Unleashing R&D Networks for Ambidexterity: The Interplay between Internal and External Networking Capabilities

ABSTRACT

Ambidexterity is key for SME survival and success, and to attain ambidexterity, resource constrained SMEs must leverage ideas and resources within their R&D networks. This research investigates how internal and external networking capabilities enable SMEs to harness their R&D network to attain ambidexterity. We test our theory using survey data from 126 SMEs from Austria, Liechtenstein, and Switzerland. Our findings reveal an important paradox: while external networking capabilities are crucial for attaining ambidexterity, internal networking capabilities come at a cost—and while they do directly contribute to ambidexterity, they also lessen the potential for firms to utilize their R&D networks to attain ambidexterity. We discuss the important theoretical and managerial implications in terms of how SMEs can most effectively harness their networks to attain ambidexterity.

Keywords: Ambidexterity, R&D networks, internal networking capabilities, external networking capabilities, exploration, exploitation, SMEs

1 INTRODUCTION

Small and medium enterprises (SMEs) face severe resource constraints, hindering their ability to simultaneously explore for new innovations while exploiting existing innovations (Brink, 2018; Hansen et al., 2023; Naudé et al., 2014). Exploration activities tend to focus on developing more radical innovations, such as introducing new products and product lines, entering new markets, and adopting entirely new technologies (He & Wong, 2004). In contrast, exploitation activities tend to focus more on incremental innovation outcomes such as enhancing existing products and processes, or reducing costs or improving resource utilization (He & Wong, 2004). Both exploration and exploitation activities are of vital importance to ensure SME long term survival and prosperity. This is because exploration enables SMEs to identify and develop new opportunities, thereby enhancing the viability of the SME into the future; while exploitation enables SMEs to more effectively and efficiently exploit existing capabilities and resources to enhance short-term performance (Benner & Tushman, 2003; Ferreras-Méndez et al., 2022; Ireland et al., 2003). The inability to attain innovation ambidexterity is a key factor contributing to the high failure rate among SMEs.

However, SMEs are embedded within networks; and these networks can potentially provide access to valuable resources (Ritter, 1999; Strobl, 2014; Yeniaras & Gölgeci, 2023). Network resources are both tangible and intangible and can be accessed through a firms' networks of external and internal relational ties (Hoang & Antoncic, 2003; Walter et al., 2006). Therefore, SME survival, development, and performance are dependent on various different types of network ties (Amankwah-Amoah et al., 2023; Naudé et al., 2014; Strobl & Kronenberg, 2016) because these constitute important sources of information and resources which would not otherwise be accessible to SMEs (Gorovaia et al., 2023; Lechner et al., 2006; Ritter, 1999). Particularly, SME innovation is considered a 'team sport' where R&D network ties regularly provide new insights and ideas, as well as a larger pool of resources

and inputs to fuel innovation (Leenders & Dolfsma, 2016; Mueller, 2021; Ritter, 1999). Therefore, SMEs need to develop and leverage R&D networks enabling them to engage in exploring and exploiting emerging innovation opportunities and achieve ambidexterity.

Despite the prominent role of R&D networks for SME ambidexterity, there has been limited theory development, and the predominant focus in the literature has been on much larger corporations (Wenke et al., 2021). Theory is currently limited since it focusses largely on the role of individual actors (e.g. owners), types of exploitative and explorative partnerships, or the strength of the overall SME network for ambidexterity (Heavey et al., 2015; Kauppila, 2010; Wenke et al., 2021). However, what has been missing so far, is detailed knowledge and understanding about how SMEs leverage existing R&D partnerships to attain ambidextrous outcomes. Simply having strong R&D network ties is unlikely to be adequate for ambidexterity. Rather, SMEs need to understand the value of different *types* of R&D network partnerships in order to create and nurture meaningful relationships and interactions with their R&D network partners.

In practice this means SMEs identifying valuable resources and information dispersed through their R&D networks and being able to direct and connect them with salient actors, departments, and organizations to attain ambidexterity. In other words, SMEs need to develop *networking capabilities*—a firm's ability "to initiate, maintain, and utilize relationships" (Walter et al., 2006, p. 546)—to derive value from their network ties and ultimately attain meaningful performance benefits (Capaldo, 2007; McGrath et al., 2019; Mitręga, 2023; Ritter, 1999; Vesalainen & Hakala, 2014). Networking capabilities focus on both internal (interlinking company internal actors) and external (interlinking the company with its external partnerships) relationships (Kauppila, 2010; Vesalainen & Hakala, 2014; Walter et al., 2006). This distinction is important, though has been largely neglected in the extant literature. While external networking capabilities make R&D network resources

available to the firm, the extent to which external resources are incorporated into the firm's underlying innovation processes depends on the firm's internal networking capabilities. Existing research investigating networking capabilities either does not distinguish between internal and external networking capabilities (e.g. Cenamor et al., 2019; Partanen, Kohtamäki, et al., 2020; Yang et al., 2018) or focuses exclusively on external networking capabilities (e.g. Degener et al., 2018; Yang et al., 2018). Existing theoretical discussions therefore are based on a simplistic perspective assuming additive reinforcing effects between different types of networking capabilities (e.g. Faroque et al., 2022; Vesalainen & Hakala, 2014; Walter et al., 2006). Thus, the extant literature provides few insights concerning how distinct types of networking capabilities (internal vs external) interact with each other in enabling SMEs to leverage their R&D networks into ambidexterity.

Employing a configurational perspective (Strobl et al., 2023; Wiklund & Shepherd, 2005), we address this important gap in research and we provide important insights into how different configurations of networking capabilities enable SMEs to convert their R&D networks into ambidexterity. In doing so, this study contributes to theory by providing new theoretical insights concerning potential trade-offs between internal and external networking capabilities in the context of SMEs. Consequently, the results of this study challenge the common and somewhat simplistic notion of 'the more the better'; and instead our findings highlight the need for more nuanced theorizing concerning networking capabilities because the ability to connect external and internal knowledge sources effectively appears to be key to attaining ambidexterity in the context of SMEs (Kauppila, 2010; Miroshnychenko et al., 2021; Raisch et al., 2009). We provide additional insights into these results by drawing upon post-study interviews with the Managing Director of Alpha Ltd[1] in the UK, which we utilize

[1] Due to confidentiality, the company name has been anonymized.

as an illustrative example of an SME leveraging an effective network of R&D partners for ambidexterity in innovation.

2 THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

From a strategic point of view, companies need to balance exploration and exploitation innovation. Performance returns from exploration and exploitation "vary not only with respect to their expected values, but also with respect to their variability, their timing, and their distribution within and beyond the firm" (March, 1991, p. 71). Exploration innovation has the benefit that it enables a company to adapt to changing circumstances by spotting and developing new business opportunities (Ireland et al., 2003). He and Wong (2004) provide evidence for positive performance outcomes by demonstrating that exploration activities increase a firm's innovation intensity which, in turn, drives sales growth. However, engaging in exploration is associated with high and continuous investments with uncertain outcomes. SMEs are characterized by scarce resources making it difficult to maintain high levels of investment and effort until exploration ultimately yields results. Lubatkin et al. (2006, p. 653) contend that purely exploration-oriented SMEs "incur significant costs both in terms of research and in the potential loss of sustained paybacks from earlier innovations, making them more vulnerable." In contrast to exploration, exploitation innovation increases efficiency through increasing problem-solving capabilities, overhauling processes and routines, and leveraging existing technologies in order to standardize and streamline structures and processes (He & Wong, 2004; Lavie et al., 2010; Smith & Tushman, 2005). Thus, by strengthening synergy realization, exploitation innovation reduces costs (Benner & Tushman, 2003) and overall risk (Bodwell & Chermack, 2010) and as a consequence, increases SME financial performance.

In order to sustain long-term competitiveness and performance, companies need to engage in both explorative and exploitative innovation (Ferreras-Méndez et al., 2022; Lavie et al., 2010; Levinthal & March, 1993; Lubatkin et al., 2006; March, 1991). While a sole focus on exploitation leads to "stagnation and failure to discover new, useful directions" a sole focus on exploration leads to "a cascade of experiments without the development of competence in any of them or discrimination among them" (March, 1991, p. 205). In this respect, companies face a dilemma because exploration and exploitation have very distinct and partly mutually exclusive requirements in terms of structures, processes and company culture (Benner & Tushman, 2003; Lavie et al., 2010; Smith & Tushman, 2005). Further, successful engagement in one of the two innovation activities creates a reinforcing effect leading to being caught in a competence trap (Gupta et al., 2006; Levinthal & March, 1993; March, 1991). Thus, structural, temporal, and contextual solutions have been proposed for managing the trade-offs between exploration and exploitation (O'Reilly & Tushman, 2013).

In the context of SMEs, contextual ambidexterity has been outlined as the main solution because SMEs lack the necessary resources to manage the costs of separating exploration and exploitation innovation activities into separate entities or shifting back and forth between the two (Lubatkin et al., 2006; Wenke et al., 2020). Contextual ambidexterity describes company cultures and capabilities that enable the "behavioral capacity to simultaneously demonstrate alignment and adaptability across an entire business unit" (Gibson & Birkinshaw, 2004, p. 209). SMEs display flatter hierarchies, and their managers are involved in both strategic and operational activities; thus, developing capabilities which help to manage the contradictions of exploitation and exploration activities, is crucial for SMEs (Lubatkin et al., 2006).

Although there is evidence that pursuing ambidextrous strategies can have negative performance outcomes for SMEs in contexts such as acquisitions (Bauer et al., 2018), the

general consensus is that ambidexterity increases SME performance; for instance, by increasing the firms speed to market when introducing new products and services (Ferreras-Méndez et al., 2022). Ambidextrous SMEs "are better able to attain and sustain their advantages in the marketplace and, thus, are more able to shield their future cash flows from external selection pressures" (Lubatkin et al., 2006, p. 653). Recent meta analytic findings support this reasoning by showing that the overall effect of ambidexterity on SME performance is positive and significant (Wenke et al., 2020).

2.1 Ambidexterity in SMEs – The Role of R&D Networks

Due to the increasingly complex nature of, among others, technologies or knowledge, networks play a key role in pursuing innovation (Liu et al., 2021; Sammarra & Biggiero, 2008; Walter et al., 2006). This is especially the case for SMEs, which on the one hand need to pursue innovation to stay competitive (Hanna & Walsh, 2002; Pullen et al., 2012) and on the other hand need to focus on their core competences due resource scarcity (Partanen, Kauppila, et al., 2020). Research on company networks highlights that unique resource endowments of companies are not limited by firm boundaries. Rather, networks provide SMEs with access to important resources, knowledge, and information and act as a potentially valuable resource in their own right (Gorovaia et al., 2023; Lavie, 2006; Yang et al., 2018).

For pursuing innovation, companies establish R&D networks which provide benefits such as joint financing, economies of scale and scope, reduced risks and uncertainty, as well as cost savings (Becker & Dietz, 2004). Becker and Dietz (2004) provide evidence for two mechanisms driving these benefits: First, innovation inputs are strengthened because the access to resources from R&D networks extends the firms technological capabilities. Second, innovation outputs are strengthened because the access to additional resources from R&D

networks increases the firm's capacity and efficiency which in turn increases the likelihood of realizing innovations. Both mechanisms are strengthened with a larger R&D network because the overall resource pool related to innovation inputs and outputs is extended. There is empirical evidence for these mechanisms. For instance, research shows that "biotechnology firms may collaborate with other small firms in their sector to gain technical knowledge (because of the complex science technology base), and with pharmaceutical firms to gain funding, business expertise and market access (as their business model dictates)" (Hendry & Brown, 2006, p. 70). Sammarra and Biggiero (2008) show that network related knowledge transfer is not limited to technological knowledge but includes market and managerial knowledge in order to tackle innovation process complexities. Thus, SMEs establish R&D networks for explorative and exploitative reasons (e.g. upstream vs downstream partnerships or related vs unrelated partnerships) enabling them to balance these innovation activities. Such networks reduce resource constraints and diminish the need to manage contradictory organizational activities (Lavie, 2006; Lavie et al., 2010).

Based on these arguments, we expect R&D network size to foster both exploration and exploitation innovation, and consequently, SME ambidexterity. On the one hand, the increased variety of innovation related inputs will enable SMEs to engage in exploration innovation because the "mix of heterogeneous parties in R&D cooperation releases synergies and enhances research productivity" (Becker & Dietz, 2004, p. 221). On the other hand, R&D networks also include collaborations with partners throughout the value chain leading to increased innovation implementation capacities and efficiencies (Becker & Dietz, 2004; Lavie et al., 2010); enabling collaborating companies to improve their products and processes optimize resource utilization and realize cost efficiencies. Finally, Heavey et al. (2015) provide empirical evidence that the strength of SME top management team overall network is

positively related to the company's ambidexterity orientation. Based on these arguments, the following hypothesis is proposed:

Hypothesis 1: *R&D network size positively influences SME ambidexterity*

2.2 Ambidexterity in SMEs – The Role of Networking Capabilities

R&D networks are difficult to manage because the underlying relationships are complex and the outcomes are often uncertain (Dhanaraj & Parkhe, 2006; Hagedoorn et al., 2006). Thus, examining a firm's "abilities to build trustful relationships, to integrate the resources of external partners and to synthesize its activities with those of network partners" (Walter et al., 2006, p. 546) is crucial for understanding how SMEs can leverage R&D networks into ambidextrous innovation activities.

Capabilities related network management help companies to leverage the value of partnerships and improve success rates (Faroque et al., 2022; Ritter, 1999; Vesalainen & Hakala, 2014) by increasing a company's capacity to "initiate, maintain and utilize relationships with various external partners" (Walter et al., 2006, p. 546). Research identifies four dimensions of capability sets related to network management, which can be classified in terms of *internal* and *external* networking capabilities.

Internal networking capabilities refer to internal communication processes and flows (Walter et al., 2006) so that knowledge can be effectively shared and utilized through the firm, which are important for learning and for absorbing knowledge from external sources (Butler, 2010; Jansen et al., 2005), and also for being responsive to important business related information (Jiménez-Castillo & Sánchez-Pérez, 2013; Slater & Narver, 1995). Thus, internal networking capabilities enable SMEs to detect synergies with partners by making knowledge and information about network ties available to relevant internal actors (Cohen & Levinthal, 1990) and by connecting these actors (Walter et al., 2006).

Internal communication plays a key role for exploration and exploitation innovation (Miller et al., 2006). Internal communication capabilities make ideas and proposals widely available in the organization which helps to increase the diversity of inputs and the overall number of ideas and proposals; all of which enhances the potential for the cross-fertilization of ideas. Further, evaluating and reflecting internally on ideas, projects and processes leads to greater operational effectiveness. Overall, different facets of internal communication are positively associated to overall organizational innovativeness and a company's patenting activities (see Kivimäki et al., 2000). Based on these arguments, we propose that internal networking capabilities will drive ambidexterity because on the one hand diversity of innovation inputs is increased thereby enabling cross-fertilization of ideas. On the other hand, internal networking capabilities will also increase operational excellence through more thorough evaluation and feedback processes which in turn increase exploitation innovation in SMEs. Further, internal networking capabilities have a crucial role in leveraging R&D ties into innovation outcomes because knowledge, information, and ideas from R&D networks have to be made available to all relevant actors within the company in order for them to be valuable. Based on these arguments, we hypothesize:

Hypothesis 2a: *Internal networking capabilities positively influence SME ambidexterity*

Hypothesis 2b: *The effect of R&D network size on SME ambidexterity increases with increasing internal networking capabilities*

External networking capabilities are a complex phenomenon. External networking capabilities encompass capabilities in terms of coordination, relational skills, and partner knowledge (Vesalainen & Hakala, 2014; Walter et al., 2006). Coordination capabilities help in terms of "connecting the firm to other firms and connecting different individual relationships into a network of mutually supportive interactions" (Walter et al., 2006).

Relational skills complement coordination by focusing on inter-personal relationships between individuals of the partnering companies. For instance, Baron and Markman (2003) proposed that high relational skills can create accurate social perceptions, positive impressions, increased persuasiveness, greater social adaptability, and the ability for actors to express emotions and feelings more effectively. Besides these skills, conflict resolution, perspective taking, and joint problem solving are important (Mohr & Spekman, 1994; Phan et al., 2005). Coordination and relational skills trigger stronger ties and higher commitment among network ties leading to joint actions and improved performance (Schreiner et al., 2009; Song & Di Benedetto, 2008).

Partner knowledge refers to "organized and structured information about a firm's upstream and downstream partners (suppliers and customers), and competitors" (Walter et al., 2006, p. 547) and captures a company's knowledge about partner products, services, resources, capabilities, and strategic goals. Without such knowledge, beneficial outcomes from R&D networks would be difficult to achieve and highly uncertain (Partanen, Kohtamäki, et al., 2020; Song & Di Benedetto, 2008). Further, partner knowledge decreases transaction costs and enhances conflict resolution (Partanen, Kohtamäki, et al., 2020; Walter et al., 2006).

SMEs with highly developed external networking capabilities will be better able to engage simultaneously in exploration and exploitation innovation because they are more effective in leveraging resources from R&D networks. Such external networking capabilities strengthen innovation outcomes from networks in several ways (Degener et al., 2018; Liu et al., 2021). For instance, coordination and access to partner knowledge enable companies to detect synergies and avoid redundancies. Further, due to an increased understanding of each other, conflicts are identified and resolved more efficiently (see Degener et al., 2018), which in turn increases creativity and innovation (e.g. Song et al., 2006).

Thus, in sum, external networking capabilities increase the exploration potential of SMEs by making R&D network resources and knowledge available to the company. This is attained by increasing the diversity of inputs and the potential for cross-fertilization between different exploration projects. Further, increased coordination between collaborating companies, together with mutual knowledge about each other's competencies and goals yields efficiency synergies and operational excellence, which in turn fosters exploitative innovation. Well-developed external networking capabilities will enable SMEs to extract greater value from their R&D networks thereby increasing SME ambidexterity. Thus, we hypothesize:

Hypothesis 3a: *External networking capabilities positively influence SME ambidexterity*

Hypothesis 3b: *The effect of R&D Network size on SME ambidexterity increases with increasing external networking capabilities*

In addition, current theoretical debate points towards a reinforcing effect between internal and external networking capabilities in leveraging R&D networks into SME ambidexterity. The common theoretical perspective is that companies need to simultaneously attend to internal (i.e., organizational introversion) and external (i.e., organizational extraversion) issues because "making use of external partners is an insufficient condition for ambidexterity because it is not the network but the firm that balances exploration and exploitation" (Kauppila, 2010, p. 307). Thus, while external networking capabilities increase the exploration and exploitation potential of SMEs by making R&D network resources and knowledge available to the company (Schreiner et al., 2009; Song & Di Benedetto, 2008; Vesalainen & Hakala, 2014); internal networking capabilities further strengthen external networking capabilities. This is because organizational responsiveness to outcomes of external R&D collaborations is increased by ensuring that information about external R&D

activities is made available to relevant organizational actors, ultimately ensuring that internal activities and processes can be aligned (Butler, 2010; Jansen et al., 2005; Kauppila, 2010; Vesalainen & Hakala, 2014). Therefore, well-developed internal and external networking capabilities reinforce each other in enabling SMEs to extract greater value from their R&D networks. Based on this reasoning, we put the following hypotheses forward:

Hypothesis 4: *The effect of R&D Network size on SME ambidexterity depends on configurations of internal and external networking capabilities. We propose that internal and external networking capabilities have a reinforcing effect on the relationship between R&D Networks on SME ambidexterity.*

3 METHODOLOGY

3.1 Procedure & Sample

To test the hypothesis a survey design was chosen. This approach was preferred because information about networking capabilities is not available in secondary data sources. This procedure is in line with other research investigating networking capabilities and their outcomes (e.g. Cenamor et al., 2019; Walter et al., 2006). In order to ensure accurate data about the company's R&D partnerships, its capabilities, and its innovation activities, a key informant design targeting top managers (e.g., owner managers and CEOs) was adopted. This key informant approach was chosen because top managers are the most knowledgeable sources for information on strategic and organizational issues (e.g. Covin & Slevin, 1989; Datta, 1991; Ellis et al., 2009; Hughes et al., 2020; Strobl et al., 2020). In order to increase reliability and validity of the survey (Churchill, 1995), a pretest involving nine business and academic experts was conducted before sending out the survey. This yielded some minor changes in the wording of survey questions and items to account for context and clarity.

The survey targeted SMEs in the Alpine Rhine valley spanning areas in Switzerland, Austria, and Liechtenstein. In line with the definition proposed by the European Commission, businesses with less than 250 employees are considered SMEs (European Commission, 2020). The Rhine valley was chosen for two reasons. First, research investigating innovation related activities in the German speaking part of Europe is still scarce (e.g. Wales et al., 2013). This is especially the case for research spanning more than one country in this culturally homogenous region (GLOBE, 2020) which is increasingly intertwined economically (Planungsamt des Kantons St. Gallen, 2002; rheintal.com, 2020). Second, this region is considered an interesting research context because of its reputation for innovation (Gassmann & Hürzeler, 2009; rheintal.com, 2020). Drawing from online business data bases in Switzerland, Austria, and Liechtenstein a random sample of 1,078 SMEs from the Rhine valley was extracted. The businesses were contacted by email and asked to respond to an online survey. To increase the response rate, anonymity was guaranteed, and the respondents could opt to receive a summary of the research findings. Two weeks after the initial email, a reminder email was sent out. After two weeks the respondents were contacted again with a reminder email. Overall, 196 companies responded to the survey, of which 126 questionnaires were useable for statistical analysis. Thus, the final response rate is 11.68% which is in line with typical response rates (10–15%) for research targeting top managers (Wales et al., 2013). 42.1% of the respondents were owner managers, 30.2% CEOs with ownership stakes, 18.3% CEOs without ownership stakes, and 9.5% held other top management positions. On average respondents had been employed in the business for 16.3 years, and 12.2% of the sample are female. On average, the companies employed 34.5 employees, and 81% of the businesses make less than 10 million Euros in revenue per year. The businesses are active in a wide range of industries (e.g., retail, wholesale, handcraft, information & consulting, manufacturing, IT, media, tourism & hospitality and transportation

& logistics). Businesses from the IT (22%) and media (17%) branches were most widely represented in the final sample (Table 1 provides information about the share of other industries).

A potential non-response bias was investigated following Armstrong and Overton (1977). When comparing the data for early and late respondents through ANOVA, no significant differences appeared between these groups. Hence, non-response bias is not considered a key issue for this study.

3.2 Measurement

All measures for the survey were adapted from existing scales. The measure for R&D networks was adapted from Lechner et al. (2006). Using two items, respondents were asked to indicate the number of existing technology partnerships in the form of joint research (item one) and development (item two) projects. The variable R&D network size is the sum of the two items.

The measurement of networking capabilities was adapted from Walter et al. (2006). The three dimensions coordination (six items; sample item: We discuss regularly with our partners how we can support each other in our success), relational skills (four items; sample item: We have the ability to build good personal relationships with business partners) and partner knowledge (four items; sample item: We know our partners' products/procedures/services) capture external networking capabilities. Internal networking capabilities captures internal communication and networking activities (four items; sample item: In our organization, communication is often across projects and subject areas). Respondents were asked to what extent the items fit their company's use and management of relationships. Respondents rated their level of agreement on a seven-point scale. For reliability and validity reasons, two items of the dimension coordination and one item of the

dimension partner knowledge had to be excluded. This is not problematic, because reflective measures are based on the assumption that antecedents and consequences of the individual items are identical (Jarvis et al., 2003). Following Walter, Auer and Ritter (2006) a linear sum of the component means of the dimensions coordination (AVE = 0.53; CR = 0.82), relational skills (AVE = 0.53; CR = 0.82) and partner knowledge (AVE = 0.65; CR = 0.85) is used to calculate external networking capabilities. Internal Networking Capabilities are measured with the component mean of the four respective items (AVE = 0.58; CR = 0.84).

Ambidexterity is based on the measures for exploitation and exploration activities developed by He and Wong (2004). Respondents were asked to what extent the items described their company's innovation activities during the previous three years. The respondents rated their level of agreement with four items each describing exploitation (sample item: We improved production flexibility) and exploration (sample item: We entered new technology fields) using seven-point scales. For measurement reasons one item measuring exploitation innovation had to be excluded. For hypothesis testing, the exploration (AVE = 0.63; CR = 0.87) and exploitation (AVE = 0.61; CR = 0.82) innovation measures were collapsed into their component means. SME ambidexterity was them calculated by multiplying the two variables with each other.

The analysis also contained several control variables. As the dependent variables might be prone to industry effects, dummy variables for different industries (retail, wholesale, handcraft, information & consulting, manufacturing, IT, media, tourism & hospitality and transportation & logistics) were included. Further, distinct institutional settings in Austria and Liechtenstein might influence the results. Thus, two dummy variables controlling for national influences were included. Company size is controlled using the number of employees. There is evidence that company age might influence innovation and company performance (e.g. Coad et al., 2016), and thus, we included a variable measuring the number of years since the

company's incorporation. Finally, other types of relationships influence innovation outcomes, such marketing networks, coopetition networks, and social and reputational networks (Lechner et al., 2006). Marketing networks (number of partnerships based on three items) and coopetition networks (number of partnerships based on four items) are based on measurement approaches proposed by Lechner et al. (2006). Social and reputational networks were measured by asking respondents to specify the number of memberships in associations and other social or reputational memberships (trade associations, alumni networks, political party memberships, club memberships (e.g. Rotary), etc.).

Before testing the hypotheses, the measurement of the latent variables (exploration, exploitation, internal networking capabilities and the dimensions of external networking capabilities), was investigated with a confirmatory factor in AMOS 26. This analysis showed that the measurement model is reliable and valid. All items loaded highly (0.61 to 0.91) on the respective latent variables and the validity and reliability statistics (see measurement description above) exceeded recommended thresholds (Bagozzi & Yi, 1988). The measurement model also displays discriminant validity (Fornell & Larcker, 1981). Overall, the measurement model displays an acceptable model fit ($\chi^2 = 308.49$ ($p = 0.000$). $\chi^2/df = 1.63$; TLI = 0.90; CFI = 0.92; RMSEA = 0.07). The significant χ^2 value is very common in social sciences and not deemed problematic (Iacobucci, 2010). Table 1 presents the variable correlations.

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Survey research based on self-reported key informant designs faces the possibility of common method bias. Thus, besides taking a priori measures preventing common method bias like guaranteeing confidentiality, separating focal variables, using multi item measures, and relying on existing scales (Harrison et al., 1996; Podsakoff et al., 2012), a marker

variable analysis was also conducted by including a marker variable in the CFA. A suitable marker is theoretically unrelated and therefore should not share variance with the focal latent variable of interest. If shared variance between the marker variable and the variables of interest are detected, this is an indication of common method variance (see Simmering et al., 2015). As the survey did not involve any a priori designed marker variable, a suitable marker variable was selected post-hoc. The data for this research was part of a larger program of research which also collected data on psychological variables of the respondents. From this data we selected the dark personality trait Machiavellianism, which is theoretically, unrelated to both organizational level networking capabilities and innovation activities. For conducting this analysis, the marker variable was included in the CFA and connected to the items of the latent constructs used in this research. In the next step, the constrained and unconstrained models were compared. Constraining the paths from the marker variable to the construct items to 0, and comparing this model with an unconstrained model, did not result in a significant chi-square difference test (p value = 0.45). Based on these results, common method variance seems not to be an issue.

4 RESULTS

To test the hypotheses, hierarchical ordinary least square (OLS) regressions in SPSS 27.0 were conducted. Model 1 regresses the control variables on ambidexterity, and then Model 2 includes the independent variable R&D networks. Model 3 adds the direct effects of the moderator variables internal and external networking capabilities, and Model 4 includes the two-way interactions between R&D networks and internal and external networking capabilities. Finally, in Model 5 we introduce the three-way interaction term (see Table 2). For an in-depth analysis of marginal effects, additional analyses were conducted based on Hayes' (2013) models 1, 2 and 3 implemented in the author's macro for SPSS 28.0. All

variables were mean centered because the regressions involve interaction terms (Aiken & West, 1991). The following regression table presents unstandardized coefficients, standard errors, and p Values. Variance inflation factors (VIFs) were investigated to check for potential multicollinearity issues. The VIF values are well below commonly proposed thresholds and do not indicate any multicollinearity issues (O'Brien, 2007).

The results in Model 2 of Table 2 reveal that R&D network size (β = 0.39***; p Value = 0.02) is a strong driver of ambidexterity, thereby providing support for hypothesis 1. However, when including moderator variables in Model 3, this effect becomes insignificant. Also, internal networking capabilities (β = 3.29***; p Value = 0.00) and external networking capabilities (β = 0.91**; p Value = 0.03) are positive and significant drivers of ambidexterity, supporting hypotheses 2a and 3a. In Model 4, the direct effect of R&D network size (β = 0.50**; p Value = 0.04) on ambidexterity turns out positive and significant again. Further, the direct effects of internal networking capabilities (β = 2.11**; p Value = 0.04) and external networking capabilities (β = 1.16***; p Value = 0.01) remain positive and significant. In addition, Model 4 reveals that while internal networking capabilities (β = -0.70***; p Value = 0.01) negatively moderates the relationship between R&D network size and ambidexterity (thereby contradicting hypothesis 2b), external networking capabilities (β = 0.23***; p Value = 0.01) exert a positive moderating effect, supporting hypothesis 3b. The interaction between internal and external networking capabilities is insignificant. In Model 5, the significant positive direct effect of R&D network size (β = 0.83***; p Value = 0.00) on ambidexterity increases slightly in magnitude. While the direct effect of internal networking capabilities (β = 1.76*; p Value = 0.09) decreases slightly in magnitude, the direct effect of external networking capabilities (β = 1.28***; p Value = 0.00) increases slightly. In addition, the interaction effects remain largely as in Model 4. However, Model 5 shows that there is a

significant negative three-way interaction between R&D network size, internal and external networking capabilities (β = -0.08**; p Value = 0.03) which contradicts hypothesis 4.

The controls for information & consulting (β = 8.54*; p Value = 0.09) and company age (β = -0.07***; p Value = 0.01) show significant effects on ambidexterity. Overall, the analysis demonstrates good explanatory power 41% (adjusted R^2 = 0.41, F = 4.81) and the inclusion of the proposed variables is justified as indicated by the significantly increasing adjusted R^2 values in Table 2.

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Figure 1 visualizes the interplay between R&D network size, and internal and external networking capabilities. This visualization reveals that R&D network size does not always drive SME ambidexterity. In the case of highly developed internal networking capabilities and poorly developed external networking capabilities, an increasing R&D network size even negatively affects SME ambidexterity. The strongest relationship (i.e., the steepest slope) between R&D network size and ambidexterity is observed for SMEs with weak internal but strong external networking capabilities. When internal networking capabilities are highly developed an increasing size of the R&D network actually reduces ambidextrous innovation activities of SMEs. However, if internal networking capabilities are not well developed, R&D network size has a positive effect (see Figure 1). Interestingly, the analysis also reveals a positive relationship between R&D network size and ambidexterity when internal and external networking capabilities are weak. This points towards trade-offs between internal and external networking capabilities which prevent SMEs from realizing the full potential of their R&D network. In particular, internal networking capabilities appear to exert a detrimental effect in this respect. Thus, we do not find the proposed reinforcing effect between internal and external networking capabilities.

--- please insert figure 1 about here ---

Figures 2 and 3 present the marginal effects of R&D network size on ambidexterity together with the 95% confidence intervals for different levels of internal and external networking capabilities. The marginal effect is considered significant when the confidence interval does not include zero. In terms of internal networking capabilities, Figure 2 provides evidence that R&D network size significantly increases ambidexterity for internal networking capability rating ranging from 2 to 5.75. However, the effect decreases in magnitude with increasing levels of internal networking capability. For ratings higher than 5.75, the effect becomes insignificant. In terms of external networking capabilities, Figure 3 provides evidence that R&D network size increases ambidexterity when external networking capability exceeds the level of 15.30. For external networking capability levels between 7.95 and 15.30, R&D network size does not significantly influence ambidexterity. If external networking capabilities are weak (for example, levels below 7.95), R&D network size even exerts significant negative influences on ambidexterity (see Figure 3).

--- please insert figure 2 about here ---

--- please insert figure 3 about here ---

Figure 4 provides a more comprehensive picture of this analysis because it simultaneously takes varying levels of internal and external networking capabilities into account (low / high = mean ± one standard deviation). Figure 4 shows that R&D network size has a positive and significant effect on ambidexterity when both internal and external networking capabilities are low. The effect starts decreasing, and eventually turns negative when internal networking capabilities increase to high levels while external networking capabilities remain low. However, under these conditions the effect of R&D network size is insignificant meaning that an increase in R&D partnerships does not significantly influence

ambidexterity. The effect increases again with increasing external networking capabilities (from low to mean). However, for mean levels of external networking capabilities SME can only turn their R&D networks into ambidextrous innovation activities when their internal networking capabilities are at a low to mean score. For high levels of external networking capabilities, the effect of R&D network size on ambidexterity is always positive and significant. However, the effect of R&D network size becomes stronger the weaker internal networking capabilities are. Overall, the results provide support for H1, H2a, H3a, and H3b. H2b and H4 are however not supported.

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5 DISCUSSION

R&D network size, as well as external and internal networking capabilities are key to SMEs for achieving ambidextrous innovation outcomes. Specifically, this study reveals several important theoretical insights. Importantly, simply collaborating with other firms on R&D activities is not sufficient for SMEs to attain ambidexterity. Rather, their ability to translate R&D networks into ambidexterity depends on the configuration of external and internal networking capabilities. Hence, this research contributes to on-going debates in the literature which suggest that SME innovation ambidexterity rests on SMEs developing external and internal networking capabilities simultaneously (Kauppila, 2010; Liu et al., 2021; Raisch et al., 2009; Vesalainen & Hakala, 2014), and we provide evidence of the potential trade-offs that exist. Crucially, our evidence challenges the popular view that simply more of both external and internal networking capabilities is desirable (e.g. Faroque et al., 2022; Vesalainen & Hakala, 2014; Walter et al., 2006). Our empirical results unexpectedly show that strong external and internal networking capabilities may actually limit SMEs' ability to

effectively translate R&D network partnerships into ambidextrous innovation activities. In the following discussion, we elaborate on our findings and contributions in more detail. To further unpack, explore, and gain insights into the relationships observed in our data, we include insights from a case study[2] of Alpha Ltd., an SME with 50 full-time employees specializing in producing high-end navigation technology. Alpha Ltd. is located in the UK and supplies industries including aerospace, defense, and space.

Our quantitative results demonstrate that R&D network size, overall, positively influences SME ambidexterity. Hence, the larger the R&D network of an SME, the greater its ability to balance both exploration (innovation) and exploitation (efficiency). A larger R&D network offers a broader pool of resources, diverse ideas, and complementary knowledge that SMEs can use to innovate and improve their existing products or processes (Gorovaia et al., 2023; Lavie, 2006; Yang et al., 2018). Alpha Ltd. provides an illustrative example of an SME leveraging an effective network of R&D partners. The firm set about systematically establishing a network comprising multiple partners, including universities, suppliers, customers and other electronic technology companies. These efforts culminated in establishing a local technology innovation cluster with 24 member companies. Establishing and increasing the company's R&D network meant that Alpha Ltd. benefits from important insights into novel technologies related to positioning, navigation, and timing technology, as well as the latest insights into ever evolving customer demands. Hence, this network provides Alpha Ltd. with the impetus to innovate with new products (exploration courtesy of insights into emerging customer trends) yet also to refine existing production processes (exploitation through insights into emerging process technologies). In sum, this network enhanced Alpha

[2] The case study is based on interview data, website information and internal documents that authors were granted access to.

Ltd.'s overall performance and enabled them to overcome liabilities of smallness (Freeman et al., 1983; Naudé et al., 2014).

Further, our results support a positive direct influence of internal networking capabilities on ambidexterity. Internal networking capabilities refer to the ability of a firm to connect internal actors (Walter et al., 2006), such as employees and departments, to ensure that knowledge from one part of the firm can be effectively shared and utilized by other parts. When an SME has strong internal networking capabilities, it can facilitate better communication, knowledge sharing, and cross-functional collaboration; all of which enhances both exploration and exploitation activities (Cohen & Levinthal, 1990; Jansen et al., 2005; Miller et al., 2006; Walter et al., 2006). Again, considering the case of Alpha Ltd., the managing director commented that "*We've been working on building up that spread of knowledge, the sharing of knowledge*" which the managing director views as vital as part of a strong internal networking culture where employees across different teams (e.g., new product development, sales, and customer support) regularly share insights through internal meetings, workshops, and shared communication tools. By having strong internal networking, the new product development department is immediately aware of customer needs and problems brought forward by the sales team, which helps them develop new features (exploration) while also improving existing products and improving after-sales service (exploitation).

Our results also support a positive influence of external networking capabilities on ambidexterity. Hence, when SMEs establish, maintain, and effectively utilize relationships with partners outside the firm (e.g., with suppliers, customers, research institutions, or even competitors), they are able to access external resources and knowledge (Naudé et al., 2014; Vesalainen & Hakala, 2014), which helps them to innovate (i.e., to explore) while also streamlining their existing operations (i.e. to exploit).

We also find empirical support demonstrating that the effect of R&D network size on ambidexterity increases with increasing external networking capabilities. Hence, our theorizing and evidence suggest that the larger the R&D network, the greater the ambidexterity, especially if the SME is effective at managing external relationships. Strong external networking capabilities help SMEs to effectively utilize the resources and knowledge they acquire through their R&D networks (Degener et al., 2018; Liu et al., 2021; Song & Di Benedetto, 2008). Thus, their external networking capabilities amplify the value they derive from their R&D network.

The example of Alpha Ltd. again provides further insights into these mechanisms. Alpha Ltd. has developed strong external networking capabilities by investing considerable time and resources into activities such as inviting potential partners to company audits, which, according to the managing director provides the company with the opportunity to "*demonstrate their capabilities* to *build up good relationships and do good marketing*" all at the same time. These well-developed external networking capabilities enable Alpha Ltd. to maintain close relationships with partners, understand their needs, and nurture mutual benefits. For instance, the managing director describes the benefits as: "*So we get their technology roadmap ahead of time. […] So we work very, very closely with them to understand what the next generation of system is going to be. And in parallel to that, we feed a lot back to them about what we've seen from the customers, what people are asking for, what we can do in our area."* Hence, because of these strong external capabilities, Alpha Ltd. is able to leverage the knowledge from its R&D network to develop innovative products (exploration) while also streamlining its existing production lines (exploitation).

While R&D networks provide benefits for SMEs, even when external and internal networking capabilities are not well developed, these kinds of networks become increasingly beneficial for SMEs with well-developed external networking capabilities. However, the role

of internal networking capabilities adds an intriguing and important perspective to deepen and broaden our understanding of the effects of R&D networks. Although internal networking capabilities directly enhance ambidexterity, the more SMEs develop internal networking capabilities the weaker their ability to innovate based on their R&D networks. In particular, when SMEs have highly developed internal networking capabilities, they are less able to translate R&D partnerships effectively into ambidexterity; in contrast to SMEs focusing to a greater extent on external networking capabilities. Our findings thus extend previous research focusing on external networking capabilities (e.g. Degener et al., 2018; Schreiner et al., 2009) by showing that, in the context of SMEs, configurations of external and internal networking capabilities determine the extent R&D networks can be translated into SME ambidexterity.

The Alpha Ltd. case provides possible explanations for this paradoxical finding. The managing director explained that he sees a stronger orientation towards external partners as crucial because it enables Alpha Ltd. to explore new products and bring them to the market faster. At the same time, he thinks that investing resources (e.g., frequent meetings, holding away days) into build strong internal communication and collaboration capabilities is also important as Alpha Ltd.'s. Crucially though, it took a change in leadership and strategy to overcome the trade-offs between internal and external networking capabilities that Alpha Ltd. used to face. Before the new managing director took over in 2020, an excessive emphasis on internal networking capabilities lead to an over-emphasis on internal projects and knowledge sharing. This strong internal focus not only prevented Alpha Ltd. from leveraging the full potential of their R&D partnerships but also limited the number of R&D partnerships. At that time the strong internal focus was driven by the previous owner-manager who focused on developing technology and solving problems within the company. The leadership openly communicated a strong preference for internal knowledge, resources, relationships, and

solutions, and signaled a distrust of external partners. Thus, the firm developed a culture and mindset that placed an imperative that internal solutions always take precedence over external ones. While this strong internal culture was successful for exploring and exploiting proprietary innovations with a very limited number of R&D partnerships, it limited Alpha Ltd's ability to grow since they were unable to integrate and use new knowledge and resources from a wider network of R&D partners. This left Alpha Ltd. exposed to the risk of losing the one major R&D partner whom they relied upon for 90% of their new business.

In 2020, the new managing director consciously changed Alpha Ltd.'s strategy and culture to be more outward looking; putting a strong emphasis on building an external networking capability. The managing director describes this shift: "*I wanted to break away from trying to do everything ourselves, so our entire mission became find the best technology to operate and that technology doesn't have to be designed at [Alpha Ltd.].*" The shift in strategy also impacted Alpha Ltd.'s internal networking capability in terms of its underlying mindset which now follows a "*Let's not reinvent the wheel!*" (managing director Alpha Ltd.) philosophy and emphasizes the value of outside knowledge and resources in exploring and exploiting innovation opportunities. Internal networking has been opened up to integrating outside ideas and resources in this way. As a direct result of this shift in strategy and culture, 80% of all new business opportunities now come from a wide number of newly established R&D partners, and only 20% from the single R&D partner the used to rely upon. Hence the case of Alpha Ltd. illustrates the risks that SMEs face when they have a culture that emphasizes a preference for what is familiar internally, instead of adapting internal processes to incorporate the latest insights from external R&D partners. This also underscores the trade-offs between internal and external networking capability that are caused by organizational culture. Overall, an emphasis on internal networking reduces the ability of SMEs to balance

exploration (from the external R&D networks) with exploitation (their established internal systems) compared to SMEs focusing more on external networks than internal ones.

The extent literature explains the preference for internal innovation sources over external ones as attributable to the "not-invented-here syndrome" (NIH), which refers to an attitude within an organization where employees undervalue knowledge, ideas, or technologies that come from outside the organization (Antons & Piller, 2014; Katz & Allen, 1982) often due to a mistrust of external sources. The NIH syndrome can cause firms to dismiss valuable insights or innovations from external R&D networks, especially if these external resources come from similar organizations (Hussinger & Wastyn, 2016), as they might be perceived as less unique or valuable compared to in-house knowledge. Thus, in highlighting the trade-offs between internal and external networking capabilities this research contributes important insights into mechanisms that may give rise to the NIH syndrome in SMEs.

In addition, we contribute to research investigating the circumstances under which external knowledge may be preferred over internal knowledge (Menon & Pfeffer, 2003). This is the case when external knowledge is scarce and costly to obtain which increases its perceived value and the status benefits it provides to managers (Menon & Pfeffer, 2003). Our research shows that for SMEs with low to moderate internal network capabilities and moderate to strong external networking capabilities, external knowledge is accessed more successfully (evidenced in increased ambidextrous innovation activities). We reason that managerial attention is focused towards external resources and knowledge when considerable investments have been made to establish and access R&D partnerships (i.e., well-developed external networking capabilities) and in doing so, increase the perceived value of external knowledge and making it less prone to scrutiny (Menon & Pfeffer, 2003).

In summary, our study demonstrates that for SMEs to attain ambidexterity, they must have externally orientated network capabilities allied to their R&D network. An overreliance on internal networks may hinder SMEs from overcoming their liability of smallness (Freeman et al., 1983; Naudé et al., 2014) by preventing them from extracting value from their R&D partnerships with other organizations. Thus, in sum, our findings highlight that SME ambidexterity depends on the fit between R&D network extensiveness, and external and internal network capabilities. While in cases where the range of R&D partnerships is limited, a greater internal focus is needed for ambidextrous innovation activities, larger R&D networks demand SMEs to pay greater attention to maintaining and developing their external networking capabilities.

5.1 Practical Implications

SME managers should pay careful attention to how they balance the development of networking capabilities. In the absence of R&D networks, SME managers should invest in developing strong internal networking capabilities. In practice, this will likely entail nurturing interactions between different departments, and organizational members of different ranks. Such communication increases organizational innovativeness (both exploratory and exploitative) because people with different functional (e.g., operations vs financing) and structural (e.g., operational vs managerial) backgrounds can contribute to idea generation and problem solving.

Once an SME has established R&D networks, external networking capabilities take on increasing importance. To develop external networking capabilities, intelligence systems should be implemented to gather knowledge about partners in terms of their resources, capabilities, and strategic goals. Further, SME managers need to engage in meaningful relationship building activities and carefully coordinate their activities with their partners.

Thus, inviting partners to attend "company audits" similarly to our case example Alpha Ltd., helps to demonstrate the firm's capabilities and trustworthiness. Alternatively, steering committees could be established comprising multiple different partners, and activities such as joint away days, and even joint participation in open innovation activities, to help establish and nurture R&D partnerships.

When considering both external and internal network capabilities, in terms of their simultaneous presence in firm strategy and the interplay between them, managers should be conscious that excessive focus on internal networking capabilities carry significant risks. Managers are cautioned against random, or nonstrategic, development of their network capabilities in the blind thought that improving both external and internal networking is optimal. Rather, the results point towards trade-offs that favor external networking. Managers in firms that prioritize both network capabilities are advised to act rapidly to overcome any within-firm inertia and prioritize network behavior towards external network capabilities to maintain ambidexterity, especially when R&D networks are of importance and the potential for proprietary innovation is limited.

5.2 Limitations and future research

Like all research, our study has limitations that future research might aim to address. First, this study covers a specific institutional and cultural context: the Rhine valley which might limit the generalizability of the results. Future research could therefore seek to replicate our findings using different samples. Further, we employed a cross-sectional survey-based key informant design. While this method has the principal advantage that it does not rely on archival proxies for focal constructs, it does have limitations. For example, common method might be a concern, although countermeasures limit such potential bias (Harrison et al., 1996; Podsakoff et al., 2012). Further, we are clearly restricted in our ability to claim causality. To

address these limitations, future research could solicit multiple responses from, for example, SMEs as well as their various network partners at different points in time; however, such an approach would inevitably limit the response. Finally, alternative methods, including in-depth interviews could be utilized to explore our unexpected findings concerning the detrimental effects of internal networking capabilities when allied to an extensive R&D network.

Additional future research directions arise from our findings. First, additional research is needed into the interplay between internal and external network capabilities when different networks beyond R&D networks are favored. The strategic trade-offs revealed in this study certainly imply that further intervening mechanisms could be present. For instance, another reason for our paradoxical finding concerning the internal networking capabilities trade-off, might be that the value of spreading information about available R&D network resources internally depends on SME absorptive capacity (Miroshnychenko et al., 2021). A firm's absorptive capacity refers to the ability to recognize, assimilate, and effectively apply new external knowledge to enhance its operations and innovation processes. In this respect, highly developed internal networking capabilities will be detrimental in cases where SMEs do not possess the required absorptive capacity to recognize the actual value that is made accessible through their R&D networks. In addition, research on absorptive capacity highlights that if firms already have extensive experience within certain knowledge fields, internal communication of other external solutions becomes ineffective because organizational members will prioritize their own experience over external sources (Lenox & King, 2004). Hence, future research could investigate how SME absorptive capacity influences the trade-offs between internal and external networking capabilities in SMEs.

Second, we do not consider situations where firms are involved in, or favor, multiple networks and how the interplay between different network actors materialize in such scenarios. Exploring further strategic trade-offs and investigating whether internal

networking capabilities become more important for certain network types are important questions that future research should strive to address.

6 CONCLUSION

This study contributes new theoretical insights concerning SME ambidexterity. By distinguishing between internal and external networking capabilities and their interactions, we have deepened and broadened understanding of how networking capabilities contribute to SME ambidexterity. Our findings show that the role of internal networking capabilities is not as might be expected. Instead of facilitating value extraction of R&D network resources by making them accessible throughout the organization, internal networking capabilities seem to do the opposite in the context of extensive R&D networks. We reason that a strong attentional focus on internal collaborative activities can yield biases such as the not-invented-here syndrome (Antons & Piller, 2014; Katz & Allen, 1982). In addition, strong attentional focus on internal collaborative activities may prove detrimental in the case of firms with too little or very extensive expertise in the field of their R&D partners (Lenox & King, 2004; Miroshnychenko et al., 2021). Our research also explains how different configurations of resources (i.e., network partnerships) and capabilities (i.e., internal and external networking capabilities) affect ambidextrous innovation activities. Thus, this study addresses some of the major limitations and criticisms that have been levelled at extant research for failing to provide clear ex ante guidance for managers on how to exploit resources (e.g. Gruber et al., 2010; Sirmon et al., 2007). Finally, we also add to the nascent body of research on ambidexterity in SMEs (e.g. Lubatkin et al., 2006; Wenke et al., 2020) by revealing the trade-offs that SMEs face in attaining ambidexterity.

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	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
(1) Ambidexterity	1.00																			
(2) R&D Networks	0.28***	1.00																		
(3) External NC	0.43***	0.16*	1.00																	
(4) Internal NC	0.51***	0.25***	0.54***	1.00																
(5) Company Age	-0.29***	-0.13	-0.17*	-0.19**	1.00															
(6) Company Size (No. of Employees)	-0.06	-0.09	-0.11	0.06	0.47***	1.00														
(7) Coopetition Networks	0.01	-0.01	0.04	0.09	0.08	0.02	1.00													
(8) Marketing Networks	0.02	0.10	0.13	0.17*	-0.12	0.08	0.02	1.00												
(9) Association & Membership Networks	-0.08	0.08	0.10	0.11	0.13	0.05	0.18**	0.13	1.00											
(10) Austria	0.03	0.13	-0.01	-0.06	0.28***	0.31***	-0.05	0.09	-0.10	1.00										
(11) Liechtenstein	-0.07	-0.15	0.06	-0.02	-0.17*	-0.21**	0.12	0.02	0.08	-0.49***	1.00									
(12) Retail	-0.22**	-0.06	-0.08	-0.06	0.15*	0.24***	-0.02	0.14	0.14	0.28***	-0.17*	1.00								
(13) Wholesale	-0.16*	-0.11	0.09	-0.03	0.06	-0.11	0.25***	-0.05	0.08	-0.16*	0.26***	-0.09	1.00							
(14) Handcraft	0.07	0.36***	0.03	0.21**	-0.14	-0.09	-0.01	0.10	0.02	-0.08	-0.05	-0.07	-0.10	1.00						
(15) Information & Consulting	-0.01	-0.08	-0.03	-0.09	0.06	-0.11	-0.02	-0.07	0.12	-0.15*	0.31***	-0.05	-0.07	-0.06	1.00					
(16) Manufacturing	0.16*	-0.02	0.02	0.05	-0.12	-0.02	-0.02	-0.04	-0.17*	-0.01	0.12	-0.04	-0.06	-0.04	-0.03	1.00				
(17) IT	0.17*	0.08	0.08	-0.08	-0.10	0.00	-0.06	-0.05	-0.16*	0.04	-0.19**	-0.14	-0.19**	-0.15*	-0.11	-0.08	1.00			
(18) Media	-0.08	-0.06	-0.10	-0.05	0.04	-0.03	-0.03	-0.04	0.04	0.09	-0.07	-0.12	-0.16*	-0.13	-0.09	-0.07	-0.25***	1.00		
(19) Tourism & Hospitality	0.03	-0.05	-0.10	0.01	-0.19**	-0.09	-0.03	-0.06	0.04	-0.11	0.14	-0.06	-0.09	-0.07	-0.05	-0.04	-0.13	-0.11	1.00	
(20) Transportation & Logistics	0.08	-0.01	0.05	0.01	-0.09	-0.12	-0.03	0.21**	0.00	-0.10	0.06	-0.08	-0.10	-0.08	-0.06	-0.05	-0.16*	-0.14	-0.07	1.00
Mean	28.55	3.40	16.36	5.33	43.67	34.51	31.46	30.31	12.79	0.36	0.30	0.06	0.11	0.07	0.04	0.02	0.22	0.17	0.06	0.08
S.D.	11.55	6.48	2.55	1.26	40.68	39.36	196.56	84.42	1.36	0.48	0.46	0.24	0.32	0.26	0.20	0.15	0.42	0.38	0.23	0.27

Note: Significant at *p<.1; **p<.05; ***p<.01;

Table 1: Correlation and Descriptive Statistics

	Model 1			Model 2			Model 3			Model 4			Model 5		
	Coefficient	*S.E.*	*p Value*	*Coefficient*	*S.E.*	*p Value*	*Coefficient*	*S.E.*	*p Value*	*Coefficient*	*S.E.*	*p Value*	*Coefficient*	*S.E.*	*p Value*
Constant	24.12***	9.05	0.01	27.31***	8.98	0.00	33.48***	7.80	0.00	30.69***	7.85	0.00	30.53***	7.71	0.00
Austria	3.09	2.56	0.23	2.03	2.55	0.43	2.24	2.22	0.31	1.70	2.28	0.46	1.59	2.24	0.48
Lichtenstein	-2.19	2.77	0.43	-1.89	2.72	0.49	-1.84	2.35	0.44	-2.00	2.30	0.39	-2.14	2.26	0.35
Retail	-11.33**	4.81	0.02	-10.35**	4.73	0.03	-7.12*	4.10	0.09	-7.05*	4.13	0.09	-6.21	4.07	0.13
Wholesale	-3.67	4.17	0.38	-3.29	4.10	0.42	-2.32	3.54	0.52	-2.13	3.47	0.54	-0.98	3.45	0.78
Handcraft	1.65	4.62	0.72	-1.64	4.75	0.73	-1.22	4.11	0.77	0.72	4.11	0.86	2.44	4.11	0.55
Information & Consulting	3.02	6.04	0.62	3.53	5.93	0.55	6.32	5.12	0.22	6.53	5.05	0.20	8.54*	5.04	0.09
Manufacturing	10.13	7.10	0.16	9.92	6.96	0.16	9.70	5.99	0.11	8.68	5.89	0.14	9.17	5.79	0.12
IT	2.40	3.32	0.47	1.87	3.26	0.57	3.86	2.86	0.18	3.84	2.85	0.18	4.03	2.80	0.15
Media	-2.31	3.49	0.51	-2.01	3.43	0.56	0.19	2.97	0.95	-0.15	2.94	0.96	1.32	2.96	0.66
Tourism & Hospitality	-0.36	5.12	0.94	0.02	5.03	0.99	3.08	4.37	0.48	2.77	4.33	0.52	3.55	4.26	0.41
Transportation & Logistics	3.32	4.55	0.47	3.27	4.46	0.47	4.89	3.85	0.21	5.39	3.78	0.16	6.10	3.72	0.10
Company Age	-0.09***	0.03	0.00	-0.09***	0.03	0.01	-0.05*	0.03	0.06	-0.06**	0.03	0.04	-0.07***	0.03	0.01
Company Size (No. of Employees)	0.03	0.03	0.34	0.04	0.03	0.25	0.02	0.03	0.48	0.02	0.03	0.54	0.02	0.03	0.40
Coopetition Networks	0.00	0.01	0.41	0.00	0.01	0.41	0.00	0.00	0.59	0.00	0.00	0.69	0.00	0.00	0.61
Marketing Networks	0.00	0.01	0.78	-0.01	0.01	0.72	-0.01	0.01	0.26	-0.01	0.01	0.25	-0.01	0.01	0.17
Association & Membership Networks	0.37	0.79	0.64	0.10	0.78	0.90	-0.45	0.68	0.51	-0.16	0.69	0.82	-0.15	0.68	0.83
R&D Networks				0.39**	0.17	0.02	0.23	0.15	0.13	0.50**	0.24	0.04	0.83***	0.28	0.00
Internal NC							3.29***	0.88	0.00	2.11**	1.03	0.04	1.76*	1.02	0.09
External NC							0.91**	0.41	0.03	1.16***	0.43	0.01	1.28***	0.43	0.00
Internal NC * R&D Networks										-0.70***	0.26	0.01	-0.84***	0.26	0.00
External NC * R&D Networks										0.23***	0.09	0.01	0.28***	0.09	0.00
Internal NC * External NC										0.11	0.23	0.62	0.31	0.24	0.20
Internal NC * External NC * R&D Networks													-0.08**	0.03	0.03
F-Value	1.83**			2.11**			4.65***			4.63***			4.81***		
F-Change	1.83**			5.40**			19.90***			2.92**			4.91**		
R^2	0.21			0.25			0.45			0.50			0.52		
Adjusted R^2	0.10			0.13			0.36			0.39			0.41		

Note: Significant at *p<.1; **p<.05; ***p<.01; Reference categories for the dummy variables are as follows: Industry (Retail, Wholesale, Handcraft, Information & Consulting, Manufacturing, IT, Media, Tourism & Hospitality, Transportation & Logistics) = Other; Country (Austria, Lichtenstein) = Switzerland

Table 2: Results OLS Regression Ambidexterity

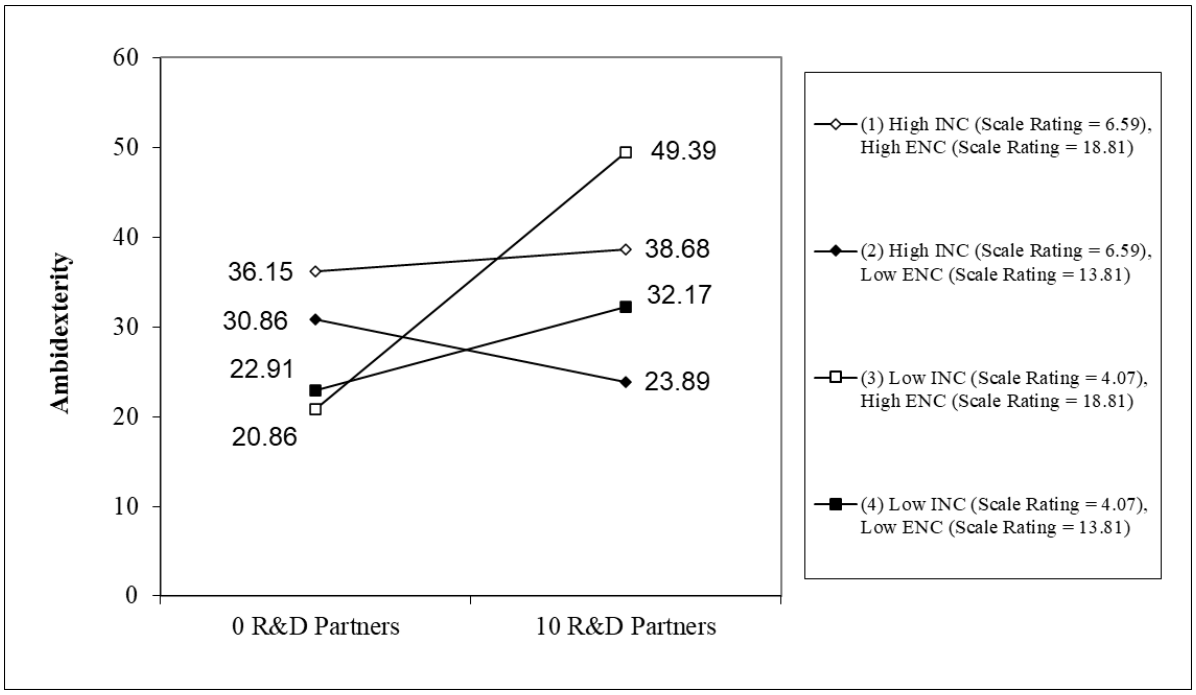

Figure 1: The relationships between R&D Network Size, Internal Networking Capabilities (INC), External Networking Capabilities (ENC) and SME Ambidexterity

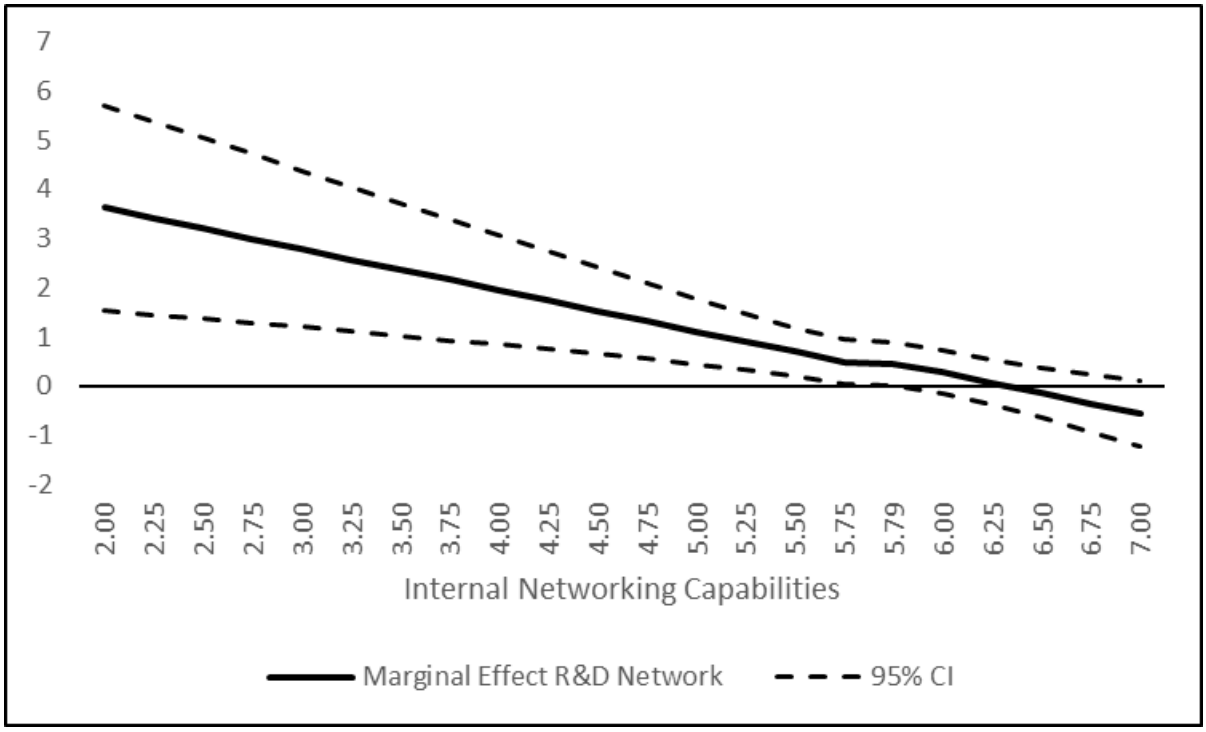

Figure 2: The Marginal Effect of R&D Networks on Ambidexterity at varying Levels of Internal Networking Capabilities

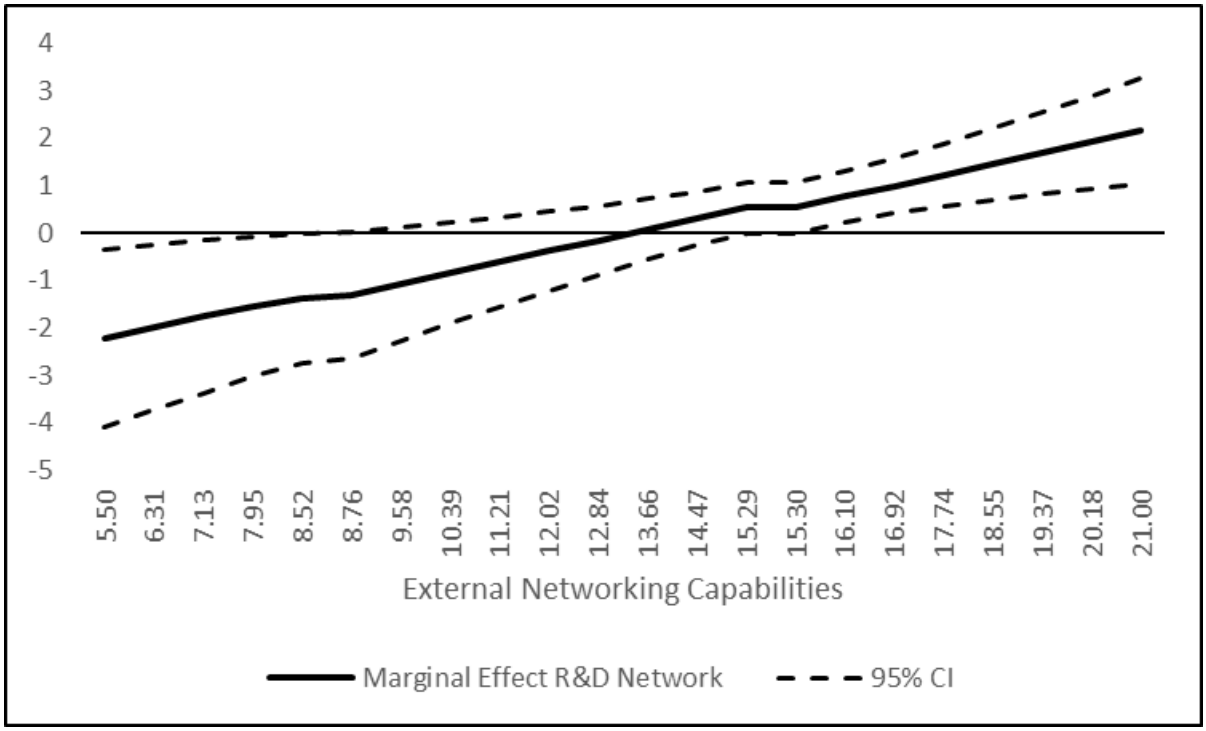

Figure 3: The Marginal Effect of R&D Network Size on Ambidexterity at varying Levels of External Networking Capabilities

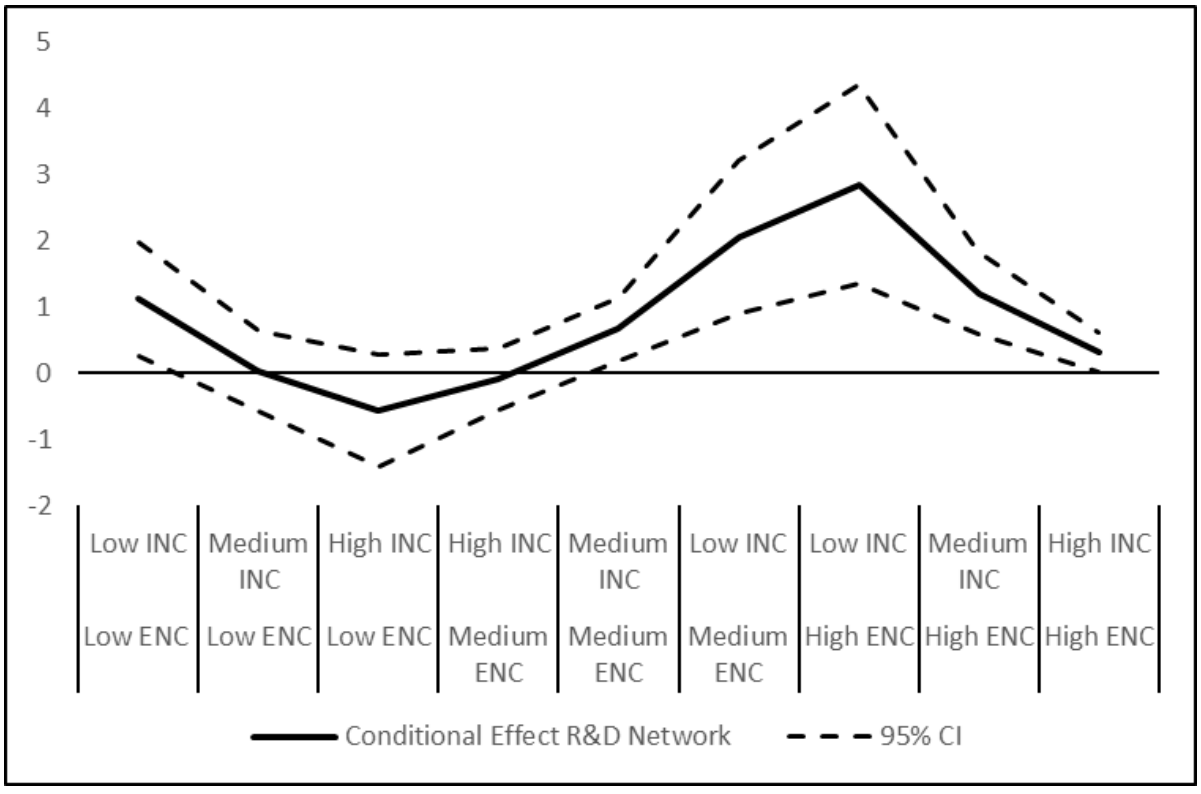

Figure 4: The Conditional Effect of R&D Networks on Ambidexterity for different Levels of Internal (INC) and External Networking Capabilities (ENC)