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Don't Step Into Your Parent's Shoes – How Exploitation and Exploration Affect Spin-out Growth

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DON'T STEP INTO YOUR PARENT'S SHOES – HOW EXPLOITATION AND EXPLORATION AFFECT SPIN-OUT GROWTH

Simon Heinrichs und Sascha Walter

Abstract

This study examines how different organizational learning strategies (i.e., exploration or exploitation) impact the sales growth of technology spin-outs, and the role of the parent firm in this context. Using knowledge-based and learning views of the firm, we propose that spin-out performance benefits from exploration, but suffers from exploitation. Results based on a sample of 134 spin-outs support these arguments. Additionally, parent goodwill reinforced the positive effect of exploration, whereas high market similarity to the parent firm increased the negative effect of exploitation.

1 INTRODUCTION

Spin-outs, defined as entrepreneurial ventures founded by ex-employees of an incumbent firm in the same industry (Agarwal *et al.*, 2004; Chatterji, 2009; Klepper *et al.*, 2005), are an important form of entrepreneurial entry in high-technology industries (Christensen, 1993; Klepper, 2002, 2007; Klepper *et al.*, 2005). Spin-out founders are typically able to both transfer and use critical knowledge from their former employer (Franco *et al.*, 2006; Sapienza *et al.*, 2004), which primarily consists of personal skills and routines (Agarwal *et al.*, 2004). While there is strong empirical evidence that such knowledge advantages enable spin-outs to outperform other new entrants (Agarwal *et al.*, 2004; Andersson *et al.*, 2012; Eriksson *et al.*, 2006), they vary in how they use parent knowledge. Some spin-outs act as simple replicators: They exploit knowledge absorbed by their founders during their time at the parent firm (e.g., Agarwal *et al.*, 2004; Franco *et al.*, 2006) without differentiating their knowledge base (Aldrich *et al.*, 2006; Bhidé, 2000; Phillips, 2002). Other spin-outs are strong innovators: They explore discoveries which their parents were not able (Anton *et al.*, 1995; Hellmann, 2007; Wiggins, 1995) or not willing (e.g., Christensen, 1993; Henderson *et al.*, 1990; Klepper *et al.*, 2005) to pursue, thereby setting themselves apart from their parents (Chesbrough, 2003; Klepper *et al.*, 2005).

Previous research on organizational learning suggests a simultaneous balance between exploration and exploitation as the dominant strategy (He *et al.*, 2004; O'Reilly *et al.*, 2004; Raisch *et al.*, 2009). However, the argument for such an ambidextrous approach primarily holds for established firms. Entrepreneurial firms, however, may be compelled to consider exploratory and exploitative learning as mutually exclusive options due to their resource scarcity (Ebben *et al.*, 2005; Gupta *et al.*, 2006; Lin *et al.*, 2007). This is because both approaches represent conflicting knowledge processes (Lubatkin *et al.*, 2006; March, 1991) and mastering the tension between exploration and exploitation consumes extensive firm resources (Lavie *et al.*, 2010; Levinthal *et al.*, 1993). Although research on organizational learning largely acknowledges the contradiction of knowledge processes and resource-allocations between exploration and exploitation, it ignores how this contradiction can be resolved if resource scarcity compels firms to focus on a single learning strategy. As a consequence, our understanding of how learning

unfolds in an entrepreneurial context remains limited (Bierly *et al.*, 2007; Fern *et al.*, 2012; Politis, 2005). This is a worrisome situation, given the special importance of learning to new ventures in their battle for competitive advantage and growth (Sapienza *et al.*, 2004). Although spin-outs have been acknowledged to possess a knowledge advantage, recent studies point to another, more worrying side of spin-outs' knowledge legacy: They suggest that an overreliance on inherited knowledge can limit spin-out development (Clarysse *et al.*, 2011; Fern *et al.*, 2012; Sapienza *et al.*, 2004). Thus, how should spin-outs learn? By sticking to what they already know or by striving off to novel knowledge territories? While past spin-out research provides arguments for spin-outs pursuing either of both learning directions, little has been done to empirically investigate the performance effects of exploration and exploitation in a spin-out context.

Recent studies indicate that organizational learning is contingent on the environmental setting (Auh *et al.*, 2005; Bierly *et al.*, 2007; Jansen *et al.*, 2006). In the case of spin-outs, scholars have suggested that their environmental conditions are largely related to their parents. In particular, it has been argued that supportive relationships with the parent firm play an important role for spin-out development (Campbell *et al.*, 1995; Chatterji, 2009; King *et al.*, 2003). Currently, there are conflicting predictions on how ongoing relationships with the parent influence spin-out performance. For example, some scholars claim that benevolent parents mitigate the liabilities of newness and smallness of their child firms, whereas according other scholars a close relation to the parent can increase spin-out inertia (Agarwal *et al.*, 2004). However, little is known about the circumstances under which spin-outs should refrain from establishing a relationship with their parent or encourage it. Spin-outs attempting to exploit parent knowledge might be differently affected by a cooperation with their parents than spin-outs exploring new knowledge. Thus, prior work tends to underestimate the role of spin-out learning in parent spin-out cooperation. Extant research on spin-outs has also highlighted the influential role of market competition with the parent firm on spin-outs (Aldrich *et al.*, 2006; Bhidé, 2000; Christensen, 1993). However, past empirical studies investigating the influence of market similarity on spin-out performance provide mixed results (Agarwal *et al.*, 2004; Eriksson *et al.*, 2006; Phillips, 2002). We believe that this inconsistency is at least partly caused by an

insufficient attention paid on what kind of learning strategy spin-outs pursue. Exploitation and exploration lead to different ways of competition between a spin-out and its parent and this may differently impact spin-out performance.

Addressing the above gaps, our study examines how and when exploitation and exploration impact spin-out growth. By analyzing organizational learning in an entrepreneurial context, we gain important insights into how spin-out firms can leverage their inherited knowledge. Drawing on knowledge-based and learning views of the firm, we argue that spin-outs pursuing exploitation will grow slower than spin-outs pursuing exploration. This is because differentiating the knowledge base is the pathway to the creation of a sustained competitive advantage. Furthermore, we suggest that the growth impact of the two strategies is contingent on factors being related to the parent firm, namely on the similarity of markets and parent goodwill. Empirical tests on original data from 134 technology-based spin-outs in Germany support most of the predicted relationships. To foreshadow our results, exploration increases spin-out sales growth, while exploitation has an opposite effect. Moreover, the negative effect of exploitation increases with the similarity of markets between spin-out and parent. The positive impact of exploration, on the other hand, is enhanced by a parent's goodwill towards its progeny. Our article therefore contributes to the literature of organizational learning by testing the efficacy of exploration and exploitation in an entrepreneurial context and to the literature on spin-outs by theorizing on the links between knowledge inheritance, learning, and spin-out growth. Furthermore, we contribute to the literature on parent-child relations by analyzing the circumstances under which spin-out learning is promoted or hindered by their parents and by making apparent the influential role of the parent on spin-out learning outcomes.

2 Theoretical development

From an organizational learning perspective, spin-outs can either focus on the exploitation of their founders' past experiences or on the exploration of new ideas or discoveries made at the parent. Following March (1991) and others, we classify learning into two ideal types: exploration and exploitation. While exploration is associated with 'search, variation, risk taking,

experimentation, play, flexibility, discovery, and innovation', exploitation refers to notions such as 'refinement, choice, production, efficiency, selection, implementation, and execution.' (March, 1991:71). As March noted, 'The essence of exploitation is the refinement and extension of existing competencies, technologies, and paradigms [...] The essence of exploration is experimentation with new alternatives' (1991:85). Thus, a main difference resides in the way how existing knowledge is deployed. Existing knowledge can either be used for the 'exploitation of old certainties' or the 'exploration of new possibilities' (March, 1991:71). Both types of learning involve fundamentally different mind-sets, structures and cultures as researchers have pointed out (Gupta *et al.*, 2006; Schildt *et al.*, 2005).

Each of the two learning modes has its own advantages making it difficult to favor one type over the other. In order to comprehend spin-out learning outcomes, it is helpful to take into consideration that spin-outs represent transfers of routines and resources through the mobility of their founders (Brittain *et al.*, 1980; Hannan *et al.*, 1989; Phillips, 2002; Romanelli, 1989). Organizational routines store genealogical information that is passed from one organization to another and provide an answer to why many organizations look alike (Wezel *et al.*, 2006). They capture the repetitive patterns of an organization's day-to-day action (Nelson and Winter, 1980) and are acquired through learning and experience, often referred to as 'learning by doing' (Feldman *et al.*, 2003). Because routines are experience-based, they primarily contain tacit knowledge stored in the memories of individuals (Nelson *et al.*, 1982). As knowledge of this kind can only be revealed through practice, it cannot be easily articulated or communicated in codified forms. Routines are therefore of great relevance within the knowledge-based view (KBV) of the firm according to which a firm's sustainable competitive advantage as well as its growth are dependent on its ability to acquire valuable and inimitable knowledge that differentiates it from its competitors (Grant, 1996; Nonaka *et al.*, 2000; Spender, 1996).

When a spin-out is 'born', its founders tend to replicate routines they carried over from the parent firm (Agarwal *et al.*, 2010; Fern *et al.*, 2012; Phillips, 2002; Wezel *et al.*, 2006). However, just as children cannot be considered as perfect clones of their parents, spin-outs cannot be either: Taking into account that spin-outs are built by a fraction of the parent's

employees, their initial knowledge base will only contain a subset of the parent's routines (Klepper, 2001; Phillips, 2002). Moreover, some routines are socially complex and shaped by common past experiences of many individuals (Nelson *et al.*, 1982). If some individuals leave to found a spin-out, they take with them their individual routines. However, as the social components of these routines are resilient to the transfer, they lose their 'binding energy' (Spender, 1996). Consequently, spin-out firms typically start with partial replications of their parent's set of organizational routines (Wezel *et al.*, 2006), which by itself can hardly be sufficient for a sustained competitive advantage. In order to survive and grow, spin-outs have to enlarge their knowledge base through learning (Sapienza *et al.*, 2004).

For spin-out founders, exploitation may be tempting as old thinking patterns and behavior, which proved to work well at the parent, are expected to work just as well at the spin-out (Fern *et al.*, 2012). Moreover, exploitation tends to be cheaper (Aldrich *et al.*, 2006), less time and effort consuming (Feldman *et al.*, 2003) and less risky than exploration. As March (1991) notes, scarce resources and the pursuit of proximate awards cause exploitation to drive out exploration. On the other hand, some scholars have pointed out the explicit benefits of exploration for spin-outs. Having previously worked in the industry, spin-out founders possess an insider status which enables them to perceive market opportunities, often already while working at the parent firm. Their prior affiliation with an incumbent together with an entrepreneurial origin has been considered to be a key reason why spin-outs are likely to become major innovators (Agarwal *et al.*, 2004). In the following sections, we adopt a knowledge-based and learning view of the firm and point out why pursuing exploitation and exploration will differently impact spin-out growth.

2.1 Organizational learning and spin-out growth

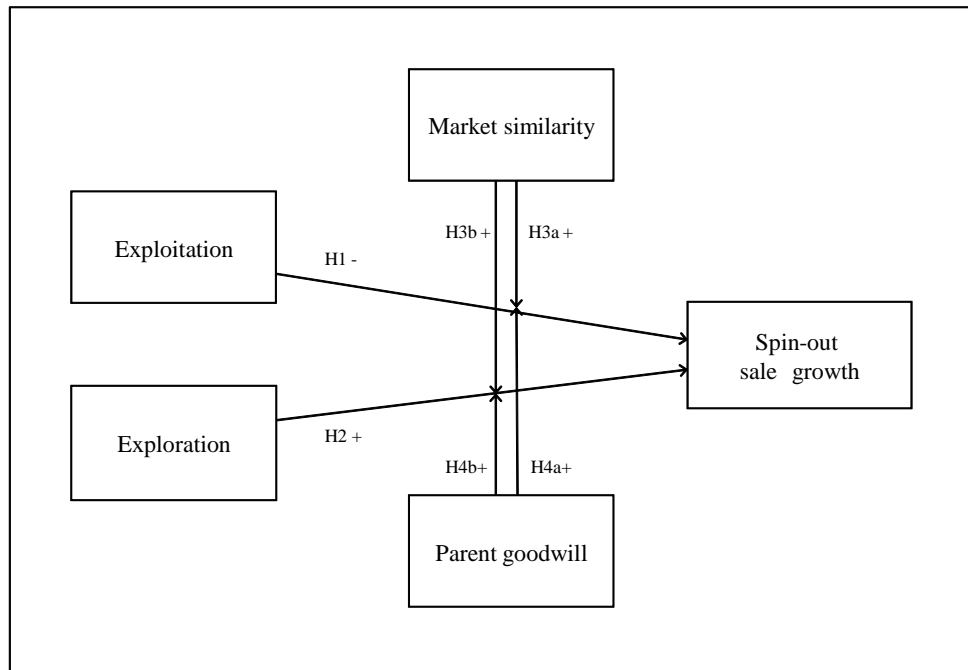
Spin-outs that pursue exploitation activities rely on experiences from their parent organizations (Clarysse *et al.*, 2011) and improve existing routines by increasing efficiency and reducing variance. We argue that this type of learning is negatively related to spin-out growth, for two reasons. First, through the lens of a knowledge-based view, knowledge is considered to be the

most strategically relevant resource which an organization can possess. Thus according to the KBV, the differing performance of organizations can be attributed to the prevalence of knowledge asymmetries. In particular, the KBV suggests that firms need a differentiating and non-imitable knowledge base in order to gain a sustainable competitive advantage which is a prerequisite to growth (Grant, 1996; Spender, 1996). Starting as an incomplete set of replicated parent routines, spin-outs are not 'born' with differentiated knowledge. Instead, they have to diversify their knowledge base through learning (Clarysse *et al.*, 2011; Klepper, 2001; Semadeni *et al.*, 2011). However, to the extent that spin-out founders try to repeat learned behaviors and rely on past experiences, their knowledge base is likely to remain undifferentiated from those of incumbents. The resulting lack of a competitive advantage should result in low levels of spin-out growth.

Secondly, parent firms are not necessarily the best source of routines as some routines are likely to be suboptimal for the spin-out (Barnett, 1997). By relying too much on the past, spin-out founders are likely to be affected by inertia (Hannan *et al.*, 1984, 1989) and core rigidities (Leonard-Barton, 1992) that hamper their capability to replace irrelevant, outdated or competitively weak routines or to adapt them to the new entrepreneurial context. Moreover, exploitation involves risks of learning myopia and competence traps (Levinthal *et al.*, 1993; March, 1991). Particularly, this may represent a threat to spin-outs that heavily rely on previous experiences (Fern *et al.*, 2012). Following a parent firm's dominant logic can lead to unquestioned and unconscious acceptance of knowledge and ways of thinking which might cause that ideas and behaviors that do not comply are filtered out (Chesbrough *et al.*, 2002; Prahalad *et al.*, 1986). Consequently, spin-outs can fail to discover more effective alternatives, e.g., new technologies, new ways of production or marketing (Levinthal, 1997; Romanelli, 1989). Thus they 'are likely to find themselves trapped in suboptimal stable equilibria' (March, 1991: 71). In line with these arguments, recent studies found that a very high knowledge overlap between parent and child firm negatively affects spin-out growth (Clarysse *et al.*, 2011; Sapienza *et al.*, 2004). This leads to our first hypothesis, which is, along with the rest of the theoretical model, depicted in Figure 1.

Hypothesis 1: A higher level of exploitation is negatively related to spin-out sales growth.

Figure 1: Our Conceptual Model



In contrast to exploitation, exploration aims at the extension of existing knowledge by search, experimentation, and variation (March, 1991). Spin-outs pursuing this path of organizational learning create new knowledge through experimental actions. Although organizational learning theorists relate exploration to an increased risk and uncertain performance gains of incumbent firms (March, 1991), we argue that exploration increases the performance of spin-outs for several reasons. First, starting with a similar but incomplete set of parent routines, spin-outs are in need of acquiring new, firm-specific knowledge in order to differentiate themselves from incumbents, in particular their parents. Past research emphasizes the importance of knowledge not held in common between spin-outs and their parents as an important requirement for differentiation (Clarysse *et al.*, 2011; Sapienza *et al.*, 2004).

Secondly, while incumbents are often plagued by bureaucratic inertia (Klepper *et al.*, 2005) or rely too much on their existing customer base (Christensen, 1993), spin-outs benefit from greater autonomy and flat hierarchical structures, which increase their flexibility (Forbes *et al.*, 1999). This provides spin-outs with a learning advantage since they can deploy new knowledge routines more quickly and decisively (Agarwal *et al.*, 2004). Hence, departing from and breaking with existing knowledge enable spin-outs to specialize in innovations that are difficult for incumbent firms to master (Bhidé, 2000; Clarysse *et al.*, 2011; Zahra *et al.*, 2000). Evidence from case studies underscores the importance of flexibility and experimentation to spin-outs. Chesbrough and Rosenbloom (2002) and Chesbrough (2003), for example, provide valuable insights from Xerox spin-outs illustrating the importance of entrepreneurial adaption, search and experimentation. Similarly, Bhidé (2000) finds that an important characteristic of successful entrepreneurs is their ability to adapt to unforeseen situations by the means of unspecific experimentation, new, creative ways of thinking and the readiness to a substantial reorientation of their activities. This includes the revision and modification of parent routines which do not fit within the entrepreneurial context or which need to be adapted to extant environmental conditions (Hannan *et al.*, 1984; Stinchcombe, 1965). Moreover, new routines have to be developed. Spin-outs can make a virtue out of this necessity by making use of their simple hierarchical structures. Their high agility further enables them to quickly implement state-of-the-art designs and transform their initial knowledge base into one that is not only differentiated but also more up-to-date than those of incumbent firms (Autio *et al.*, 2000; Bierly *et al.*, 2007; Roberts, 1980). Several authors have noted the dominating position of emergent firms in explorative activities compared to incumbents which, in contrast, are said to be better at pursuing exploitation (Abernathy *et al.*, 1988; Sen *et al.*, 2000).

Thirdly, spin-outs start with knowledge endowments that have the potential to help them direct exploration to promising ends, thereby avoiding 'failure traps' as stated by Levinthal and March (1993): Due to their industry experience, spin-outs possess valuable insider knowledge about opportunities, technologies and trends (Agarwal *et al.*, 2004; Dahl *et al.*, 2007; Klepper, 2002; Phillips, 2002; Shane, 2000). Empirical analyses show that industry experience is positively related to the quality of opportunities identified by founders of new firms (Buenstorf,

2007; Elfenbein *et al.*, 2010). Just as exploratory learning activities allow spin-outs to depart from their existing knowledge, their insider status enables spin-out founders to focus learning efforts on valuable knowledge sources (Agarwal *et al.*, 2004; Chatterji, 2009; Cohen *et al.*, 1990; Grant, 1996), thereby mitigating the risks of inadequate research (Bhidé, 2000). In other words, exploration enables spin-outs to use their existing industry experience as a stepping stone for the development and integration of valuable new knowledge (Zahra *et al.*, 2007). In addition to their knowledge endowments, spin-out founders benefit from their social capital which enables them to gain access to resources, complementary assets and sources of knowledge (Adler *et al.*, 2002; Phillips, 2002). Research has confirmed the importance of external relationships on organizational learning (Zahra *et al.*, 2000), and on performance (Yli-Renko *et al.*, 2001). Due to their industry contacts spin-outs are able to identify potential new product applications and to quickly evaluate consumers' preferences for potential uses of new technologies or new product applications (Zahra *et al.*, 2007). Thus, we formulate our second hypothesis as follows:

Hypothesis 2: A higher level of exploration is positively related to spin-out sales growth.

Our above arguments point to different outcomes of exploration and exploitation for spin-outs, but what conditions strengthen or mitigate the growth effects of both types of organizational learning? In addressing this question, we start with the notion that parent companies play a crucial role in the development of their progenies. In particular, scholars have suggested that market characteristics and supportive relationships are important contingency factors (Auh *et al.*, 2005; Belderbos *et al.*, 2010; Lavie *et al.*, 2010). In the case of spin-outs, these factors are highly determined by the parent organization. In the following, we will analyze whether market competition and supportive relationships between spin-outs and their parent firms strengthen or mitigate the effects of exploration and exploitation on spin-out sales growth

2.2 The moderating role of market similarity

Not only have spin-outs to decide on *how* to use their knowledge legacy, they also have to decide *where* to use it. Gruber (2008), for instance, suggests that entrepreneurs can serve a variety of different markets with varying market conditions. Being founded by former employees of established firms in the same industry, spin-outs create a market overlap with their parents. The degree of overlap, however, varies: while some spin-outs are characterized by a high market similarity (the extent to which the spin-out's targeted customer segment is also targeted by the parent) (Cooper, 1985; Franco *et al.*, 2006; Klepper, 2001) others tend to avoid overlapping markets (Helfat *et al.*, 2002).

Choosing a similar market focus to the parent is attractive to spin-out founders as they can leverage specific opportunities in these markets, having already been encountered during their time of employment at the parent firm. Likewise, serving the same market allows spin-out founders to benefit from existing ties to parent customers (Phillips, 2002). On the other hand, market similarity is likely to increase direct competition between the spin-out and the parent (Barnett, 1997; Hannan *et al.*, 1989) which can be detrimental to the spin-out's performance. Whether a spin-out can successfully master such competition may depend on its competitive strength compared to the parent (Barnett, 1997).

In the organizational learning literature, exploitation has frequently been related to the risk of too narrowly focusing on the refinement of existing knowledge, thereby creating competency traps (March, 1991). In addition, it has been highlighted that spin-out founders are prone to overemphasize exploitation by drawing on a mindset primarily shaped by past experiences (Fern *et al.*, 2012). The risk of relying too much on the past might be increased by high market similarity as this might induce a spin-out to rely too strongly on existing customer preferences. In their studies about the global disk drive industry, Christensen (1993) and Christensen and Bower (1996) have shown that a firm's specific customer demand can have a great impact on the allocation of resources in the process of technological innovation. If spin-out founders target customers of the parent firm, they tend to accept customer needs as fixed instead

of questioning them (Uzzi, 1997; Yli-Renko *et al.*, 2001). This may further increase the risk of learning traps and limit the spin-out's potential and need for adaption and differentiation.

Moreover, lacking a competitive advantage, spin-outs pursuing an exploitation strategy do not provide unique benefits to existing or potential customers of the parent. Thus, one would expect that high market similarity is highly disadvantageous to spin-outs, especially with respect to the fact that the parent and other incumbents are perceived as more reliable, rational and accountable by other market participants (Hannan *et al.*, 1984). Moreover, the parent and other incumbents are likely to benefit from established distribution networks and size advantages, e.g., economies of scale in management, production, finance, marketing and R&D, which enable them to exploit knowledge more efficiently (Rothwell *et al.*, 1991). Thus,

Hypothesis 3a: Market similarity strengthens the negative relationship between exploitation and spin-out sales growth.

In contrast to exploitation, spin-outs pursuing an exploration strategy substantially deviate from already existing knowledge. The path of exploratory learning is more likely to lead to products that are distinct from those of the parent. However, there is no guarantee that those products fulfill the market needs of target customers. Organizational learning scholars have argued that exploration increases the risk of inadequate search leading to failure, which necessitates the search for even more radical ideas and thus more exploration which can lead to a 'failure trap' (March, 1991). The chance of being trapped in failure can be reduced if a spin-out focuses its exploration activities on a familiar market. Targeting familiar markets allows a spin-out to more readily align search and experimentation with well-known value requirements of potential customers (Helfat *et al.*, 2002). Moreover, spin-out founders are well-informed about routines favored by the parent. Extant research has suggested (Aime *et al.*, 2010) that the knowledge of parent routines helps spin-outs direct their explorative actions to the development of adequate responses aiming at defending and competing against the parent.

In addition, compared to their parents, spin-outs possess a flexibility advantage because of their flat hierarchical structures and small size (Rothwell *et al.*, 1991). A high degree of flexibility allows spin-outs to be more adaptive to customer needs as they can integrate and combine new knowledge more quickly than their parents. In summary, it can therefore be said that targeting a market similar to the one of their parents allows spin-outs to rush into an exploration strategy and to quickly develop both a differentiated knowledge base and products that offer unique benefits to potential customers. Thus, as spin-outs are equipped with a flexibility advantage over their parents and are also capable of drawing on their personal relationships with the parent's customers, spin-outs should be able to readily compete in the parent's market. Evidence from the disk drive industry suggests that spin-outs developing new product variants are able to gain a sustained competitive advantage which makes them more resistant to competitive pressures by the parent (Christensen, 1993; McKendrick *et al.*, 2009). Thus,

Hypothesis 3b: Market similarity strengthens the positive relationship between exploration and spin-out sales growth.

2.3 The moderating role of parent goodwill

Past research has emphasized that learning cannot take place without resources (March, 1991). As spin-outs suffer from a liability newness and smallness this insight is of particular relevance for them as their limited resource availability may constrain effective learning (King *et al.*, 2003). Indeed, recent literature has pointed out that new ventures face particular challenges in their learning activities due to their limited resources (Ebben *et al.*, 2005; Lin *et al.*, 2007). Spin-outs, however, may be able to alleviate resource constraints by maintaining a supportive relationship with their parents (Shane *et al.*, 2002). As Thornton (1999) points out, organizational cultures often support employees who quit their job to found a new venture. Similarly, other authors have highlighted the advantageous situation of being 'spawned with a silver spoon' (King *et al.*, 2003):

Spin-outs, for example, may access technical or organizational know-how (Agarwal *et al.*, 2004; Clarysse *et al.*, 2011; Nonaka *et al.*, 2000), gain credibility (Burton *et al.*, 2002) and establish ties to new network partners (Hite *et al.*, 2001) more easily if they have supportive parents. On the other hand, parental backing has also been argued to have its drawbacks as a close relationship to the parent may lead to inertia (Agarwal *et al.*, 2004) and insulation from *other* external sources of learning (Parhankangas *et al.*, 2003).

Spin-outs focusing on exploitation tend to be constrained by their past experiences, which might cause them to refrain from revising and adapting routines or creating new ones. The latter is a prerequisite to new firms to develop idiosyncratic skills and use the advantage of new ventures. These tendencies are likely to be reinforced by the preservation of a close and supportive relationship with the parent since spin-out founders are affected by a 'spatial myopia' (Levinthal *et al.*, 1993). Being subject to structural inertia and following the parent's dominant logic (Prahalad *et al.*, 1986), the spin-out is locked into past courses of action, inhibiting the search for alternative external sources of learning. Positive local feedback from the parent, in turn, will foster further imitation (March, 1991). Similarly, studies about inter-firm learning suggest that knowledge transfers between firms increase the resemblance of their knowledge bases (Mowery *et al.*, 1998). This, in turn, will further inhibit the development of differentiating knowledge and sustained competitive advantage. Thus,

Hypothesis 4a: The parent's goodwill strengthens the negative relationship between exploitation and the spin-out's sales growth.

Organizational learning literatures consider exploration as more risky and resource-consuming than exploitation (March, 1991). Being affected by liabilities of newness and smallness, it is a particular challenge to spin-outs to pursue exploration as they in addition have to compensate for resource scarcity (Stinchcombe, 1965) by gaining access to external complementary resources (Rothwell *et al.*, 1991). Acquiring resources from external sources may be difficult for spin-outs with an exploration strategy as potential resource providers may be skeptical about the spin-out's

capability to successfully conduct exploration (Agarwal et al., 2004). As potential customers may be hesitant or even reluctant to place orders with the spin-out because of its short operating history, it is of great importance that spin-outs make an effort in order to be recognized as legitimate and reliable firms by consumers. Past research has suggested that overcoming these obstacles is facilitated by collaborative linkages to incumbent firms (King *et al.*, 2003; Roberts, 1980). Stuart et al. (1999), for example, provide evidence that having high-status alliance partners can signal quality and aid young firms to acquire legitimacy in a market (Baum *et al.*, 1991; Burton *et al.*, 2002; Higgins *et al.*, 2006; Stuart *et al.*, 2007). Scholars have also pointed to the benefits of other types of resources, such as managerial, financial and marketing resources, to which new ventures can gain access either by cooperating with incumbents (King *et al.*, 2003) or other potential network partners (Hite *et al.*, 2001). Hence, by maintaining a supportive relationship with a benevolent parent, spin-outs may combine the advantages of a new venture's entrepreneurial spirit and utilize the existing assets of a large corporation (Parhankangas *et al.*, 2003; Roberts, 1980). Thus,

Hypothesis 4b: The perceived parent's goodwill strengthens the positive relationship between exploration and the spin-out's sales growth.

3 Methods

3.1 Sample and procedure, and response validity

Our study was conducted in two phases. In the first phase, we adapted measures from the extant literature or, if unavailable, constructed measures based on Rositter's (2002) procedure. Our scales were pre-tested by six founders of technology spin-outs in three successive rounds. Their feedback was used to revise the items until the respondents perceived them as clear, meaningful, and relevant. Detailed information on the measures and their validity is presented in the Appendix.

In the second phase, we searched print media and the internet to create a comprehensive list of 800 potential technology spin-outs. Firms were selected on three sampling criteria: (1) At least one founder has worked for the parent directly before founding the spin-out. (2) There exists a transfer of technology from the parent to the spin-out on which the spin-out's business model is built. (3) The spin-out is not older than 15 years and headquartered in Germany. We called randomly selected firms to arrange interview appointments after reconfirming that our sampling criteria were met. Afterwards, trained interviewers conducted face-to-face interviews with the founders of spin-outs, who were willing to participate in this research project. This resulted in a number of 134 usable cases with complete performance data. On average the spin-outs were eight years old (mean = 7.73, sd = 3.13), had 28 full-time employees (mean = 27.90, sd = 94.38) and were active in the fields of electrical engineering (29.1%), instruments (13.4%), chemistry (13.4%), mechanical engineering (17.1%), and others (26.8%). Data on 105 parent firms was available. Parent firms were on average 34 years old (mean = 34.66, sd = 43.95) and had 12,627 employees (mean = 12,627.52, sd = 47790.21). The average geographical distance between parent and child firm was 170 km (mean = 170.53, sd = 213.02, median = 37.00 km).

Since our research required fine-grained information, the use of surveys seemed to be an appropriate approach. However, our research design can be subject to response bias which can systematically exclude firms from our sample. To evaluate the likelihood of a response bias, we compared responding and non-responding firms in terms of age, size (number of employees) and technological fields. This analysis indicated no significant differences and therefore suggested a low threat of non-response bias.

4 Measures

4.1 Dependent variables

Measuring performance in small, privately held firms is a challenging task as these firms are often reluctant to disclose financial information (Chatterji, 2009). We measured performance in terms of sales growth, which is one of the most frequently used measures for new venture growth

(Delmar, 1997), and reflects the acceptance of a new firm's offerings in the market. Sales growth indicates the perceived benefit of a new firm's products and services and thus also a firm's competitiveness (Brinckmann et al., 2011). Corporate growth has been suggested to be an important goal for new firms, in particular technology-based ones (Delmar et al., 2003). Among empirical growth measures, sales growth is the most preferred as it can be applied to different sorts of firms and contexts and is less sensitive to capital intensity (Delmar et al., 2003).

Following a row of other authors (e.g., Florin et al., 2003; Stam et al., 2008), we measure sales growth as the two year change of total sales after the year of market entry (as reported by the respondent). Previous research has shown that sales and venture performance measures are reliable when they are self-reported (Brush et al., 1992). As the use of relative measures may produce inflated growth figures for small firms, we controlled for sales in the year of market entry. To assess criterion validity, we examined correlations between sales growth and theoretically related measures. As expected, sales growth significantly correlated with employee growth ($r = .26, p < .001$), which supports the validity of our sales growth measure.

4.2 Independent variables

This study used existing scales from the literature where it was possible. As extant empirical studies on *exploration* and *exploitation* focused on large companies, a modification of the existing scales was necessary in order to account for the present paper's specific context of entrepreneurial firms. We decided to base our learning measures on scales developed by Jensen et al. (2006) as, according to our opinion, their scales are applicable to a wide range of technological contexts which are reflected in our cross-sectional sample. After assessing the construct validity of the original items regarding exploration and exploitation through exploratory factor analysis, we deleted three non-fitting items of each construct, resulting in four-item scales for exploration ($\alpha = .76$) and exploitation ($\alpha = .80$).

As we found no directly applicable measure of *market similarity*, we constructed our own measure. Respondents were asked to rate the extent to which the parent and the child firm served similar markets in the founding year (7-point Likert-scale; 1= 'very dissimilar', 7= 'very

similar'). To assess criterion validity, we investigated the correlation between this variable and the share of customers known prior to founding of the spin-out with respect to all spin-out customers in the founding year. As expected, both measures are significantly correlated ($r = .32$, $p < .001$). Our measure is rooted in Porter's (1980) work on competitive strategies. He suggested that interfirm competition increases when additional firms enter a market and that rivalry intensifies with market interdependencies among these firms, e.g. by competing for the same customers. *Parent goodwill* was measured with the following three reflective items: 'The management of the parent firm has appreciated the spin-out', 'In the phase of spinning-out, there has always been a benevolent posture', and 'The parent firm was open-minded about the idea of creating a spin-out'. The items were measured on a 7-point Likert-scale (1 = 'does not apply at all', 7 = 'applies fully and completely'). The measure is reliable at an alpha of 0.96. It includes principal notions of social capital theory, which relates the goodwill available to individuals or groups within networks to the benefits and resources they can receive from it (Adler *et al.*, 2002).

4.3 Control variables

To isolate the effect of our predictor variables, we considered the effect of several important control variables. As exploration and exploitation imply different uses of transferred knowledge, we had to control for whether the spin-out possesses similar traits compared to its parent. Therefore, we include three controls, *product similarity*, *technological similarity* and *product relatedness* in our model. The first two variables describe the extent to which the child firm's products and technologies were similar to those of the parent in the founding year (7-point Likert-scale; 1 = 'very dissimilar', 7 = 'very similar'). The third variable refers to the share of sales being generated through products or services based on developments at the parent.

We further controlled for the *number of employees* and *absolute sales*, as well as the *number of patents* held in the founding year. *Market serving knowledge* is likely to be important to direct learning into an effective direction and was included as reflective 3-item measure ($\alpha = .77$) based on Marvel *et al.* (2007). *Market growth* ($\alpha = .83$) refers to the extent to which the environment can support sustained growth and has been found to constitute an important

contingency factor in prior organizational learning studies (Bierly *et al.*, 2007; Cao *et al.*, 2009). This measure, which we based on items from Zahra (1993) assesses how favorable the respondent perceived industry conditions in the first years after founding. Using a 7-point Likert-scale (1= 'does not apply at all', 7 = 'applies fully and completely'), respondents were asked to evaluate how accurately each of the three item statements describe their respective industries. Finally, we controlled for five technological fields, including *electrical engineering*, *instruments*, *chemistry*, *mechanical engineering*, and others.

5 Results

Table 1 provides the descriptive statistics and correlation matrix. Table 2 reports the regression results. Computations of the condition index (CI) and variance inflation factor (VIF) reveal no serious multicollinearity problems ($CI < 3.46$, $VIF < 2.02$).

Our first hypothesis suggested a negative impact of exploitative learning on spin-out performance. Exploitation and sales growth are significantly negatively related in all estimated models. There is therefore strong support for Hypothesis 1 which implies that exploitation seems to hamper spin-out growth. Our second hypothesis proposed exploratory learning to have a positive effect on spin-out performance. As expected, exploration was significantly positively related to sales growth, providing support for Hypothesis 2.

Another set of hypotheses examined the moderating effect of the similarity of markets between spin-out and parent on spin-out learning outcomes. Hypothesis 3a proposed that market similarity negatively moderates the relationship between exploitation and sales growth. Indeed, our results provide strong support for such a relationship. Hypothesis 3b proposed an opposite effect in the case of exploration, i.e. exploration has a stronger positive impact on sales growth in case of exploratory learning. The interaction term of exploration and market similarity was statistically insignificant. Hypothesis 3b was therefore not supported. Figure 2 displays the interaction plot.

Table 1: Descriptive Statistics and Correlations^a

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Sales growth	1.54	0.68	-																
2. Exploitation	5.80	1.10	-0.22*	-															
3. Exploration	5.17	1.55	0.15	0.37**	-														
4. Product similarity	3.85	2.42	-0.15	-0.05	-0.21*	-													
5. Market similarity	4.31	2.32	-0.08	-0.16	-0.12	0.59**	-												
6. Technological similarity	4.54	2.21	-0.06	-0.11	-0.01	0.52**	0.48**	-											
7. Employees (founding year)	6.94	4.15	-0.07	-0.06	-0.02	0.03	0.05	0.09	-										
8. Sales (founding year)	382.18	627.80	-0.20*	0.03	-0.08	0.18*	0.20*	0.13	0.53**	-									
9. Market knowledge	5.62	1.16	0.19*	0.08	-0.05	0.11	0.19*	0.01	-0.05	0.01	-								
10. Patents at founding	0.46	1.59	-0.04	0.10	0.19*	-0.08	-0.07	-0.06	0.01	-0.05	0.04	-							
11. Product relatedness	32.04	40.42	-0.08	-0.04	-0.21*	0.30**	0.25**	0.11	0.11	0.30**	-0.01	0.04	-						
12. Market growth	4.77	1.40	0.20*	0.12	0.15	-0.04	-0.08	0.06	0.00	0.06	0.02	0.10	-0.06	-					
13. Parent goodwill	3.70	2.47	-0.01	-0.09	-0.06	-0.04	-0.05	0.05	0.00	-0.03	-0.02	0.03	0.17	-0.03	-				
14. Electronics	0.29	0.46	-0.05	0.02	-0.11	0.07	0.11	0.13	0.07	0.12	0.15	0.00	0.04	0.02	0.09	-			
15. Instruments	0.13	0.34	-0.12	0.06	0.05	-0.08	-0.16	-0.11	-0.17*	-0.09	0.02	-0.07	-0.19*	-0.03	-0.04	-0.25**	-		
16. Chemistry	0.13	0.34	0.07	-0.06	0.18*	-0.13	-0.14	-0.11	-0.11	-0.13	-0.12	0.17	-0.11	-0.11	-0.01	-0.25**	-0.16	-	
17. Mechanical engineering	0.17	0.38	0.17	-0.09	0.12	0.09	0.18*	0.08	0.09	0.08	-0.09	0.12	0.11	-0.01	-0.16	-0.29**	-0.18*	-0.18*	-

^a n = 134. Pearson product moment correlations are reported for pairs of continuous variables, Spearman rank correlations are reported for pairs of continuous and dichotomous variables.

^t p < .10

* p < .05

** p < .01

*** p < .001 (two-tailed test).

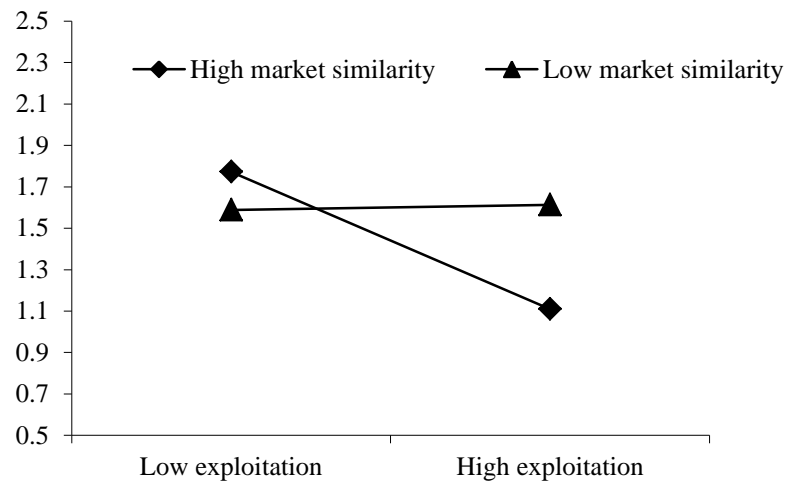
Table 2: Regression Results for Sales Growth^a

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
<i>Control variables</i>										
Product similarity	-0.05	0.03	-0.02	0.03	-0.02	0.03	-0.03	0.03	-0.03	0.03
Technological similarity	0.00	0.03	-0.01	0.03	0.00	0.03	-0.02	0.03	-0.01	0.03
Employees (founding year)	0.01	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02
Sales (founding year)	0.00*	0.00	0.00*	0.00	0.00 ^t	0.00	0.00 ^t	0.00	0.00 ^t	0.00
Market serving knowledge	0.15**	0.05	0.17**	0.05	0.16**	0.05	0.16**	0.05	0.15**	0.05
Patents at founding	-0.07*	0.04	-0.07 ^t	0.04	-0.07*	0.03	-0.07*	0.03	-0.08*	0.03
Product relatedness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Market growth	0.12**	0.04	0.11**	0.04	0.12**	0.04	0.10**	0.04	0.11**	0.04
Electronics	0.08	0.15	0.05	0.14	0.05	0.14	0.05	0.14	0.04	0.14
Instruments	-0.12	0.19	-0.19	0.18	-0.17	0.18	-0.33 ^t	0.19	-0.30 ^t	0.18
Chemistry	0.34 ^t	0.19	0.17	0.19	0.19	0.19	0.22	0.19	0.23	0.19
Mechanical engineering	0.50**	0.17	0.38*	0.18	0.36*	0.17	0.36*	0.17	0.34*	0.17
<i>Main effects</i>										
Exploitation			-0.20***	0.06	-0.16**	0.06	-0.18**	0.06	-0.15**	0.06
Exploration			0.09*	0.04	0.10*	0.04	0.11**	0.04	0.11**	0.04
Market similarity			-0.03	0.03	-0.03	0.03	-0.04	0.03	-0.03	0.03
Parent goodwill			0.00	0.02	-0.01	0.02	0.00	0.02	-0.01	0.02
<i>Interaction effects</i>										
Exploitation x Market similarity					-0.07**	0.02			-0.07**	0.02
Exploration x Market similarity					0.01	0.02			0.01	0.02
Exploitation x Parent goodwill							-0.03	0.02	-0.03	0.02
Exploration x Parent goodwill							0.05**	0.02	0.05**	0.02
F-value	3.09***		3.39**		3.80**		3.61*		4.07*	
R ²	0.23		0.32		0.37		0.36		0.42	
adj. R ²	0.16		0.22		0.27		0.26		0.32	

^a n = 134; unstandardized coefficients.

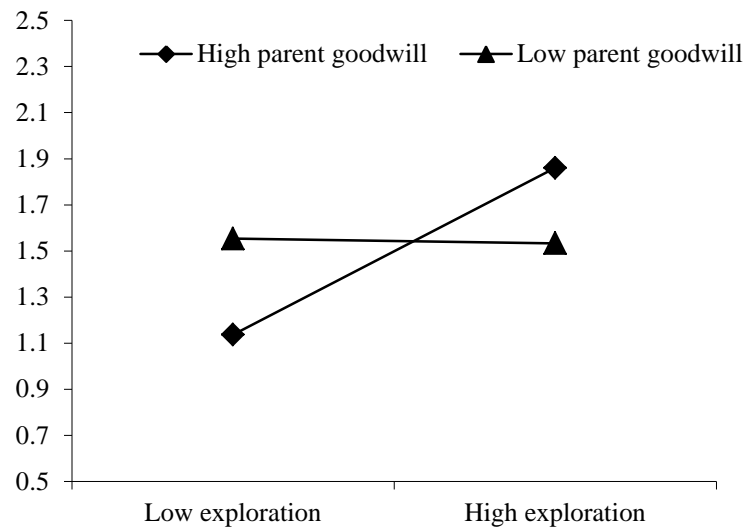
^t p < .10; * p < .05; ** p < .01; *** p < .001 (two-tailed test).

Figure 2: Moderating Effect of Market Similarity on the Relationship between Exploitation and Sales Growth



Our last set of hypotheses illuminated the direct support from the parent as a contingency factor of spin-out learning. According to Hypothesis 4a, the negative impact of exploitation on sales growth is stronger in case of benevolent parents. The interaction term of exploitation and parent goodwill was statistically not significant. Therefore, Hypothesis 4a was not supported. As mentioned in Hypothesis 4b, we expected that the performance consequences of exploration on sales growth are stronger for spin-outs being endowed with high parent goodwill. Indeed, parent goodwill significantly and positively moderated the relationship between exploration and sales growth. Figure 3 displays the interaction plot.

Figure 3: Moderating Effect of Parent Goodwill on the Relationship between Exploration and Sales Growth



6 Discussion and implications

As has been noted in the recent past, we know little about how exploration and exploitation unfold in contexts being different from those of large organizations (Harrison *et al.*, 2005; Politis, 2005). This study used knowledge-based and learning views of the firm to examine how organizational learning unfolds in the entrepreneurial context of corporate spin-outs. We integrated ideas of knowledge inheritance to take into account the idiosyncratic starting conditions of founders with past experiences in the same industry. Although extant work suggests that knowledge - in the form of skills and routines - provides spin-out founders with a major advantage over other types of industry entrants, researchers know little about how different uses of this knowledge legacy impact spin-out performance. By providing evidence of the systematic links between knowledge transfer, organizational learning, and spin-out performance, our research redirects attention to examine the important dichotomy between exploitation and exploration activities in the entrepreneurial context of spin-outs as a potentially fruitful theoretical lens through which to study this important phenomenon. We have also addressed the

particular advantages and threats of a spin-out's knowledge legacy, which can both constrain or empower learning. In prior research, the threat of overreliance and the learning advantage being inherent in a spin-out's knowledge legacy have both been noted. Our study, however, went further than extant research as it shows that the potentially adverse consequences of exploitation and exploration activities on spin-out growth can among other factors explain why some spin-outs seem to be more able to leverage their knowledge legacy than others. Our theoretical framework proposed that spin-outs pursuing exploitation activities are not able to reap the potential benefits of their knowledge legacy (Hypothesis 1). Spin-outs pursuing an exploration strategy, in turn, use their knowledge legacy as a stepping stone for the development of new, differentiating knowledge, which results in a competitive advantage and growth benefits (Hypothesis 2). Our findings confirm the adverse effects of exploitation and exploration on spin-out growth. Hence, we add to the extant literature on organizational learning as we show that exploration and exploitation impact on the performance of new ventures differently. While prior work has speculated that resource constraints may impel new ventures to focus on either exploitation or exploration, our study may be among the first to empirically substantiate adverse performance outcomes of both modes of organizational learning. Furthermore, we contribute to the ongoing debate surrounding the question under which conditions spin-outs suffer from their past experiences or benefit from them. Our study indicates that the way how spin-outs build on their knowledge legacy, either by exploitation or by exploration, determines whether past knowledge tends to constrain or empower spin-out learning and growth.

A second important insight is that spin-out learning is contingent on the degree of market competition with the parent, but only in case of exploitation (Hypothesis 3a). Our results indicate that a high overlap of markets between spin-out and parent firm increases the negative performance outcome of exploitation. This is consistent with our argument that spin-outs that do not strategically differentiate themselves from incumbents, in particular from their parents, suffer from efficiency disadvantages. Surprisingly, market similarity did not strengthen the positive effect of exploration on spin-out performance, as postulated in Hypothesis 3b. Rather, exploration seems to be unaffected by the degree of market overlap with the parent. One possible explanation

is that spin-outs pursuing an exploration strategy are not dependent on their founder's customer contacts as their offerings attract customers in the parent markets as much as in other markets.

Another notable finding is that spin-outs in our sample pursuing an exploration strategy could benefit from a supportive relationship to their parents. As suggested in Hypothesis 4b, a spin-out's exploration strategy may be negatively affected by its liabilities of newness and smallness. Similarly, potential network partners may be skeptical about the spin-out's reliability. Maintaining a supportive relationship with its parent seems to help spin-outs overcome these obstacles and pursue their exploration strategy more effectively. Yet, the insignificant moderation effect of parent goodwill for spin-outs pursuing exploitation (Hypothesis 4a) indicates that parent goodwill did not increase the negative outcome of exploitation. These findings add to the literature of parent-child relationships by showing that maintaining a close relationship to the parent is particularly beneficial for a spin-out's exploration activities.

7 Limitations and implications for future research

Our study's limitations also provide exciting avenues for future research. First, taking into account that our sample consists of spin-outs and parent firms both being headquartered in Germany, care should be taken about overgeneralizing the findings from a single country. Future research could investigate the extent to which our framework is applicable in other country settings. Secondly, given the purpose of our research, our measures of exploitation and exploration are built on organizational learning theory and were selected to be applicable in a wide range of industry settings. In order to do so, we drew on existing scales and adapted them to our context. Consequently, our measures of exploration and exploitation are created to reflect the principal direction to which spin-out learning is headed in the early years of its existence. We did, however, not possess information about the degree to which spin-outs pursuing exploration activities created substitutes of their parent's products. This missing information might explain our insignificant moderation effect of market similarity in case of exploration. Future research could investigate to what extent exploration leading to substitutions of parent products differs from spin-outs creating complementary products.

Third, we argued that spin-outs with benevolent parents are more effective in their exploration activities. We did, however, not investigate whether different kinds of support, e.g., financial benefits, material resources or recommendations are more supportive than others. Future research could investigate this topic in more detail.

The overall theoretical implication of our study is that different modes of using a spin-out's knowledge legacy lead to different performance outcomes, and that spin-out learning is contingent on conditions shaped by their parent firms. Spin-outs generally suffer from pursuing an exploitation strategy, especially in case of a high degree of market overlap with their parents. Exploration, in turn, proves to be a more effective way of using a spin-out's knowledge legacy, especially if the spin-out has a benevolent parent. Hence, spin-out founders have to be aware of the fact that their experience can be advantageous but also constraining, depending on the chosen learning mode. Furthermore, spin-out founders have to consider under which circumstances their parent enhances or constrains spin-out learning. While this study contributed to our understanding of the consequences and contingencies of organizational learning in the entrepreneurial context of corporate spin-outs, we hope that future research will further investigate this exciting topic.

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Appendix

Table 3: Study Measures^a

	Factor loading	t-Value
Parent's goodwill ($\alpha = 0.96$, CR = 0.96, AVE = 0.89)		
(1) The management of the parent firm has appreciated the spin-out.	0.95	14.55
(2) In the phase of spinning-out, there was always a benevolent posture.	0.95	14.56
(3) The parent firm was open-minded about the idea of creating a spin-out.	0.95	14.68
Exploitation ($\alpha = 0.78$, CR = 0.81, AVE = 0.52)		
(1) We frequently refined the provision of existing products and services.	0.69	8.38
(2) We regularly implemented small adaption to existing products and services.	0.72	8.81
(3) We introduced improved, but existing products and services for our local market.	0.61	7.08
(4) We improved our provision's efficiency of products and services.	0.84	10.64
Exploration ($\alpha = 0.76$, CR = 0.79, AVE = 0.5)		
(1) We invented new products and services.	0.58	6.7
(2) We experimented with new products and services that were completely new to our company.	0.73	8.95
(3) We commercialized products and services that were completely new to our company.	0.86	10.91
(4) We frequently utilized new opportunities in new markets.	0.62	7.22
Knowledge about ways to serve markets ($\alpha = 0.77$, CR = 0.79, AVE = 0.56)		
(1) Hands-on experiences in creating products/services similar to our forthcoming business	0.83	9.49
(2) Knowledge of ways to produce products/services similar to that of our forthcoming product/service.	0.84	9.55
(3) Knowledge of products/services similar to that of our forthcoming business.	0.54	6.18
Market growth ($\alpha = 0.83$, CR = 0.86, AVE = 0.67)		
(1) Demand increased substantially in our industry.	0.57	6.92
(2) There was abundant opportunity for growth in our industry.	0.99	13.68
(3) In our industry, there were many promising chances for future growth.	0.84	10.83

^a α = Cronbach's Alpha; CR = Composite reliability; AVE = Average variance extracted. Model fit: $\chi^2/df = 1.33$; AGFI = 0.85; CFI = 0.89; IFI = 0.97; RMSEA = 0.043; Fornell-Larcker-Criterion confirmed.