D., 2004. Bounded rationality and the search for organizational architecture: an evolutionary perspective on the design of organizations and their evolvability. *Administrative Science Quarterly*, 49 (3), 404–437.

Feldman, M.S., Pentland, B.T., 2003. Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly*, 48 (1), 94–118.

Felin, T., Foss, N.J., Heimeriks, K.H., Madsen, T.L., 2012. Microfoundations of routines and capabilities: individuals, processes, and structure. *Journal of Management Studies*, 49 (8), 1351–1374.

Felin, T., Foss, N.J., Ployhart, R.E., 2015. The microfoundations movement in strategy and organization theory. *Academy of Management Annals*, 9 (1), 575–632.

Fleming, L., Sorensen, O., 2004. Science as a map in technological search. *Strategic Management Journal*, 25 (8-9), 909–928.

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.

Foss, N.J., 2011. Invited editorial: why micro-foundations for resource-based theory are needed and what they may look like. *Journal of Management*, 37 (5), 1413–1428.

Foss, N.J., Lyngsie, J., Zahra, S.A., 2013. The role of external knowledge sources and organizational design in the process of opportunity exploitation. *Strategic Management Journal*, 34 (12), 1453–1471.

Gaba, V., Bhattacharya, S., 2012. Aspirations, innovation, and corporate venture capital: a behavioral perspective. *Strategic Entrepreneurship Journal*, 6 (2), 178–199.

Gaba, V., Joseph, J., 2013. Corporate structure and performance feedback: aspirations and adaptation in M-form firms. *Organization Science*, 24 (4), 1102–1119.

Garcia, P.R.J., Sharma, P., De Massis, A., Wright, M., Scholes, L., 2018. Perceived parental behaviors and next generation engagement in family firms: a social cognitive perspective. *Entrepreneurship Theory & Practice*, https://doi.org/10.1177/1042258718796087.

Gavetti, G., 2012. Perspective—toward a behavioral theory of strategy. *Organization Science*, 23 (1), 267–285.

Gavetti, G., Levinthal, D., 2000. Looking forward and looking backward: cognitive and experiential search. *Administrative Science Quarterly*, 45 (1), 113–137.

Gavetti, G., Levinthal, D.A., Rivkin, J.W., 2005. Strategy making in novel and complex worlds: the power of analogy. *Strategic Management Journal*, 26 (8), 691–712.

Gersick, K.E., Davis, J.A., Hampton, M.M., Lansberg, I., 1997. *Generation to Generation: Life Cycles of the Family Business*. Boston, MA: Harvard Business Press.

Gibson, C.B., Birkinshaw, J., 2004. The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of Management Journal*, 47 (2), 209–226.

Gomez-Mejia, L.R., Haynes, K.T., Nunez-Nickel, M., Jacobson, K.J., Moyano-Fuentes, J., 2007. Socioemotional wealth and business risks in family-controlled firms: evidence from Spanish olive oil mills. *Administrative Science Quarterly*, 52 (1), 106–137.

Gomez-Mejia, L.R., Nunez-Nickel, M., Gutierrez, I., 2001. The role of family ties in agency contracts. *Academy of Management Journal*, 44 (1), 81–95.

Gomez-Mejia, L.R., Patel, P.C., Zellweger, T.M., 2017. In the horns of the dilemma: socioemotional wealth, financial wealth, and acquisitions in family firms. *Journal of Management*, 44 (4), 1369–1397.

Greve, H.R., 2003a. A behavioral theory of R&D expenditures and innovations: evidence from shipbuilding. *Academy of Management Journal*, 46 (6), 685–702.

Greve, H.R., 2003b. *Organizational Learning from Performance Feedback: a Behavioral Perspective on Innovation and Change*. Cambridge: Cambridge University Press.

Greve, H.R., 2007. Exploration and exploitation in product innovation. *Industrial and Corporate Change*, 16 (5), 945–975.

Gupta, A.K., Smith, K.G., Shalley, C.E., 2006. The interplay between exploration and exploitation. *Academy of Management Journal*, 49 (4), 693–706.

Hargadon, A., Sutton, R.I., 1997. Technology brokering and innovation in a product development firm. *Administrative Science Quarterly*, 42 (4), 716–749.

Harrison, J.R., Lin, Z., Carroll, G.R., Carley, K.M., 2007. Simulation modeling in organizational and management research. *Academy of Management Review*, 32 (4), 1229–1245.

Harrison, S.H., Rouse, E.D., 2015. An inductive study of feedback interactions over the course of creative projects. *Academy of Management Journal*, 58 (2), 375–404.

He, Z.L., Wong, P.K., 2004. Exploration vs. exploitation: an empirical test of the ambidexterity hypothesis. *Organization Science*, 15 (4), 481–494.

Helfat, C.E., Martin, J.A., 2015. Dynamic managerial capabilities: review and assessment of managerial impact on strategic change. *Journal of Management*, 41 (5), 1281–1312.

Iyer, D.N., Miller, K.D., 2008. Performance feedback, slack, and the timing of acquisitions. *Academy of Management Journal*, 51 (4), 808–822.

Katila, R., 2002. New product search over time: past ideas in their prime? *Academy of Management Journal*, 45 (5), 995–1010.

Katila, R., Ahuja, G., 2002. Something old, something new: a longitudinal study of search behavior and new product introduction. *Academy of Management Journal*, 45 (6), 1183–1194.

Kelley, J.L., 1955. *General Topology*. Van Nostrand, Princeton: NJ.

Knudsen, T., Levinthal, D.A., 2007. Two faces of search: alternative generation and alternative evaluation. *Organization Science*, 18 (1), 39–54.

Kotlar, J., De Massis, A., 2013. Goal setting in family firms: goal diversity, social interactions, and collective commitment to family-centered goals. *Entrepreneurship Theory and Practice*, 37 (6), 1263–1288.

Kotlar J., De Massis, A., Frattini, F., Bianchi, M., Fang, H., 2013. Technology acquisition in family and nonfamily firms: a longitudinal analysis of Spanish manufacturing firms. *Journal of Product Innovation Management,* 30 (6), 1073–1088.

Kotlar, J., De Massis, A., Wright, M., Frattini, F., 2018. Organizational goals: antecedents, formation processes, and implications for firm behavior and performance. *International Journal of Management Reviews*, 20 (S1), S3–S18.

Lant, T.K., Montgomery, D.B., 1987. Learning from strategic success and failure. *Journal of Business Research*, 15 (6), 503–517.

Laursen, K., 2012. Keep searching and you'll find: what do we know about variety creation through firms' search activities for innovation? *Industrial and Corporate Change*, 21 (5), 1181–1220.

Laursen, K., Salter, A.J., 2014. The paradox of openness: appropriability, external search and collaboration. *Research Policy,* 43 (5), 867–878.

Lavie, D., Stettner, U., Tushman, M.L., 2010. Exploration and exploitation within and across organizations. *Academy of Management Annals*, 4 (1), 109–155.

Levinthal, D., March, J.G., 1981. A model of adaptive organizational search. *Journal of Economic Behavior & Organization*, 2 (4), 307–333.

Levinthal, D.A., March, J.G., 1993. The myopia of learning. *Strategic Management Journal*, 14 (S2), 95–112.

Levinthal, D., Posen, H.E., 2007. Myopia of selection: does organizational adaptation limit the efficacy of population selection? *Administrative Science Quarterly*, 52 (4), 586–620.

Levitt, B., March, J.G., 1988. Organizational learning. *Annual Review of Sociology*, 14 (1), 319–338.

Li, Q., Maggitti, P.G., Smith, K.G., Tesluk, P.E., Katila, R., 2013. Top management attention to innovation: the role of search selection and intensity in new product introductions. *Academy of Management Journal*, 56 (3), 893–916.

Lubatkin, M.H., Simsek, Z., Ling, Y., Veiga, J.F., 2006. Ambidexterity and performance in small-to medium-sized firms: the pivotal role of top management team behavioral integration. *Journal of Management*, 32 (5), 646–672.

Luger, J., Raisch, S., Schimmer, M., 2018. Dynamic balancing of exploration and exploitation: the contingent benefits of ambidexterity. *Organization Science*, 29 (3), 449–470.

Madsen, P.M., Desai, V., 2010. Failing to learn? The effects of failure and success on organizational learning in the global orbital launch vehicle industry. *Academy of Management Journal*, 53 (3), 451–476.

Maggitti, P.G., Smith, K.G., Katila, R., 2013. The complex search process of invention. *Research Policy*, 42 (1), 90–100.

March, J.G., 1991. Exploration and exploitation in organizational learning. *Organization Science*, 2 (1), 71–87.

March, J.G., Simon, H.A., 1958. *Organizations*. New York, NY: John Wiley.

Martin, X., Mitchell, W., 1998. The influence of local search and performance heuristics on new design introduction in a new product market. *Research Policy*, 26 (7), 753–771.

Miller, D., Breton-Miller, L., Lester, R.H., 2011. Family and lone founder ownership and strategic behaviour: social context, identity, and institutional logics. *Journal of Management Studies*, 48 (1), 1–25.

Miller, D., Steier, L., Le Breton-Miller, I., 2003. Lost in time: intergenerational succession, change, and failure in family business. *Journal of Business Venturing*, 18 (4), 513–531.

Miron-Spektor, E., Ingram, A., Keller, J., Smith, W., Lewis, M., 2017. Microfoundations of organizational paradox: the problem is how we think about the problem. *Academy of Management Journal*, 61 (1), 26–45.

Nason, R.S., Mazzelli, A., Carney, M., 2018. The ties that unbind: socialization and business-owning family reference point shift. *Academy of Management Review*, 61 (1), 26–45.

Nelson, R.R., Winter, S.G., 1978. Forces generating and limiting concentration under Schumpeterian competition. *The Bell Journal of Economics*, 9 (2), 524–548.

Nerkar, A., 2003. Old is gold? The value of temporal exploration in the creation of new knowledge. *Management Science*, 49 (2), 211–229.

Nickerson, J.A., Zenger, T.R., 2004. A knowledge-based theory of the firm: the problem-solving perspective. *Organization Science*, 15 (6), 617–632.

Nonaka, I., 1994. A dynamic theory of organizational knowledge creation. *Organization Science*, 5 (1), 14–37.

Ocasio, W., Mauskapf, M., Steele, C.W., 2016. History, society, and institutions: the role of collective memory in the emergence and evolution of societal logics. *Academy of Management Review*, 41 (4), 676–699.

O'Reilly, C.A., Tushman, M.L., 2013. Organizational ambidexterity: past, present, and future. *Academy of Management Perspectives*, 27 (4), 324–338.

Patel, P.C., Chrisman, J.J., 2014. Risk abatement as a strategy for R&D investments in family firms. *Strategic Management Journal*, 35 (4), 617–627.

Patel, P.C., Fiet, J.O., 2011. Knowledge combination and the potential advantages of family firms in searching for opportunities. *Entrepreneurship Theory and Practice*, 35 (6), 1179–1197.

Pentland B., Feldman M., Becker M., Liu P., 2012. Dynamics of organizational routines: a generative model. *Journal of Management Studies*, 49 (8), 1484–1508.

Petruzzelli, A.M., Savino, T., 2014. Search, recombination, and innovation: lessons from haute cuisine. *Long Range Planning*, 47 (4), 224–238.

Posen, H.E., Chen, J.S., 2013. An advantage of newness: vicarious learning despite limited absorptive capacity. *Organization Science*, 24 (6), 1701–1716.

Posen, H.E., Keil, T., Kim, S., Meissner, F.D., 2018. Renewing research on problemistic search—a review and research agenda. *Academy of Management Annals*, 12 (1), 208–251.

Raisch, S., Birkinshaw, J., 2008. Organizational ambidexterity: antecedents, outcomes, and moderators. *Journal of Management*, 34 (3), 375–409.

Raisch, S., Birkinshaw, J., Probst, G., Tushman, M.L., 2009. Organizational ambidexterity: balancing exploitation and exploration for sustained performance. *Organization Science*, 20 (4), 685–695.

Rivkin, J.W., Siggelkow, N., 2003. Balancing search and stability: interdependencies among elements of organizational design. *Management Science*, 49 (3), 290–311.

Rogan, M., Mors, M.L., 2014. A network perspective on individual-level ambidexterity in organizations. *Organization Science*, 25 (6), 1860–1877.

Rosenkopf, L., Nerkar, A., 2001. Beyond local search: boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, 22 (4), 287–306.

Rudolph, J.W., Morrison, J.B., Carroll, J.S., 2009. The dynamics of action-oriented problem solving: linking interpretation and choice. *Academy of Management Review*, 34 (4), 733–756.

Schulze, W.S., Lubatkin, M.H., Dino, R.N., 2003. Toward a theory of agency and altruism in family firms. *Journal of Business Venturing*, 18 (4), 473–490.

Selznick, P., 1949. *TVA and the Grass Roots: A Study in the Sociology of Formal Organization*. CA: University of California Press.

Selznick P., 1996. Institutionalism old and new. *Administrative Science Quarterly*, 41 (2), 270–277.

Sheremata, W.A., 2000. Centrifugal and centripetal forces in radical new product development under time pressure. *Academy of Management Review*, 25 (2), 389–408.

Simon, H. A., 1955. A behavioral model of rational choice. *The Quarterly Journal of Economics,* 69 (1), 99–118.

Smets, M., Jarzabkowski, P., 2013. Reconstructing institutional complexity in practice: a relational model of institutional work and complexity. *Human Relations*, 66 (10), 1279–1309.

Smith, W.K., Lewis, M.W., 2011. Toward a theory of paradox: a dynamic equilibrium model of organizing. *Academy of Management Review*, 36 (2), 381–403.

Sørensen, J.B., Stuart, T.E., 2000. Aging, obsolescence, and organizational innovation. *Administrative Science Quarterly*, 45 (1), 81–112.

Strike, V.M., Rerup, C., 2016. Mediated sensemaking. *Academy of Management Journal*, 5*9* (3), 880–905.

Stryker, S., 2008. From Mead to a structural symbolic interactionism and beyond. *Annual Review of Sociol*ogy, 34, 15–31.

Teece, D.J., 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28 (13), 1319–1350.

Vissa, B., Greve, H.R., Chen, W.R., 2010. Business group affiliation and firm search behavior in India: responsiveness and focus of attention. *Organization Science*, 21 (3), 696–712.

Weick, K.E., 1976. Educational organizations as loosely coupled systems. *Administrative Science Quarterly*, 21 (1), 1–19.

Table 1
The agentic nature of search in family firms.

Individual position	Pre-reflective element	Reflective element
	The social context of family firms and the socio-material representations related to family histories predispose actors toward 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 toward alternatives that involve internal, rather than external, knowledge.	Search behavior reflects 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 render 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 toward 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-control configuration.

Parameter	Non-family firms	Family firms with non-family CEOs	Family firms with founder CEOs	Family firms with later-generation CEOs
υ	-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 5
Difference in mean performance across search approaches at search end.

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)†

Notes:
†p < .10; * p < .05; ** p < .01; ***p <.001.
Standard 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 6
Difference in mean performance across firm-control specifications at search end.

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)†

Notes:
†p < .10; * p < .05; ** p < .01; ***p <.001.
Standard 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.

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)†

Notes:
†p < .10; * p < .05; ** p < .01; ***p <.001.
Standard 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-control configurations at search end under dynamic environmental conditions.

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)

Notes:
†$p < .10$; * $p < .05$; ** $p < .01$; ***$p < .001$.
Standard 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.
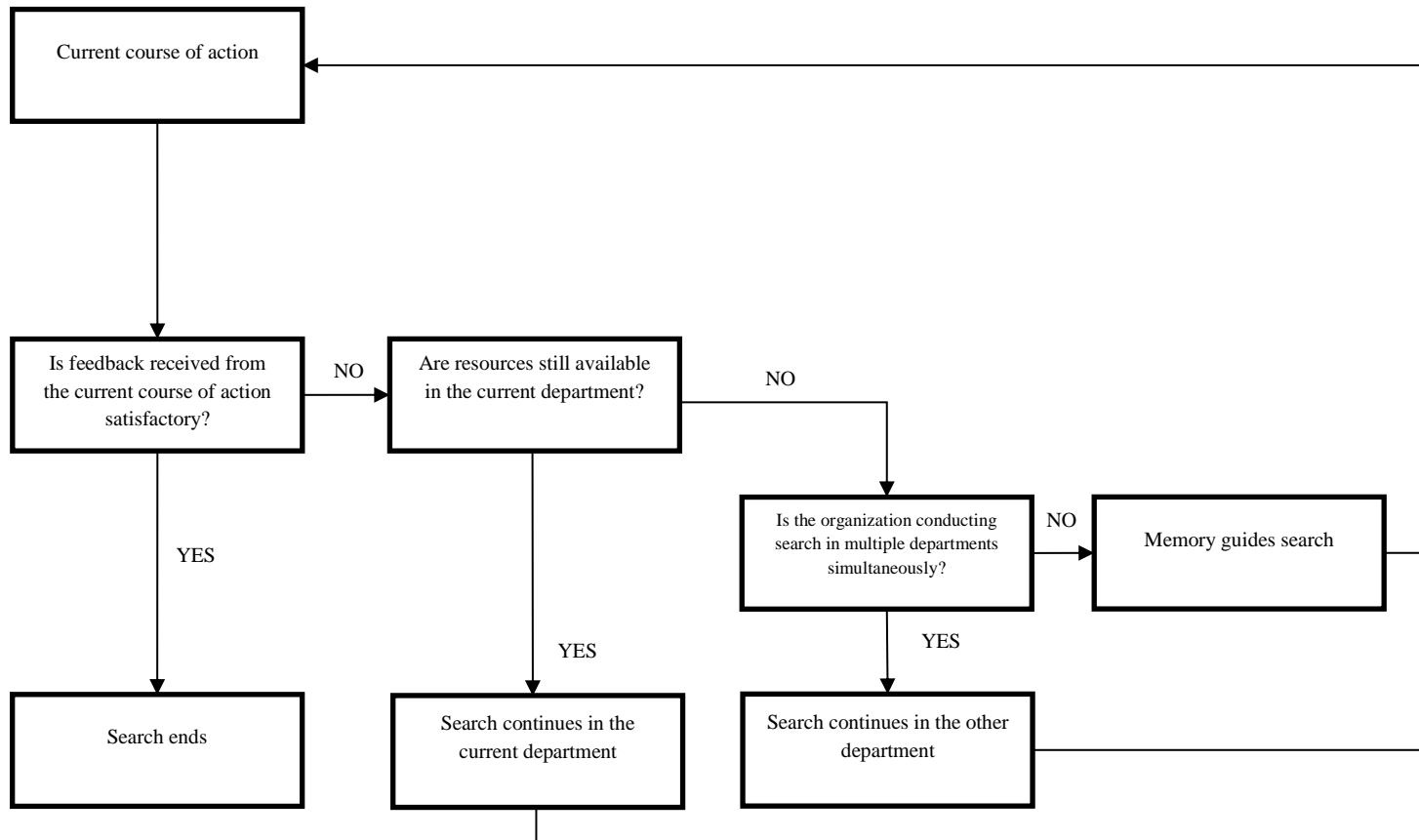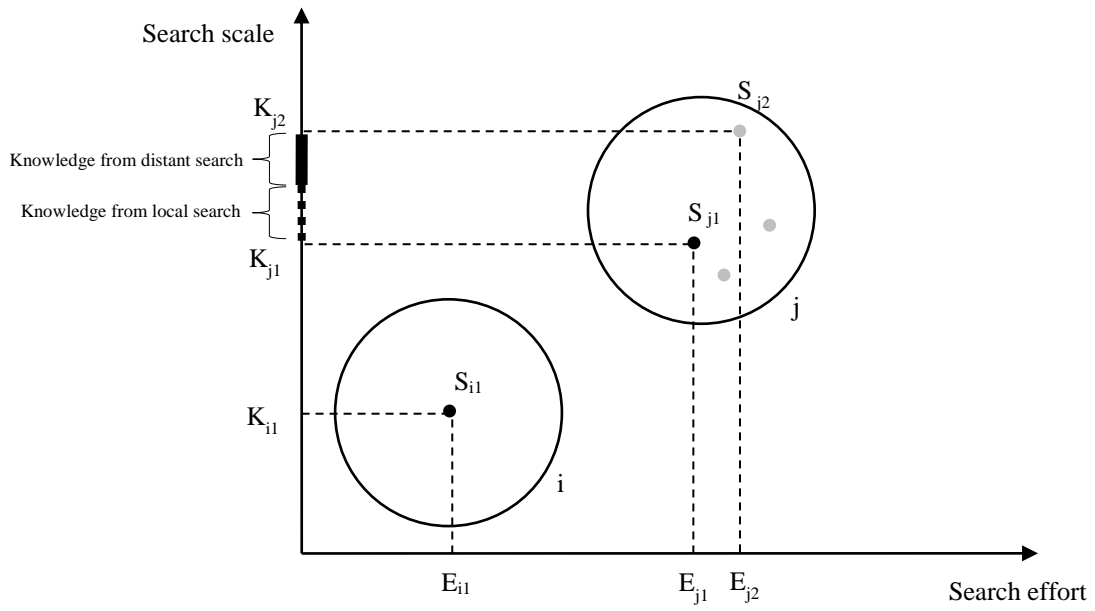
Fig. 1. Search process: flow diagram.

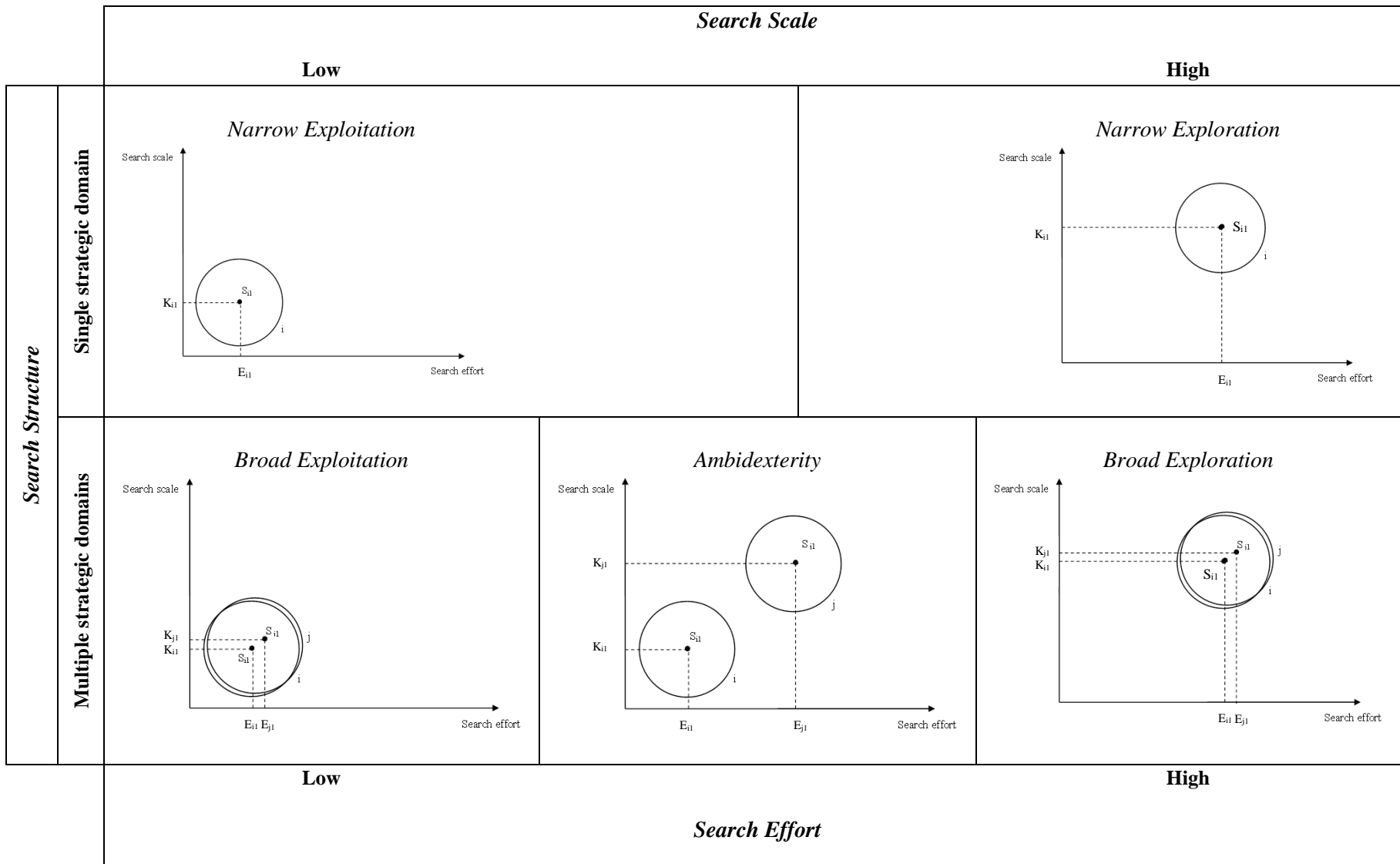**Fig. 2.** Search attributes in the Euclidean search space.

Fig. 3. Search approaches in the Euclidean search space.