

Walter, Sascha; Heinrichs, Simon; Walter, Achim

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HOSTILE PARENT FIRMS AND CHILD FIRM PERFORMANCE

Sascha Walter, Simon Heinrichs und Achim Walter

Abstract

We investigated how and when parent hostility (degree to which a parent firm disapproves the spawning of an own spin-out) affects spin-out performance and how spin-outs can effectively react to it. Analyses of 144 technology spin-outs support our arguments that spin-outs suffer from hostility. Hostility consequences are, however, less severe if market turbulence is high or if the spin-out pursues effective network development.

1 Introduction

Spin-outs (entrepreneurial ventures by ex-employees) are legion in many high-tech industries and well-known for being strong innovators (Agarwal, Echambadi, Franco, & Sarkar, 2004; Bhide, 1994). Evidence suggests that more favorable starting conditions allow spin-outs to outperform other new entrants (Agarwal et al., 2004; Andersson, Baltzopoulos, & Lööf, 2012; Eriksson & Moritz Kuhn, 2006; Lindholm Dahlstrand, 1997; Wennberg, Wiklund, & Wright, 2011). From a network and social capital perspective, such performance differentials reflect variance in the quality and quantity of inter-organizational relations. Many spin-outs are, indeed, said to be “spawned with a silver spoon” (Chatterji, 2009) when close relationships to the parent firm provide them with benefits that other start-ups lack. For instance, these ties allow the spin-out to transfer and use parent knowledge (Agarwal et al., 2004; Sapienza, Parhankangas, & Autio, 2004), gain credibility required to mobilize network resources (Starr & Macmillan, 1990; Stuart & Sorenson, 2007), and establish ties to new partners (Hite & Hesterly, 2001). Given that the parent firm can serve as a powerful ally in the fight against liabilities of newness and smallness (Baum & Oliver, 1991), a growing literature has illuminated how relations to the parent nurture spin-out performance (Agarwal et al., 2004; Chatterji, 2009; Wennberg et al., 2011).

However, many of the granted benefits depend on the parents’ benevolence and not all parents appreciate spin-outs. Often spin-outs are perceived as predators that steal ideas and innovations (Klepper & Sleeper, 2005). Another illustration of disapproval is the name “dirty dozen” given for founders of the first IBM spin-out (McKendrick, Wade, & Jaffee, 2009). Parent hostility, referred to as the degree to which an incumbent firm disapproves the spawning of an own spin-out, can also manifest in anti-spinout policies, such as lawsuits over intellectual property (Klepper & Sleeper, 2005). Since relatively little is known about how parent hostility impacts spin-outs, we attempted to examine some fundamental questions that are key to develop a theory-based understanding of parent-child firm relations: How does parent hostility influence spin-out performance? How can spin-outs effectively respond to hostility? Under which environmental conditions is hostility likely to have less severe consequences?

Our study builds on prior work that has studied how links to the parent firm influence spin-out development. For instance, there is evidence that knowledge legacy from the parent

enables spin-outs to perform better than de novo start-ups (Agarwal et al., 2004; Chatterji, 2009; Klepper & Sleeper, 2005; Wennberg et al., 2011). According to other research, excessive knowledge overlaps with the parent hinder spin-out growth (Clarysse, Wright, & Van de Velde, 2011; Sapienza et al., 2004). Prior employment affiliations were also found to affect product-market strategies (Boeker, 1997; Klepper & Sleeper, 2005) and survival of spin-outs (Phillips, 2002). However, despite a growing activity in the research field, a few critical gaps remain in our understanding of parent-child relationships (Chatterji, 2009) and of how and when a parent firm's attitude toward a spin-out is likely to impact the latter.

First, although many scholars expect a negative parent reaction to spin-outs (e.g., Klepper & Sleeper, 2005; Lindholm, 1994; McKendrick et al., 2009) and disagreement between founders and parent is seen as an antecedent of spin-out formation (Klepper & Thompson, 2010; Thompson & Chen, 2011), prior research has primarily looked at benevolent or neutral spin-off parents (Chesbrough, 2003, Parhankangas & Arenius, 2003, Woo, Willard, & Daellenbach, 1992), but neglected parent hostility towards spin-outs.¹ This is surprising given that hostility can cause major problems for spin-outs, such as time and money consuming lawsuits (Klepper & Sleeper, 2005). To be successful, founders have to know when hostility is more dangerous and how to defend against it. Second, extant studies have adopted resource- or knowledge-based perspectives and focused on the parent-child dyad, with little theorizing about its wider network effects. The parent's influence on spin-out performance may flow not only directly via the dyad (e.g., by providing limited or no support) but also more indirectly via the network (e.g., by hindering the spin-out from establishing third-party ties). Thus, prior work might lead to underestimate the role of the parent firm, whereas studying hostility from a network perspective promises new, important insights. Third, the wider literature on entrepreneurial networks has long acknowledged the pivotal role of networks in the venturing process (e.g., Hoang & Antoncic, 2003). Yet, it has paid insufficient attention to a special tie, the link to the parent firm, and how this link affects the ease or difficulty of establishing new ties, and thus spin-out performance. Hostility may, in part, lead to an exclusion of newcomers from an established

¹ The terminology related to start-ups is often confusing. Following Agarwal et al. (2004), we define spin-offs as ventures *intentionally* created by an incumbent firm, whereas spin-outs are created by ex-employees *without intention* of the incumbent. Both organizational forms differ in start-up rationales and equity involvement of the parent (King, Covin, & Hegarty, 2003; Hellmann, 2007; Parhankangas & Arenius, 2003; Semadeni & Cannella, 2011).

network – also an under-researched aspect (Stuart & Sorenson, 2007). Finally, scholars have investigated how incumbents defend against market entry by start-ups (e.g., Aghion & Bolton, 1987; Gallini, 1984; Seamans, 2012; Simon, 2005). However, our knowledge of when and how parent hostility yields defensive reactions that ultimately hurt spin-out performance is, to date, still limited.

In addressing the above gaps, our study examines how and when parent hostility affects spin-out performance and how spin-outs can effectively react to it. Drawing on network and social capital literatures, we argue that parent hostility per se reduces child performance as it has negative effects on the dyadic level (e.g., no or limited support from parent) and/or the network level (e.g., no legitimization by parent, negative reputational spillovers). We also suggest that spin-outs can avoid dysfunctional behaviors of parents by emphasizing two strategies: one, focusing on other product-market combinations than the parent (strategic differentiation), and establishing ties to industry actors outside the parents' immediate network (network development). We finally argue that in turbulent environments where market and technology dynamics are high, hostility effects are less severe. These conditions, as we theorize, lead to more volatile industry networks that enable a spin-out to more easily establish critical ties despite parent hostility.

Using original survey data from 144 technology-based spin-outs provides empirical support for most of our arguments. To foreshadow our results, hostility hampers spin-out performance in terms of increasing time to breakeven. Moreover, creating links to new customers, suppliers, and competitors helps to mitigate the negative effect of hostility. Spin-outs in highly turbulent markets suffer less from hostility. Our article thus contributes to the literature on parent-child relations by demonstrating the critical role of hostility, to the literature on entrepreneurial networks by introducing the notion of “badwill” as opposed to goodwill and by theorizing about its effects, and to the organizational ecology literature by pointing to the possibility of intergenerational conflicts and by adding parent hostility as an additional explanation for variation in spin-out survival rates.

2 Theoretical development

The extant literature has provided three broad explanations for why spin-outs are formed (Klepper, 2001; Klepper & Thompson, 2010): One, an employee makes a valuable discovery at work. Although the incumbent firm would be interested in pursuing this opportunity, information asymmetries and inappropriate incentive structures lead the employee not to disclose, but to exploit it herself by creating a spin-out (Anton & Yao, 1995; Hellmann, 2007; Wiggins, 1995). Two, the incumbent has knowledge about the discovery but is uninterested because the firm underestimates the discovery's value, lacks the capabilities to exploit, and/or is concerned about cannibalizing or losing focus on the core business (Christensen, 1993; Henderson & Clark, 1990; Klepper & Sleeper, 2005). Third, the employee absorbs critical knowledge from the incumbent which enables her to create a new venture in the same industry (Agarwal et al., 2004; Franco & Filson, 2006).

Once a spin-out has been announced or registered, the parent firm will respond in one of many ways. The literature has pointed to several possible reactions, ranging from more friendly to more hostile. Some firms react more friendly by encouraging and actively supporting spin-outs (Lindholm Dahlstrand, 1997). This allows them, as Agarwal et al. (2010) suggest, to benefit via two mechanisms: an agglomeration and legitimacy effect which can stimulate demand in the industry and thus permit simultaneous growth of both firms, and a capability enhancement effect that occurs when the spin-out occupies a complementary position and provides a learning opportunity for the parent (Parhankangas & Arenius, 2003). Other firms adopt a more neutral position and tolerate spin-outs that initially do not compromise the viability of their markets. Spin-outs in a study by Klepper and Sleeper (2005), for instance, were not perceived as a competitive threat, possibly due to their smallness or efforts to differentiate themselves.

Finally, many parent firms tend to be skeptical about the spin-out or even take actions against it (Garvin, 1983).² This is, in part, because the spin-out process is conflict-prone. Initial tension between former employee and employer can lead the parent to disapprove the spin-out. Similarly, some scholars view employee frustration as a key motivation for starting a venture;

² Often ethical issues are involved in spin-outs and it is in many cases obvious why parent firms are or become hostile. However, such ethical issues are outside the boundaries of our study.

frustration with a rigid bureaucracy that discourages the pursuit of opportunities and penalizes entrepreneurial minded employees for deviating from assigned tasks (Chatterji, 2009; Garvin, 1983; Hellmann, 2007; Klepper, 2001). Other scholars proposed internal disputes, mismanagement, turmoil and disagreement among members of the management team as another important impetus (Cooper, 1985; Klepper & Thompson, 2010; Thompson & Chen, 2011). In addition, many spin-outs result in a loss of critical firm-specific skills, routines, and resources for the parents or disrupt ongoing innovation processes and general social organization (Phillips, 2002; McKendrick et al., 2009; Wezel, Cattani, & Pennings, 2006). Concerns of resource misappropriation can arise. As Klepper and Sleeper (2005: 1305) note, “Many parents perceive spinoffs as predators that steal their ideas and innovations.” In response to the perceived threat, some firms—Intel is a very popular example (Jackson, 1998: 211-338)—systematically attempt to prevent or handicap spin-outs through non-compete covenants, litigation related to intellectual property rights, rewards for revealing inventions, or compensation packages (Campbell, Ganco, Franco, & Agarwal, 2012; Thompson & Chen, 2011).

Together, the literature suggests great variance in parents’ reactions towards spin-outs. Here we focus on parent hostility, defined as the degree to which an incumbent firm disapproves the spawning of an own spin-out. This understanding resembles the cognitive phenomenon of hostility in psychology where hostility comprises “negative beliefs about and attitudes toward others” (Miller, Smith, Turner, Guijarro, & Hallet, 1996: 323). In contrast, other scholars have referred to actual behavior rather than attitudes when defining hostility as “overt actions by one party toward another that the target perceives as malevolent, unfavorable, or even warlike toward himself or herself” (Doucet, 2004: 761). Similarly, in finance, hostility occurs, when a target firm aggressively rejects a public takeover offer (Schwert, 2000: 2600). As we propose below, viewing hostility as an attitude rather than behavior is consistent with the wider literature on social capital and networks.

Start-ups in general have to overcome resource constraints by accumulating supportive resources from existing or new ties (Birley, 1985; Hallen, 2008; Hite & Hesterly, 2001; Hoang & Antoncic, 2003; Hansen, 1995; Slotte-Kock & Coviello, 2010; Starr & Macmillan, 1990; Stuart & Sorenson, 2007). A central tenet of the network and social capital perspective is that the success of resource mobilization critically depends on the founders’ social capital (Florin,

Lubatkin, & Schulze, 2003; Stam & Elfring, 2008). Adler & Kwon (2002: 23) understand social capital broadly as goodwill available to individuals and groups. In their conception, social capital emerges from the content and structure of an actor's social network and its effects emanate from the information, influence, and solidarity it makes available to the actor. The term goodwill, in turn, is often used synonymously with benevolence and includes attributes such as sympathy, trust, and forgiveness (Adler, 2001; Dore, 1983; Williamson, 1985). In contrast, hostility is typically associated with malevolence (Doucet, 2004; Miller et al., 1996) and may come along with antipathy, distrust, and lack of forgiveness. These features of hostility can, in part, reflect lack of or even "negative" goodwill ("badwill"): While spin-outs from friendly parents can convert the social capital in this relation into benefits, such as access to knowledge or capital (Agarwal et al., 2004; Hallen, 2008), these benefits are not only denied to spin-outs from hostile parents (indicating lack of social capital), but the parent is also likely to sanction the spin-out and disadvantages accrue (indicating "negative" social capital). This "badwill effect" can have critical implications for a spin-out's success in effectively recruiting resources from existing or new ties.

2.1 Performance impacts of parent hostility

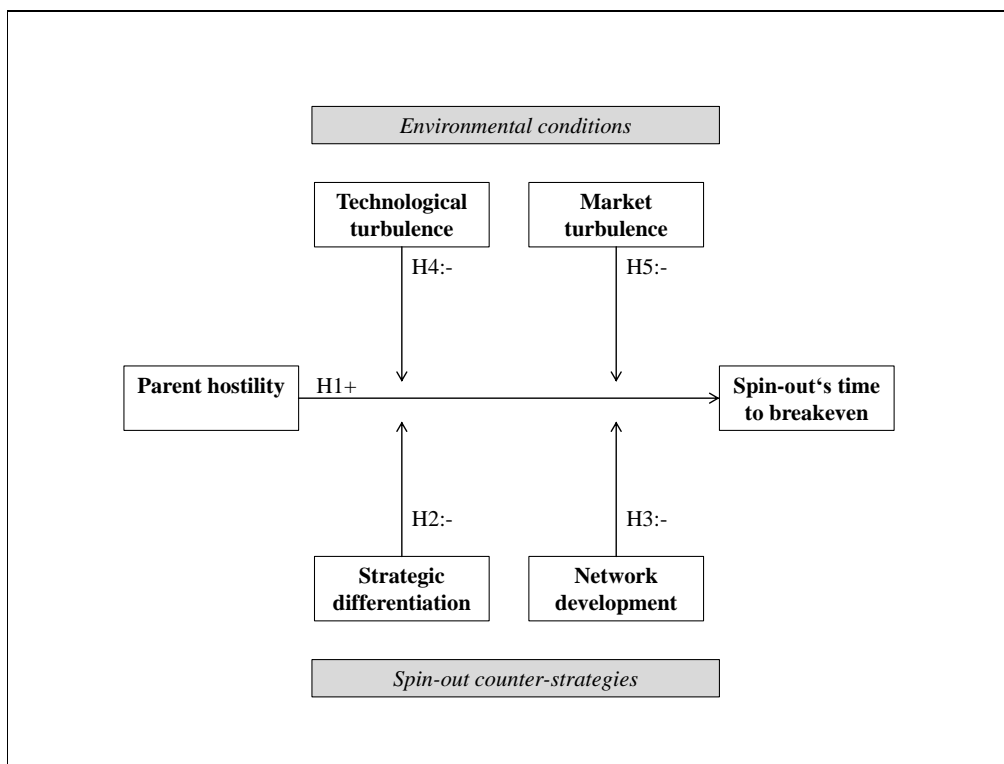
We first consider the direct effects of parent hostility and argue that it is negatively related to spin-out performance (defined as time to breakeven, as explained in the methods section). An emerging start-up's network is, as research on network evolution indicates (Hite & Hesterly, 2001; Larson & Starr, 1993; Vissa, 2011), initially dominated by preexisting social ties to family, friends, or prior business contacts. The founders' endowments with social capital make these actors more willing to provide resources when more distant ties are unwilling. For spin-outs in particular, leveraging on ties to the parent constitutes – absent hostility – an attractive option for several reasons.³ First, a progeny is likely to replicate some of the parent's characteristics (Phillips, 2002). The homophily thesis holds that actors tend to associate or bond with similar (homophilous) others and a spin-out will, thus, prefer to transact with the parent (Stuart & Sorenson, 2007). Second, inherent social capital can lower transaction costs, allowing the spin-out to acquire resources from the parent below market prices or otherwise unavailable resources

³ Some studies also point to substantial risks of overembedding with the parent (Clarysse et al., 2011; Sapienza et al., 2004; Semadeni & Cannella, 2011).

(Lindholm, 1994:52; Parhankangas & Arenius, 2003). Third, spin-outs were found to transfer substantial knowledge from the parent (Agarwal et al., 2004) which creates overlaps in the firms' knowledge bases. Knowledge overlaps facilitate transfers of further knowledge (Sapienza et al., 2004), due to which the parent firm can serve as an effective partner in the offspring's ongoing R&D efforts. Finally, affiliations to prominent parents serve as signals of quality and reduce the uncertainty of potential investors, thereby enabling the spin-out to more effectively access capital and other critical resources (Chatterji, 2009; Higgins & Gulati, 2003; Stuart, Hoang, & Hybels, 1999).

Prior work suggests that exchanges with the parent equip spin-outs with distinct performance advantages. In a study by Phillips (2002), resource transfers from the parent increased the survival chances of spin-outs. According to other research, knowledge transfers enable spin-outs to perform better than other start-ups (Agarwal et al., 2004; Eriksson & Moritz Kuhn, 2006; Wennberg et al., 2011). However, as argued in detail above, these privileges may depend on the benevolence or at least indifference of the parent, whereas hostile parents are likely to deny them and/or handicap the spin-out (Lindholm, 1994:165). Transactions with hostile parents may be more costly or impossible, impeding timely and cost-efficient resource acquisition. In particular, parent knowledge is often protected and hostility may, thus, complicate or hinder its transfer to the spin-out. For instance, the parent can take legal actions to prevent the spin-out from using its intellectual property (Klepper & Sleeper, 2005). Our own case studies indicate that such lawsuits, even if unsuccessful, significantly delay spin-out development. Given the resource disadvantages caused by hostility, spin-outs from hostile parents should perform worse than other spin-outs. In other words, at average values of the belowmentioned moderators, malevolent attitudes of the parent may turn into actions with adverse effects on spin-out performance. This leads to our first hypothesis, which is, along with the rest of the theoretical model, depicted in Figure 1.

Hypothesis 1: The higher the parent hostility, the longer the spin-out's time to breakeven.

Figure 1: Our conceptual model

Our above arguments point to the threats of hostility, but how can spin-outs mitigate its consequences and when is hostility a more serious problem? In addressing these questions, we start with the straightforward notion that the consequences of hostility may depend on the parent's *interest* and *ability* to take actions against the spin-out. In other words, hostility may induce more serious problems for the spin-out, the more the parent is motivated and able to act upon this attitude. This leads to several possible counter-strategies: The spin-out can reduce the parent's interest by not economically hurting the parent, for instance by pursuing other product-market strategies (*strategic differentiation*). It can lower the ability by connecting to sections of the industry network outside the parent's reach (*network development*).⁴ Regarding environmental conditions, interest and ability should be lower in turbulent environments (*technological and market turbulence*). Here the value of social capital deteriorates more quickly and industry networks are more volatile (Adler & Kwon, 2002), which increases benefits from

⁴ Although often considered standard strategies for the development of de novo start-ups and spin-offs (Fan, 2010), spin-outs tend to vary in their usage of strategic differentiation and network development. Reasons include, for instance, organizational inertia (Cooper, 1985; Phillips, 2002) or economic rationales (Klepper & Sleeper, 2005).

cooperating with the progeny (McKendrick et al., 2009) and debilitates the parent's sanctions via existing ties. We argue below that these influences alleviate hostility effects on spin-out performance or, put differently, weaken the relationship between hostility and a spin-out's time to breakeven.

2.2 Strategic differentiation

The extant literature indicates that spin-outs are no perfect clones, but tend to initially resemble their parents in many ways. The parents' "blueprints" usually transfer through the experiences of the founders from prior employment in their parent organizations. Founders are constrained by their organizational experience, and, therefore, the new organization is constrained by the characteristics of the founders' previous organization (Phillips, 2002). Many spin-outs not only locate in close proximity to the parent firm, but also inherit its product and market focus (Cooper, 1985; Franco & Filson, 2006). 83% of the spin-outs in a study by Klepper and Sleeper (2005) initially produced lasers that their parents had previously produced. Staying in the same business is an attractive option as the new firm can leverage on transferred knowledge and prior business contacts, while drawing on a proven business concept. We, however, suggest for two reasons that in the face of hostility, the child firm has to reduce overlaps in the product-market combinations with the parent in order to limit damages.

First, strategic differentiation defuses parent-child competition, thereby lowering the parent's interest in acting upon hostility. Serving other markets and/or similar markets with differentiated products does not seriously compromise the parent's rent streams. Then, even a hostile parent is less likely to view the progeny as a threat and thus less likely to invest valuable resources and time to fight it, which allows the spin-out to grow unharmed. This is in line with Klepper and Sleeper (2005) who regard later efforts to differentiate as one explanation why so many spin-outs in their sample could initially pursue the same product-market strategy as their parents. Moreover, spin-outs can serve as customers or subcontractors to the parent (Lindholm Dahlstrand, 1997), which provides access to critical resources or promotes early sales growth. A hostile parent is more likely to consider this option, if the benefits of economic exchanges outweigh the costs. The costs grow with extent of parent-child competition because cooperation

would then mean to strengthen a competitor. Thus, a differentiating spin-out increases the chances of beneficial cooperation with the parent by decreasing interfirm competition.

Second, strategic differentiation confines a parent's ability to handicap unwelcome offspring. Undifferentiated spin-outs directly compete with more experienced, more established and often larger parent organizations that tend to possess the resources required to retaliate through various actions (Thompson & Chen, 2011). Examples include starting price wars or wooing away key customers. Illustrating the disadvantageous market position of entrants, Sapienza et al. (2004) demonstrate that high overlaps of production and technological knowledge with that of the parent (which impedes differentiation on the market), handicapped the sales growth of spin-outs. However, retaliation measures are more costly or impossible in markets currently not served by a firm. Put differently, even if the management of the parent firm wanted to take actions against the progeny, the involved costs are likely to exceed a level that is justifiable to firm owners. Thus,

Hypothesis 2: Strategic differentiation weakens the positive relationship between parent hostility and the spin-out's time to breakeven.

2.3 Network development

Mobilizing resources via networks is a critical task for resource-constrained new ventures (Baum, Locke, & Smith, 2001; Lechner, Dowling, & Welppe, 2006). At the time of founding, many spin-outs benefit from established industry-specific networks and social capital endowments that the founders bring in from their previous employment (Agarwal et al., 2004; Higgins & Gulati, 2003; Yli-Renko, Autio, & Sapienza, 2001). Since many spin-outs are created in the same geographic location as the parent (Woo et al., 1992), the networks of both firms often initially overlap (Agarwal et al., 2004; Higgins & Gulati, 2003; Yli-Renko et al., 2001). We have argued above (p. 8), that, absent hostility, the parent firm and its partners constitute attractive exchange partners for a spin-out. This is consistent with predictions of social network theory that organizations show a strong tendency toward forming ties with the same organizations repeatedly or with their

partner's partners (Gulati, 1995; Hallen, 2008; Powell, White, Koput, & Owen-Smith, 2005). Indeed, spin-outs are said to gain access to important social and financial networks of the parent (Chatterji, 2009) or establish legitimacy through associations with prestigious partners, including the parent (Higgins & Gulati, 2003; Stuart et al., 1999).

However, hostility may impede mobilizing resources not only from the parent, but also from industry actors connected to the parent. The parent can use social capital advantages to partly exclude the progeny from the parent's immediate network (Stuart & Sorenson, 2007). Network actors may provide resources based on social capital considerations. Since the parent may exceed the child in industry-specific social capital and is not subject to the liability of newness and smallness, the actors are likely to prefer exchanges with the parent to exchanges with the child. When choosing among potential partners able to provide similar resources, organizations tend to select the partner for whom there is less uncertainty about whether this tie will produce the desired benefits (Eisenhardt & Schoonhoven, 1996; Podolny, 1994). In addition, prior research indicates that established organizations prefer to form ties with their partner's partners (Gulati, 1995; Sorenson and Stuart, 2001). This is because a current and trusted partner can provide first-hand information on the reliability, integrity and business acumen of a potential partner, thereby mitigating information asymmetry problems of the established organization (Hallen, 2008). A hostile parent is likely to disseminate negative information on a spin-out which, in turn, makes it impossible or more costly for the spin-out to acquire material resources from the parent's direct ties or link to prestigious partners. In this way, hostility can cutoff a spin-out from reputational spillovers that are critical to gain legitimacy and social status, thus access to financial and social capital within the industry (Higgins & Gulati, 2003; Shane & Cable, 2002; Stuart et al., 1999).

One counter-strategy against these "badwill effects" is to enter the industry network in sections remote to the parent and, thus, to partners not directly linked to the parent. We refer to this approach as "network development", this is forming ties to previously unconnected partners, including suppliers, customers, and competitors, post founding. While the literature on entrepreneurial network evolution suggests that network adaptation, in general, is a critical success factor for new ventures (Lechner et al., 2006; De Carolis, Litzky, & Eddleston, 2009; Raz & Gloor, 2007; Yli-Renko et al., 2001) and, over time, entrepreneurial networks become less

path dependent and more intentionally managed, new ventures vary in their tendency to develop their networks (Hoang & Antoncic, 2003; Hite & Hesterly, 2001; Walter, Auer, & Ritter, 2006). Network development becomes, as we suggest, particularly critical in the face of hostility.

Network development can defuse the insidious consequences of hostility for several reasons. First, a lack of social capital in distant network regions reduces the parent's ability to sanction and block the spin-out. If potential resource providers do not have to compare levels of social capital and select between working with the child or parent, barriers to mobilizing critical resources are lower. Second, given the limited prior contact, potential partners in these network sections are less likely to request parent information on the spin-out or put the same weight on this information as from other market actors. From our own experience, some spin-outs even cover their tracks, e.g. by keeping the firm's origin secret, in order to avoid contacts between potential partners and the parent (Hoang & Antoncic, 2003). In this way, hostility is less of a hindrance in acquiring new, possibly prominent partners. Third, connecting to competitors of the parent may be easier for the spin-out. These firms might be interested in tapping into previously inaccessible parent knowledge transferred by the spin-out (Agarwal et al., 2004; Sapienza et al., 2004). Finally, prior work on network inertia suggests that established rather than new organizations develop a resistance to or have difficulties in dissolving existing network ties and forming new ones (Christensen, 1993; Kim, Hongseok, & Swaminathan, 2006). The parent firm, thus, is less likely to enter remote network sections, making it a "safe place" to enter the industry network. For the above reasons, linking to network sections outside the parent's immediate reach mitigates a hostility handicap as it reduces the parent's ability to take effective actions. Then tie formation depends more on the founders' strategies to encourage and accelerate tie formation with sought partners (Hallen & Eisenhardt, 2012). Thus,

Hypothesis 3: Network development weakens the positive relationship between parent hostility and the spin-out's time to breakeven.

2.4 Technological turbulence

Industry environments vary in their degree of turbulence or dynamism. Turbulent environments have been associated with high levels of unpredictable change, quickly eroding competitive advantage, low market entry barriers, and volatile competitive landscapes. In contrast, environments low in turbulence are characterized by less uncertainty and relatively stable competitive landscapes (Calantone, Garcia, & Dröge, 2003; Ganco & Agarwal, 2009). In their influential work, Jaworski & Kohli (1993) have distinguished technological and market turbulence. Technological turbulence taps the rate of technological change, whereas market turbulence refers to the rate of change in the composition of customers and their preferences (Jaworski & Kohli, 1993:57). In keeping with this distinction, we argue that high technological and market turbulence create more favorable conditions for spin-outs to embed into the existing industry network and, thus, evade the negative consequences of parent hostility.

Technological turbulence increases uncertainty to which organizations respond by establishing links to other organizations in pursuit of critical resources (Pfeffer & Salancik, 1978). In this context, technological advance is said to be the pathway to organizational success and obsolescence to failure (McKendrick et al., 2009). This can have two consequences: One, high technological turbulence destabilizes existing networks. Firms increasingly form new ties to access the upcoming technology, while the social capital inherent in old ties tends to become less useful (Kim et al., 2006). Entrepreneurial firms, in turn, can take advantage of the flux in the environment to forge new ties with new partners (Koka, Madhavan, & Prescott, 2006). Moreover, often technological turbulence goes hand in hand with increased competition, which in turn is expected to spur organizational network changes. Stuart (1998), for instance, has demonstrated that crowding in technological spaces increases the likelihood of tie formation among semiconductor firms. A related study by Burkhardt & Brass (1990) showed that changes in technology enabled early adopters to enhance their power and centrality within an intra-organizational network. Moreover, rapid changes in the technological environment create opportunities for peripheral firms to acquire a more favorable network position (Koka et al., 2006). This can contribute to counterbalancing a spin-out's social capital disadvantage vis-à-vis the parent and, thus, limit a parent's ability to act upon hostility.

Two, high technological turbulence can also increase a parent's benefits from cooperating with the child in order to cope with technological changes. Under these conditions, firms tend to actively tap into external knowledge as they are unable to internally respond to all technological developments (Cassiman & Veugelers, 2006). When technological changes rapidly, forming new ties can help firms to improve their performance (Nohria & Garcia-Pont, 1991). Although a parent firm might clearly disapprove the spawning of a spin-out, the need to keep pace with changing technological standards can lead the parent to seek collaboration rather than confrontation with the child, despite hostility. In the face of rapid technological changes, the parent is can benefit from such collaboration by securing access to critical technologies. This point is pronounced by Agarwal et al. (2010) who argue that a parent firm may be able to use a spin-out it has spawned as complementary asset and leverage of its capabilities. Since both firms share a similar knowledge base, interfirm transfer of knowledge and capabilities tends to be more effective than in collaborations with third parties (Sapienza et al., 2004). McKendrick et al. (2009) found that parent firms of technologically sophisticated spin-outs first suffer poorer technological performance, but outperform firms with no spin-outs over time. Similarly, King et al. (2003) propose that small firms rather than large firms will develop a new technology following a technological discontinuity and that, after the emergence of a new dominant design, collaborations between both types of firms tend to increase. Overall, technologically turbulent environments constitute a context, in which not only the ability, but also the interest of the parent to act upon hostility is reduced. Thus,

Hypothesis 4: Technological turbulence weakens the positive relationship between parent hostility and the spin-out's time to breakeven.

2.5 Market turbulence

In highly turbulent markets, there is a continuous change in customer preferences, price and cost structures, and the composition of competitors. Marketplace instabilities can result from real technological innovations or just fast changing customer expectations (Calantone et al., 2003). Prior work suggests that organizational change constitutes an adequate response to environmental

shifts and generates performance benefits to firms as turbulence rises (Brown & Eisenhardt, 1997; Davis, Eisenhardt, & Bingham, 2009). Established firms and new ventures are, however, believed to differ in their ability to change (Lindholm, 1994:13). Established firms have more inert, established processes and possess stocks of valuable resources which make them more likely to experience a sense of certainty about the future rather than an urgent need to change (Kraatz & Zajac, 2001). New ventures, in turn, possess more fluid, readily changeable structures (Ganco & Agarwal, 2009) and typically face resource scarcity. This enables and drives them to overcome the structural inertia plaguing established firms. In other words, spin-outs tend to be more adaptive to market turbulence than parent firms.

We argue that due to this responsiveness advantage spin-outs suffer less from parent hostility in fast-changing markets. If customer preferences change, spin-outs may react faster than more inert parents. Being able to directly address changed needs, they can attract ex-customers of the parent and/or new customers. Yet, not only needs fulfillment, but also loyalty plays a key role for customers' buying decisions. Customer loyalty can be regarded as one manifestation of social capital (Palmatier, Dant, & Grewal, 2007) that hostile parents can use to, partly, handicap spin-outs in forging ties to customers. However, the more turbulent a market, the more drastically customer demands change and the more likely needs dissatisfaction will outweigh customer loyalty. Then customers will tend to switch their preferred supplier despite social capital endowments. Overall, the value of parent's social capital with customers may erode more quickly in turbulent markets which impedes its ability to exclude a spin-out from customer networks. The situation is different in less turbulent markets. Here a gap between customer demand and incumbent firms' supply is less likely to occur. The parent firm and other incumbents can utilize the social capital in ongoing business relationships to retain current customers, thereby blocking the spin-out from accessing customers.

In addition, the structure of turbulent markets is volatile and market niches are more likely to emerge. Since these markets often lack a dominant product design, many new product variants are introduced over time. This results in new market niches outside the focus of incumbent firms and industry outsiders, thus providing distinctive opportunities for a spin-out to exploit (Garvin, 1983). Many of these niches are too small to pose a serious threat to the rent streams of incumbent firms (Klepper & Sleeper, 2005). In this case, a hostile parent is more likely not to

invest valuable time and resources to invade a niche occupied by a spin-out. Thus, market turbulence can create a context, where inertia makes a hostile parent less able to take actions against a spin-out, and the modesty of a spin-outs approach less willing to do so. Thus,

Hypothesis 5: Market turbulence weakens the positive relationship between parent hostility and the spin-out's time to breakeven.

3 Methods

3.1 Sample, 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 own measures based on Rossiter's (2002) procedure. CEOs of technology spin-outs then pre-tested the scales in six 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 1168 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 headquartered in Germany. We called 648 randomly selected firms to arrange interview appointments after reconfirming that our sampling criteria were met. Trained interviewers then conducted face-to-face interviews with founders of spin-outs who were willing to participate. This resulted in a number of 144 usable cases with complete performance data. The spin-outs were on average eight years old (mean = 7.77, sd = 3.11), employed 24 full-time employees (mean = 24.25, sd = 85.67), and were active in the fields of software (34%), electronics (27%), nanotechnology and new materials (10%), biotechnology (8%), and others (21%). We sampled from multiple industries to increase the generalizability of our findings and to complement prior studies with a mono-industry focus (e.g., Agarwal et al., 2004; Chatterji,

2009). Data on 105 parent firms was available. These firms were on average 43 years old (mean = 43.47, sd = 48.03) and had 38,233 employees (mean = 38,232.27, sd = 92,501.57). The average geographical distance between parent and child firm was 138 km (mean = 138.49, median = 25.10, sd = 203.13).

Since our research required fine-grained information, the use of surveys seemed to be an appropriate approach. Archival data is no adequate alternative as firms not always disclose information on tension between parent and child. However, our research design can be subject to two biases. The first is response bias which can create a systematic exclusion of firms from our sample. To assess the likelihood of such bias, we compared responding and non-responding firms in terms of age, size (number of employees) and technological field. This analysis indicated no significant differences and therefore suggested a low threat of non-response bias. The other bias, common method bias, results from using the same sources for dependent and independent variables and increases measurement error. To minimize this threat, we relied on a hostility measure constructed by independent coders (described below) in our main analysis. Moreover, in Harman's one-factor test on all of the items, no single factor emerged and no factor accounted for most of the variance. Finally, we validated respondents' information on breakeven using financial statements available for 42 spin-outs. A strong correlation between data from both sources ($r = .88, p < .001$) further strengthened our belief that a common method bias does not seriously threaten the validity of our results.

3.2 Measures

3.2.1 *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 *time to breakeven*, defined as the number of full months between firm founding (date of incorporation) and the first point in time, at which costs equaled revenues and the spin-out started to make profits (as reported by the respondent). This measure fits the purpose of this study nicely for three reasons. First, using time to breakeven is consistent with our theoretical framework. Our

theory revolves around the notion that spin-outs can mitigate negative consequences of hostility because different actions or environmental conditions allow them to, nevertheless, effectively link to resource providers and customers. Both aspects are theoretically related to breakeven: linking to resource providers lowers costs of resource acquisition (Starr & Macmillan, 1990), linking to customer increases revenues. Second, the measure captures progress toward profitability and thus survival, an important goal not only of new firms. Third, respondents were more willing to provide information on breakeven than on actual profits which reduced the threat of non-response bias. To assess criterion validity, we examined correlations between time to breakeven and theoretically related measures. As expected time to breakeven significantly correlated with goal achievement in terms of return on investment ($r = -0.41, p < 0.001$), profits ($r = -0.35, p < .001$), market share ($r = -0.33, p < 0.001$), and sales ($r = -0.37, p < 0.001$).⁵

3.2.2 Independent variables

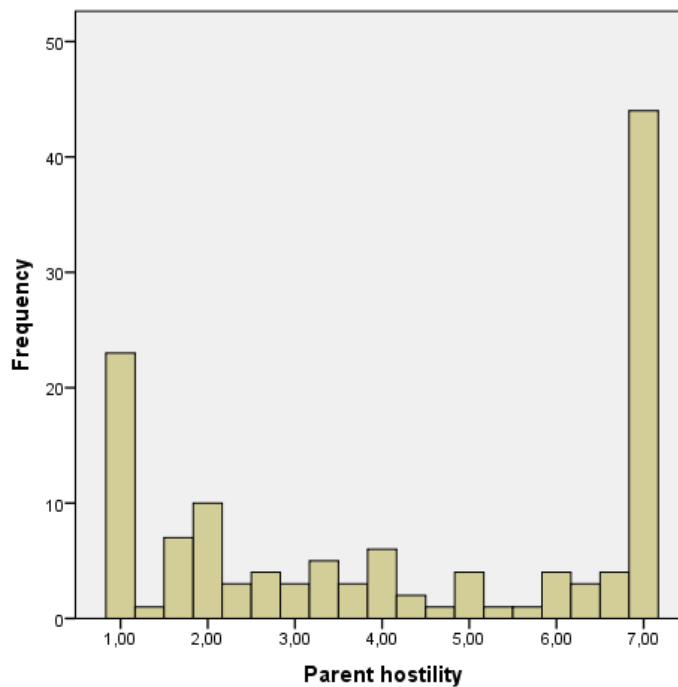
Parent hostility was captured with two alternative measures. Following Doucet (2004), we measured the degree of hostility displayed by the parent firm using three coders. They independently coded case studies for each spin-out. The case studies were written by our interviewers and complemented the survey with additional information on the parent-child relationship, as available from the internet or respondent. The raters coded a parent firm as 1 (hostile), if the reports displayed some form of disapproval, for instance negative attitudes toward the spin-out or threats of litigation, or as 0 (friendly or neutral) otherwise. The average agreement rate was 94%, with a Fleiss' Kappa of 0.86 indicating high inter-rater reliability (Fleiss, 1971). Remaining discrepancies were resolved via discussion and reaching consensus.

In addition, we measured hostility with three reverse coded, 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, like all items unless stated otherwise, measured on a 7-point Likert-scale (1 = “does not apply at all, 7 = “applies fully and completely”). The measure is

⁵ Respondents rated the degree of goal achievement on a 7-point Likert-scale (1 = “goal definitely not achieved”; 7 = “goal completely achieved”).

reliable at an alpha of 0.96. The appendix presents further validity information on all constructs. Because this hostility measure was clearly non-normal distributed (Figure 2), we dichotomized it using a median split (median = 3.5). Interestingly, Figure 2 also indicates that the parent firms' reaction to a spin-out was rarely neutral, but polarized to being more friendly or more hostile. Overall, both measures highly correlate ($r = 0.92, p < 0.001$). To minimize the threat of common method bias, we draw on the coding-based measure in our main analyses and use the survey-based measure for robustness checks reported in the appendix.

Figure 2: Histogram of parent hostility



Having no directly applicable measure, we constructed our own measure of *strategic differentiation*. Respondents rated the extent to which the parent and child firm offered similar products and served similar markets (7-point Likert-scale; 1 = “very dissimilar”, 7 = “very similar”) at two points in time, the founding year and three years after that. The sum of the temporal change in market and product similarity yielded our measure of strategic differentiation. High values indicate that the spin-out increasingly pursued a strategy different from the parent’s, whereas low values indicate that both firms’ strategies became more similar over time. Our

measure is conceptually rooted in Ansoff's (1957) work on product-market strategies. He suggested that developing markets and/or products substantially drives firm growth. Drawing on this notion, our measure implies that spin-outs can strategically differentiate themselves from their parents by serving new markets with existing parent products, by serving the same markets with new or modified products, or by doing both. In other words, the extent to which both firms offer similar products and/or serve similar markets reflects their relative strategic focus.

Our measure for *network development* is conceptually rooted in work suggesting that parent and spin-out often reside in close geographic proximity (Woo et al., 1992) and share the same set of network contacts pre-founding (Agarwal et al., 2004; Yli-Renko et al., 2001). Contacts that the spin-out newly establishes post-founding are, thus, likely to be not directly linked to the parent. Consequently, we asked respondents for the number of partners they had ties to in the founding year. Partners included key actors in the industry, namely suppliers, customers, and competitors (Sapienza et al., 2004). They further specified how many of these contacts were newly established after firm founding and how many thereof based on referrals by the parent firm. We calculated the ratios of new, post-founding contacts (excluding referrals by the parent firm) to total contacts with regard to suppliers, customers, and competitors. Parent referrals were disregarded as they can allow the parent to exert indirect influence on the spin-out. The three ratios were then summed up to yield our composite measure of network development. High values reflect that a spin-out "renewed" its network by acquiring new partners in the industry. This is likely to reduce the overlaps in the parent and child networks. Low values show that the spin-out tended to rely on pre-existing contacts or referrals by the parent firm which leads to significant overlaps in both firms' networks.

Measures for environmental turbulence were adapted from Jaworski and Kohli (1993). Regarding *technological turbulence*, the original items "Technological changes provide big opportunities in our industry" and "It is very difficult to forecast where the technology in our industry will be in the next 2 to 3 years" were eliminated during scale purification procedures. A new item "Technologies are frequently replaced in our industry" was added. The four-item measure is reliable at an alpha of 0.85. Regarding *market turbulence*, the original items "Sometimes our customers are very price-sensitive, but on other occasions, price is relatively unimportant" and "We are witnessing demand for our products and services from costumers who

never bought them before” were dropped during scale refinement. The four-item measure is reliable at an alpha of 0.73.

3.2.3 Control variables

To isolate the effect of our predictor variables, we considered the effect of several important control variables. *Product quality* describes its perceived benefits to customers and superiority over competing products. Offering higher-quality products may increase demand and shorten time to breakeven. The three-item measure was adapted from Atuahene-Gima & Ko (2001) and is reliable at an alpha of 0.75. *Start-up experience* can provide knowledge of how to exploit an entrepreneurial opportunity more effectively and at lower costs. It was measured as the number of prior start-ups created by founders of the spin-out. *Initial product-market similarity* is a composite of two items for the market similarity and product similarity (7-point Likert-scale; 1 = “very dissimilar”, 7 = “very similar”) between parent and child firm in the founding year. This variable controls for the initial strategic positioning of the spin-out, whereas strategic differentiation captures its change over time. *Network heritage* taps the extent to which a spin-out’s network is characterized by pre-existing contacts in the founding year. Spin-out founders are believed to benefit from social capital endowments that they accumulated in previous employments (Agarwal et al., 2004; Higgins & Gulati, 2003; Yli-Renko et al., 2001). The variable was measured as the ratio of existing contacts to suppliers, customers, and competitors to total contacts in the founding year. Finally, we controlled for sectoral differences with dummies for five *technological fields*, including biotechnology, electronics, nanotechnology and new materials, software, and others. The latter serves as reference group.

4 Results

4.1 Main results

Table 1 provides the descriptive statistics and correlation matrix. Table 2 reports the regression results. Since our dependent variable is a count of scores, we used negative binomial regression

to estimate our models.⁶ Computations of the condition index (CI) and variance inflation factor (VIF) reveal no serious multicollinearity problems (CI < 2.44, VIF < 1.65).

In our first hypothesis, we suggested a negative impact of parent hostility on spin-out performance. Hostility and a spin-out's time to breakeven were significantly and negatively related in all estimated models. This provided strong support for Hypothesis 1. Thus, hostility seems to extend the time spin-outs need to reach profitability. Another set of hypotheses examined how counter-strategies can alleviate the negative consequences of hostility. Hypothesis 3 proposed that strategic differentiation negatively moderates the relationship between hostility and time to breakeven.

Surprisingly, our analyses pointed to a positive moderation effect (Models 3, 7, and 8) which is the opposite of what we expected. To advance further interpretation, we followed recommendations in the extant literature (Hoetker, 2007; Norton, Wang, & Ai, 2004) to plot the interaction (Figure 3).⁷ Strategic differentiation, indeed, appears to worsen rather than defuse the effects of hostility. We discuss this finding in more detail in the next section. Hypothesis 3 suggested network development as another counter-strategy. As expected, network development negatively moderated the relationship between hostility and time to breakeven (Models 4, 7, and 8). Since also the plot in Figure 4 is in line with this finding, Hypothesis 4 was supported. Spin-outs that formed ties to new industry partners in the founding year, including suppliers, customers, and competitors, suffered less from hostility than other spin-outs.

⁶ Poisson regression and its generalized form, the negative binomial regression, are two ways of dealing with count data (Hausman, Hall, & Griliches, 1984). The first model assumes that the conditional mean of the outcome is equal to the conditional variance. According to a likelihood-ratio test for overdispersion, the conditional variance of our dependent variable was significantly greater than the conditional mean, violating this assumption. We therefore used negative binomial regression which assumes a gamma distribution for the conditional mean, thereby allowing conditional mean and variance to vary.

⁷ Hoetker (2007) and Norton et al. (2004) point out that OLS and non-linear models differ regarding the interpretation of interactions. In non-linear models, for instance, the magnitude and sign of the effect can vary across observations. Ignoring these differences can lead to serious misinterpretations. Norton et al. (2004) proposed procedures for plotting interactions in logit model which we adapted to count models.

Table 1: Descriptive statistics and correlations^a

□ Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Time to breakeven (months)	18.54	21.24	-													
2. Parent hostility	0.49	0.50	0.22**	-												
3. Parent hostility (alternative measure)	0.50	0.50	0.19*	0.92***	-											
4. Strategic differentiation	1.21	2.72	-0.12	0.02	0.00	-										
5. Network development	0.79	0.69	0.08	0.12	0.13 ^t	-0.18*	-									
6. Technological turbulence	4.72	1.41	0.05	-0.10	-0.08	0.02	0.10	-								
7. Market turbulence	3.40	1.31	-0.05	-0.04	-0.01	0.03	0.22**	0.32***	-							
8. Product quality	5.52	1.20	-0.11	-0.08	-0.01	0.08	0.03	0.08	0.10	-						
9. Start-up experience	0.74	1.13	0.28***	-0.03	-0.02	-0.01	0.05	0.17*	0.16 ^t	-0.01	-					
10. Initial product-market similarity	8.19	4.20	-0.18*	0.04	0.05	0.47***	-0.17*	-0.09	0.04	-0.10	-0.07	-				
11. Network heritage	0.98	0.85	-0.08	-0.01	0.01	0.14 ^t	-0.57***	-0.14	-0.29***	-0.07	-0.25**	0.24**	-			
12. Electronics	0.27	0.45	-0.11	-0.09	-0.11	0.04	-0.15 ^t	0.06	0.15 ^t	-0.06	0.04	0.08	0.15 ^t	-		
13. Nanotechnology and new materials	0.10	0.31	0.10	0.12	0.11	-0.07	0.12	-0.23**	-0.05	-0.05	0.07	0.04	-0.06	-0.05	-	
14. Biotechnology	0.08	0.28	0.14 ^t	0.16 ^t	0.10	-0.02	0.02	-0.12	-0.14 ^t	-0.01	-0.01	-0.06	-0.04	-0.13	0.14 ^t	-
15. Software	0.34	0.48	-0.14 ^t	-0.08	-0.07	-0.03	-0.04	0.24**	0.08	0.12	0.09	0.02	-0.07	-0.24**	-0.24**	-0.22**

^a n = 144. Pearson product moment correlations are reported for pairs of continuous variables, Spearman rank correlations are reported for pairs of continuous and dichotomous variables. ^b Coding: 1 = hostile parent, 0 = otherwise.

^t < .10

* p < .05

** p < .01

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

Table 2: Regression results for time to breakeven^a

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
<i>Control variables</i>																
Product quality	-0.15 *	0.07	-0.09	0.07	-0.11	0.07	-0.10	0.07	-0.10	0.07	-0.13 ^t	0.07	-0.17 *	0.08		
Start-up experience	0.25 ***	0.07	0.28 ***	0.08	0.28 ***	0.08	0.24 **	0.08	0.28 ***	0.08	0.25 **	0.08	0.20 **	0.08		
Initial product-market similarity	-0.06 *	0.03	-0.05 ^t	0.03	-0.05 ^t	0.03	-0.04 ^t	0.03	-0.05 *	0.03	-0.05 ^t	0.03	-0.05 ^t	0.03		
Network heritage	0.05	0.13	0.05	0.14	0.03	0.13	0.03	0.14	0.05	0.14	-0.01	0.15	-0.03	0.13		
Electronics																-0.20 0.30
Nanotechnology and new materials																0.42 0.33
Biotechnology																0.38 0.34
Software																-0.29 0.27
<i>Main effects</i>																
Parent hostility			0.65 ***	0.19	0.64 ***	0.19	0.68 ***	0.19	0.65 ***	0.19	0.64 ***	0.18	0.64 ***	0.18	0.56 **	0.20
Strategic differentiation			-0.03	0.04	0.04	0.05	-0.06	0.04	-0.03	0.04	-0.02	0.04	0.03	0.06	-0.01	0.06
Network development			0.07	0.15	0.13	0.16	-0.33 ^t	0.20	0.05	0.15	0.10	0.16	-0.14	0.20	-0.17	0.19
Technological turbulence			0.05	0.07	0.04	0.07	0.04	0.07	-0.01	0.09	0.07	0.06	0.04	0.08	0.14	0.09
Market turbulence			0.00	0.08	-0.03	0.08	0.04	0.08	0.01	0.08	-0.16	0.11	-0.14	0.10	-0.11	0.10
<i>Interaction effects</i>																
Parent hostility X strategic differentiation					0.15 *	0.07							0.14 *	0.07	0.14 *	0.07
Parent hostility X network development							-0.76 **	0.27					-0.59 *	0.30	-0.62 *	0.29
Parent hostility X technological turbulence									-0.13	0.13			-0.04	0.13	0.00	0.14
Parent hostility X market turbulence											-0.38 *	0.17	-0.40 *	0.17	-0.37 *	0.16
Constant	2.85 ***	0.10	3.13 ***	0.13	3.09 ***	0.12	3.15 ***	0.13	3.12 ***	0.13	3.10 ***	0.13	3.07 ***	0.12	3.47 ***	0.73
df	138		133		132		132		132		132		129		129	
Deviance (-2 log likelihood)	170.08		170.09		170.17		170.05		170.10		170.05		170.02		169.95	
LR X ²	11.87 *		19.65 *		23.56 **		24.80 **		20.22 *		23.53 **		31.62 **		25.12 *	

^a n = 144; unstandardized coefficients. ^b Coding: 1 = hostile parent, 0 = otherwise.

^t p < .10

* p < .05

** p < .01

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

Figure 3: Moderating effect of strategic differentiation on the relationship between parent hostility and time to breakeven

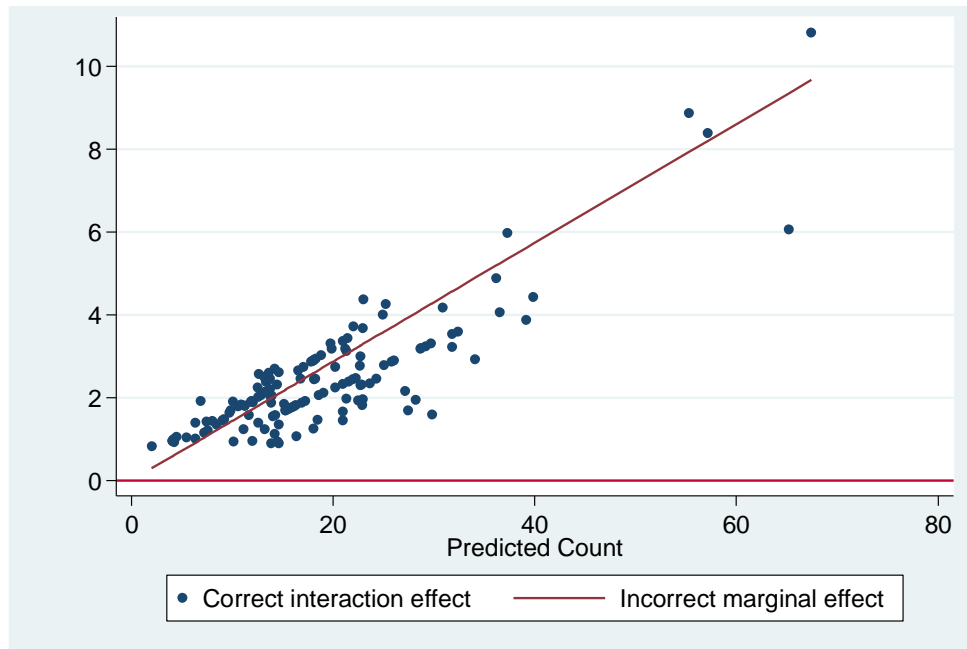
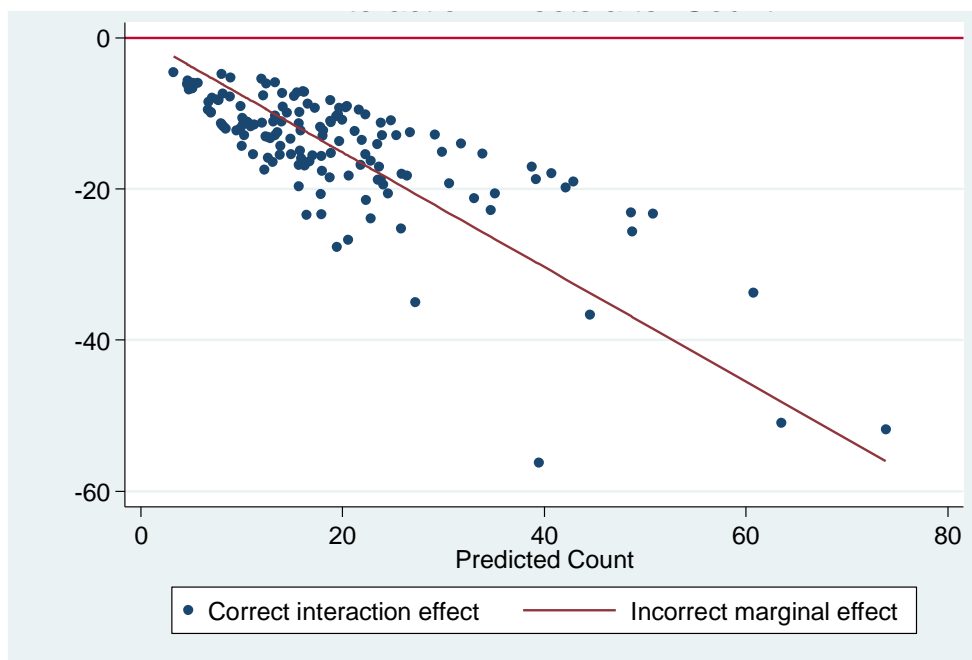
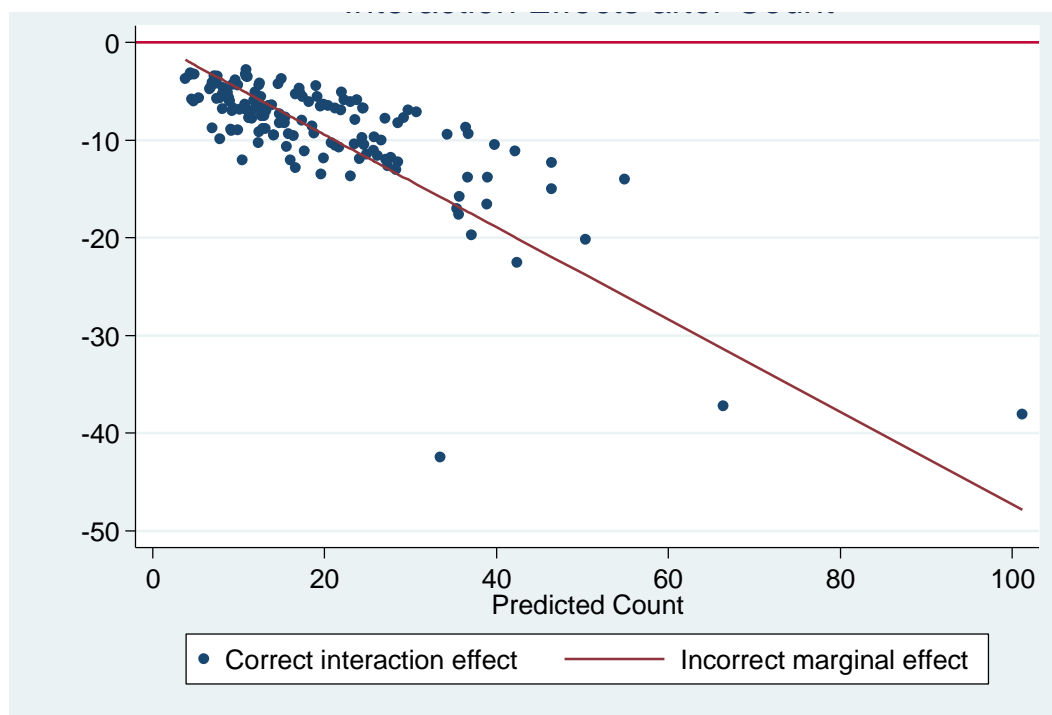


Figure 4: Moderating effect of network development on the relationship between parent hostility and time to breakeven



Our last set of hypotheses illuminated environmental contingencies. According to Hypothesis 4, the impact of hostility is weaker in environments characterized by technological turbulence. The interaction term of parent hostility and technological turbulence was statistically not significant. Hypothesis 4 was therefore not supported. As articulated in Hypothesis 5, we expected that the performance consequences of hostility are less severe for spin-outs operating in turbulent markets. Indeed, market turbulence significantly and negatively moderated the relationship between hostility and time to breakeven (Models 6, 7, and 8). Figure 5 displays the interaction plot. Market turbulence, therefore, seems to be a favorable condition for spin-outs exposed to parent hostility.

Figure 5: Moderating effect of market turbulence on the relationship between parent hostility and time to breakeven



4.2 Endogeneity analysis

Spin-outs with higher economic potential can cause a greater financial loss to the parent firm and intensify competition on the market, which possibly fuels parent hostility. Thus, parent hostility might not only affect venture performance, but (anticipated) venture performance might drive parent hostility. In the case of simultaneous causality, independent variables and the error term are correlated and conventional estimation methods yield biased and inconsistent coefficients. Two-stage instrumental variables regression can mitigate this problem but produces much larger standard errors than conventional estimation and is consequently considered less efficient (Wooldridge, 2003).⁸ It is thus recommendable, even if a variable appears theoretically endogenous, not to model it as endogenous until tests confirm that endogeneity is a statistical problem. Tests recommended in the extant literature (Bascle, 2008; Wooldridge, 2003:121-122) indicated that parent hostility did not create an endogeneity problem.⁹ This increased our confidence in relying on the original regression results.

5 Discussion and implications

Research suggests that the origins of new firms may explain their heterogeneity in initial resource endowments and, thus, performance. More specifically, spin-outs are said to enjoy superior access to critical resources and knowledge via the parent firm – a privilege allowing them to outperform de novo start-ups (e.g., Agarwal et al., 2004; Chatterji, 2009; Klepper & Sleeper, 2005; Wennberg et al., 2011). However, prior research seems to have neglected one important issue: Whether a parent firm grants or denies these benefits may critically depend on the parent's

⁸ In the first stage, the endogenous variable is regressed on the other independent variables and instrument variables. The predicted value of the endogenous variable is then used in the second stage instead of the observed values, when time to breakeven is regressed on the predictor variables.

⁹ We first regressed the potentially endogenous variable parent hostility on the other independent variables plus instruments. Theoretical considerations and exploratory analyses suggested that five variables might serve as valid instruments: intensity of parent-spin-off cooperation in research & development, marketing, production, and procurement (7-point Likert-scales from 1 = “not at all” to 7 “very intensive”) and supply relationships (percentage of total procurement costs caused by supplies from the parent firm). Having more instruments than endogenous variables, we could test for under- and overidentification which indicated that all instruments were exogenous and relevant. We then performed the Durbin-Wu-Hausman Test on endogeneity (Davidson & MacKinnon, 1993) by regressing time to breakeven on the independent variables and the residual from the first regression. The test pointed to no serious endogeneity problems as the residual was not significant ($X^2 = .09, p > .10$).

attitude toward the spin-out. Friendly parents are likely to support and cooperate with a spin-out, whereas hostile parents might even fight and try to hinder it. To date, there has been little development, both theoretical and empirical, of how the nature of the parent-spin-out relationship shapes the development of new ventures. In this research, we adopted a network and social capital perspective and studied how parent hostility impacts on a spin-out's early performance, as indicated by time to breakeven (Hypothesis 1), how spin-outs can effectively respond to hostility by pursuing other product-market strategies than the parent (Hypothesis 2) or by developing their own industry network (Hypothesis 3), and under which environmental conditions of technological turbulence (Hypothesis 4) and market turbulence hostility (Hypothesis 5) is likely to be a less severe problem.

A first intriguing finding of this study is that parent hostility is a common and serious problem for newly established spin-outs. Nearly 50% of the surveyed ventures encountered some form of hostility in the year of founding. More importantly, our results for Hypothesis 1 confirm that spin-outs from hostile parents take longer to reach breakeven. Hostility thus seems to impede spin-out development. This finding adds to a small but growing literature on parent-child firm relations. While prior work has speculated about possibly negative parent reactions to a spin-out event (e.g., McKendrick et al., 2009), our study contributes to the extant literature by providing empirical evidence that the problem of parent hostility really exists and spin-outs suffer from it. Other work has examined how spin-outs vis-à-vis de novo start-ups benefit from knowledge legacies (e.g., Agarwal et al., 2004; Chatterji, 2009). Theorizing about hostility points to the possibility that the level of knowledge transfers may diminish in the presence of hostility. Moreover, other implications relate to the literature on networks and social capital in the entrepreneurial process. Our theoretical framework proposes that hostility comes along with antipathy, distrust, and lack of forgiveness, and may therefore nurture a negative form of social capital (or "badwill"). This notion extends on prior studies on how (positive) social capital endowments foster spin-out development and growth (e.g., Phillips, 2002). Finally, the finding for hostility also contributes to the organizational ecology literature by suggesting that intergenerational transfers of resources and routines might be impaired by parent hostility. Thus, hostility may provide an additional explanation for variation in spin-out survival rates.

A second important insight is that spin-outs are not helplessly exposed to hostility, but can draw on useful counter-strategies. Network development is, according to the results for Hypothesis 3, one of such strategies: Spin-outs in our sample that quickly created ties to new partners, including suppliers, customers, and competitors, could alleviate hostility's negative impact on their performance. This is consistent with our argument that entering the industry network in sections outside the parent's immediate reach reduces a parent's ability to sanction the spin-out. In general, the question of "how do fledgling firms gain initial entry to established networks [...]?" (Stuart & Sorenson, 2007:212) is central to the entrepreneurial domain. Our research provides a potential answer in a context, in which a newcomer firm has problematic relations to its parent firm and has therefore to cope with restricted access to the industry network. In contrast, the results for strategic differentiation (Hypothesis 2) are the opposite of what we postulated: the time to breakeven was longer for spin-outs that increasingly pursued other product-market strategies than their parents. One possible explanation for this unexpected finding is that such a strategy involves extra costs for developing new products and/or markets, with a negative impact on the firm's short-run operating result. Yet, parent hostility might lead spin-outs to bear these costs in pursuit of further firm growth. Strategic differentiation therefore seemed to be a "necessary evil" for spin-outs with hostile parents.

Another notable finding is that the effect of parent hostility is contingent on environmental conditions. As suggested in Hypothesis 5, spin-outs in turbulent markets could cope better with hostility, thus achieve breakeven faster, than their counterparts in less turbulent markets. Market turbulence provides a favorable condition, as we argued, because it increases customers' willingness to switch and creates market niches, thereby reducing a hostile parent's ability to use its social capital advantage against the spin-out. This finding adds to the literature on entrepreneurial networks and social capital by showing that an initial conflict-prone, dyadic relationship to a key actor, the parent firm, is less likely to impede a spin-out's ability to create ties to new customers or the parent's ex-customers in volatile markets. Yet, the nonsignificant moderation effect of technological turbulence (Hypothesis 4) indicates that rapid technological changes do not condition the impact of parent hostility. While our core argument might still hold and spin-outs in such environments might establish ties to new partners more easily, these ties are

possibly less income- or cost-effective in the short-run. For instance, the ties could be R&D collaborations that substantially yield income or save costs only in the long run.

5.1 Limitations and implications for future research

This study is not without limitations, likewise exciting avenue for future research. First, we sampled from the population of spin-outs headquartered in Germany with parents from the same country. Our results are therefore conditional upon and mostly generalizable to this context. Future research could investigate to what extent our framework holds in other country settings. Second, our conceptual model builds on network and social capital theory to illuminate the theoretical mechanisms behind the proposed relationships. Given the purpose of our research, we did not draw on advanced methods of structural network analysis but used aggregated measures. More fine-grained studies could use these techniques to explore in more detail how parent hostility affects the network entry and structural network characteristics of spin-outs over time. Third, some established firms disapprove spin-outs in general and have established anti-spin-out policies to minimize their occurrence. Such “institutionalized parent hostility” can also affect spin-out formation rates, not only performance, which constitutes an interesting area for future research. Our theoretical framework refers to the population of spin-outs that have made it, while our results confirm that parent hostility has drastic impacts on their performance. Finally, our study disregards efforts by the founders to proactively prepare the spin-out event and foster goodwill of the parent prior to founding. Such pre-founding championing behavior might secure parent support or at least prevent parent hostility by creating understanding or win-win situations. It would be important for future research to gauge the consequences of such behavior on hostility and ultimately on spin-out performance.

The overarching theoretical implication of our study is that parent hostility does matter for the performance of technology spin-outs, and it does matter depending on the selected counter-strategy and wider environmental conditions. Spin-outs generally suffer from parent hostility, but can mitigate its negative consequences by quickly developing their industry network. The performance impacts of hostility are also less severe in turbulent markets. Hence firms have to be conscious of the problem of hostility, how to effectively respond to it, and under

which environment conditions hostility poses greater problems. While this study contributed to our understanding of the consequences and contingencies of hostility, we hope that future research will provide more insights into this exciting topic.

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Appendix

Table 3: Study Measures^a

	Factor loading	t-Value
Parent hostility ($\alpha = 0.96$, CR = 0.96, AVE = 0.88) ^b		
(1) The management of the parent firm has appreciated the spin-out. (r)	0.92	13.68
(2) In the phase of spinning-out, there has always been a benevolent posture. (r)	0.95	14.67
(3) The parent firm was open-minded about the idea of creating a spin-out. (r)	0.95	14.56
Technological turbulence (based on Jaworski & Kohli, 1993; $\alpha = 0.85$, CR = 0.85, AVE = 0.59)		
(1) The technology in our industry is changing rapidly.	0.80	10.46
(2) A large number of new product ideas have been made possible through technological breakthroughs in our industry.	0.62	7.50
(3) Substantial technological development exists in our industry.	0.84	11.13
(4) Technologies are frequently replaced in our industry.	0.80	10.51
Market turbulence (based on Jaworski & Kohli, 1993; $\alpha = 0.73$, CR = 0.74, AVE = 0.42)		
(1) In our kind of business, customers' product preferences change quite a bit over time.	0.63	6.95
(2) Our customers tend to look for new products all the time.	0.63	6.89
(3) New customers tend to have product-related needs that are different from those of our existing customers.	0.75	8.42
(4) We cater other customers than in the past.	0.56	6.05
Product quality (adapted from Atuahene-Gima & Ko, 2001; $\alpha = 0.75$, CR = 0.76, AVE = 0.52)		
(1) Our product provided unique benefits superior to competitors.	0.82	9.09
(2) Customers perceived the product as giving superior performance outcomes relative to the competition.	0.72	8.02
(3) Our product provided higher quality than competitors' products.	0.60	6.64

^a α = Cronbach's Alpha; CR = Composite reliability; AVE = Average variance extracted. Model fit: $\chi^2/df = 1.42$; AGFI = 0.84; CFI = 0.96; IFI = 0.96; RMSEA = 0.05; Fornell-Larcker-Criterion confirmed. ^b Because the variable was grossly non-normal distributed, we dichotomized it using a median-split. Details are provided in the methods section.

Table 4: Regression Results for Time to Breakeven with an Alternative Measure for Parent Hostility^a

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
<i>Control variables</i>																
Product quality	-0.15 [*]	0.07	-0.14 ^t	0.07	-0.14 ^t	0.07	-0.13 ^t	0.07	-0.13 ^t	0.07	-0.15 [*]	0.08	-0.17 [*]	0.08		
Start-up experience	0.25 ^{***}	0.07	0.28 ^{***}	0.08	0.27 ^{***}	0.08	0.24 ^{**}	0.08	0.27 ^{***}	0.08	0.25 ^{**}	0.08	0.21 ^{**}	0.08		
Initial product-market similarity	-0.06 [*]	0.03	-0.05 ^t	0.03	-0.05 ^t	0.03	-0.05 [*]	0.03	-0.06 [*]	0.03	-0.05 ^t	0.03	-0.05 ^t	0.03		
Network heritage	0.05	0.13	0.05	0.15	0.03	0.13	-0.01	0.14	0.04	0.14	-0.05	0.15	-0.09	0.14		
Electronics															-0.28	0.29
Nanotechnology and new materials															0.39	0.32
Biotechnology															0.50	0.35
Software															-0.37	0.26
<i>Main effects</i>																
Parent hostility			0.53 ^{**}	0.19	0.53 ^{**}	0.19	0.57 ^{**}	0.19	0.54 ^{**}	0.19	0.57 ^{**}	0.18	0.57 ^{***}	0.17	0.43 [*]	0.19
Strategic differentiation			-0.03	0.04	0.04	0.05	-0.05	0.04	-0.02	0.04	-0.02	0.04	0.04	0.05	0.00	0.06
Network development			0.05	0.16	0.12	0.16	-0.32 ^t	0.19	0.03	0.15	0.10	0.17	-0.11	0.21	-0.08	0.18
Technological turbulence			0.04	0.07	0.04	0.07	0.04	0.07	-0.02	0.09	0.08	0.07	0.04	0.08	0.15 ^t	0.09
Market turbulence			0.00	0.08	-0.03	0.08	0.03	0.08	0.01	0.08	-0.18	0.11	-0.19 ^t	0.11	-0.17 ^t	0.10
<i>Interaction effects</i>																
Parent hostility X strategic differentiation					0.15 [*]	0.07							0.14 [*]	0.07	0.15 [*]	0.07
Parent hostility X network development							-0.78 ^{**}	0.28					-0.59 [*]	0.30	-0.55 [*]	0.28
Parent hostility X technological turbulence									-0.16	0.13			-0.04	0.13	-0.01	0.14
Parent hostility X market turbulence											-0.47 ^{**}	0.17	-0.48 ^{**}	0.16	-0.48 ^{**}	0.16
Constant	2.85 ^{***}	0.10	3.08 ^{***}	0.13	3.05 ^{***}	0.12	3.11 ^{***}	0.13	3.07 ^{***}	0.13	3.06 ^{***}	0.13	3.04 ^{***}	0.12	3.36 ^{***}	0.71
df	138		133		132		132		132		131		128		129	
Deviance (-2 log likelihood)	170.08		170.07		170.13		170.02		170.07		170.00		170.04		169.94	
LR X ²	11.87 [*]		17.29 [*]		21.09 [*]		22.53 [*]		18.15 [*]		24.04 [*]		31.75 ^{**}		25.25 [*]	

^a n = 144; unstandardized coefficients. ^b Coding: 1 = hostile parent, 0 = otherwise.

^t p < .10

* p < .05

** p < .01

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

