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Abstract
Organizational ambidexterity is the simultaneous act of exploiting existing competences and exploring new opportunities. Prior studies suggest that resource-constrained SMEs cannot successfully pursue simultaneous interorganizational ambidexterity but need to rely on functionally separated alliances (i.e., alliances based on their value chain function such as explorative R&D alliances or exploitative commercialization alliances) to achieve ambidexterity. Yet, others propose that ambidexterity can occur within the functional domain of a supply chain. We investigate the relationships among supply chain ambidexterity, network capabilities, strategic information flow, and firm performance. In a sample of manufacturing SMEs in Sweden, we hypothesize the direct association between supply chain ambidexterity and performance and the moderating effect of network capabilities and strategic information flow. By testing our hypotheses in a sample of 200 manufacturing SMEs, we show that supply chain ambidexterity decreases firm performance; however, network capabilities and strategic information flow with their supply chain partners help mitigate this negative relationship. The present study advances understanding of ambidextrous interorganizational collaboration and alliances in general and supply chain ambidexterity of manufacturing SMEs in particular. In particular, in contexts where supply chain ambidexterity is negatively associated with performance, network capabilities and strategic information flow may be necessary to lower the negative effects.

1. Introduction

Organizational ambidexterity, i.e., the simultaneous act of exploiting existing competences and exploring new opportunities, has become one of the central domains of research (Raisch et al., 2009; Benner and Tushman, 2003; O'Reilly III and Tushman, 2013; Junni et al., 2013). Rooted in the seminal work of March (1991), exploitation refers to streamlining firms' existing operations, whereas exploration is needed to adapt to the changing environment through, for example, search, risk taking, and experimentation (Duncan, 1976; Tushman and O'Reilly, 1996; Levinthal and March, 1993). The established scholarly view also proposes that, to survive and prosper, firms need to maintain "balance between exploration and exploitation" (March, 1991, p. 71), while recent studies advance the discussion further by arguing that interorganizational (IO) relationships and alliances (Stettner and Lavie, 2014; Kauppila, 2010; Lavie, 2006) play an important role in achieving such balance (Wassmer, Li, and Madhok, 2017; Hoang and Rothaermel 2010; Hoffmann, 2007; Lavie and Rosenkopf, 2006; Koza and Lewin, 1998).

The challenge of balancing exploitation and exploration is even amplified among small- and medium-sized enterprises (SMEs), as they tend to suffer from resource constraints (Hannan and Freeman, 1989). To

overcome such challenge, some propose that it is the specific role of functionally separated alliances (i.e., alliances based on their value chain function; Lavie et al., 2011), such as explorative R&D initiatives or exploitative commercialization alliances (Yang, Zheng, and Zhao, 2014; Rothaermel and Deeds, 2004), that help empower SME ambidexterity and enhance performance (Lin et al., 2007; Park et al., 2002). This view receives support from Kauppila (2015), who found that ambidextrous IO collaboration (i.e., simultaneous co-exploration and co-exploitation) among small manufacturing firms does not enhance firm performance due to the underlying "conflicts and inconsistencies" (p. 163) between exploitation and exploration also known as "ambidexterity as a paradox" (Andriopoulos and Lewis, 2009; Papachroni, Heracleous, and Paroutis, 2014).

Ambidexterity can also occur within the specific functional domain of a supply chain. Supply chain ambidexterity refers to a manufacturer's efforts to refine/extend its existing resources and to develop new supply chain competencies and yield performance benefits, especially for large manufacturing firms (Kristal, Huang, and Roth, 2010; Aoki and Wilhelm, 2017; Im and Rai, 2008). We set up the following research objectives: (1) to examine the supply chain ambidexterity and performance relationship among manufacturing SMEs, and (2) to investigate the moderating role of network capabilities and strategic information flow on supply chain ambidexterity and the performance relationship.

Our first objective builds upon the notion that suppliers contribute to a firm's operational effectiveness and its innovation also in the context of SMEs (Song and Di Benedetto, 2008; Meeus et al., 2001; Robson and Bennet, 2000; Lipparini and Sobrero, 1994) while simultaneously acknowledging prior studies' claim that supply chain management (i.e., the integration of key business processes among partners) is different (Beekman and Robinson, 2004) or "fits poorly" (Arend and Wisner, 2005, p. 404) in the SME context. More importantly, by drawing on the resource-based view (Barney, 1991; Grant, 1991; Wernerfelt, 1984), the capability perspective (Kogut and Zander, 1992; Andrews, 1971), and on the transaction cost economics (Williamson, 1975), our second objective focuses on the role of network capabilities (i.e., a firm's ability

to initiate, maintain, and utilize relationships with various external partners; Walter, Auer, and Ritter, 2006). Network capabilities are salient because prior studies have shown that complex interplay exists among ambidextrous collaboration, collaborative capabilities, and performance (Kauppila, 2015) and as SMEs are known to rely on a relational approach (Adams et al., 2012) and trust (Morrissey and Pittaway, 2006) in managing their supplier relationships (Wynarczyk and Watson, 2005).

However, network capabilities may not be sufficient for reaping the benefits of supply chain ambidexterity. Thus, while prior studies show that, e.g., ambidextrous collaboration requires absorptive capacity of the focal firm (Kauppila, 2010; Rothaermel and Alexandre, 2009) and that information sharing is vital for managing the conflicts and inconsistencies of ambidextrous supply chain collaboration (Kauppila, 2015; Tiwana, 2008; Im and Rai, 2008), less is known on the detailed nature of such shared information (van Wijk et al., 2008). Hence, we complement our model with the concept of strategic information flow (Klein and Rai, 2009), which represents the extent to which an SME utilizes information technology (IT) to share strategic information (e.g., cost and margin structures, decision-making criteria) with its business partners.

The study advances the discussion on ambidextrous supply chain collaboration and alliances in general and supply chain ambidexterity of manufacturing SMEs in particular. First, while supply chain ambidexterity does seem to enhance firm performance among large manufacturing firms (Kristal et al., 2010; Aoki and Wilhelm, 2017), in the context of SMEs, we show that supply chain ambidexterity has a negative association with performance. Second, we challenge the prevailing view, which proposes that resource-constrained SMEs cannot successfully pursue simultaneous supply chain ambidexterity (Kauppila, 2015; Yang, Zheng, and Zhao, 2014; Lin et al., 2007; Park et al., 2002) and demonstrate that manufacturing SMEs, equipped with network capabilities can mitigate the negative effects of supply chain ambidexterity on performance. Third, we show that SMEs can further mitigate the negative supply chain ambidexterity performance association by improving strategic information flow with their partners. In

doing this, we answer call of Kauppila (2015) who states that "because of the mixed findings across different studies, future studies should investigate variables that might moderate the relationship between ambidextrous IO [interorganizational] collaboration and different types of firm performance" (p. 163).

2. Theoretical Background and Hypotheses Development

2.1. Ambidexterity, Alliances, and SMEs

The prior literature tends to agree that especially large firms achieve performance benefits via organizational ambidexterity (Junni et al., 2013; He and Wong, 2004; Siggelkow and Levinthal, 2003). The established scholarly view also proposes that firms can achieve ambidexterity by temporal or organizational separation (Simsek et al., 2009). Rooted in the literature on punctuated equilibrium (Brown and Eisenhardt, 1997; Gersick, 1991) and sequential attention to divergent goals (Cyert and March, 1963), temporal or cyclical (Simsek et al., 2009) separation emphasizes sequential shifts in organizational focus (Raisch et al., 2009; Gupta et al., 2006; Tushman and O'Reilly, 1996). Organizational separation, in turn, refers to establishing and maintaining organizational structures (O'Reilly and Tushman, 2004; Simsek et al., 2009), business units (Jansen, Simsek, and Cao, 2012), and culture (Tushman and O'Reilly, 1996)—both for exploration and exploitation. Some argue that alliances also play an important role in balancing exploitation and exploration (Wassmer, Li, and Madhok 2017; Lavie, 2006; Lavie and Rosenkopf, 2006; Gulati, 1999; Dyer and Singh, 1998; Koza and Lewin, 1998). Firms can do such balancing in a functional domain by engaging in explorative R&D partnerships and/or exploitative commercialization collaboration (Grant and Baden-Fuller, 2004; Park et al., 2002; Rothaermel, 2001). Alternatively, firms can achieve a balance between exploitation and exploration within the structural domain by establishing new partnerships for generating new knowledge and relying on existing partners for exploiting such knowledge (Baum et al., 2005; Lin, Yang, and Demirkan, 2007; Beckman et al., 2004). Firms can also combine the two and operate "across" the domains by exploring within existing alliances and exploiting with new partners (Stettner and Lavie, 2014; Lavie et al., 2011).

The importance of functional domain separation tends to be amplified in the context of small firms (Park et al., 2002). Thus, while some studies argue that such resource-constrained firms are better off focusing on either exploration or exploitation (Giarratana and Fosfuri, 2007; Cao et al., 2009; Ebben and Johnson, 2005), others propose that simultaneous pursuit of exploitation and exploration can also occur among small firms (Voss and Voss, 2013; Bierly and Daly, 2007; Lubatkin et al., 2006) and that it is the specific role of functionally separated alliances to enable SMEs to pursue ambidexterity (Lin et al., 2007; Park et al., 2002). Yang, Zheng, and Zhao (2014), for instance, investigated small biotechnology firms and found that firms are likely to perform better if they conduct exploration in-house while establishing alliances for exploitation, whereas Rothaermel and Deeds (2004) combined the temporal and functional separation by demonstrating how small biotechnology firms' "exploration alliances predict products in development, which in turn predict exploitation alliances, and that exploitation alliances predict products on the market" (p. 216).

Yet, we need to bear in mind that the above studies were also completed in high-tech industries in which combining exploitation and exploration sequentially is plausible, "since exploration (discovering, acquiring, and developing new technologies) necessarily precedes exploitation (commercializing, applying, and leveraging new technologies)" (Simsek et al., 2009, p. 883). As such, it can be argued that the high-tech context may explain the dominant role of temporally or functionally separated exploitation alliances. Yet, the picture might be different for manufacturing SMEs, as prior studies suggest that "it is primarily manufacturing resources that facilitate a [small] firm's involvement in exploration alliances" (Park et al., 2002, p. 542) and that suppliers, too, play an important role in small firms' radical innovation (Song and Bendetto, 2008; Pittaway et al., 2004; Meeus et al., 2001; Lipparini and Sobrero, 1994). This is also in line with Kauppila (2015) who concludes that small manufacturing firms can and "should make a strategic choice as to whether co-exploration or co-exploitation should be more emphasized in their alliance portfolio, and they should then develop their level of alliance management capability accordingly" (p. 163).

In brief, we challenge the dominant view on the performance benefits of functionally separated alliances among SMEs and also argue that pursuing ambidexterity in SMEs' supply chain is not a straightforward task, as we elaborate below.

2.2. Ambidexterity within Supply Chain and SME Performance

In general, a few recent studies have adopted ambidexterity into the context of large manufacturing firms and their supply chains (Kristal et al., 2010; Aoki and Wilhelm, 2017). Still, pursuing supply chain exploration and exploitation can provide benefits for such firms, as it enables effective utilization of existing supply chains while capitalizing on unexplored supply chain opportunities. More specifically, supply chain exploitation focuses on clearly defined, short-term, measurable targets; reliability; risk reduction; and the overall efficiency of supply chains, which can be regarded as the traditional approach to supply chain management (Adler et al., 2009). Supply chain exploration, in turn, is characterized by uncertainty, learning, and innovation in supply chains (Ojha, Acharya, and Cooper, 2018; Adler, Goldoftas, and Levine, 1999; Patel et al., 2012). Indeed, innovations and new ideas often emerge within networks (Baum et al., 2000; Powell, Koput, and Smith-Doerr, 1996), and suppliers especially play a vital role in facilitating innovation (Song and Benedetto, 2008). By emphasizing exploitation and exploration as complementary activities in their supply chains (Gupta, Smith, and Shalley, 2006), manufacturing firms can take "a holistic view" and "reap benefits by exploiting current capabilities while simultaneously build[ing] new competencies for future use" (Kristal et al., 2010, p. 416).

Interestingly, a handful of studies provide empirical evidence on ambidexterity and its performance implications in supply chains. Im and Rai (2008), for instance, found that explorative and exploitative knowledge sharing has an impact on the performance of long-term relationships between supply chain vendors and their clients, while Rojo et al. (2016) revealed that supply chain ambidexterity helps manufacturing firms to achieve supply chain flexibility, which, in turn, build supply chain competence and enhance firm performance. Kristal et al. (2010), in turn, concluded that an ambidextrous supply chain

strategy coincides with manufacturers' combinative competitive capabilities (i.e., their abilities to simultaneously excel in terms of quality, delivery speed, process flexibility, and low cost) and business performance, whereas Patel et al. (2012) found that operational ambidexterity facilitates the relationship between manufacturing flexibility and firm performance. Drawing from prior research, a reciprocal and reinforcing (He and Wong, 2004) effect arguably exists between supply chain exploration and supply chain exploitation (Kristal et al., 2010). More specifically, supply chain exploitation enhances *short-term* performance by increasing cost-efficiency and reliability (via, e.g., IT-enabled automation in billing and inventory management), whereas supply chain exploration improves a firm's adaptability and *long-term* performance (via, e.g., experimentation with novel technologies with suppliers)—or, as Ojha, Struckell, Acharya, and Patel (2018) put it, "Exploration practices [in supply chain context] yield new knowledge and ideas, but only after the ideas are exploited (selected, implemented, produced) can they create value" (p. 79).

Yet, we propose that, in the context of SMEs, there exists an ancillary logic regarding the relationship between supply chain ambidexterity and firm performance, as there seem to be finite horizons on how extensively SMEs can govern their relationships (Agostini et al., 2015; Rothaermel and Deeds, 2006; Beekman and Robinson, 2004; Arend and Wisner, 2005). The rationale behind such argument is that small firms are known to suffer from the liability of smallness and the liability of newness (Stinchcombe, 1965). The liability of smallness refers to the fact that small firms are resource-constrained actors in terms of, e.g., financial, technological, physical, and intangible resources (Hannan and Freeman, 1989). The liability of newness refers to small firms' lack of reputation and credibility (Freeman, Carroll, and Hannan, 1983; Stuart, 2000). Therefore, with such resource scarcity and a lack of attractiveness as partners, SMEs may find it challenging to pursue supply chain ambidexterity. More specifically, supply chain exploitation (i.e., efforts to refine and extend existing resources within the supply chain) tends to be challenging for SMEs, as they have limited resources and less legitimate positions with which to initiate and demand such

refinements and extensions from their partners (Adams et al., 2012). Thus, focusing on pursuing exploitation might be possible through mutual adjustments within the existing supply chain, especially with small- and same-sized partners; hence, larger supply chain partners may be reluctant to invest time and resources in developing relationships with their small, low-volume clients (Mudambi et al., 2004). In other words, small firms may face difficulties in reaping the benefits of effective supply chain exploitation by, e.g., applying contractual governance (Dallago, 2001) or by "exploiting full purchasing power" (Kraljic, 1983, p. 112) with their supply chain partners, as no such power exists to begin with (Song and Benedetto, 2008; Williamson, 1975). Ignoring this relatively weak bargaining position and attempting to act as a powerful corporate buyer may actually harm existing partner relationships, thus increasing sourcing costs and, as a consequence, decreasing firm performance.

The rationale described above is amplified if we consider supply chain exploration. While exploration is costly for large corporations, it is even more expensive for small firms, which lack the necessary scope of routines and competences (Rosenbusch, Brinckmann, and Bausch, 2011). Investing limited resources into risky projects with partners who may be reluctant to commit to and invest in such relationships (Song and Benedetto, 2008) increases the transaction costs of such projects, lowers their success rates, and, consequently, decreases firm performance. Thus, although a focused strategy to implement explorative or exploitative supply chain activities could be feasible strategic choices (Rothaermel and Deeds, 2004; Ebben and Johnson, 2005), pursuing both activities simultaneously can cause tension (Andriopoulos and Lewis, 2009) and hence is highly demanding, particularly for SMEs. Therefore, we suspect that SMEs' pursuits of ambidexterity may be negatively associated with their financial performances. Hence, we propose:

Hypothesis 1: Supply chain ambidexterity is negatively associated with SMEs' financial performance.

2.3. The Moderating Role of Network Capability

While there seems to be a consensus among academics that alliances and network relationships yield performance benefits for small firms (Semrau and Sigmund 2012), the extant empirical evidence is inconclusive due to the conflicting perspectives on, e.g., which types of network relationships facilitate small firm performance (Stam et al., 2014). Theoretically, there are two opposing views. The weak-tie theory (Granovetter, 1973), for one, suggests that distant, infrequent, and arm's-length relationships are suitable for searching external resources such as new opportunities, novel ideas, and new contacts, which corresponds well with exploration (Tiwana, 2008; Stam and Elfring, 2008), whereas the strong-tie perspective highlights that it is the role of close collaborative relationships to mobilize and transfer (Hansen, 1999) complex resources toward firm performance (Lavie, 2006; Lee and Tsang, 2001). In the context of SMEs and their supply chains, the above connotes that weak-tie supplier relationships are useful for exploration, whereas collaborative supplier relationships facilitate exploitation (Song and Di Benedetto, 2008; Arend, 2006)

Yet, our central argument is that ambidextrous supply chain activities cannot be sustained if an SME's supply chain strategy is based purely on transactional, arm's-length relationships with partners (Aoki and Wilhelm, 2017; Kauppila, 2010; Poppo and Zenger, 2002; Günsel et al., 2018). Even though the prior argument may not be true for larger corporations that can make the strategic choice between transactional and collaborative relationships, we propose that it is especially applicable for SMEs (Dallago, 2000). Thus, resource-constrained SMEs need to build their supply chain activities on relational, collaborative, and long-term relationships (Adams et al., 2012; Beekman and Robinson, 2004). Such argument is supported by the transaction cost economics (Williamson, 1975) as well as by, e.g., Morrissey and Pittaway (2006), who highlight that SMEs rely on soft factors, such as relational skills and trust, in managing their supplier relationships to circumvent the challenges of power asymmetry and any consequent overdependence on their suppliers. In addition, resource-constrained SMEs typically need to limit their relationships and partnering activities (Kale et al., 2002) within a manageable scope (Rothaermel and Deeds, 2006). Hence,

small firms may be more motivated (Rothaermel, 2001) and committed (Song and Benedetto, 2008) to discover and exploit the value of existing interorganizational relationships (Wiklund and Shepherd, 2009; Alvarez and Barney, 2001). Fortunately, the existing literature offers various constructs for conceptualizing the capability to manage such collaborative interorganizational relationships, e.g., alliance management capability (Kauppila, 2015; Schreiner, Kale, and Corsten, 2009), relational capability (Kale and Singh, 2007), and network capabilities (Walter et al., 2006).

We adopt network capabilities, i.e., "abilities to initiate, maintain, and utilize relationships with various external partners," because it "expresses that managing relationships goes beyond coping with single relationships and alliances" (Walter et al., 2006, p. 546) such as supply chains (Mitrega et al., 2012). Furthermore, unlike alliance management capability and relational capability, network capabilities also include assessment on a firm's internal communication and firm's knowledge regarding its partners, which are both essential for pursuing ambidexterity and coping with tension (Andriopoulos and Lewis, 2009) especially with external partners (Kauppila, 2015).

More specifically, network capabilities, as a latent construct, includes four dimensions: partner knowledge, relationship skills, interfirm coordination, and internal communication (Walter et al., 2006). To begin with, partner knowledge helps to turn SMEs' supply chain ambidexterity toward performance because, without the basic knowledge on partners', e.g., products and strengths, any development within a supply network would be difficult (Song and Benedetto, 2008). In addition, relationship skills and interfirm coordination increase bonding (Schreiner, Kale, and Corsten, 2009) and commitment (Song and Benedetto, 2008) between an SME and its partners, which, in turn, reduces transaction costs, increases the value of the exchange (Dyer, 1997), and diminishes the above-mentioned challenges regarding power asymmetry, lack of attractiveness, and the partners' consequent reluctance to commit to and invest in ambidextrous relationships. This view is also supported by Wynarczyk and Watson (2005) and Arend (2006), who revealed that SMEs that adopt an explicit strategy of developing close partnerships with other supply chain

members achieve higher growth and performance rates than do noncollaborative firms. Similarly, relationship skills and coordination allow SMEs to establish an open dialogue (Paulraj, Lado, and Chen, 2008) with their supply chain partners as well as develop trust with them (Alvarez and Barney, 2001), both of which are especially important for experimental creation of new competences (Tiwana, 2008).

Finally, internal communication is vital for ambidexterity, as exploitation and exploration are distinct or even conflicting in terms of their objectives and operational practices (Jansen et al., 2009; Raisch and Birkinshaw, 2008). Thus, internal communication enables interactive (Meeus et al., 2001) and mutually reinforcing learning of existing and new knowledge (Fernhaber and Patel, 2012; Andriopoulos and Lewis, 2009) and helps in managing the "contradictory knowledge processes, which are required to attain an ambidextrous orientation" (Lubatkin et al., 2006, p. 651). Moreover, the role of internal communication is even more important when exploitation and exploration occur in the specific domain of the supply chain (Adler et al., 2009). Without such internal communication, SMEs might risk sending conflicting and confusing messages to their supply chain partners, who, in turn, lose sight of the big picture, i.e., whether the firm is driven by exploitation, exploration, or both, which is also labeled as the paradox of "strategic intent" (Andriopoulos and Lewis, 2009, p. 702). Hence, we propose:

> *Hypothesis 2: Network capabilities mitigate the negative relationship between supply chain ambidexterity and SMEs' financial performance.*

2.4. The Moderating Role of Strategic Information Flow

The construct of network capabilities touches upon information sharing by assessing partners' knowledge (i.e., how well a firm knows its partners' markets, products, strengths, and weaknesses). Yet, it does not elucidate the kind of knowledge or the ways in which the knowledge is shared among partners. Thus, we extend our research model by introducing the strategic information flow, which is defined as the extent to which an SME utilizes IT to share strategic information (Klein and Rai, 2009). To begin with,

there seems to be a wide consensus among academics that information exchange and knowledge transfer are critical for succeeding in interfirm alliances (Schreiner, Kale, and Corsten, 2009; Tiwana, 2008; van Wijk et al., 2008; Grant and Baden-Fuller, 2004; Mowery et al., 1996). Similar arguments can be found from studies that focus on manufacturing firms and their supply chain management (Im and Rai, 2008). As such, these studies argue that, "Having a long-term relationship orientation can increase collaborative communication between supply chain partners, which is necessary for disseminating and sharing strategically important information and knowledge [emphasis added] for mutual gains" (Paulraj, Lado, and Chen, 2008, p. 57).

Following this line of thought, creating new knowledge (i.e., exploration) *or* leveraging existing knowledge (i.e., exploitation) in alliances entails that alliance partners improve strategic information flow (Lavie et al., 2011). Thus, it seems safe to argue that, when firms pursue exploitation and exploration simultaneously within the specific domain of a supply chain, the need for strategic information flow is even stronger. Or, as Rothaermel and Alexandre (2009), who investigated ambidexterity and sourcing, put it, "Ambidexterity in technology sourcing at the firm level, therefore, implies that managers combine internal and external sources of existing and new knowledge in a simultaneous fashion" (p. 763). Further, while some strategic information flow items can be linked either to exploitation practices (e.g., inventory and capacity planning, production scheduling) or to exploration practices (e.g., product and service development), most items, such as decision-making processes and criteria, cost and margin structures, pricing plans, and marketing strategies, are valuable for exploitation and exploration (Im and Rai, 2008). Moreover, we build on the view that one of the main benefits of information sharing within supply chains comes from coordinated decision-making (Sahin and Robinson, 2005) and argue that such coordinated decision-making is a key ingredient when pursuing supply chain ambidexterity toward performance. That is, effective knowledge sharing improves the quality of information available during the decision-making process and increases the quality of strategic and operational decisions (Petersen et al., 2005).

Besides the quality of the shared information, it is also the IT-enabled nature of information sharing that puts supply chain ambidexterity to work toward performance. Thus, technology-based information sharing may increase adaptiveness and agility in decision-making (Malhotra, Gosain, and EI Sawy, 2007). In addition, sharing strategically relevant information via an efficient IT system may help in improving operational efficiency (i.e., exploitation) by streamlining processes across the supply chain, thereby reducing redundancy and decreasing costs (Dehning, Richardson, and Zmud, 2007). Similarly, IT-enabled information sharing may also facilitate supply chain exploration through, e.g., virtual experiments among partners (Thomke, Von Hippel, and Franke 1998), such as rapid prototyping and computer-aided design, which can reduce the costs of new product development (Petersen et al., 2005).

Finally, while the above might be true for large firms, we argue that strategic information flow is vital for SMEs, too. Thus, as the prior studies demonstrate, it is the quality of the information exchange, the collaborative behavior, and joint decision-making within the management team (Lubatkin et al., 2006) that facilitates ambidextrous orientation of an SME. Therefore, one could easily argue that improving strategic information flow with partners decreases the negative relationship between supply chain ambidexterity and SME performance and, hence, helps to turn supply chain ambidexterity to work toward performance. Similarly, prior studies suggest that SMEs' management teams' versatile affiliations (Beckman, 2006) and extensive social networks "can offer dual knowledge benefits conducive to ambidexterity" (Heavey, Simsek, and Fox, 2015, p. 201), which supports our argument on the positive moderating role of strategic information flow between supply chain ambidexterity and SME performance. Moreover, and as noted by transaction cost theory (Williamson, 1975), relationships between small firms and their suppliers can be characterized by information asymmetries (Arend and Wisner, 2005), which are caused by their inability to interact and share information to enhance common understanding. Effective strategic information flow between partners reduces such information asymmetries (Heide and Miner, 1992) and decreases transaction costs (Stump, Athaide, and Joshi, 2002), thereby enhancing firm performance. Thus, we hypothesize:

Hypothesis 3: Strategic information flow mitigate the negative relationship between supply chain ambidexterity and SMEs' financial performance.

3. Methodology

3.1. Sample and Data Collection

To test the proposed hypotheses, we draw on two data sources, i.e., a postal survey of manufacturing firms (to measure supply chain ambidexterity, network capability, strategic information flow, and firm characteristics) and archival data on financial performance (to measure performance). We conducted a survey of equipment manufacturing firms in Sweden using *Infotorg Företag*, a database on Swedish companies. In particular, we selected firms from four SIC industry codes: 26 (i.e., manufacturing of computer, electronic, and optical products); 27 (manufacturing of electrical equipment); 28 (manufacturing of machinery and equipment); and 61 (telecommunications). The four industries, including the telecommunication industry, focus on equipment manufacturing, which includes manufacturing of telecommunication equipment. Broadly considered, firms in these sectors require networking capability, maintain strategic information flows, and must collaborate with supplier and customers. Relatively, manufacturing firms in other sectors face lower pressure to collaborate (e.g., paper and pulp or food manufacturing). Equipment manufacturers must act pro-cyclically to meet demands from firms demanding equipment to meet pro-cyclical demands. Based on the EU's definition of SMEs, we randomly selected 1,200 firms from each of these sectors with 250 or fewer employees. We drew on a sample of Swedish firms, as the Swedish government requires firms to report performance data (e.g., return on investment; ROI) that are certified by a chartered accountant. This requirement increases the validity of these performance outcomes and limits common method bias.

During the survey's pilot testing phase, the questionnaire was pre-tested on four CEOs from manufacturing firms and four academic researchers. Based on feedback from the pilot testing, the questionnaire was finalized, and items that were less understood or lacking clarity were changed. The

questionnaire and a cover letter explaining the purpose of the study were mailed to CEOs. After the initial mailing, two more waves of reminder letters and phone calls were made to the firms. Among the 1,200 firms, 23 questionnaires did not reach the identified firms' addresses and were returned by the postal service, and 35 firms refused to participate in the study for various reasons, including high workload. From the remaining 1,142 firms, we received 219 responses. Of these surveys, five either were incorrectly filled out and 10 were incomplete. Thus, the usable number of questionnaires was reduced to 204, which represents a 16.83% response rate (Armstrong and Overton, 1977). The nonresponse bias for firm size (p = 0.38), firm age (p = 0.92), and firm sales (p = 0.21) was not significant. The early and late respondents were not significantly different on the dimensions of firm size (p = 0.95), firm age (p = 0.92), and firm sales (p = 0.76). The response rate is comparable with typical response rates in management research (Baruch, 1999). The range of employees is from 10 to 98 employees. Based on case-wise deletion, the final sample includes 200 firms. An average respondent had worked in the company for seven years (s.d. = 4 years), was 38 years (s.d. = 7 years), and all the respondents had a college education. The survey was addressed to the CEOs; 94% of the respondents were CEOs, 5% were top-level operating officers, and one respondent was a chief manufacturing officer. Note that, based on the pilot survey, some scale items were adapted and, in some cases, item(s) were dropped. We have listed the scale items for each construct in Table 1.

3.2. Measures

3.2.1. Dependent Variable: Performance

As mentioned, we acknowledge the temporal difference on how exploitation and exploration influence firm performance (March, 1991; He and Wong, 2004). To overcome such methodological challenges, we use the mean ROI over the past four years as the outcome variable. Thus, while a four-year period may not be suitable for investigating global high-tech corporations that typically engage in long-term (five to 10 years) innovation projects, it should be appropriate for studying manufacturing SMEs that do not possess

the resources for such lengthy development projects and whose time-to-market is shorter (Terziovski, 2010).

3.2.2. Predictor Variable: Supply Chain Ambidexterity

We use supply chain exploitation (four items; $\alpha = 0.749$) and exploration (four items; $\alpha = 0.849$) practices (Kristal *et al*., 2010) that are broadly based on March (1991), Levinthal and March (1993), Lewin et al. (1999), and Lewin and Volberda (1999). The exploration dimension measures the manufacturer's efforts to refine and extend its existing resources, whereas exploration practices measure its efforts to develop new supply chain competencies by experimenting and acquiring new knowledge and resources. All the scale items for this measure and the moderator are listed in Table 1.

Supply chain ambidexterity was calculated as a product of supply chain exploration and supply chain exploitation. The multiplicative approach to operationalizing ambidexterity allows for a combinative measure of progress on exploration and exploitation dimensions (He and Wong, 2004; Gibson and Birkinshaw, 2004). More specifically, we draw on Cao, Gedajlovic, and Zhang (2009) who suggest that "that high levels of exploration and exploitation can complement and augment the performance-enhancing effect of the other" (p. 788) and propose that such complementing and augmenting effect is especially relevant between supply chain exploration and supply chain exploitation (Kristal et al., 2010). To lower the effect of false equivalence in the proposed operationalization (i.e., 2 x 2 = 1 x 4), we controlled for the direct effects of supply chain exploration and exploitation.

3.2.3. Moderator Variable: Network Capabilities

Network capabilities (NC) were measured using the scale proposed by Walter et al. (2006). Based on the feedback during the pilot survey, we complemented the dimension of coordination with an additional item (i.e., "we develop relations with each partner based on what they can contribute") as resource-scarce SMEs especially need to ration their investments to relationships according to the

expected return (Rothaermel and Deeds, 2006). The scale conceptualizes NC as a construct that consists of four dimensions (i.e., coordination activities, relationship skills, partner knowledge, and internal communication). Three-item scales were used to measure coordination activities ($\alpha = 0.953$), relationship skills ($\alpha = 0.904$), partner knowledge ($\alpha = 0.717$), and internal communication ($\alpha = 0.812$). Exploratory factor analysis (EFA) revealed the four NC dimensions to load on a single factor with reasonably high loadings, with item loadings ranging from 0.74 to 0.92 ($\alpha = 0.926$). Compared with Walter et al. (2006) who proposed a formative index, our analysis supports a reflective index of the four subconstructs of network capability. The principal components analysis also resulted in a single factor, and this first factor had a correlation of 0.990 ($p < 0.001$), indicating a single item measure, and the single factor predicted 97.92% of the variance. The correlations among the subconstructs were also strongly positive, ranging from 0.753 ($p < 0.01$) between coordination activities and relationship skills to 0.592 ($p < 0.01$) between relationship skills and partner knowledge. Related to collinearity diagnosis is the condition number of 13.34. Due to lack of support for a measure constituting four subconstructs, we averaged the scale items to derive a measure of network capability.

3.2.4. Moderator Variable: Strategic Information Flow

We used the 11-item scale, which is based on Klein and Rai (2009), to measure strategic information flow. The variable captures the organization's use of IT to share diverse types of information with its business partners, including information related to inventory/capacity planning, production schedules, cost structures, marketing strategies, and others ($\alpha = 0.942$).

3.2.5. Control variables

To control for alternate explanations we include a variety of controls. We control for four-year mean of employee productivity (sales per employee), inventory (in Swedish Krona), cash flow (operating

cash flow in Swedish Krona), and cash (in Swedish Krona) to control for multiple firm-specific unobservables. *Employee productivity*, as an indicator of human capital capability, could influence firm performance and innovation activity (Crook, Todd, Combs, Woehr, and Ketchen Jr, 2011). Similarly, employee productivity tend to be associated with small- and medium-sized manufacturing firms as such firms benefit from "simplified organizational structures, lower complexity, facilitated communication thanks to informal relationships and higher flexibility in the use of the workforce" (Cagliano, Blackmon, and Voss, 2001, p. 479; Schulze, Heinemann, and Abedin, 2008). *Inventory*, as a core indicator of material stock, could influence production decisions and sales efforts (Lee, Zhou, and Hsu, 2015). High inventory stocks could lower firm performance by limiting the availability of fungible resources and constraining capital flow. High inventory could be particularly limiting to smaller firms that face the liability of smallness. *Cash flow* could influence performance by allowing for additional investments in innovation activities (Lamont, 1997; Vorhies, Morgan, and Autry, 2009). Cash flow can also be used as a proxy for steady development of absolute sales and effective management of working capital (Delmar et al., 2003). Finally, cash acts as an unabsorbed slack that influences innovation activities potentially related to ambidexterity (Nohria and Gulati, 1996). Availability of slack is central to pursuing risky innovation activities and provides a necessary buffer against cost of experimentation.

These measures were used to control organizational performance of the studied firms beyond the supply chain performance. Employee productivity, inventory, cash flow, and cash control for the organizational capabilities other than those related to supply chain ambidexterity, managing networks, and strategic information flow, to isolate supply chain ambidexterity related performance effects from other organizational performance improving capabilities.

Insert Tables 1-3 and Figure 1-2 about here

3.3. Results

Table 2 presents means, standard deviations, and correlations. The correlations between some constructs were relatively high, such as the correlation between exploration and exploitation (.79). Thus, standardized measures were utilized to run the models. In addition, multicollinearity was analyzed by applying variance inflation factors (VIFs), which ranged from 1.03 for cash flow to 4.30 for employee productivity. Thus, VIF values remained clearly below the threshold of 10 (Tabachnick and Fidell, 2007).

Table 3 presents the results of the ordinary least-squares (OLS) regression analysis. The first model controls the effects of the main constructs without supply chain ambidexterity, whereas the second model adds the supply chain ambidexterity construct. The third model adds the interaction between supply chain ambidexterity and network capabilities, whereas the fourth model concentrates on the interaction between supply chain ambidexterity and strategic information flow. Finally, the fifth model tests the model with all the controls, direct effects, and moderating factors.

The first model controls the effects of the main constructs, thus demonstrating a statistically significant direct effect of cash flow and network capability on small firm performance. The second model includes the supply chain ambidexterity construct, confirming Hypothesis 1, i.e., that ambidexterity has a negative influence on small-firm profit performance (model 2: $\beta = -3.162$; $p < 0.05$). The third model includes interaction between supply chain ambidexterity and network capabilities, thus demonstrating the validity of Hypothesis 2, which proposed that network capabilities would mitigate the negative relationship between supply chain ambidexterity and performance (model 3: $\beta = 2.941$; $p < 0.05$). The fourth model includes the interaction between supply chain ambidexterity and strategic information flow, providing slight support for Hypothesis 3, i.e., strategic information flow would positively moderate the effect of supply chain ambidexterity on small firms' performance (model 3: $\beta = 1.480$; $p < 0.10$).

As the interaction effect should be studied by plotting the effect, Figure 1 demonstrates the moderating effect of network capabilities on the relationship between supply chain ambidexterity and firm performance. At lower levels of network capabilities, the effects of supply chain ambidexterity on firm performance are strong and negative (solid line), while higher levels of network capabilities mitigate the negative effect of supply chain ambidexterity on performance (dashed line). With lower levels of network capabilities, the effects of supply chain ambidexterity on firm performance are strong and negative (solid line), while higher levels of network capabilities mitigate the negative effect of supply chain ambidexterity on performance. Interpreting the margins based on Aiken, West, and Reno (1991), for low levels of network capabilities, at low SC ambidexterity (9.73, $p < 0.01$), mean SC ambidexterity (5.47, $p < 0.01$), and high SC ambidexterity (1.22, $p < 0.01$), the effect on the outcome variable declines significantly. However, at high levels of network capability, the marginal effects are similar for low, mean, and high levels of SC ambidexterity, i.e., 9.73, 9.73, and 9.62, respectively.

Hypothesis 3 posits that strategic information flow would mitigate the negative relationship between supply chain ambidexterity and performance (model 4: $\beta = 1.480$; $p < 0.10$). Figure 2 demonstrates that, for lower levels of strategic information flow, the effects of supply chain ambidexterity on firm performance are strong and negative (the solid line). However, higher levels of strategic information flow mitigate the negative effect of supply chain ambidexterity on firm performance (the dashed line). Related to the interpretation based on margins effects, for low strategic information flow, the values of effect for low, mean, and high SC ambidexterity are 11.28, 7.41, and 3.55, respectively. This decline in effects is significantly steeper than the margin effects at high strategic information flow for low, mean, and high SC ambidexterity, i.e., 8.30, 7.96, and 7.64, respectively.

Although we used a four-year mean for ROI, using a three-year mean led to consistent results. The results are available from the authors.

4. Discussion

This study advances the discussion on ambidextrous IO collaboration and alliances in general and supply chain ambidexterity of manufacturing SMEs in particular. First, while supply chain ambidexterity does seem to enhance firm performance among large manufacturing firms (Kristal et al., 2010; Aoki and Wilhelm, 2017), we show that this is not the case for resource-constrained SMEs. We argue that resource-constrained SMEs do not possess sufficient resources (Park et al., 2002) nor do they occupy legitimate power positions (Song and Benedetto, 2008; Williamson, 1975) that allow them to conduct simultaneous practices of exploitation and exploration in their supply chains with arm's-length and transactional relationships. Supply chain ambidexterity seems to "fit poorly" into the SME context, as is the case with supply chain management (cf., Arend and Wisner 2005, p. 404). But, more importantly, we also demonstrate that manufacturing SMEs, equipped with network capabilities, can mitigate the negative association between supply chain ambidexterity and performance. Hence, we build on the work of Kauppila (2015), who found that a strong alliance management capability is harmful among small manufacturing firms, as they begin to favor interorganizational exploitation (or co-exploitation) over interorganizational exploration ("co-exploration"), which leads to increased short-term financial performance but also decreases a firm's long-term growth. Our study, in turn, complements this view by demonstrating that network capabilities are vital in ameliorating negative association between supply chain ambidexterity and performance.

Second, while network capabilities are vital necessities, SMEs can further mitigate the negative supply chain ambidexterity and performance association by improving strategic information flow with their supply chain partners. So, while we agree with the prior studies that sharing strategic information with large partners or "sharks" (Katila et al., 2008) can be extremely risky, especially in the context of exploitation

alliances (Alvarez and Barney, 2001), we propose that pursuing supply chain ambidexterity requires a more versatile and agile information flow between partners (Rothaermel and Alexandre, 2009; Im and Rai, 2008). Thus, we extend the view of Rothaermel and Alexandre (2009), who state that "to harness the tensions inherent in ambidexterity in technology sourcing requires that a firm be able to effectively integrate external and internal sources of known and new knowledge" (p. 764) by arguing that, for manufacturing SMEs who aim to reap the performance benefits from supply chain ambidexterity, such integration of knowledge and absorptive capacity (Rothaermel and Alexandre, 2009) is not enough; however, strategic information flow is needed, too. In addition, by demonstrating that the pragmatic construct of strategic information flow positively moderates the relationship between supply chain ambidexterity and performance, we answer the call of Im and Rai (2008) who state: "The nature of IT design that promotes exploration and exploitation in long-term interorganizational relationships has not been investigated" (p. 1282).

Third, our findings inform the prior literature and the conflicting views on the role of ambidexterity among manufacturing firms. Junni et al. (2013), for instance, conclude that "organizational ambidexterity is less important in manufacturing than in service and high-technology sectors" by arguing that it is the environmental dynamism and knowledge-intensiveness of such sectors that amplifies the "need to continuously be on the lookout for new opportunities (exploration)" (p. 308). However, others propose that it is the role of exploration alliances to support manufacturing firms (Park et al., 2002). Yet, some studies highlight that exploration and exploitation among small manufacturing firms are not competitive constructs that require trade-offs (Cao et al., 2009; Gupta et al., 2006; Abernathy, 1978) but rather complement each other (Birley and Daly, 2007), and the interaction between the two contributes to firm performance (He and Wong, 2004). We build on Birley and Daly (2007), who state that "[small manufacturing] firms can simultaneously pursue exploration and exploitation, and the organizational barriers discussed in the literature appear to be exaggerated" (p. 508), but also extend the discussion by proposing that performance-enhancing interaction between exploitation and exploration can also occur within SMEs' supply chains (He

and Wong, 2004). Hence, we also go beyond the category-type classification of supply chain as exploitative collaboration and argue that collaboration and resource exchange with supply chain partners can simultaneously incorporate resource development (i.e., exploration) and leverage (i.e., exploitation). As such, we concur with Wassmer (2017) who concludes that "It [prior research] implicitly assumes a one-on-one correspondence between the two levels [of alliances and exchanged resources] and equates alliances with partner resource access via alliances, which need not be the case" (p. 391).

The topic of alliances leads us to the fourth contribution of our study. Prior studies seem to agree that alliances play an important role in achieving balance between exploitation and exploration (Wassmer, Li, and Madhok, 2017; Stettner and Lavie, 2014; Kauppila, 2010; Lavie, 2006; Lavie and Rosenkopf, 2006; Koza and Lewin, 1998), and that it is the specific role of functionally separated alliances to empower ambidexterity among resource-constrained SMEs (Yang, Zheng, and Zhao, 2014; Lin, Yang, and Demirkan, 2007; Park et al., 2002; Colombo et al., 2006; Rothaermel, 2001). Our findings contradict this view by demonstrating that, if an SME is equipped with network capabilities, it can pursue ambidexterity within the supply chain and enhance firm performance. Thus, we extend the view of Lavie et al. (2011) who state that: "A small firm is sufficiently agile to transition between R&D alliances and production or marketing alliances, or to juggle new and existing partners" (p. 1522) by proposing that such juggling can also occur within the specific functional alliance domain of a supply chain.

Our study also includes two important messages for decision-makers and managers in manufacturing SMEs. First, attempting to adopt the concept of ambidexterity within their supply chains without network capabilities or strategic information flow will likely lead to losses. As such, managers who want to reap the benefits of the short-term refinement and long-term development of their supply chains need to invest in developing (via, e.g., training) and/or recruiting such capabilities. In practice, such capabilities include good relational skills (e.g., good personal relationships and joint problem-solving), interfirm coordination (e.g., objective setting and regular discussions), and internal communication skills (e.g., regular meetings and

informal contacts). Further, while our study demonstrates that these capabilities help to convert supply chain ambidexterity ameliorate lower financial performance, we suspect that they also help to cope with the ambidextrous conflicts and tensions within the manufacturing firm.

Second, while the facilitating role of network capabilities is likely to mitigate a negative relationship between supply chain and performance, SME managers can achieve better firm performance by (1) adopting an IT-based system for sharing information and (2) sharing strategic information with their partners. This "open-book" approach includes sharing information on, e.g., pricing, cost and margin structures, marketing strategies, and decision-making criteria, to name a few. Third and relatedly, we do not nevertheless advise managers to share strategic information in haste without careful consideration of the partners' actual attitudes and motives toward collaboration, as such overly optimistic but one-sided openness may backfire, especially with large partners. Hence, it may be advisable to start by developing a firm's internal network capabilities, which, in turn, helps to develop a firm's supply chain ties into collaborative and trustworthy relationships. Only after such collaborative relationships have proven to be mutually beneficial with good rapport, it might be the right time to start sharing strategic information with partners and hence realize the additional benefits from supply chain ambidexterity.

As always, this study must be evaluated against its limitations. First, not all potential control variables were available in our data; thus, the results should be considered against the utilized control variables. Furthermore, causality is neither inferred nor implied. Although we rely on archival performance data, due to the omitted variable bias and potential for reverse causality, we cannot identify instrumental variables that influence the predictors but not the outcome variables. Second, although our measurements were deemed to provide acceptable validity, the measurement on strategic information flow particularly would require improvement. We encourage future research to develop improved measurement for strategic information flow. Third, quantitative methods cannot fully capture the complexity of pursuing ambidexterity in the SCM sphere. Such complexity offers several interesting paths for future research. More

specifically, not too much is known on the reciprocal processes of SCM ambidexterity and how such dual governance occurs in practice. For instance, how does supply chain exploitation feed exploration? Or what kind of complementing, overlapping, and/or conflicting professional roles are required to pursue ambidexterity? As such, longitudinal qualitative studies are especially needed in the field. Future research could also adopt a more fine-grained view on supply chains and alliances and investigate how ambidexterity occurs among specific groups of partners, e.g., technology, service, or downstream partners. Distributors, for instance, clearly operate in the exploitation domain but typically also possess detailed knowledge on markets and end-customers, which is extremely valuable in developing new products (i.e., exploration). Yet, distributors may be reluctant to share their knowledge with their manufacturing clients. As such, knowledge is one of their key competitive advantages that allows them to maintain their brokering position in the value chain; otherwise, there is a risk that their clients will bypass them. Hence, it may not be enough to build collaborative relationships to pursue ambidexterity with distribution partners, but more novel and mutually lucrative governance mechanisms may be needed, too. Relatedly, this study focuses on manufacturing firms. Hence, another avenue for future research is to assess supply chain ambidexterity among, e.g., software or service-based firms. For example, what is ambidexterity among horizontal technology partners? Or how do service firms exploit and explore their businesses, with e.g., complementary service providers? Finally, we also encourage scholars to develop the supply chain ambidexterity measure, so that it also can be used to analyze the suppliers' perspective on supply chain ambidexterity and then conduct studies that capture ambidexterity both within the buyers and in the suppliers' organizations.

In conclusion, this article contributes to the current body of knowledge on supply chain ambidexterity of manufacturing firms and ambidextrous collaboration among SME. In particular, we reveal that supply chain ambidexterity decreases firm performance among manufacturing SMEs, thereby contributing empirical evidence to the literature on performance implications of ambidextrous collaboration among

small- and mediums-sized firms. But, more importantly, we also reveal that, equipped with network capabilities and by improving strategic information flow with their partners, SMEs can mitigate the negative association between supply chain ambidexterity and performance. Overall, this study is one of the first inquiries that investigates the relationships between supply chain ambidexterity and performance within the context of resource-constrained manufacturing SMEs, thus serving an important basis for future endeavors.

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Table 1

Measurement Model Specification

Constructs and items	Loadings	Model Fit
Supply-chain exploitation practices (representative references: March 1991, Levinthal and March 1993, Lewin et al. 1999, Lewin and Volberda 1999)		
A1: In order to stay competitive, our supply chain managers focus on reducing operational redundancies in our existing processes.	0.936***	$\chi2$ = 25.107 (17), p = 0.003 [model vs. saturated]; $\chi2$ = 2027.176 (28), p = 0.000 [baseline vs. saturated]; CFI = 0.992; TLI = 0.975; SRMR = 0.014; ; RMSEA = 0.089 [90% C.I. = 0.048, 0.131] Composite reliability (CR): 0.998 Average variance extracted (AVE): 0.968
A2: Leveraging of our current supply chain technologies is important to our firm's strategy.	0.746***	
A3: In order to stay competitive, our supply chain managers focus on improving our existing technologies.	0.811***	
A4: Our managers focus on developing stronger competencies in our existing supply chain processes.	0.782***	
Supply-chain exploration practices (representative references: March 1991, Levinthal and March 1993, Lewin et al. 1999, Lewin and Volberda 1999)		
EA1: We proactively pursue new supply chain solutions.	0.873***	
EA2: We continually experiment to find new solutions that will improve our supply chain.	0.887***	
EA3: To improve our supply chain, we continually explore for new opportunities.	0.964***	
EA4: We are constantly seeking novel approaches in order to solve supply chain problems.	0.971***	
Network capability (based on Walter, Auer, and Ritter 2006)		
Internal Communication		
1. In our company we have regular meetings for every project …	0.698***	$\chi2$ = 139.291 (50), p = 0.000 [model vs. saturated]; $\chi2$ = 2208.793 (66), p = 0.000 [baseline vs. saturated]; CFI = 0.958; TLI = 0.945; SRMR = 0.046; RMSEA = 0.089 [90% C.I. = 0.071, 0.106] CR: 0.991 AVE: 0.964
2. In our company employees develop informal contacts among themselves …	0.843***	
3. In our company managers and employees often give feedback to each other...	0.798***	
Coordination		
1. In our company we analyze what we would like and desire to achieve with which partner …	0.933***	
2. In our company we develop relations with each partner based on what they can contribute	0.910***	
3. In our company we discuss regularly with our partners how we can support each other…	0.940***	
Relationship Skills		
1. In our company we have the ability to build good personal relationships with our business partners…	0.857***	
2. In our company we can deal flexibly with our partners …	0.924***	
3. In our company we almost always solve problems constructively with our partners ...	0.847***	

Partner Knowledge		
1. In our company we know our partners' markets …	0.543***	
2. In our company we know our partners' products/procedures/services…	0.841***	
3. In our company we know our partners' strengths and weaknesses…	0.790***	
Strategic information flow (Klein and Rai 2009)		
Our organization uses IT to share the following types of information with its business partners (1= Strongly disagree, 2 = Disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 = Agree; 7 = Strongly agree):		$\chi2$ = 18.888 (18), p = 0.399 [model vs. saturated]; $\chi2$ = 2157.083 (55), p = 0.000 [baseline vs. saturated]; CFI = 1.000; TLI = 0.999; SRMR = 0.020; RMSEA = 0.015 [90% C.I. = 0.000, 0.062] CR: 0.998 AVE: 0.946
1. Inventory/capacity planning	0.822***	
2. Production schedules	0.795***	
3. Cost structures	0.805***	
4. Margin structures	0.832***	
5. Marketing strategies	0.679***	
6. Demand patterns	0.723***	
7. Decision-making processes	0.784***	
8. Decision-making criteria	0.820***	
9. Pricing schedule plans	0.841***	
10. Product/services in development	0.621***	
11. Support strategies	0.679***	

Notes.
*** $p < 0.001$

Table 2
Means, standard deviations and correlations

		Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9
1	ROI	8.1012	17.2851	-282.548	124.3675	1								
2	Employee Productivity	2239.1420	2855.9030	3.61	52241.72	0.0956*	1							
3	Inventory	10289.1500	21510.1400	0	558770.3	0.0012	0.6393*	1						
4	Cash Flow	3748.3360	11512.5200	-146434	149400.4	0.3368*	0.2912*	0.2759*	1					
5	Cash	10151.1900	25921.8000	-3159	371648	0.0801*	0.2015*	0.2242*	0.0926*	1				
6	Supply Chain Exploration	4.4531	1.4471	1	7	-0.0414	0.1038	0.0912	0.0116	0.0406	1			
7	Supply Chain Exploitation	4.5935	1.5413	1	7	0.0119	0.1304*	0.1077	0.0152	0.1098	0.7885*	1		
8	Supply Chain Ambidexterity	0.7058	0.6881	0	3.5	-0.1603*	0.0719	0.0525	-0.0009	-0.0205	0.011	0.1019	1	
9	Network Capability	5.0188	1.1724	1	7	0.0805	-0.012	-0.0039	-0.0453	0.0941	0.3124*	0.2703*	0.0909	1
10	Strategic Information flow	3.7414	1.6565	1	7	-0.0053	0.0325	0.0206	-0.0316	0.022	0.2608*	0.1480*	-0.0519	0.1366*

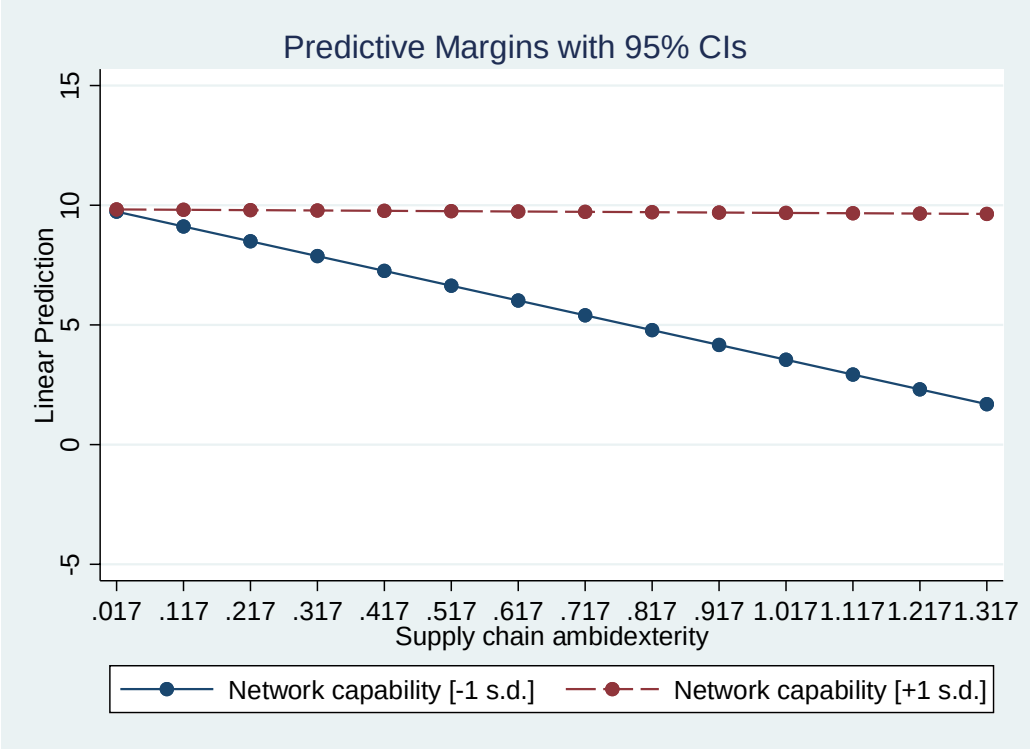
Notes.

$*p < 0.05$

Table 3
OLS estimates

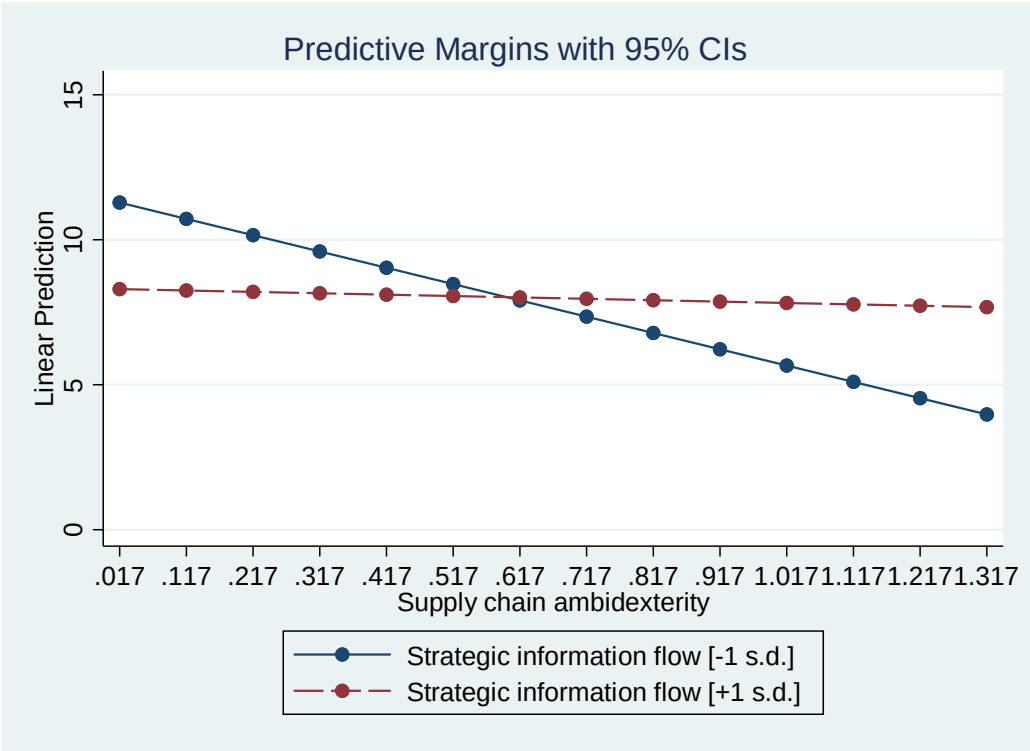
VARIABLES	(1)	(2)	(3)	(4)	(5)
Employee Productivity	0.000888	0.00109	0.00112	0.00112	0.00115
	(0.00101)	(0.00101)	(0.00100)	(0.00101)	(0.000997)
Inventory	-6.56e-05	-7.27e-05	-7.65e-05	-7.52e-05	-7.92e-05
	(8.58e-05)	(8.52e-05)	(8.45e-05)	(8.48e-05)	(8.41e-05)
Cashflow	0.000459***	0.000462***	0.000469***	0.000473***	0.000481***
	(8.85e-05)	(8.78e-05)	(8.72e-05)	(8.77e-05)	(8.70e-05)
Cash	1.03e-05	2.35e-06	8.57e-06	-2.58e-07	6.05e-06
	(4.19e-05)	(4.18e-05)	(4.16e-05)	(4.16e-05)	(4.14e-05)
Supply Chain Exploration	-1.156	-1.407	-1.185	-1.739	-1.525
	(1.192)	(1.189)	(1.185)	(1.200)	(1.194)
Supply Chain Exploitation	0.264	0.481	0.305	1.008	0.852
	(1.105)	(1.101)	(1.096)	(1.141)	(1.133)
Network Capability	1.878*	2.059*	0.0675	2.056*	-0.00434
	(0.905)	(0.901)	(1.336)	(0.897)	(1.329)
Strategic Information flow	0.110	0.0789	0.101	-0.902	-0.927
	(0.617)	(0.612)	(0.608)	(0.849)	(0.842)
Supply Chain Ambidexterity		-3.162*	-15.69*	-8.695*	-21.92**
		(1.546)	(6.426)	(3.673)	(7.312)
Supply Chain Ambidexterity × Network Capability			2.491*		2.576*
			(1.241)		(1.236)
Supply Chain Ambidexterity × Strategic Information flow				1.480+	1.552+
				(0.892)	(0.885)
Constant	-1.296	0.00334	9.469	2.734	12.66+
	(5.479)	(5.471)	(7.191)	(5.689)	(7.379)
Observations	200	200	200	200	200
R-squared	0.149	0.167	0.185	0.179	0.198
R-2	0.149	0.167	0.185	0.179	0.198
p-value	0.000126	5.07e-05	2.19e-05	3.66e-05	1.39e-05

Notes.
Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10



Margin	Margin	s.e.	t	P>	95% CI	
Low SC ambidexterity, low network capability	9.7324	2.0390	4.77	<0.001	5.7103	13.7546
Low SC ambidexterity, high network capability	9.8250	2.1570	4.55	<0.001	5.5699	14.0801
Mean SC ambidexterity, low network capability	5.4717	1.4603	3.75	<0.001	2.5909	8.3525
Mean SC ambidexterity, high network capability	9.7258	1.4056	6.92	<0.001	6.9531	12.4986
High SC ambidexterity, low network capability	1.2208	2.0794	0.59	0.558	-2.8811	5.3228
High SC ambidexterity, high network capability	9.6269	1.8611	5.17	<0.001	5.9557	13.2981

Figure 1. Moderation effects of network capability



Margin	Margin	s.e.	t	P>	95% CI	
Low SC ambidexterity, low strategic information flow	11.2821	2.0159	5.6	<0.001	7.3053	15.2588
Low SC ambidexterity, high strategic information flow	8.2977	1.9557	4.24	<0.001	4.4397	12.1557
Mean SC ambidexterity, low strategic information flow	7.4104	1.4012	5.29	<0.001	4.6463	10.1745
Mean SC ambidexterity, high strategic information flow	7.9685	1.3934	5.72	<0.001	5.2197	10.7172
High SC ambidexterity, low strategic information flow	3.5478	2.0228	1.75	0.081	-0.4425	7.5381
High SC ambidexterity, high strategic information flow	7.6400	2.0752	3.68	<0.001	3.5462	11.7337

Figure 2. Strategic information flow moderation effects