Embracing supply base complexity: The contingency role of strategic purchasing

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Embracing supply base complexity: The contingency role of strategic purchasing

Abstract

Purpose – This paper aims to empirically examine the moderating role of strategic purchasing on the relationship between supply base complexity (SBC) and purchasing performance.

Design/methodology/approach – Survey data were collected from 209 firms listed in the Capital Top 500 Firms of Turkey. Measurement properties were assessed via confirmatory factor analysis, and the conceptual model was tested via hierarchical regression analysis. A supplementary analysis based on 14 semi-structured interviews was conducted to provide further insights on the survey findings.

Findings – Regarding structural SBC, the results suggest that *horizontal complexity* and *supplier interaction* improve purchasing performance, but only in firms with high strategic purchasing. In contrast, *spatial complexity* reduces purchasing performance in firms with high strategic purchasing, while *supplier differentiation* does not have any effect. Regarding dynamic SBC, the results show that both *delivery complexity* and *supplier instability* reduce purchasing performance when firms have low strategic purchasing. Interviews further suggest that firms with high strategic purchasing leverage the positive effects and mitigate the negative effects of SBC by having a long-term focus, considering multiple performance criteria and adopting advanced purchasing practices.

Practical implications – In contrast to what is widely posited in the existing literature, the nuanced findings of this study reveal that complexity is not always detrimental. The results suggest that practitioners should aim for high levels of strategic purchasing to suppress the negative effects of SBC while leveraging its benefits.

Originality/value – By investigating the contingency role of strategic purchasing, this study provides novel insights into the under-investigated issue of how to best 'manage' SBC.

Keywords – Supply base complexity, Strategic purchasing, Purchasing performance

Paper type – Research paper

1. Introduction

Supply chains have become increasingly complex due to heterogeneous customer demands, expanding product portfolios and the escalating volatility of global supply bases (Bode and Wagner, 2015; Bozarth *et al.*, 2009; Choi and Krause, 2006; Lu and Shang, 2017). From the perspective of business managers, supply chain complexity represents one of the most pressing issues in the corporate agenda (Bode and Wagner, 2015; Dittfeld *et al.*, 2018; PricewaterhouseCoppers, 2016), being often associated with detrimental outcomes such as increased supply chain disruptions, higher costs and delivery problems (Bozarth *et al.*, 2009; Brandon-Jones *et al.*, 2015; Vachon and Klassen, 2002). Such complexity can stem from internal operations or external actors in the supply chain (Bozarth *et al., 2009;* Dittfeld *et al.*, 2018). Concerning the latter, suppliers play a significant role in overall supply chain complexity (Brandon-Jones *et al.*, 2015; Choi and Krause, 2006; Lu and Shang, 2017).

The complexity regarding "the suppliers of a firm that are actively managed through contracts and the purchase of parts, materials and services" (Choi and Krause, 2006, p. 639) is known as supply base complexity (SBC). While the importance of SBC is acknowledged by scholars and practitioners, studies report mixed findings on its performance implications, leaving practitioners perplexed as to how to effectively manage SBC (Turner *et al.*, 2018). Some scholars associate SBC with detrimental performance outcomes such as increased operational load (Choi and Krause, 2006), a high likelihood of supply disruptions (Birkie *et al.*, 2017; Bode and Wagner, 2015) and difficulties in meeting delivery dates and schedules (Bozarth *et al.*, 2009). The proponents of this view argue that large supply bases consisting of various suppliers with high volatility and uncertainty increase coordination costs and reduce visibility (Bode and Wagner, 2015; Brandon-Jones *et al.*, 2014; Choi and Krause, 2006). However, other scholars perceive SBC as a strategic asset that can be utilised to increase the likelihood of generating innovations (Choi and Krause, 2006; Lu and Shang, 2017), provide

firms with the ability to recover from disruptions (Birkie and Trucco, 2020) and consequently improve organisational performance (e.g. Aitken *et al.*, 2016; Lu and Shang, 2017; Sharma *et al.*, 2019).

Reconciling these two contrasting views is important not only to design effective supply bases, but also to successfully manage SBC. We assert that there are two plausible reasons for the mixed findings. First, SBC is a multifaceted phenomenon, in which sub-dimensions have a variety of effects on performance (Brandon-Jones *et al.*, 2014; Lu and Shang, 2017; Sharma *et al.*, 2019). Scholars distinguish between two dimensions of SBC: structural complexity and dynamic complexity (e.g. Brandon-Jones *et al.*, 2015; Bozarth *et al*., 2009). Structural SBC is high when buying firms have a large number of suppliers, with varying firm characteristics, located in different geographical regions and interacting with each other (Brandon-Jones *et al.*, 2015; Bode and Wagner, 2015; Choi and Krause, 2006). Dynamic SBC is high when long and unreliable supplier lead times are present, and when firms frequently change their suppliers (Brandon-Jones *et al.*, 2015; Fernández Campos *et al.*, 2019; Gao *et al.*, 2015). Among the studies that examine the performance implications of the SBC sub-dimensions, the focus has been on structural SBC as opposed to dynamic SBC. In addition, some SBC sub-dimensions, such as *supplier interaction* and *supplier instability*, have been only conceptually studied and thus lack empirical evidence for their performance effects.

The second rationale relates to the extent to which firms effectively manage SBC. Anecdotal evidence suggests that some firms handle SBC better than others and are even able to generate value from complexity by adopting collaborative, integrated and aligned purchasing practices, which go beyond traditional cost-focused approaches (Deloitte, 2019). However, in terms of how firms manage SBC, research is scarce (Aitken *et al.*, 2016; Fernández Campos *et al.*, 2019; Turner *et al.*, 2018) and only highlights a limited number of practices, such as managing the scope of control (e.g. Giannoccaro *et al.*, 2018) and influencing the supply

network (e.g. Sharma *et al.*, 2019). The purchasing function has received little to no attention thus far, which is surprising given that it acts as the firm's immediate interface to suppliers, managing both day-to-day and long-term relationships (Patrucco *et al.*, 2017; Paulraj *et al.*, 2006). As firms are at different stages of the purchasing maturity cycle (Schiele, 2007), not all firms have a purchasing function that has the resources and capabilities to cope with the challenges, or to harness the opportunities, of SBC. While some firms have a more traditional purchasing function focusing on operational practices with mostly cost considerations, others have a strategic purchasing function with a long-term focus on advanced purchasing practices to gain more value from suppliers (Nair et al., 2015; Patrucco *et al.*, 2017; Paulraj et al., 2006).

In this study, we address these two gaps. First, we adopt a fine-grained conceptualisation of SBC and investigate the impact of four structural SBC sub-dimensions (*horizontal complexity, supplier differentiation, spatial complexity* and *supplier interaction*) and two dynamic SBC sub-dimensions (*delivery complexity* and *supplier instability*) on purchasing performance. Second, we focus on the ways in which firms manage complexity by studying the contingency role of strategic purchasing, defined here as the extent to which the purchasing strategies and activities are aligned with the firm's strategies to achieve its long-term goals (Carr and Pearson, 2002; González-Benito, 2007, Paulraj *et al.*, 2006). The research model is illustrated in *Figure 1*. Using data from 209 firms listed in the Capital Top 500 firms of Turkey, we (i) examine the impact of the structural and dynamic SBC sub-dimensions on purchasing performance; and (ii) investigate whether strategic purchasing moderates the relationship between the structural and dynamic SBC sub-dimensions and purchasing performance. Additionally, via semi-structured interviews, we present a supplementary analysis to further explore our findings and provide anecdotal evidence.

--- Insert Figure 1 about here ---

This research makes two main contributions to the literature. First, by offering a comprehensive conceptualisation of SBC and empirically testing its under-investigated sub-dimensions, we deepen the understanding of its distinctive performance implications. Due to the varying effects identified, our results demonstrate that SBC is better conceptualised as a multidimensional practice. Second, we illustrate that the mixed findings of the existing literature are partly attributable to the hitherto neglected issue of how SBC is managed. By investigating the contingency role of strategic purchasing, we demonstrate that SBC is not always detrimental. More specifically, our results suggest that some structural SBC sub-dimensions (i.e. *horizontal complexity* and *supplier interaction*) even have a positive effect on purchasing performance when there is high strategic purchasing, and that the dynamic SBC sub-dimensions only reduce purchasing performance when there is low strategic purchasing.

2. Theoretical background

2.1 Supply base complexity

The concept of complexity has attracted attention in several disciplines, including biology, computer science and social sciences. Supply chain management scholars examined complexity from a variety of theoretical lenses: the entropy-based approach (e.g. de Leeuw *et al.*, 2013), systems theory (e.g. Bode and Wagner, 2015; Bozarth *et al.*, 2009; Dittfeld *et al.*, 2018), complex adaptive systems (e.g. Choi and Krause, 2006) and social network theory (e.g. Kim, 2014). The entropy-based approach builds on the work of Shannon (1948), who relates complexity to the quantity of information necessary to describe the state of a system. Systems theory focuses on the architecture of systems, and defines a system as complex if it "includes a large number of varied elements that interact in a non-simple way" (Simon, 1962, p.468). The complex adaptive systems approach explores the interactions between the self-organising, autonomous elements of a system (Choi and Krause, 2006). Finally, social network theory

emphasises how the structure of ties between members affects their relationships (Kim, 2014). Despite the intricate differences across these theoretical lenses, all of them highlight the multidimensional nature of complexity, with the most-cited dimensions being multiplicity, diversity and interrelatedness (Dittfeld *et al.,* 2018; Giannoccaro *et al.*, 2018).

The unit of analysis for complexity also varies in supply chain management. While some studies focus on the extended supply network to examine complexity (e.g. Tachizawa and Wong, 2015), others conceptualise complexity from the perspective of a business unit, and differentiate between various levels of complexity, such as upstream, downstream and internal (e.g. Bozarth *et al.,* 2009; Brandon-Jones *et al.,* 2015). In this study, we focus on the complexity of the supply base, which comprises a firm's suppliers that provide the firm with parts, materials and services, and that are 'actively' managed through contracts (Choi and Krause, 2006). This focus on the supply base is appropriate as we strive to develop a better understanding of 'managing' complexity. Firms have more control over their supply base (which mostly consists of first tier suppliers), yet the structure of a supply network is not dictated by a single firm and is thus more adaptive and autonomous (Sharma *et al.,* 2019), making it difficult to manage.

Drawing on systems theory, we conceptualise SBC by differentiating between structural (or detail) and dynamic (or operational) complexity (Bode and Wagner 2015; Bozarth *et al.*, 2009; Dittfeld *et al.,* 2018; Serdarasan, 2013). The former refers to the number and the variety of the elements defining the system (Bozarth *et al.*, 2009; Aitken *et al.,* 2016); the latter refers to the unpredictability and volatility of a system (Bode and Wagner, 2015; Bozarth *et al.*, 2009), and is associated with time and randomness (Dittfeld *et al.,* 2018; Serdarasan, 2013). In line with this conceptualisation, we define SBC as the level of structural complexity and dynamic complexity exhibited in the supply base.

Table 1 reviews the key studies that investigate the link between SBC and performance outcomes. This review suggests that, despite a variety of data sources (surveys, cases, secondary data), theoretical lenses (system theory, contingency theory, normal accident theory, information processing theory, transaction cost theory, knowledge-based view, social network theory) and performance outcomes (plant, cost, innovation, financial performance, and frequency of disruptions) adopted by scholars, the investigated SBC dimensions are highly similar. Accordingly, we identify four structural SBC sub-dimensions, namely: *horizontal complexity, supplier differentiation, spatial complexity* and *supplier interaction*; and two dynamic SBC sub-dimensions, namely: *delivery complexity* and *supplier instability*.

--- Insert Table 1 about here ---

The four structural SBC sub-dimensions are defined as follows. *Horizontal complexity*, the most studied structural SBC sub-dimension, refers to the number of suppliers that a firm has (Choi and Krause, 2006). *Supplier differentiation* is defined as "the degree of different characteristics such as organizational cultures, operational practices and technical capabilities of the suppliers" (Choi and Krause, 2006, p.642). Choi and Krause's (2006) original definition also includes the geographical separation of suppliers; however, following Bode and Wagner (2015) and Brandon-Jones *et al.* (2015), we treat geographical separation of the suppliers as a separate sub-dimension, called *spatial complexity.* Finally, *supplier interaction*, a rather less examined structural SBC sub-dimension, refers to the extent of collaboration and information sharing between suppliers in the supply base (Ateş *et al.*, 2015; Choi and Krause, 2006).

The two dynamic SBC sub-dimensions are defined as follows. *Delivery complexity* is characterised by the long lead times and unreliability of supplier delivery (Bozarth *et al.*, 2009; Brandon-Jones *et al.*, 2015). *Supplier instability*, a sub-dimension that only recently received attention in the literature (e.g. Gao *et al.*, 2015; Fernández Campos *et al.*, 2019), is the extent

to which firms change their suppliers (Gao *et al.*, 2015), and focuses on the ambiguity created by a lack of supplier continuity.

We observe that the majority of the studies focus on structural SBC sub-dimensions rather than dynamic SBC sub-dimensions, and that some sub-dimensions such as *supplier interaction* and *supplier instability* received considerably less attention. We assert that the lack of a comprehensive conceptualisation of SBC engenders the mixed findings in the literature. Thus, as a response, we investigate structural and dynamic SBC together, and adopt a conceptualisation that encapsulates all sub-dimensions to disentangle the varying effects of each on performance.

2.2 Managing supply base complexity

Extant literature often associates SBC with negative outcomes such as increased frequency of disruptions, higher costs and lower delivery performance (Bode and Wagner, 2015; Bozarth *et al.*, 2009; Vachon and Klassen, 2002). However, a number of studies have adopted a different stance, suggesting that SBC is not always detrimental (e.g. Aitken *et al.*, 2016; Lu and Shang, 2017; Sharma *et al.*, 2019). For example, Aitken *et al.* (2016) distinguish between dysfunctional and strategic complexity, and suggest that certain types of complexity can be beneficial, especially when they support the firm's business strategy. A plausible explanation for these contradicting views relates to how complexity is 'managed' by the firm. If firms have practices to cope with SBC, they may reduce the negative effects of, and even gain a competitive advantage from, complexity (Aitken *et al.*, 2016; Fernández Campos *et al.*, 2020). However, research investigating how SBC can be effectively managed is scarce.

A limited number of studies about managing the complexity in supply chains illustrate that managers adopt a variety of responses, ranging from practices that focus on reducing complexity and absorbing complexity (e.g. Aitken *et al.*, 2016; Turner *et al.*, 2018) to practices

that transfer complexity to actors upstream or downstream in the supply chain (Huaccho Huatuco *et al.,* 2020). Other studies highlight the moderating factors, such as the scope of managerial control (e.g. Giannoccaro *et al.,* 2018) and influence over the supply network (e.g. Sharma *et al.,* 2019). Some relationship management practices such as collaboration and coordination are also considered effective complexity management tools (e.g. Fernández Campos *et al.,* 2019).

These studies suggest that the effect of complexity on performance is contingent on how complexity is managed; however, our understanding of complexity management practices specifically focusing on SBC is rather limited. As the purchasing function is the immediate interface to the supply base, we look at how the purchasing function can play a role in mitigating the negative effects and leveraging the benefits of SBC. More specifically, we investigate the moderating role of strategic purchasing on the relationship between SBC and purchasing performance.

2.3 Strategic purchasing

Traditionally, purchasing was seen as a tactical support function focused primarily on cost reduction (Nair *et al.*, 2015; Paulraj, 2011). However, firms across different industries are increasingly acknowledging the strategic role that purchasing can play in successfully implementing firm strategies and contributing to competitive advantage (Carr and Pearson, 2002; Luzzini and Ronchi, 2016; Nair *et al.,* 2015; Patrucco *et al.,* 2017). A necessary condition to achieve these strategic benefits is to ensure alignment between business strategy and purchasing strategy (Baier *et al.*, 2008; González-Benito, 2007; Rodríguez-Escobar and Gonzalez-Benito, 2017). A strategic purchasing function also aligns and structures a firm's supply base with the long-term priorities of its business strategy (Handfield *et al.*, 2015). In line with these views, we define strategic purchasing as the extent to which the purchasing

strategies and activities are aligned with the firm's strategies to achieve its long-term goals (Carr and Pearson, 2002; González-Benito, 2007; Paulraj *et al.*, 2006). A strategic purchasing function is not only knowledgeable about the business strategy, but also included in the strategic planning process and acknowledged by top management as an essential business function (Luzzini and Ronchi, 2016; Nair *et al.*, 2015; Paulraj *et al.*, 2006).

Firms with a strategic purchasing function have more collaborative and long-term relationships with suppliers, with whom they are more likely to engage in open communication and joint problem solving (Patrucco *et al.*, 2017; Yeung *et al.*, 2015). Such long-term focus also enables the firm to better evaluate supplier capabilities and supplier risk (Paulraj *et al.*, 2011). Furthermore, greater recognition of the strategic purchasing function within the organisation leads to attracting the organisational resources necessary for implementing advanced purchasing practices such as supplier development and supplier integration (González-Benito, 2016; Luzzini and Ronchi, 2016). The mutual benefits associated with such practices reduce supplier uncertainty and increase supplier commitment to the relationship (Patrucco *et al.*, 2017; Yeung *et al.*, 2015). Extant literature suggests that strategic purchasing improves both purchasing performance (e.g. Nair *et al.*, 2015; Yeung *et al.*, 2015) and overall firm performance (e.g. Carr and Pearson 2002).

3. Hypothesis development

3.1 Supply base complexity and performance

Complexity in supply chains is often associated with detrimental performance outcomes (Bode and Wagner, 2015; Bozarth *et al.*, 2009; Vachon and Klassen, 2002). Our review of the key empirical studies of SBC (see *Table 1*) also highlights that the majority of extant research perceives SBC as having a negative impact on firms' operations performance. Such cited repercussions include increased frequency of disruptions, lower plant performance and higher

costs (Bode and Wagner, 2015; Bozarth *et al.*, 2009; Choi and Krause, 2006). Of the few studies that report a positive effect, the focus has been on financial performance (e.g. Lu and Shang, 2017) and innovation performance (Sharma *et al.*, 2019). In this study, we focus on the more direct outcome of SBC: the impact it has on purchasing performance. We deliberately refrain from approaching the performance construct from a broader perspective, given the marginal effects and equivocal results reported in the literature (e.g. Dong et al., 2020; Lu and Shang, 2017). From an operational stance, purchasing performance concerns the cost, quality, delivery and flexibility performance of the suppliers (González-Benito *et al.*, 2016; Nair *et al.*, 2015). Below, we distinguish between the sub-dimensions of structural and dynamic SBC, and elaborate on their impact on performance.

The four structural SBC sub-dimensions are *horizontal complexity, supplier differentiation, spatial complexity* and *supplier interaction*. Traditionally, firms have focused on rationalising their supply base and reducing the *horizontal complexity* (i.e. the number of suppliers) by limiting purchasing volumes to fewer suppliers (Bode and Wagner, 2015; Vanpoucke *et al.*, 2014). When the number of suppliers increases, the buying firm needs to coordinate a greater number of both physical flows and information flows, and effectively manage the relationships with and between suppliers (Bode and Wagner, 2015; Bozarth *et al.*, 2009). Therefore, large supply bases are often associated with increased administrative burden and transaction costs (Choi and Krause, 2006). Furthermore, firms might have difficulty identifying early signs of supply chain disruptions in large supply bases (Bode and Wagner, 2015; Brandon-Jones *et al.*, 2015). In contrast, having a small supply base enables the adoption of more collaborative practices, such as supplier development and supplier integration (Brandon-Jones *et al.*, 2015; Vanpoucke *et al.*, 2014), which often leads to performance improvements for both the buyer and the supplier (Benton *et al.*, 2020; Kim, 2013). A small number of studies perceive *horizontal complexity* as being beneficial for certain types of

performance – such as innovation performance (e.g. Sharma *et al.,* 2019) – but the overall consensus is that *horizontal complexity* has a detrimental effect on firms' operations.

Supplier differentiation increases operational burden, as purchasing managers need to implement different practices and policies to match the varying backgrounds of the suppliers (Ateş *et al.,* 2015; Brandon-Jones *et al.,* 2014). Firms with high *supplier differentiation* may need to adopt different relationship approaches to accommodate the potential coordination problems with suppliers. This leads to increased information-processing requirements and further contributes to operational burden (Brandon-Jones *et al.,* 2015; Choi and Krause, 2006). *Spatial complexity* is the source of further operational challenges, such as increased uncertainty and transaction costs due to long travel distances and customs operations (Bode and Wagner, 2015; Bozarth *et al.,* 2009; Jeble *et al.,* 2018; Vanpoucke *et al.,* 2014). As a response, firms might also need to keep extra safety stock. The global network of suppliers with longer travel paths and variable lead times also increases the vulnerability of firms to supply chain disruptions (Brandon-Jones *et al.,* 2015; Bode and Wagner 2015). Furthermore, assuring uniform quality across suppliers globally is an operational challenge for firms with high *spatial complexity* (Brandon-Jones *et al.,* 2014).

Although it is posited that *supplier interactio*n can improve buyer performance by increasing coordination in the development of new products (Ateş *et al.,* 2015; Lu and Shang, 2017), it can also have a detrimental effect when suppliers share information related to the bidding process, unbeknownst to the buying firm (Choi and Krause, 2006). In order to prevent such damage, the buying firm needs to manage the interactions between suppliers, as well as balance conflicting objectives, resulting in greater coordination efforts and higher information-processing costs; all of which increase the burden on operational performance (Choi and Krause, 2006; Giannoccaro *et al.,* 2018).

To summarise, the general position found in the literature is that structural SBC increases operational load, coordination costs and process outcome variability (Birkie *et al.,* 2017; Bozarth et al., 2009; Choi and Krause, 2006), resulting in lower transparency and performance. In line with these arguments, the following hypothesis is formulated:

Hypothesis 1. Structural SBC sub-dimensions are negatively associated with purchasing performance.

While previous studies on supply chain complexity report that dynamic complexity has a larger effect on performance than structural complexity (Bozarth *et al.,* 2009), it is interesting to note that dynamic SBC has been examined to a lesser extent. The two sub-dimensions of dynamic SBC examined in this study are *delivery complexity* and *supplier instability*. The former, referring to the prolonged lead times together with high variance, leads to difficulty in quickly responding to demand fluctuations (Vanpoucke *et al.*, 2014), increases supply chain disruption risk (Brandon-Jones *et al.,* 2015), and requires longer planning horizons and the retention of extra safety stock (Bozarth *et al.,* 2009). The bullwhip effect is also more evident in supply bases with high *delivery complexity*, since firms keep more safety stock in order to respond to changes in demand (Brandon-Jones *et al.*, 2014; Vanpoucke *et al.,* 2014). As such, *delivery complexity* is associated with lower performance.

Supplier instability, referring to the frequent changing of suppliers, increases the likelihood to face supplier opportunism (Tachizawa and Wong, 2015) and higher administrative costs associated with building relationships with new suppliers (Richardson, 1993). Furthermore, it is difficult to establish high-quality standards among frequently changing suppliers (Song *et al.,* 2012); as such, operational performance suffers.

Dynamic SBC sub-dimensions are highly associated with uncertainty, volatility and instability, all of which increases supply risks, transaction costs and coordination needs

(Bozarth *et al.*, 2009; Vachon and Klassen, 2002). Based on this, we formulate the following hypothesis:

Hypothesis 2. Dynamic SBC sub-dimensions are negatively associated with purchasing performance.

3.2 The moderating role of strategic purchasing

Strategic purchasing functions have long-term purchasing strategies that are aligned with business strategies (Baier *et al.*, 2008; González-Benito *et al.*, 2016; Nair *et al.*, 2015). Such an alignment enables firms to go beyond the cost-reduction emphasis of traditional purchasing and to pursue multiple objectives that are also reflected in the business strategy. For instance, the purpose of a strategic purchasing function is to establish long-term relationships between a firm and its suppliers, thus allowing the firm to utilise its market-sensing capabilities to understand and learn from its complex supply base (Aslam *et al.*, 2020; Brandon-Jones and Knoppen, 2018). In such firms, a large and varied supply base is not purely seen as an administrative burden (Bode and Wagner, 2015; Choi and Krause, 2006), but rather as a strategic asset that reduces dependency and gives more flexibility in case of supply disruptions (Birkie and Trucco, 2020). Furthermore, such a long-term focus requires the adoption of a more proactive approach and having purchasing strategies that integrate risk and uncertainty into supply base management practices (Paulraj *et al.*, 2006; Wiengarten and Ambrose, 2017). Since firms with a strategic purchasing function are more likely to identify SBC as a source of potential supply risk, they are also more likely to develop proactive approaches for managing the challenges of SBC and to assess its impact on a range of performance outcomes.

If purchasing strategies are aligned with the priorities of a firm's business strategy, it is reasonable to expect that the legitimacy of this purchasing function is acknowledged by top management (Baier *et al.*, 2008). Such recognition enables attracting more organisational

resources and adopting advanced purchasing practices such as supplier integration and supplier development (Nair *et al.,* 2015; Yeung *et al.,* 2015); all of which reduce the potential negative effects of SBC. For instance, the operational challenge of managing long lead times are overcome when suppliers are integrated via joint replenishment systems (Gimenez *et al.*, 2012). In other words, strategic purchasing functions have the necessary resources to invest in reconfiguring and coordinating supply bases to respond to changes in the external environment (Schütz *et al.*, 2020).

To summarise, firms with a strategic purchasing function are more likely to have purchasing strategies that integrate policies for assessing, managing and mitigating SBC. Therefore, we argue that such firms are not only less affected by the negative outcomes of SBC, but also benefit from certain SBC sub-dimensions (Aitken *et al.,* 2016, Sharma *et al.,* 2019). The following hypotheses are thus formulated:

Hypothesis 3. Strategic purchasing moderates the relationships between structural SBC sub-dimensions and purchasing performance.

Hypothesis 4. Strategic purchasing moderates the relationships between dynamic SBC sub-dimensions and purchasing performance.

4. Research methodology

4.1 Sample

To test our hypotheses, we surveyed the Capital Top 500 firms of Turkey. With a GDP of $743.71 billion in 2019, Turkey ranks as the 19th largest economy in the world (IMF, 2019). According to the New Generation CPO survey, 54% of the purchasing departments in Turkish firms engage in strategic planning, yet 38% of these do not have a formal risk management process (PricewaterhouseCoopers, 2020). This context enables us to investigate a wide variety of approaches to strategic purchasing.

To select the respondents, we targeted purchasing and supply chain managers and professionals. We identified the respondents by calling the companies for whom they worked, and by using the job title search option of LinkedIn. The respondents received an online questionnaire between June and August 2019. An online questionnaire was chosen as the data collection tool as it provides a user-friendly interface and typically generates a high response rate (Melnyk *et al.*, 2012). After two reminders, 209 surveys were obtained, resulting in a response rate of 41.8%, which is comparable to most recent research adopting similar sampling designs (e.g. Nath and Agrawal, 2020).

Table 2 provides the descriptive statistics for the sample. Manufacturing firms constitute 69.9% of the sample, with the top five sectors being food and beverage, automotive, industrial metals, textile and electronics. 86.1% of the participating firms have more than 500 employees, and the purchasing spend ratio is normally distributed. 68.4% of the respondents are from executive levels in purchasing and supply chain management, and 78.9% of the respondents have more than five years of purchasing and supply chain management experience.

--- *Insert Table 2 about here* ---

4.2 Measurement

The unit of analysis is the firm, and the respondents were asked Likert-type questions measured on a five-point scale. *Table 3* illustrates the constructs and their respective measurement items. The survey was pre-tested with two academics from the operations management field and three practitioners, in order to assess the relevance and clarity of the items. Based on their feedback, minor changes were made to the wording. Questions were translated to Turkish using the back-translation method (Brislin, 1986) to ensure conceptual equivalence.

--- *Insert Table 3 about here* ---

The four structural SBC sub-dimensions were operationalised as follows. *Horizontal Complexity* measures were adopted from Bozarth *et al.* (2009) and Brandon-Jones *et al.* (2015), and measured the number of suppliers. *Supplier Differentiation* items were developed based on the measure of Brandon-Jones *et al.* (2015) and conceptualisation of Choi and Krause (2006), and assessed the similarity between suppliers in terms of size, technical capability, organisational culture and practices (reverse item). *Spatial Complexity* was assessed by asking the respondents to indicate the share of their suppliers from five regions (Turkey, Europe, Asia, North America, and Other) and was measured using the following formula, adopted from Brandon-Jones *et al.* (2015):

$$= 1 - \frac{(|\ Turkey\% - 20\ | + |\ Europe\% - 20\ | + |\ Asia\% - 20\ | + |\ North\ America\% - 20\ | + |\ Other\% - 20\ |)}{160}$$

Where the minimum value of 0 indicates that all suppliers are located in a single region, and where the maximum value of 1 indicates that suppliers are spread equally across all five regions.

The last structural SBC construct, *Supplier Interaction*, was newly developed based on the conceptualisation of Choi and Krause (2006), and indicated the extent of communication, information sharing and collaboration between suppliers.

Dynamic SBC was operationalised with two constructs. *Delivery Complexity* scale was developed based on Bozarth *et al.* (2009) and Brandon-Jones *et al.* (2015), and was measured by asking the respondents to indicate the extent to which their suppliers provided short lead times and on-time delivery (reverse item). *Supplier Instability* scale was newly developed based on Gao *et al.* (2015), and assessed the extent to which the firm changed its suppliers (i.e. whether it had mostly short-term relationships or not).

Strategic Purchasing scale was adopted from Paulraj *et al.* (2006) and Luzzini and Ronchi (2016), and measured the extent of purchasing involvement in overall firm strategy planning, as well as the presence of a formally written, long-term plan. Finally, the multi-item *Purchasing*

Performance measurement was developed based on Nair *et al.* (2015), Paulraj *et al.* (2006) and Sánchez-Rodríguez (2009). The respondents were asked to rate the performance of their purchasing function in the last three years, in relation to their targets of cost, quality, delivery and flexibility (i.e. the most frequently used dimensions to assess operational purchasing performance) (González-Benito *et al.*, 2016; Nair *et al.*, 2015). Furthermore, three control variables were included: *firm size* (logarithm of FTEs), *industry* (dummies for service, retail, energy and construction compared to manufacturing as the base industry) and *purchasing spend ratio* (purchasing spend divided by all expenditures).

4.3 Reliability and validity

We evaluated the unidimensionality, item reliability and convergent validity of the constructs by conducting a confirmatory factor analysis using the Lavaan package of R, version 1.3.959 (See *Table 3*). The measurement model revealed a good fit of the model. We observed a chi-square value: $\chi 2(231) = 394.33$; Tucker–Lewis Index (TLI) = 0.91; comparative fit index (CFI) = 0.93; and root mean square error of approximation (RMSEA) = 0.06, all indicating a good model fit. Cronbach's alpha values were higher than 0.7. All factor loadings were significant (t >2.0) with values higher than the commonly accepted threshold of 0.4 (Anderson and Gerbing, 1988), indicating convergent validity. Furthermore, the average variance extracted (AVE) was higher than 0.5 for all constructs except for *Horizontal Complexity*, which had an AVE of 0.46. In order to preserve face validity of this construct, we did not remove any items, given that the AVE value was close to the threshold. Finally, discriminant validity was achieved as the square roots of AVEs for all constructs (reported on the diagonal of *Table 4*) were greater than their respective zero-order correlation coefficients with all other constructs in the model (Fornell and Larcker, 1981).

--- *Insert Table 4 about here* ---

4.4. Common method bias and non-response bias

We took several measures in the survey design phase to control for common method bias (Podsakoff *et al.,* 2003). First, the respondents were informed that their answers would be anonymous, and that the results would only be reported at a collective level. Second, questions about independent and dependent variables were distributed over separate pages in the online survey, thus reducing the potential item priming effects (Podsakoff *et al.,* 2003). Finally, we targeted experienced respondents from purchasing and supply chain departments. 78.9% of our respondents had more than five years of experience in purchasing, indicating the credibility of their answers.

We also assessed the threat of common method bias after data collection. First, we adopted the single-factor approach of Harman (1967), using exploratory factor analysis. The results indicated a solution with seven factors that accounted for 69.69% of the total variance, with the first factor accounting for only 23.62% of the total variance; much less than the commonly suggested threshold of 50%. Second, via confirmatory factor analysis, we constructed a model consisting of a single factor (Malhotra *et al.*, 2006). This model had a very poor fit ($\chi 2$ (252) = 1541.45; TLI = 0.35; CFI = 0.40; and RMSEA = 0.16). Based on the results of these controls and tests, we concluded that common method bias was not a concern for our data.

To test for non-response bias, 30 randomly chosen responding and non-responding firms were compared based on two objective indicators: *firm size* and *earnings before tax*. Mean differences for both items were not significant (p=0.14 and p=0.65, respectively), indicating that non-response bias was not a major concern.

5. Results

5.1. Survey results

The hypotheses were tested via hierarchical regression analysis. *Table 5* illustrates the results of this analysis. Correlations between the variables are lower than the threshold of 0.50, and the largest variance inflation factor value is 1.684, suggesting that multicollinearity is not a concern (Neter *et al.,* 1989). The first model with only the control variables (i.e. logarithm of firm size, industry dummies and purchasing spend ratio) is not significant. The second model predicting the direct effects is significant (F= 4.64 p= 0.001) and explains 24.2% of the variance. The results show that out of the structural SBC sub-dimensions, *horizontal complexity, supplier differentiation* and *spatial complexity* do not have an effect on purchasing performance, whereas *supplier interaction* has a positive effect (b= 0.15, p= 0.05). Therefore, Hypothesis 1 is not supported. On the other hand, both dynamic SBC sub-dimensions, namely *delivery complexity* and *supplier instability*, have a negative effect on purchasing performance *(*b= -0.21, p=0.01 and b= -0.11, p=0.10), respectively), supporting Hypothesis 2. Furthermore, strategic purchasing has a positive effect on purchasing performance (b= 0.24, p= 0.001). The third model with the interaction terms is significant (F= 4.86, p= 0.001), and explains an additional 9.3% of the variance (F= 4.29, p= 0.001). The results illustrate that Hypothesis 3 and Hypothesis 4 are largely supported. Regarding structural SBC sub-dimensions, the findings show that strategic purchasing positively moderates the impact of *horizontal complexity* and *supplier interaction* (b= 0.21, p= 0.01 and b= 0.14, p= 0.05, respectively), and negatively moderates the impact of *spatial complexity* on purchasing performance (b= -0.14, p= 0.05). On the other hand, the interaction coefficient for *supplier differentiation* is not significant. Regarding dynamic SBC sub-dimensions, strategic purchasing positively moderates the impact of both *delivery complexity* and *supplier instability* on purchasing performance (b= 0.13, p= 0.05 and b= 0.15, p= 0.05).

--- Insert Table 5 about here ---

Upon examining the interaction plots (see *Figure 2*), varying effects are observed. The results indicate that in firms with low strategic purchasing, *horizontal complexity* does not have an effect on purchasing performance (the gradient of the simple slope is −0.14, *p*= ns); however, in firms with high strategic purchasing, it improves purchasing performance (the gradient of the simple slope is 0.27, *p*= 0.001). *Spatial complexity* has a negative effect on purchasing performance in firms with high strategic purchasing (the gradient of the simple slope is −0.17, *p*= 0.10), but it does not have an effect in firms with low strategic purchasing (the gradient of the simple slope is 0.11, *p*= ns). *Supplier interaction* is associated with a higher purchasing performance only in firms with high strategic purchasing (the gradient of the simple slope is 0.25, *p*= 0.01). Finally, both *delivery complexity* and *supplier instability* result in a lower purchasing performance only in firms with low strategic purchasing (the gradient of the simple slopes are -0.31, *p*= 0.001 and -0.23, *p*= 0.05, respectively).

--- Insert Figure 2 about here ---

5.2 Supplementary analysis

We performed a supplementary analysis[1] to further explore our survey findings and provide anecdotal evidence for the hypothesised relationships (e.g. Ateş *et al.*, 2020). We conducted semi-structured interviews with purchasing and supply chain executives of 14 firms who had participated in our survey. Since we were interested in parsing the differences between firms with high strategic purchasing against those with low strategic purchasing, we used purposive sampling for this qualitative analysis (Yin, 2013). Data were collected in December 2020, and each interview ranged between 30–90 minutes, with an average of approximately 55 minutes. *Appendix A* illustrates the interview details, and *Appendix B* illustrates exemplary quotes and

[1] We thank the anonymous reviewer for suggesting this analysis.

findings from the interviews. Next, we present the key interview findings for each SBC sub-dimension and elaborate on how they bring further clarity to the survey results.

Horizontal complexity. Many of the interviewees indicated that the number of suppliers is not a goal in and of itself, and that large firms with a high product variety by default have a larger supply base. A great number of suppliers (i.e. high *horizontal complexity*) was often preferred due to the competition between the suppliers in offering lower purchase prices. However, *horizontal complexity* was also associated with high administrative load and documentation regarding getting quotes, invoicing and auditing. In firms with low strategic purchasing, cost reductions from increased competition seemed to be offset by the higher administrative load, resulting in a null net effect. However, in firms with high strategic purchasing, the administrative load was often successfully managed via purchasing digitalisation and automation. Additionally, firms with a greater number of suppliers aimed at not only reducing costs, but also increasing flexibility (i.e. alternative suppliers can easily be found in case of disruptions) and fostering innovation, thereby resulting in greater performance gains. These findings shed further light on our survey results, reporting that *horizontal complexity* has a positive impact on purchasing performance only in firms with high strategic purchasing.

Supplier differentiation. The survey results had revealed that *supplier differentiation* does not have an effect on purchasing performance. Our interview findings illustrated that while differentiation in supplier firm size was in fact desired (i.e. the flexibility of small suppliers versus the professionalism of large suppliers). However, differentiation in technical capabilities, operational strategies and organisational culture was often perceived as a problem (i.e. 'the misfit between the firm and the supplier') due to issues of poor quality, difficulties in developing standard practices and cultural clashes. This observation signals that examination of the different aspects of *supplier differentiation* could be a beneficial research avenue for future studies.

Spatial complexity. Although the interviewees stated several reasons for sourcing globally – cost advantages, proximity to raw materials, and access to better-quality services and technology – they also stressed that it is becoming more challenging due to trade wars, increasing taxes, customs issues and currency fluctuations. The majority of interviewees agreed that Turkey would be their first choice for supply, presuming this was an option. This finding is in line with recent reshoring trends, whereby firms are realising that the costs of global sourcing may outweigh the benefits. The survey results indicate a negative effect of *spatial complexity* on firms with high strategic purchasing. The interviewees in such firms indicated that, despite the technological advancements, supplier collaboration and control are still better when in close proximity than across large distances. One interviewee from the automotive industry stated: *"I even intervene in the HR [human resources] practices of my key suppliers to improve their operations. This is not really possible if my suppliers are far away"* (INT-B). Having suppliers dispersed across different countries may hamper the long-term, strategic relationships pursued by strategic purchasing functions, resulting in a more detrimental impact when compared to traditional purchasing functions.

Supplier interaction. The overall impression of *supplier interaction* was positive. However, this was only the case in firms with high strategic purchasing; for example, information sharing and working on joint projects were practices only mentioned by interviewees from such firms (in particular, those from automotive, electronics and fast-moving consumer goods companies). Interviewees noted that, often, tier-1 and tier-2 suppliers (or suppliers of different parts) work on joint projects, resulting in quality improvements and innovations. These interactions are not autonomous; often, the case companies either coordinate these projects or organise events for suppliers to share ideas. It became evident for firms with a strategic purchasing function that going beyond cost focus and having resources to foster interaction between suppliers enables the leveraging of *supplier interaction*.

Delivery complexity. All interviewees unanimously agreed that *delivery complexity* poses a significant threat to purchasing performance. Despite this, the way in which *delivery complexity* was managed in firms with low and high strategic purchasing varied to a great extent. On the one hand, firms with low strategic purchasing mostly had a reactive approach and relied on the penalty clauses found in contracts. Such an approach only financially penalised the supplier; it did not solve the issue of late deliveries to the customer, meaning the firm still incurred financial losses. On the other hand, firms with high strategic purchasing had a more proactive approach, aiming to prevent delivery problems by adopting long-term strategic plans. This includes the provision of timely demand updates to the suppliers, and the use of enterprise resource planning systems in which suppliers are integrated. Acknowledging this proactive stance, one interviewee stated: *"If there is a supplier delivery problem, we know that it mostly stems from us – either we did not inform the supplier on time, did not plan well or did not carefully monitor the supplier"* (INT-F1). To summarise, the interview findings demonstrate that in firms with high strategic purchasing, the detrimental effects of *delivery complexity* are mitigated by the adoption of advanced purchasing practices.

Supplier instability. The survey results suggest that *supplier instability* (i.e. the high turnaround of suppliers) leads to low purchasing performance in firms with low strategic purchasing. The interviewees revealed that firms with low strategic purchasing often see long-term relationships as 'risky', meaning suppliers changed more frequently. In contrast, the majority of firms with high strategic purchasing emphasized that once they have a successful, established relationship with key suppliers, they are reluctant to change them due to the potential increase in costs associated with training a new supplier to ensure the same level of quality. Although these firms monitored the supply market for high-performing new suppliers, they did not immediately switch to a new supplier for incremental price differences. Interviewee INT-J stated that, when adding a new supplier, the firm gradually increases the order quantity from

this new supplier so as not to upset the existing suppliers and to encourage fair competition. Interviewee INT-G further added that although the approach of keeping more suppliers in the system can cause additional costs in the short term, the long-term benefits are much greater. To summarise, these findings illustrate how the detrimental effects of *supplier instability* are overcome in high strategic purchasing functions by focusing on long-term impact and continuity.

Trade-offs between SBC and performance dimensions. The interviews shed further light on our survey findings by illustrating some of the trade-offs between SBC and performance dimensions. For instance, on the one hand, Interviewee INT-G indicated that dependence on a few suppliers (i.e. low *horizontal complexity*) can result in high *delivery complexity*. On the other hand, Interviewees INT-A and INT-M both claimed that the structural SBC sub-dimension of low *spatial complexity* can reduce *delivery complexity*. They further asserted that while high structural SBC increases the administrative and operational load, it improves performance by enhancing flexibility and innovation. These findings highlight the complex interplay between the SBC sub-dimensions, and the varying effects these have on performance.

The contingency role of strategic purchasing. Overall, our survey results illustrate that strategic purchasing mitigates the negative effects, and leverages the positive effects, of SBC on purchasing performance. From the interviews, we derived two main insights that shed light on the underlying rationale of this relationship. First, firms with a strategic purchasing function are better positioned to assess the trade-offs between the various SBC sub-dimensions, and to determine the short-term versus long-term performance outcomes of SBC. Such firms often have long-term strategies that emphasise multiple performance criteria that go beyond a sole focus on cost objectives. Second, because strategic purchasing functions have high recognition from top management, they are more likely to have increased resources (e.g. labour and budget). Due to this, advanced purchasing practices – such as purchase category management,

supplier risk assessment, supplier integration, supplier development and purchasing digitalisation – are more likely to be implemented.

6. Discussion

6.1 Summary of the findings

The extant literature generally perceives supply chain complexity in a negative light (Bode and Wagner, 2015; Bozarth *et al.,* 2009). Drawing on the current literature, we theorized about the the detrimental effects of both structural SBC and dynamic SBC on purchasing performance. Interestingly, our results only partially support the notion that SBC has a detrimental impact; we find that these effects differ across the various SBC sub-dimensions and are contingent on strategic purchasing. Below, we present a discussion of the findings for each SBC sub-dimension.

Although the consensus is that dynamic complexity has a negative effect, study results are more mixed concerning structural complexity. The majority of scholars agree that such a discrepancy derives from the varying effects of the structural SBC sub-dimensions (Brandon-Jones *et al.,* 2015; Lu and Shang, 2017; Sharma *et al.,* 2019), which are also observed in this study. In addition, given our finding that strategic purchasing acts as a moderator, we believe that the inconclusive findings can be explained by understanding the ways in which SBC is 'managed' (Aitken *et al.,* 2016; Turner *et al.*, 2018).

Our results show that *horizontal complexity* does not have an effect on purchasing performance in firms with low strategic purchasing, but it improves purchasing performance in firms with high strategic purchasing. Previously, studies encouraged 'supply base rationalisation' (i.e. diminishing *horizontal complexity* by reducing the number of suppliers) as a means to improving performance (Choi and Krause, 2006). In contrast, the supplementary interviews revealed the favourable light in which firms typically see a larger supply base,

whereby prices can be lowered by fostering competition, and flexibility can be improved by simplifying the process of sourcing alternative suppliers. A larger supply base can therefore be seen as a strategic asset that increases the buying firm's options and enables recovery after supply chain disruptions (Birkie and Trucco, 2020). Furthermore, firms with higher strategic purchasing are less affected by the higher administrative load, since they already have advanced purchasing practices, such as purchasing digitalisation and automation, in place.

Similarly, we find that *supplier interaction* is associated with higher performance when strategic purchasing has been adopted. To date, only conceptual studies have examined *supplier interaction* (Choi and Krause, 2006). Our study empirically illustrates that, when suppliers share information with one another and collaborate, firms with strategic purchasing functions are better off compared to firms with low strategic purchasing (the latter of which see no effect). These findings suggest that current concerns (e.g. too much *supplier interaction* resulting in autonomous, destructive supplier behaviour) (Choi and Krause, 2006) can be overcome if firms have strategic purchasing functions. Additional insights from the interviews suggest that advanced supplier relationship management practices – such as supplier development and supplier integration – have been adopted by such firms, leading to increased collaboration with and between suppliers, and improved purchasing performance (Nair *et al.*, 2015; Sánchez-Rodríguez, 2009).

Number, interaction and variety of nodes constitute the most common sub-dimensions of structural complexity (Choi and Krause, 2006; Simon, 1962). While our results suggest that the number (i.e. *horizontal complexity*) and interaction (i.e. *supplier interaction*) are associated with higher performance, variety (i.e. *supplier differentiation* and *spatial complexity*) produces mixed results. In line with Brandon-Jones *et al.* (2015), we find that *supplier differentiation* does not have an effect on purchasing performance. It could be that supplier diversity has an impact on other performance outcomes, such as innovation performance, by increasing the

likelihood of generating innovative ideas (Choi and Krause, 2006; Sharma *et al.*, 2019). The interviews demonstrate the need to examine diversity dimensions separately. For instance, interviewees seemed to favour variety of size due to the different advantages provided (i.e. responsiveness versus professionalism); however, diversity in technical capabilities and organisational culture were often associated with negative effects.

We find that *spatial complexity* reduces purchasing performance in firms with high strategic purchasing. Increasingly, studies acknowledge the 'dark side' of global sourcing, with extensive global sourcing posing challenges relating to issues in customs, country risks and currency fluctuations (Holweg, 2011; Stanczyk *et al.*, 2017). The majority of our interviewees acknowledged these challenges. Another hidden cost was the difficulty of coordinating supplier relationships (Holweg, 2011). Firms with strategic purchasing functions often prioritise long-term relationships with their suppliers built on trust (Nair *et al.*, 2015), and when they source from many different regions and continents, physical distance might hamper these collaborative relationships (Stanczyk *et al.*, 2017). Furthermore, often the primary reason behind sourcing from many different regions and continents is cost reduction; such an emphasis on cost reduction might clash with the collaborative, long-term relationships emphasised by strategic purchasing. Assuming that said collaboration is hampered due to the distance and contradicting objectives behind supplier choices, the aims of strategic purchasing may be rendered futile.

Detrimental effects of supply chain complexity are often more pronounced for dynamic complexity (Bozarth *et al.*, 2009, Brandon-Jones *et al.*, 2015). Similar to previous research, this study finds that both dimensions of dynamic SBC – *delivery complexity* and *supplier instability* – reduce purchasing performance. However, the results suggest that this effect is only observed in firms with low strategic purchasing. These findings indicate that when firms have strategic purchasing functions that participate in strategic decision-making, have long-

term plans and coordinate with other functions, they are better prepared and have the necessary resources to manage the complexities associated with uncertain supplier lead times and frequently changing suppliers. Additional insights from the interviews also support this view, as we observed that firms with a strategic purchasing function display a more proactive approach to managing dynamic complexity, whereby they aim to 'prevent' problems as opposed to 'reacting' to supplier uncertainty and volatility. Such firms often have long-term strategic plans, IT integration with suppliers, and joint demand planning. These results are in line with the more recent research focus of 'managing' complexity (e.g. Fernández Campos *et al.*, 2019; Giannoccaro *et al.*, 2018; Turner *et al.*, 2018), thus highlighting the contingency role of strategic purchasing as a mechanism to suppress the negative effects of dynamic SBC.

Overall, the findings illustrate that SBC is not always detrimental; some sub-dimensions of SBC result in a higher purchasing performance. The results further suggest that strategic purchasing plays an important contingency role in the relationship between SBC and purchasing performance; when there is strategic purchasing, the negative effects of *delivery complexity* and *supplier instability* vanish and the positive effects are evident in *horizontal complexity* and *supplier interaction*. Further insights from the interviews suggest that firms with a strategic purchasing function are better positioned to assess the trade-offs between SBC sub-dimensions, and to determine the short-term versus long-term performance outcomes of SBC. These findings highlight the importance of distinguishing between the different sub-dimensions of SBC, and of aiming for a strategic purchasing function to mitigate the negative effects and leverage the strategic benefits of SBC.

6.2 Theoretical implications

Recent studies advocate the need for a better understanding of complexity and how to best manage it (Fernández Campos *et al.*, 2019; Giannoccaro *et al.*, 2018; Huaccho Huatuco *et al.*,

2020; Turner *et al.,* 2018). This study responds to this call by examining both of these gaps. First, we improve the understanding of what constitutes SBC by adopting a fine-grained conceptualisation of SBC, and by empirically investigating both structural and dynamic SBC, taking into account the less examined sub-dimensions as well. Previously, studies mostly focused on structural SBC (Birkie *et al.,* 2017; Sharma *et al.,* 2019), with some sub-dimensions of SBC – such as *supplier interaction* and *supplier instability* – only being examined conceptually. Illustrating varying effects of SBC sub-dimensions on purchasing performance, this study emphasises the notion that SBC is a multidimensional concept (Bode and Wagner 2015; Giannoccaro *et al.,* 2018) and not always detrimental.

Second, we contribute to the purchasing literature by demonstrating that the effect of SBC on purchasing performance is contingent on the level of strategic purchasing. Although the number of studies investigating the performance effects of SBC has seen a recent increase, there is still a dearth of research investigating how SBC can be effectively managed (Giannoccaro *et al.,* 2018; Huaccho Huatuco *et al.,* 2020; Turner *et al.,* 2018). The limited number of studies about managing complexity mostly focus on the overall supply chain, and adopt either case study or simulation methods. In this study, we specifically focus on upstream supply chain complexity and empirically test its effect on purchasing performance. We also identify a core contingency – strategic purchasing –, which has not been investigated to date. We empirically illustrate that when firms have strategic purchasing functions, they are less affected by the detrimental outcomes of SBC and might even be capable of strategically leveraging certain SBC sub-dimensions, such as *horizontal complexity* and *supplier interaction*.

6.3 Managerial implications

This study provides purchasing and supply chain managers with a number of useful insights regarding supply base management. Recent industry reports illustrate how managers consider complexity in supply chains as one of the most pressing contemporary supply chain management issues, and often search for ways to 'reduce' complexity (Deloitte, 2019; Pricewaterhouse Coopers, 2015). However, our findings assert that firms should not hastily jump to the conclusion that SBC reduces performance. Complexity does not need to be reduced for high performance; to fully utilise the benefits of SBC, complexity should be accompanied by a strategic purchasing function.

Unreliable supplier lead times and frequently changing suppliers diminish purchasing performance only in firms with low strategic purchasing. Firms that are further along the purchasing maturity cycle and have a strategic purchasing function can take advantage of SBC. More specifically, such firms might aim at increasing the number of their suppliers and improving the interaction between them in order to reduce dependency on a few suppliers, better survive disruptions and gain access to more ideas, thereby increasing purchasing performance. Additional coordination efforts required to manage the operational load of a larger supply base can be circumvented by adopting advanced strategic purchasing practices such as purchase category management, supplier risk assessment, supplier development, supplier integration, and purchasing digitalisation (González Benito, 2016; Luzzini and Ronchi, 2016).

We also acknowledge that firms, even with strategic purchasing functions, should not unconditionally embrace all sources of SBC. When firms with strategic purchasing functions rely heavily on global sourcing and supply from a variety of geographical regions, their purchasing performance deteriorates. Firms that have low levels of strategic purchasing have to be more cautious when increasing dynamic SBC, as unreliable supplier lead times and

frequently changing suppliers are associated with lower purchasing performance. A good remedy to preventing such unfavourable situations is achieved by transforming the purchasing function so that it is involved in long-term strategic planning and is recognised by top management. As such, the purchasing function is more likely to be provided with the resources needed to implement advanced purchasing practices to identify, assess and manage both the short- and long-term effects of SBC.

7. Conclusion, limitations and future research opportunities

This study investigated the link between SBC and purchasing performance by examining the moderating role of strategic purchasing. In contrast to what is widely posited in the existing literature, we found that SBC is not always detrimental: the effects are contingent on both the sub-dimensions of SBC and the level of strategic purchasing.

This study is not without limitations. First, despite drawing on earlier research to justify the direction of our theoretical arguments, the use of cross-sectional data limits causal inferences. Future studies might aim at collecting longitudinal data, observing the changes in SBC and purchasing performance over time. Second, this study investigates a single contingency – strategic purchasing – in the relationship between SBC and purchasing performance. Studying other salient contingencies for each sub-dimension of SBC might be a fruitful research avenue. Third, we measure purchasing performance from an operational perspective (González-Benito *et al.*, 2016; Nair *et al.*, 2015). Future research might also investigate the link between SBC and other outcomes such as financial performance, innovation performance and sustainability performance, by also taking into account the trade-offs between them. Fourth, as we were interested in 'managing' complexity, we focused on the more manageable portion of the supply network: the supply base. Future studies might extend

the unit of analysis to include the entire supply network (Gionnoccaro *et al.*, 2018; Sharma *et al.*, 2020).

The preliminary insights from the interviews suggest that firms with strategic purchasing functions adopt advanced purchasing practices to cope with SBC. Future research could investigate the set of advanced purchasing practices needed to successfully manage each sub-dimension of SBC. A dynamic capabilities view (Teece, 2007) or resource-based view (Barney, 2001) might be useful theoretical lenses to investigate these advanced purchasing practices. Additionally, we observed some contingencies that might affect the link between SBC and purchasing performance: sectoral differences, the impact of business strategy on SBC (e.g. cost or differentiation focus), differences across purchase categories (i.e. supply market conditions, category objectives) and recent globally disruptive events such as the COVID-19 pandemic and Brexit. Therefore, future research might replicate our study in different contexts, taking into account such circumstances.

Notwithstanding the limitations, this research fills a significant gap in the literature by illustrating the various effects of SBC sub-dimensions, and by adopting the novel approach of focusing on the ways in which SBC can be effectively managed.

REFERENCES

Aitken, J., Bozarth, C. and Garn, W. (2016), "To reduce or absorb supply chain complexity: A conceptual model and case study", *Supply Chain Management: An International Journal,* Vol.21 No.6, pp.759-774.

Anderson, J.C. and Gerbing, D.W. (1988), "Structural modeling in practice: A review and recommended two-step approach", *Psychological Bulletin,* Vol.103 No.3, pp.411-423.

Aslam, H., Blome, C., Roscoe, S. and Azhar, T.M. (2020), "Determining the antecedents of dynamic supply chain capabilities", *Supply Chain Management: An International Journal,* Vol.25 No.4, pp.427-442.

Ateş, M.A., Wynstra, F. and van Raaij, E.M. (2015), "An exploratory analysis of the relationship between purchase category strategies and supply base structure", *Journal of Purchasing and Supply Management,* Vol.21 No.3, pp.204-219.

Ateş, N.Y., Tarakci, M., Porck, J.P., van Knippenberg, D. and Groenen, P.J. (2020), "The dark side of visionary leadership in strategy implementation: Strategic alignment, strategic consensus, and commitment", *Journal of Management,* Vol.46 No.5, pp.637-665.

Baier, C., Hartmann, E. and Moser, R. (2008), "Strategic alignment and purchasing efficacy: an exploratory analysis of their impact on financial performance", *Journal of Supply Chain Management,* Vol.44 No.4, pp.36-52.

Benton, Jr. W.C., Prahinski, C. and Fan, Y. (2020), "The influence of supplier development programs on supplier performance", *International Journal of Production Economics,* Vol.230 No:December, pp.107793.

Birkie, S.E., Trucco, P. and Fernández Campos, P. (2017), "Effectiveness of resilience capabilities in mitigating disruptions: Leveraging on supply chain structural complexity", *Supply Chain Management: An International Journal,* Vol.22 No.6, pp.506-521.

Birkie, S.E. and Trucco, P. (2020), "Do not expect others do what you should! Supply chain complexity and mitigation of the ripple effect of disruptions", *International Journal of Logistics Management,* Vol.31 No.1, pp.123-144.

Bode, C. and Wagner, S.M. (2015), "Structural drivers of upstream supply chain complexity and the frequency of supply chain disruptions", *Journal of Operations Management,* Vol.36 No.May, pp.215-228.

Bozarth, C.C., Warsing, D.P., Flynn, B.B. and Flynn, E.J. (2009), "The impact of supply chain complexity on manufacturing plant performance", *Journal of Operations Management,* Vol.27 No.1, pp.78-93.

Brandon-Jones, A. and Knoppen, D. (2018), "The role of strategic purchasing in dynamic capability development and deployment", *International Journal of Operations and Production Management,* Vol.38 No.2, pp.446-473.

Brandon-Jones, E., Squire, B. and van Rossenberg, Y.G.T. (2015), "The impact of supply base complexity on disruptions and performance: The moderating effects of slack and visibility", *International Journal of Production Research,* Vol.53 No.2, pp.6903-6918.

Brandon-Jones, E., Squire, B., Autry, C.W. and Petersen, K.J. (2014), "A contingent resource-based perspective of supply chain resilience and robustness", *Journal of Supply Chain Management,* Vol.50 No.3, pp.55-73.

Brislin, R.W. (1986), *The Wording and Translation of Research Instruments, Field Methods in Cross-Cultural Research,* Sage Publications, Thousand Oaks, CA, pp.137-164.

Carr, A.S. and Pearson, J.N. (2002), "The impact of purchasing and supplier involvement on strategic purchasing and its impact on firm's performance", *International Journal of Operations and Production Management,* Vol.22 No.9, pp.1032-1053.

Choi, T. and Krause, D. (2006), "The supply base and its complexity: Implications for transaction costs risks responsiveness and innovation", Journal of Operations Management, Vol. 24 No. 5, pp.637-652.

De Leeuw, S., Grotenhuis, R. and van Goor, A.R. (2013), "Assessing complexity of supply chains: Evidence from wholesalers", *International Journal of Operations and Production Management,* Vol.33 No.8, pp.960-980.

Deloitte (2019), The Deloitte Global CPO survey, https://www2.deloitte.com/content/dam/insights/us/articles/2019_CPO-Survey/6267_CPO-Survey-Collection-Page/DI_CPO-Survey.pdf

Dittfeld, H., Scholten, K. and van Donk, D.P. (2018), "Burden or blessing in disguise: Interactions in supply chain complexity", *International Journal of Operations and Production Management,* Vol.38 No.2, pp.314-332.

Eisenhardt, K. and Martin, J. (2000), "Dynamic capabilities: What are they?", *Strategic Management Journal,* Vol.21 No.10-11, pp.1105-1121.

Fernández Campos, P., Trucco, P. and Huaccho Huatuco, L. (2019), "Managing structural and dynamic complexity in supply chains: Insights from four case studies", *Production Planning and Control,* Vol.30 No.8, pp.611-623.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research,* Vol.18 No.1, pp.39-50.

Gao, Y.G., Xie, E. and Zhou, K.Z. (2015), "How does technological diversity in supplier network drive buyer innovation? Relational process and contingencies", *Journal of Operations Management,* Vol.36 No.May, pp.165-177.

Giannoccaro, I., Nair, A., Choi, T. (2018), "The impact of control and complexity on supply network performance: An empirically informed investigation using NK simulation analysis", Decision Sciences, Vol. 49 No. 4, pp.625-659.

Gimenez, C., van der Vaart, T. and van Donk, D.P. (2012), "Supply chain integration and performance: The moderating effect of supply complexity", *International Journal of Operations and Production Management,* Vol.32 No.5, pp.583-610.

Gonzalez-Benito, J. (2007), "A theory of purchasing's contribution to business performance", *Journal of Operations Management,* Vol.25 No.4, pp.901-917.

González-Benito, J., Lannelongue, G., Ferreira, L.M. and Gonzalez-Zapatero, C. (2016), "The effect of green purchasing on purchasing performance: The moderating role played by long-term relationships and strategic integration", *Journal of Business and Industrial Marketing,* Vol.31 No.2, pp.312-324.

Handfield, R.B., Cousins, P.D., Lawson, B. and Petersen, K.J. (2015), "How can supply management really improve performance? A knowledge-based model of alignment capabilities", *Journal of Supply Chain Management,* Vol.51 No.3, pp.3-17.

Harman, H.H. (1967), *Modern Factor Analysis*, 2nd edn. Chicago: University of Chicago Press.

Holweg, M., Reichhart, A., and Hong, E. (2011), "On risk and cost in global sourcing", *International Journal of Production Economics,* Vol.131 No.1, pp.333-341.

Huaccho Huatuco, L., Smart, J., Calinescu, A. and Sivadasan, S. (2020), "Complexity transfer in supplier-customer systems", Production Planning and Control, forthcoming.

IMF (2019), World Economic Outlook Database, https://www.imf.org/external/pubs/ft/weo/2019/02/weodata/index.aspx

Jeble, S., Dubey, R., Childe, S.J., Papadopoulos, T., Roubaoud, D. and Prakash, A. (2018), "Impact of big data and predictive analytics capability on supply chain sustainability", *The International Journal of Logistics Management,* Vol.29 No.2, pp.513-538.

Kim, D.Y. (2014), "Understanding supplier structural embeddedness: A social network perspective", *Journal of Operations Management,* Vol.32 No.5, pp.219-231.

Kim, D.Y. (2013), "Relationship between supply chain integration and performance", *Operations Management Research,* Vol.6, pp.74-90.

Lu, G. and Shang, G. (2017), "Impact of supply base structural complexity on financial performance: Roles of visible and not-so-visible characteristics", *Journal of Operations Management,* Vol.53-56, No.November, pp.23-44.

Luzzini, D. and Ronchi, S. (2016), "Cinderella purchasing transformation: Linking purchasing status to purchasing practices and business performance", *Production Planning and Control,* Vol.27 No.10, pp.1-10.

Malhotra, N.K., Kim, S.S. and Patil, A. (2006), "Common method variance in IS research: A comparison of alternative approaches and a reanalysis of past research", *Management Science*, Vol.52 No.12, pp.1865-1883.

Melnyk, S.A., Page, T.J., Wu, S.J. and Burns, L.A. (2012), "Would you mind completing this survey: Assessing the state of survey research in supply chain management", *Journal of Purchasing and Supply Management,* Vol.18 No.1, pp.35-45.

Nair, A., Jayaram, J. and Das, A. (2015), "Strategic purchasing participation supplier selection supplier evaluation and purchasing performance", *International Journal of Production Research,* Vol.53 No.20, pp.6263-6278.

Nath, V. and Agrawal, R. (2020), "Agility and lean practices as antecedents of supply chain social sustainability", *International Journal of Operations and Production Management,* forthcoming.

Neter, J., Wasserman, W. and Kutner, M.H. (1989), *Applied Regression Models*, Homewood: IL Irwin

Patrucco, A.S., Luzzini, D. and Ronchi, S. (2017), "Achieving innovation through supplier collaboration: The role of the purchasing interface*", Business Process Management Journal*, Vol.23 No.6, pp.1270-1289.

Paulraj, A. (2011), "Understanding the relationship between internal resources and capabilities sustainable supply management and organizational sustainability", *Journal of Supply Chain Management*, Vol.47 No.1, pp.19-37.

Paulraj, A., Chen, I.J and Flynn, J. (2006), "Levels of strategic purchasing: Impact on supply integration and performance", *Journal of Purchasing and Supply Management*, Vol.112 No.3, pp.107-122.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N.P (2003), "Common method biases in behavioural research: A critical review of the literature and recommended remedies", *Journal of Applied Psychology,* Vol.88, pp.879-903.

PricewaterhouseCoopers (2020), Yeni Nesil Satınalma Araştırması, https://www.pwc.com.tr/tr/advisory/yeni-nesil-satinalma-arastirmasi-2020-final-v2.pdf

PricewaterhouseCoopers (2015), Global Operations Survey, http://operationssurvey.pwc.com/

Richardson, J. (1993), "Parallel sourcing and supplier performance in the Japanese automobile industry", *Strategic Management Journal*, Vol.14 No.5, pp.339-350.

Rodríguez-Escobar, J.A. and González-Benito, J. (2017), "The effect of strategic alignment on purchasing management", *Management Research Review,* Vol.40 No.11, pp.1175-1200.

Sanchez-Rodríguez, C. (2009), "Effect of strategic purchasing on supplier development and performance: A structural model", *Journal of Business and Industrial Marketing,* Vol.24 No.3/4, pp.161-172.

Schiele, H. (2007), "Supply-management maturity, cost savings and purchasing absorptive capacity: Testing the procurement–performance link", *Journal of Purchasing and Supply Management,* Vol.13 No.4, pp.274-293.

Schütz, K., Kässer, M., Blome, C. and Foerstl, K. (2020), "How to achieve cost savings and strategic performance in purchasing simultaneously: A knowledge-based view*", Journal of Purchasing and Supply Management,* Vol.26 No.2, pp.100534.

Serdarasan, S. (2013), "A review of supply chain complexity drivers", *Computers and Industrial Engineering,* Vol.66 No.3, pp.533-540.

Shannon, C.E. (1948), "The mathematical theory of communication", *The Bell System Technical Journal,* Vol.27, pp.379-423.

Sharma, A., Pathak, S., Borah, S.B. and Adhikary, A. (2020), "Is it too complex? The curious case of supply network complexity and focal firm innovation", *Journal of Operations Management,* Vol.66 No:7-8, pp.839-865.

Simon, H. (1962), "The architecture of complexity", *Proceedings of the American Philosophical Society,* Vol.106, pp.467-482.

Stanczyk, A., Cataldo, Z., Blome, C. and Busse, C. (2017), "The dark side of global sourcing: a systematic literature review and research agenda", *International Journal of Physical Distribution & Logistics Management,* Vol.47 No.1, pp.41-67.

Tachizawa, E.M. and Wong, C.Y. (2015), "The performance of green supply chain management governance mechanisms: A supply network and complexity perspective", *Journal of Supply Chain Management,* Vol.51 No.3, pp.18-32.

Turner, N., Aitken, J. and Bozarth, C. (2018), "A framework for understanding managerial responses to supply chain complexity", *International Journal of Operations and Production Management,* Vol.38 No.6, pp.1443-1466.

Vachon, S. and Klassen, R.D. (2002), "An exploratory investigation of the effects of supply chain complexity on delivery performance", *IEEE Transactions on Engineering Management,* Vol.40 No.3, pp.218-230.

Vanpoucke, E., Vereecke, A. and Wetzels, M. (2014), "Developing supplier integration capabilities for sustain-able competitive advantage: A dynamic capabilities approach", *Journal of Operations Management,* Vol.32 No.7, pp.446-461.

Wiengarten, F. and Ambrose, E. (2017), "The role of geographical distance and its efficacy on global purchasing practices", *International Journal of Operations and Production Management,* Vol.37 No.7, pp.865-881.

Winter, S.G. (2003), "Understanding dynamic capabilities", *Strategic Management Journal,* Vol.24 No.10, pp.991-995.

Yeung, K., Cheng, T.C.E. and Lee, P.K.C. (2015), "Buyers' perceptions on the impact of strategic purchasing on dyadic quality performances", *International Journal of Production Economics,* Vol.168 No.October, pp.321-330.

Figure 1. Research model

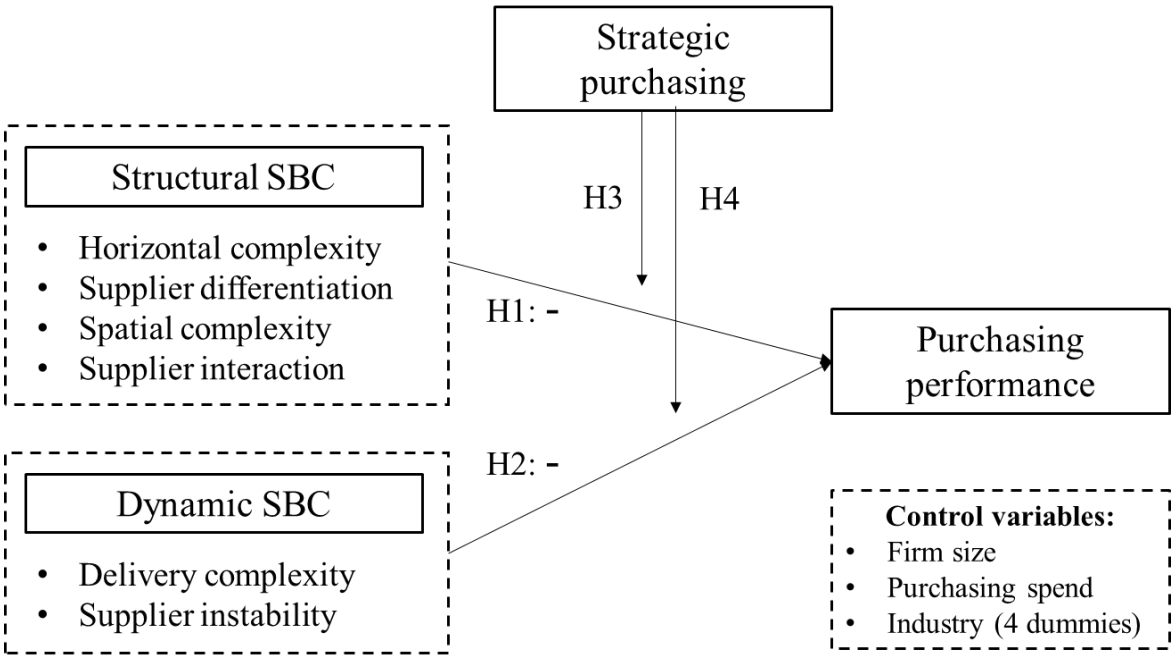

Figure 2. Interaction plots

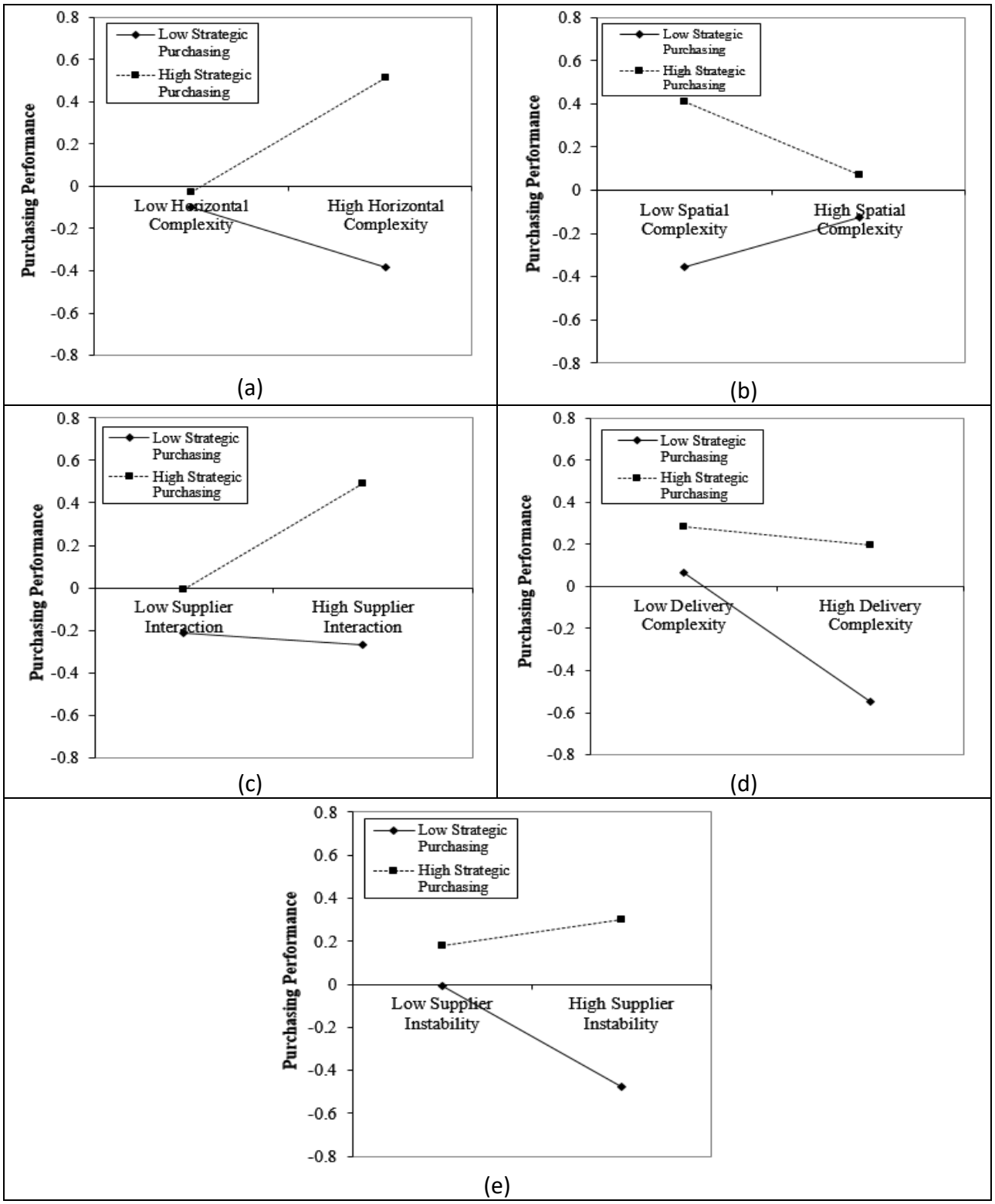

Table 1. Summary of key empirical studies investigating SBC-performance direct relationships

Article	Method	SBC type	SBC dimension	Performance	Results	Theories used
Bozarth *et al.*, (2009)	Survey	Structural	Horizontal complexity	Plant performance	No effect	Systems theory
		Dynamic	Delivery unreliability		Negative	
		Structural	Global sourcing		No effect	
Ateş *et al.*, (2015)	Multiple case study	Structural	Horizontal complexity	Cost performance Innovation performance	Various effects per SBC dimension, also contingent on supply market characteristics	Contingency theory
		Structural	Supplier differentiation			
		Structural	Supplier-supplier interaction			
		Dynamic	Supplier volatility			
		Relational	Supplier information sharing			
Bode and Wagner (2015)	Survey	Structural	Horizontal complexity	Frequency of disruptions	Positive	Normal accident theory
		Structural	Vertical complexity		Positive	
		Structural	Spatial complexity		Positive	
Brandon-Jones *et al.*, (2015)	Survey	Structural	Horizontal complexity	Frequency of disruptions	Positive	Information processing theory
		Structural	Differentiation complexity		No effect	
		Structural	Spatial complexity		No effect	
		Dynamic	Delivery complexity		Positive	
Lu and Shang (2017)	Secondary data	Structural	Horizontal complexity	Financial performance	Positive - diminishing	Transaction cost economics, Knowledge-based view, Social network theory
		Structural	Vertical complexity		No effect	
		Structural	Spatial complexity		Negative - diminishing	
		Structural	Supplier-customer interaction		Negative - diminishing	
		Structural	Supplier-supplier interaction		Positive - diminishing	
Sharma *et al.*, (2020)	Secondary data	Structural	Horizontal complexity	Innovation performance	Positive - diminishing	Transaction cost economics, Recombinatory search
		Structural	Vertical complexity		Positive - diminishing	
		Structural	Spatial complexity		Negative	

Table 2. Sample characteristics

	Freq.	%		Freq.	%
Industry			***Number of employees***		
Aerospace and defence	7	3.3%	Less than 250	13	6.2%
Agriculture	4	1.9%	250-499	16	7.7%
Automotive and parts	24	11.5%	500-999	43	20.6%
Cement/glass/ceramics	13	6.2%	1000-4999	88	42.1%
Construction	11	5.3%	More than 5000	43	20.6%
Electronics	11	5.3%	Missing	6	2.9%
Food and beverages	33	15.8%	*Total*	*209*	*100.0%*
Industrial metals	24	11.5%			
Oil and energy	17	8.1%	***Informant title***		
Other manufacturing	8	3.8%	CEO, General Manager	5	2.4%
Paper and packaging	10	4.8%	CPO, Purchasing Manager	115	55.0%
Pharmaceuticals	7	3.3%	Supply Chain Director, Manager	23	11.0%
Telecommunications	4	1.9%	Purchasing Specialist, Buyer	58	27.8%
Textiles and apparel	16	7.7%	Supply Chain Specialist	4	1.9%
Transportation	7	3.3%	Other (e.g. Finance)	4	1.9%
Wholesale/retail	13	6.2%	*Total*	*209*	*100.0%*
Total	*209*	*100.0%*			
			Informant experience		
Purchasing spend			Less than 2 years	10	4.8%
Less than %20	18	8.6%	2-5 years	34	16.3%
%20 - %39	32	15.3%	6-10 years	71	34.0%
%40 - %59	54	25.8%	11-15 years	68	32.5%
%60 - %79	72	34.4%	More than 16 years	26	12.4%
80% or more	33	15.8%	*Total*	*209*	*100.0%*
Total	*209*	*100.0%*			

Table 3. Measurement item properties

Constructs and Items	Loading	SE
Horizontal complexity (Item-to-item=0.414**; CR=0.61; AVE=0.46)		
We have a complex supply chain.	0.85	0.22
We have many suppliers.	0.45	0.12
Supplier differentiation (Cronbach's α=0.89; CR=0.89; AVE=0.67) (R)		
Our suppliers are of similar size	0.65	0.04
Our suppliers have similar level of technical capability	0.89	0.02
Our suppliers have similar operational strategies	0.86	0.02
Our suppliers have similar organizational culture	0.86	0.02
Supplier interaction (Cronbach's α=0.84; CR=0.85 ; AVE= 0.66) (R)		
Our suppliers communicate with each other	0.87	0.03
Our suppliers share information with each other	0.90	0.03
Our suppliers collaborate with each other in joint projects	0.65	0.05
Delivery complexity (Item-to-item=0.71***; CR= 0.85; AVE= 0.74) (R)		
We can depend on on-time delivery from suppliers in this supply chain	0.87	0.05
We can depend on short lead-times from suppliers in this supply chain	0.84	0.05
Supplier instability (Item-to-item=0.42**; CR=0.83; AVE=0.74)		
In the last two years, a large portion of our suppliers has changed	0.41	0.17
We mostly have short term relationships with suppliers	1.16	1.18
Strategic purchasing (Cronbach's α=0.78; CR=0.81; AVE=0.52)		
Purchasing is included in the firm's strategic planning process.	0.72	0.05
The purchasing function has a good knowledge of the firm's strategy	0.82	0.04
Purchasing's focus is on long-term issues involving risk & uncertainty.	0.73	0.04
The purchasing function has a formally written long-range plan.	0.60	0.05
Purchasing performance (Cronbach's α=0.88; CR=0.89; AVE=0.54)		
Decrease of purchase costs of products and services	0.47	0.06
Increase in purchased product/service quality	0.74	0.04
Increase in contract compliance	0.74	0.04
Conformance to delivery dates and amounts	0.88	0.02
Improvement in delivery duration	0.85	0.02
Flexibility to change product volume	0.69	0.04
Flexibility to change product mix	0.70	0.04

Table 4. Descriptive statistics

	Mean	STD	1	2	3	4	5	6	7	8	9	10
1. Firm size	3.22	0.54	N/A									
2. Purchasing spend ratio	3.33	1.17	-0.12	N/A								
3. Horizontal complexity	5.50	1.19	0.24	0.12	0.68							
4. Supplier differentiation	4.71	1.44	0.14	-0.06	-0.04	0.82						
5. Spatial complexity	0.27	0.18	0.24	0.05	0.02	0.09	N/A					
6. Supplier interaction	3.19	1.31	0.04	0.03	0.02	-0.16	0.05	0.81				
7. Delivery complexity	2.69	1.07	0.06	0.08	-0.02	0.31	0.08	-0.07	0.86			
8. Supplier instability	2.38	1.08	0.01	-0.11	0.10	-0.04	-0.07	0.00	0.07	0.86		
9. Strategic purchasing	5.35	1.19	0.04	0.10	0.16	-0.16	0.08	0.05	-0.21	-0.10	0.72	
10. Purchasing performance	5.16	0.90	0.09	-0.05	0.12	-0.21	-0.06	0.19	-0.30	-0.15	0.32	0.74

Note: N = 209. Correlations larger than .14 (.18) are significant at the level of .05 (.01), two-tailed test.
The numbers in the diagonal are square root of AVEs.

Table 5. Hierarchical regression results

	Performance	Performance	Performance
Control variables			
Firm size (Log FTE)	0.099	0.088	0.102
Industry-service	0.072	-0.009	-0.018
Industry-retail	0.125†	0.110†	0.055
Industry-energy	0.074	0.030	0.025
Industry-construction	-0.057	-0.040	-0.007
Purchasing spend ratio	-0.021	-0.074	-0.063
Main effects			
Structural SBC			
Horizontal complexity		0.079	0.064
Supplier differentiation		-0.083	-0.097
Spatial complexity		-0.051	-0.029
Supplier interaction		0.152*	0.112*
Dynamic SBC			
Delivery complexity		-0.214**	-0.174**
Supplier instability		-0.106†	-0.086
Moderator			
Strategic purchasing (SP)		0.237***	0.241***
Interaction effects			
Horizontal complexity X SP			0.207**
Supplier differentiation X SP			0.085
Spatial complexity X SP			-0.142*
Supplier interaction X SP			0.139*
Delivery complexity X SP			0.132*
Supplier instability X SP			0.147*
R-square	0.036	0.242	0.335
Adjusted R-square	0.007	0.191	0.266
Model F	1.221	4.638***	4.859***
Change in R-square	0.036	0.206	0.093
Change in F	1.221	7.329***	4.290***

Significance levels: ***p<0.001, **p<0.01, *p<0.05, †<0.10

Appendix A. Interview details

Companies	Industry	Number of employees	Purchasing Dept. Size	Interview Duration	Interviewee	Interviewee Position	Active /Key Suppliers	Strategic Purchasing
COMP-A	Automotive	1800	7	75	INT-A	Director of Purchasing	500 / 100	High
COMP-B	Automotive	7000	120	60	INT-B	Cost Engineering & Process Manager	150 / 50	High
COMP-C	Aviation	4200	40	60	INT-C	Chief Procurement Officer	168 / 110	High
COMP-D	Cement	1200	15	50	INT-D	Supply Chain & Procurement Executive	1032 / 108	Low
COMP-E	Chemicals	500	3	60	INT-E	Country Buyer	200 /60	Low
COMP-F	Defence	9000	250	60	INT-F1 INT-F2	Supply Chain Director / Supply Chain Manager	3200 / 50	High
COMP-G	Electronics	17000	54	90	INT-G	Sourcing & Purchasing Manager	2815 / 783	High
COMP-H	Food and beverage	1200	7	60	INT-H	Procurement Manager	485 / 150	High
COMP-I	Food and beverage	350	10	45	INT-I	Country Purchasing Manager	500 / 30	Low
COMP-J	Food and beverage	200	7	45	INT-J	Procurement Executive	485 / 30	High
COMP-K	Food and beverage	17200	25	40	INT-K	Senior Purchasing Specialist	N/A	Low
COMP-L	Retail	10500	N/A (Conf.)	50	INT-L	Non-food Category Group Manager	N/A (Conf.)	High
COMP-M	Textile	5200	N/A	45	INT-M	Purchasing Manager	400 / 150	High
COMP-N	Textile	4250	N/A	40	INT-N	Director of Supply Chain Management	N/A	Low

Appendix B. Exemplary quotes and findings from the interviews

SBC sub-dimension	Representative quotes	Trade-offs/ contingencies
Horizontal complexity	<u>High strategic purchasing:</u> *"There is no difference between us getting quotes from 2 or 12 suppliers; competition is more important" (INT-A)* *"Rather than an 'optimum' number of suppliers, we are after the 'right' supply base. As long as you do not treat all suppliers the same, a higher number is better for competition. We also have no touch order processing for indirect purchases, so there is not much operational load" (INT-C)* *"More suppliers is better; but only if you have long-term strategies to benefit from it" (INT-H)* *"Having more suppliers really proved advantageous during the pandemic; we could shift orders easily. We try to balance the number across purchase categories" (INT-F1)* <u>Low strategic purchasing:</u> *"Auditing becomes an issue in large supply bases – I do not have time and resources for that" (INT-N)* *"A large supply base results in quality issues and creates control problems" (INT-D)* *"Having more suppliers is better for cost - since we constantly think about cost, it comes to my mind first" (INT-I)*	Enablers: Purchase category management and purchasing digitalization are enablers of managing a large supply base
Supplier differentiation	<u>High strategic purchasing:</u> *"It does not matter if suppliers organization, size, culture differs. All is based on a contract. If I get an offer, they all need to have the same standards" (INT-J)* *"If there are big differences in technical capabilities, quality problems arise" (INT-G)* *"Large suppliers are more professional, but also less flexible compared to suppliers here in Turkey. I can call local suppliers for emergencies and they would not say 'no' to work overnight". (INT-B)* *"Suppliers should have a similar culture with your firm, but geographical distance makes it more difficult" (INT-A)* <u>Low strategic purchasing:</u> *"(If there is high supplier differentiation) I need to ensure control with limited personnel. Having supplier evaluation criteria end ensuring quality also becomes more challenging" (INT-D)*	Variety in firm size is preferred, but variety in technical capabilities, organizational culture is viewed as 'misfit"
Spatial complexity	<u>High strategic purchasing:</u> *"On purpose we want to diversify locations to reduce risk and increase flexibility. Now with the pandemic, this has become more evident"(INT-G)* *"Operationally, the sector characteristic is implicit embargoes, customs, taxes, import permits. The more countries you source from, the more the operational challenges and costs pushing you to source locally" (INT-F)* *"Low cost is not the main motivation for sourcing globally, for us, it is the high quality overseas" (INT-J)* *"I even intervene in the HR practices of my key suppliers to improve their operations. This is not really possible if my suppliers are far away" (INT-B)* <u>Low strategic purchasing:</u> *"Local suppliers know the Turkish market better and serve the neighbouring countries easily" (INT-K)* *"If there is a local supplier, this is always our first option because we have high logistics costs" (INT-E)*	Several motivations behind spatial complexity: cost, diversify risk, quality, etc.; but many 'hidden' costs as well. More difficult to pursue long-term relationships with suppliers

Appendix B. Exemplary quotes and findings from the interviews *(continued)*

SBC sub-dimension	Representative quotes	Trade-offs/ contingencies
Supplier interaction	High strategic purchasing: *"Especially between Tier-1 and Tier-2, interactions are highly regulated"(INT-F)* *"We organize events where suppliers meet each other and learn from each other. Not all OEMs do that; our suppliers are good at this" (INT-B)* *"I do not see why supplier interaction can create a disadvantage. Problematic suppliers do not engage in interaction at all" (INT-B)* *"If suppliers of the different parts of a final product interact, it is useful" (INT-G)* Low strategic purchasing: *"(Supplier interaction) is more of a new concept, frankly. I would like to be included in the ideas that will arise about it, but it is the last thing to do according to classical thought of purchasing"(INT-N)*	Interactions are often not autonomous; they are initiated by the buying firm.
Delivery complexity	High strategic purchasing: *"There should not be anything left where you ask 'how were we doing that'? You need to ensure supply chain visibility, even till the second and third tier suppliers and identify bottlenecks. Otherwise you keep extra stock" (INT-H)* *"We make forecasts and share them with the suppliers frequently. It is very important that the ERP systems communicate with each other" (INT-H)* *"To prevent problems in delivery, we increase communication and make the supplier feel confident" (INT-A)* *"There is already long-term plans – I make my plans a year ahead. We do not have serious delivery issues"(INT-L)* Low strategic purchasing: *"Late deliveries are handled with penalty clauses in the contrasts. We fill up all spaces (!) with extra inventory just to make sure that we sell. We are a sales-oriented firms, purchasing has secondary importance (INT-D)* *"Well, sometimes supplier volatility results in larger stocks or emergency purchases with much higher prices" (INT-E)*	Enablers: Long-term plans, IT integration and use of ERP systems, demand updates frequently shared with suppliers, multi-tier management
Supplier instability	High strategic purchasing: *"Frequently changing suppliers creates quality problems: production does not allow this. Also, it causes unpredictability for the supplier and then the suppliers reflects this in the form of higher prices"(INT-G)* *"When we introduce a new supplier, even if the existing supplier has a small share, it is still kept in the system. This increases prices a bit, but it is not important in the long-run" (INT-G)* *"We do not change suppliers just for the sake of changing. It often takes around 3-5 years for us to switch to a new supplier, ensure the same quality levels and integrate it to our operations. If it is worth it, then we change suppliers. Always having the same suppliers is also dangerous – both parties lose competitiveness" (INT-C)* *"If we are happy about a supplier, we do not change it. However, we also keep an eye on new suppliers who have developed themselves" (INT-F)* *"I do not want to change suppliers in strategic categories where I have already established a system" (INT-A)* Low strategic purchasing: *"The product is standard and specifications are clear. Who brings that specification can supply for us" (INT-I)* *"Long-term relationships are considered risky by the management" (INT-D)*	Enablers: both short-term and long-term assessments of costs, focusing on multiple criteria (cost, quality, supplier relations) Contingencies: some differences across industries and purchase categories