Supplier integration, operational capability and firm performance: an investigation in an emerging economy environment

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Abstract:

The literature on supplier integration's (SI) impact on firm performance is intertwined with mixed findings in terms of definitional differences, study context, specific integration components, and the types of relationships examined. This study contributes to the supplier integration and firm performance (SI-FP) literature by investigating how and when supplier integration influences firm performance. Drawing on the relational view, the resource-based view, and the Dynamics Capability theories, we suggest that improvements in firm performance from the supplier integration perspective are dependent on gains in operational capabilities. We test this dependency with survey data from firms in Ghana, a developing economy. The results show positive significant relationships between supplier integration and competitive operational capabilities and between supplier integration and firm performance. Our results highlight the importance for managers in developing economies and elsewhere to improve their firms' operational capabilities and competitiveness by investing in supplier integration. We also discuss implications of these findings for research.

Keywords: Supplier integration | operational capability | firm performance | Ghana | mediation tests

Article:

1. Introduction

Results from prior research on the supplier integration – firm performance relationships suggest that supplier integration (SI) does not always contribute directly to improvements in firm performance (FP) (Swink, Narasimhan, and Wang 2007; Flynn, Huo, and Zhao 2010; Wong, Boon-Itt, and Wong 2011; Schoenherr and Swink 2012; Lai et al. 2012; Zhao et al. 2013; Huo,

Qi, et al. 2014; Zhang, Lettice, et al. 2018). Thus, in order to understand if, when, and how SI impacts firm performance, it is important to study other structural relationships in addition to those that focus on the examination of direct linkages between SI and firm performance. Firm performance in this context refers to the attainment of the strategic goals of firms such as market share increases, growth in sales and, and improvements in profitability. The context of this study is developing countries where firms face challenges such as resource limitations governmental controls, infrastructural shortfalls, as well as global challenges that hinder their ability to achieve competitive advantage. Supplier integration is an important component of supply chain integration (SCI), which is recognized as an avenue through which such firms achieve sustainable competitive advantage (Ataseven and Nair 2017; He et al. 2017; Palomero and Chalmeta 2014; Huo, Zhao, et al. 2014; Alfalla-Luque, Medina-Lopez, and Dey 2013; Liao, Hong, and Rao 2010; Paulraj, Chen, and Flynn 2006; Kouvelis, Chambers, and Wang 2006; Shou et al. 2017). Hence, it also important to study SCI (and specifically SI in this case) in non-traditional environments to find out if these relationships exist so as to strengthen theory and provide guidelines for managers as there is indication that context is important in operations management research (Sousa and Voss 2008).

SCI represents the degree to which a firm 'strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organizational processes' (Flynn, Huo, and Zhao 2010, 58) to achieve its goals and objectives. The degree to which firms integrate aspects of their operations with other firms provides benefits in the form of cost reductions; productivity increases; improved access to resources (e.g. increased access to finance and technology); ability to react to changes within their environments; ability to identify new business opportunities; new product development capability; improved delivery performance; superior quality, and improved overall competitiveness (Palomero and Chalmeta 2014; Huo, Zhao, et al. 2014; Huo 2012; Bunduchi 2013). The nature of linkages – operational, informational, and relational – that a firm establishes with its supply chain partners as well as those with other functions within the organization are important in achieving organisational success (Leuschner, Rogers, and Charvet 2013; He et al. 2017; Hvolby, Trienekens, and Steger-Jensen 2007; Vanpoucke, Vereecke, and Muylle 2017; Lii and Kuo 2016).

There are three principal dimensions of supply chain integration namely: internal, customer, and supplier integration (Frohlich and Westbrook 2001; Flynn, Huo, and Zhao 2010). Customer integration refers to a focal firm's integration with its immediate customers. The focal firm refers to an organization such as a manufacturer with key suppliers (upstream) and customers (downstream) segments of its supply chain. Internal integration refers to the extent to which a focal firm's internal operations are closely linked with other functions such as marketing, finance, engineering, etc. within the organization. And, supplier integration (SI) refers to the extent to which firms exchange information, link their operations, processes, technology, and other functions with those of their suppliers to make joint decisions (Yu 2015; Huo 2012).

The focus of this study is supplier integration (SI) and firm performance (FP). The goal of the study is to ascertain, if supplier integration impacts firm performance directly, and further if supplier integration's impact on firm performance is strengthened by competitive operational capability. Based on data collected from Ghana – a developing economy – coupled with rigorous statistical analysis procedures, we seek to contribute to the debate in the supply chain integration

literature as to whether the impact of SCI, in particular SI, on firm performance is universal or is contingent upon other variables (Huo, Zhao, et al. 2014).

The rest of the article is organized as follows. In the following section, we discuss the literature review, followed by a discussion on the study context and follow that with the theoretical background and hypotheses development. Next, we describe the methodology used to collect and validate the data. We follow up with the analysis and results section which details the method of analysis and the results. This is then followed by discussion of the results. We end the paper with our conclusions, limitations, and opportunities for future research.

2. Literature review

Research suggests that supplier integration (SI) contributes to firm performance in the form of market share increases, growth in sales and, and improvements in profitability, among others (e.g. Frohlich and Westbrook 2002; Vickery et al. 2003; Saeed, Malhotra, and Grover 2005; Devaraj, Krajewski, and Wei 2007; Garengo and Panizzolo 2013; Whipple, Wiedmer, and Boyer 2015; von Haartman and Bengtsson 2015; Yu 2015; He et al. 2017; Ataseven and Nair 2017; Zhang, Chen, et al. 2018). For example, Vanpoucke, Vereecke, and Muylle (2017) note that supplier integration helps create visibility within the upstream supply chain, reducing uncertainty for the focal firm; and as we will argue later, supply uncertainty is very prevalent in developing country environments. Similarly, Zhu, Krikke, and Caniëls (2018) noted that 'a close relationship between key suppliers and the focal firm facilitates their mutual exchange of information about products, processes, schedules, and capabilities, helping develop production plans, produce goods on time, and improve delivery performance' (215). Zhang, Lettice, et al. (2018), citing past research, noted that 'Supplier integration aims to improve the efficiency and effectiveness of the information and physical flows between manufacturers and suppliers, which can lead to seamless processes and cohesive supply networks that cannot be easily matched by competitors' (802) and therefore enhancing the firm's performance.

However, the findings on the SI–FP link are often mixed and sometimes 'controversial' (He et al. 2017; Moyano-Fuentes, Sacristán-Díaz, and Garrido-Vega 2016). The mixed results appear to suggest that some other variables could also potentially explain the relationship between SI and FP. In a recent meta-analytic study of the broader SCI and firm performance, Ataseven and Nair (2017) observed that, almost without fail, all aspects of SCI do not have the same impact on firm performance. Moreover, the impact of supplier integration on firm performance might be dependent on the specific type of integration implemented: informational, operational or relational (Palomero and Chalmeta 2014; Huo, Zhao, et al. 2014). In a meta-analytic review of the supply chain integration and firm performance literature, Leuschner, Rogers, and Charvet (2013) found that information integration (the extent to which firms coordinate, communicate and transfer information and link their information technologies) has a positive impact on firm performance. This is supported by findings from Yu (2015) who observed that IT-enabled SCI enhances firm performance. At the same time, Leuschner, Rogers, and Charvet (2013) did not find any significant relationship between operational integration (i.e. processes, activities, and decision linkages) and firm performance, echoing the findings of Alfalla-Luque, Medina-Lopez, and Dey (2013). The mixed and inconsistent findings in the literature indicate that more studies are needed to help understand *if, when,* and *how* supply chain integration affects firm

performance, particularly in under-researched economies or environments such as prevalent in sub-Saharan Africa (Yu 2015), so as to enhance theory development and understanding of the theory.

The reasons attributed to the mixed findings reported in the literature include inconsistent definitions and operationalizations, failure to consider the different supply chain integrations, the context and underlying environment for the studies, and the absence of mediation tests. (Zhu, Krikke, and Caniëls 2018; Vanpoucke, Vereecke, and Muylle 2017; Tsinopoulos and Mena 2015; Alfalla-Luque, Medina-Lopez, and Dey 2013; Huo 2012). In response to the mixed findings, some researchers have examined both mediating and moderating relationships among various SI and FP constructs. For example, Zhang, Chen, et al. (2018) studied the moderating effect of internal integration on the SI and FP relationship and concluded that the higher the internal integration, the stronger the impact of SI on FP. Similarly, Huo (2012) examined the mediating effects of organizational capability on the SI–FP relationship (among others) and noted that organizational capability in the form of supplier-oriented capability strengthens the impact of SI on firm performance. However, full mediation was not always observed, suggesting the need for identification of additional covariates in the SI–FP relationship. This represents a significant motivation for our study. We propose and examine a model that posits that supplier integration's impact on firm performance is enhanced by the integration's impact on the firm's operational (i.e. cost, delivery, quality, and flexibility) capabilities. We define supplier integration as the setting up of systems and processes that lead to smooth flow of supplies and the resolution of supply related problems facilitated by information sharing, as well as joint investments and execution of projects that contribute to the long-term viability of a firm and its suppliers (Flynn, Huo, and Zhao 2010; Vanpoucke, Vereecke, and Wetzels 2014; Zimmermann and Foerstl 2014). This research seeks to contribute to the knowledge base on supplier integration (SI) and its impact on firm performance (FP) using data collected from a developing country environment. We examine both direct and indirect effects of SI on FP. Studies on supplier integration and performance very often focus on the enhancement of supplier performance, for example, how the relationship leads to improvements in supplier agility or supplier quality. This work, on the other hand, focuses on the focal firm. These focal firms, as part of the integration efforts, make joint investments with their suppliers to get the needed components and/or supplies for their operations. Firms establish relationships with their suppliers, which could result in process efficiencies and improvements, thereby enhancing their competitiveness in the market place (Tsinopoulos and Mena 2015; Welch and Nayak 1992).

By and large, the bulk of empirical studies on supplier integration and its impact on firm performance have been limited to data collected from developed countries (Droge, Jayaram, and Vickery 2004; Rai, Patnayakuni, and Seth 2006; Kim 2009). Although lately, some studies on this topic use data collected from other developing countries such as China (e.g. Flynn, Huo, and Zhao 2010), and Vietnam (Zhang, Chen, et al. 2018), our study's context is in a relatively lesser developed economy, Ghana – a developing country in sub-Sahara Africa. Firms in less developed economies face difficult business challenges because of the lack of contract enforcing mechanisms; excessive governmental interferences via policies; lack of internal integration within firms; the presence of organizational structures without formally defined levels; the absence of managerial know-how; cultural differences; and poor or inadequate infrastructure. All of these challenges have the potential to impact the extent of integration with suppliers

(Palomero and Chalmeta 2014; Huo, Zhao, et al. 2014; Iyer, Lee, and Roth 2013). For example, Zhang, Chen, et al. (2018) note that Vietnam's specific cultural environment might help explain if and how supplier integration impacts firm performance in that environment. Thus, we are motivated by the fact that studies that contribute to how firms in such environments can achieve and sustain performance should be of interest to researchers not only because of the potential to validate existing theories but also because the findings can help 'multinationals optimise their global supply chains to boost productivity' (Zhang, Chen, et al. 2018, 2). In the context of developing countries, the relationship between supplier integration and firm performance has only recently attracted the attention of researchers (Zhang, Chen, et al. 2018; London and Hart 2004; Schoenherr et al. 2012; Martens, Scheibe, and Bergey 2012; Yu 2015). We add to this knowledge base of supplier integration's impact on performance by providing findings from Ghana, a less developed country in sub-Saharan Africa. Similar to the arguments of Vanpoucke, Vereecke, and Wetzels (2014) and Alfalla-Luque, Medina-Lopez, and Dey (2013), we note that a study of supplier integration of firms in developing economy environments such as those in Ghana is important because firms might either not fully understand how integration contributes to performance; the specific aspects of their own capabilities that might be important in exploiting supplier resources; or even have processes in place for components of supplier integration such as information sharing. It is important for firms to understand that relying solely on their own internal resources (and the integration of internal functions), although important, might not be enough, if they are to become competitive in the marketplace (Alfalla-Luque, Medina-Lopez, and Dey 2013). According to Handfield et al. (2015), studies from international contexts might help increase the understanding of supplier integration and its related engagements within supply chains.

This study makes several contributions to the literature and offers guidelines to practitioners. We examine the role that operational capabilities – in terms of cost, delivery, quality and flexibility – play in mediating the influence of SI on firm performance. It is interesting to note that studies on the impact of supplier integration on firm performance often end at operational performance in the form of improved product design, reduced lead times, responsiveness and enhanced quality for the focal firm (Moyano-Fuentes, Sacristán-Díaz, and Garrido-Vega 2016; Wong, Boon-Itt, and Wong 2011; Schoenherr and Swink 2012; Srinivasan and Swink 2015, von Haartman and Bengtsson 2015). Our study goes a step further and examines overall performance improvement in the form of market and financial outcomes. Thus, examining these mediating relationships allows us to contribute to the theoretical foundations of how supplier integration enhances firm performance. Not only do we argue for the direct improvement in firm performance from supplier integration perspective but also we also suggest that firm performance improvement is dependent on the gains in competitive operational capabilities. Also, we examine our proposed model of supplier integration's influence on firm performance in a less developed sub-Saharan African country. By so doing, we respond to several calls to test the robustness and applicability of theory in emerging and developing country environments (Zhang, Chen, et al. 2018; Simpson et al. 2015; Kouvelis, Chambers, and Wang 2006; Meyer et al. 2009). We add to the knowledge base by providing further evidence on the importance of context in supply chain studies (Shou et al. 2017; He et al. 2017; Alfalla-Luque, Medina-Lopez, and Dey 2013; Moyano-Fuentes, Sacristán-Díaz, and Garrido-Vega 2016). Moreover, we also contribute to fostering the development of a cumulative body of supply chain management knowledge in developing countries, demonstrating that Africa's context can also offer a fertile ground for theory

development and testing. Investing in supplier integration activities might be costly for firms in developing countries because of the nature of the environments in which they operate, the size of the firms, power and information asymmetry between the local firms and their suppliers who might be from outside the country (Iyer, Lee, and Roth 2013). Thus, if we can demonstrate that supplier integration provides long-term and lasting benefits, then managerial inclinations to avoid supplier integration investments might be mitigated.

3. Study context

Similar to previous studies (e.g. Zhang, Chen, et al. 2018) we provide a brief overview of the context, specifically the geographical and economic context for our study. Not only is it our motivation to broaden theory but to also understand if a strong supplier integration provides an avenue for enhanced performance and greater competitive ability in the presence of economic, regulatory, infrastructural and manpower challenges. Although, as noted earlier, other studies have been done on supplier integration and its impact on firm performance, Wong, Boon-Itt, and Wong (2011) study of the relationships between supply chain integration and operational capability in the automotive industry in Thailand showed that the impact of SCI on OC might be dependent on the prevailing business environmental conditions. Wong, Boon-Itt, and Wong (2011) modelled environmental uncertainty as a moderating variable and observed that in periods of high environmental uncertainty, the relationships between SI and OC (specifically delivery and flexibility) will be strengthened. Since supplier integration represents a set of practices among firms, it is expected that the effectiveness of these practices might be dependent on the different levels of environmental uncertainty. We do not model the environment specifically in our study. However, we use the environment as a backdrop of the conditions in which firms were operating. We next provide details of the context.

This study was carried out in Ghana, a developing economy and an emerging market in sub-Saharan Africa. Ghana's population stood at just under 27 million as of January 2018 (Central Intelligence Agency 2018). Ghana is recognized as having successfully implemented measures such as removal of barriers to foreign trade, deregulation and monetary reforms to liberalize its economy (Debrah 2002). However, of late, the country has been plagued with huge financial and economic challenges. For example, Ghana's currency (Cedis, GHC) depreciated by about 27% in 6 months from January through June 2014. In an effort to slow down the continuing depreciation of the currency, the central bank, Bank of Ghana (BoG), introduced a tight monetary policy in 2014, with an increase in both the policy rate and reserve requirements while issuing a fiat for all trades to be conducted in the domestic currency. In addition to this policy, all foreign currency withdrawals over the counter were not to exceed US$ 10,100 (Ghana News Agency 2014). These directives created an environment of anxiety for businesses and individuals.

There was an avalanche of concerns following BoG's directives, some of which included firms not having the needed foreign currency to pay for imported materials. Further, concerns about suppliers' unwillingness to offer favourable credit terms for purchases created an environment of supply uncertainty, especially given that over 50% of all materials needed for production in Ghana are imported (Amoako-Gyampah and Meredith 2007). Some of the resultant effects of these macro-economic challenges were increases in the cost of raw materials; the decline of foreign direct investments; and the decline of local production capacities, among others. In

addition to the financial concerns, Ghana has been experiencing a major shortfall in energy supplies since the middle of 2012. Anecdotal evidence seems to suggest that several businesses operating in the environment cut back on production because of the erratic power supply. With environments characterized by frequent plant shut-downs and restarts and limited access to financial credits and technology, it will be reasonable to assume that improving supplier integration will provide mechanisms for minimizing the impact of such uncertainties. However, our search in the literature did not reveal studies in such volatile environments, marking our pursuit of this study worthwhile.

Firms in Ghana are relatively small and medium-sized compared to firms in places like China, United States, Brazil, etc. In fact, firms in Ghana are likely to face some of the same challenges identified by Palomero and Chalmeta (2014) that hinder the implementation of supplier integration approaches among small/medium-sized companies. Palomero and Chalmeta (2014) noted that such firms are likely to be plagued by 'immature buyer-supplier relationships, lack of understanding on merits and demerits of alliances' (376). Thus, pursuing a study such as ours that examines SI and FP relationship and the role that operational capabilities (OC) play in a developing country environment dominated by small and medium-sized firms will be beneficial to managers in helping them understand the specificity of the SI–OC–FP relationship. This is a key motivation for our study.

4. Theoretical background and hypotheses development

4.1. Conceptual model

Many firms have re-evaluated the way they do business by integrating their supply chains to create a competitive advantage. The literature is inundated with several theories such as the Resource-Based View of the firm (RBV), Resource Dependency Theory (RDT), Transaction Cost Economics (TCE) and Relational View (RV) that have been used to propose, explain, and predict how and why a firm's relationship with other firms are developed and exploited (e.g. Lii and Kuo 2016; Walker and Weber 1984). We build the theoretical foundation for our research on the Relational View of the firm theory (RV) and RBV given the business environment in which firms in sub-Saharan Africa, particularly Ghana operate, the relatively small average size of the Ghanaian firms, and the capabilities of such firms. The relational view theory, a derivative of the resource-based view of the firm theory, posits that firms working as partners stand to gain complementary resources that ultimately lead to competitive advantage through investments in relations-specific assets (Chen, Preston, and Xia 2013; Huo 2012; Leuschner, Rogers, and Charvet 2013; He et al. 2017).

An underlying assumption of the RV theory is the premise that the firm is fully cognisant of its own capabilities (and limitations) and will seek to integrate processes, plans, practices, and activities with other players in the supply chain to strengthen those capabilities, leading to the attainment of competitive advantage (Zhang, Chen, et al. 2018; Alfalla-Luque, Medina-Lopez, and Scharge 2013; Moyano-Fuentes, Sacristán-Díaz, and Garrido-Vega 2016). These strengthened linkages open up opportunities for the firm to tap into the resources of its suppliers for training, technical assistance, and improvement activities (Handfield et al. 2015). This is perhaps more so for firms in developing country environments who often lack the ability to

develop those resources in-house. Within the Ghanaian environment, the economic conditions and the governmental policies discussed earlier point to the need for supplier integration to address some of the potential shortfalls in resources. Broadly, the relational view theory predicts that investments made as a result of the collaborative relationships between firms and their suppliers will result in tangible benefits including; cost efficiencies, delivery performance, quality enhancement and product mix flexibility (Handfield et al. 2015; He et al. 2017; Wong, Boon-Itt, and Wong 2011). Moreover, firms cannot rely on their internal resources alone because they might not even possess these resources internally. For firms to be successful in managing their operations, reliance on resources from external partners might be a necessary condition (Leuschner, Rogers, and Charvet 2013; Teece, Pisano, and Shuen 1997; Eisenhardt and Martin 2000; Van Weele and Van Raaij 2014).

While the relational view theory helps predict and explain the relationship between supplier integration (SI) and firm performance (FP), it is also important to identify mechanisms through which supplier integration affects firm performance. In other words, is the impact of supplier integration on firm performance a direct relationship or are there intervening variables that alter such a relationship? For example, Flynn, Huo, and Zhao (2010) noted that supplier integration may not have an impact on performance unless internal integration is also present. Besides, Shou et al. (2017) observed that the impact of supplier integration on performance is dependent on the production systems in place in the focal firm. The RBV theory suggests that firms possess resources that need to be translated into capabilities and, for these capabilities to contribute to sustainable competitive performance, the resources should be valuable, rare, not easy to imitate, and non-substitutable or organised to capture value (Rothaermel 2013; Kristal, Huang, and Roth 2010; Barney 2001b; Wernefelt 1984). We expect that these capabilities in the form of cost, delivery, flexibility, and quality will, over time, become 'embedded in operational competencies, routines, and processes; and therefore, make them difficult to develop or imitate' (Kristal, Huang, and Roth 2010, 419) and thus, contributing to improved organisational performance. Our conceptual model is shown in Figure 1. The next sections describe the various components of the model.
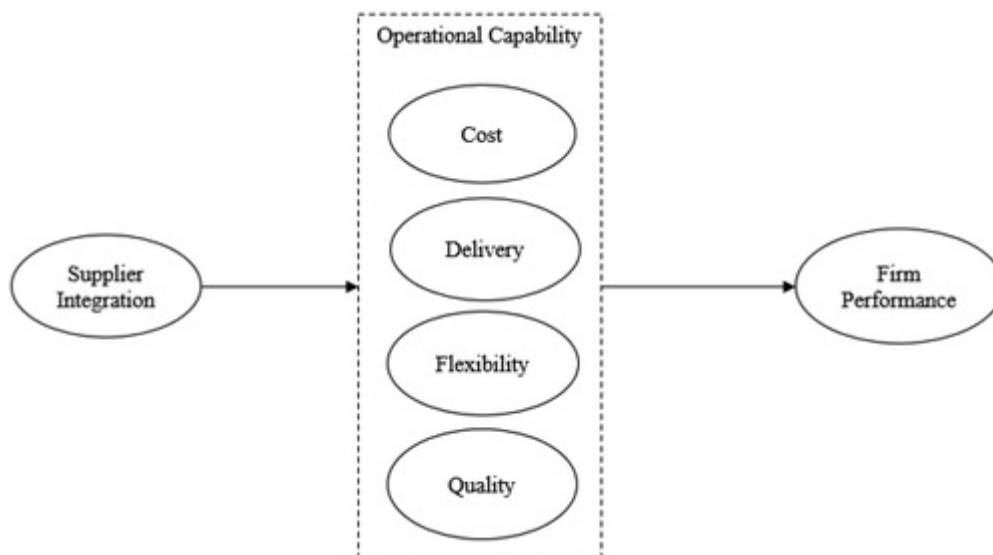

Figure 1. Conceptual model.

4.2. Supplier integration and competitive operational capability

Supplier integration represents one of the components of external supply chain integration or supplier facing integration with the other being customer integration (Yu 2015; Zhang and Huo 2013; Kristal, Huang, and Roth 2010; Zimmermann and Foerstl 2014; Tsinopoulos and Mena 2015). Supplier integration focuses on the need to obtain materials for successful operations in a timely manner, materials of the right quantity and quality, and at the right place as well as at reasonable costs (Zhu, Krikke, and Caniëls 2018; He et al. 2017; Vanpoucke, Vereecke, and Muylle 2017). In a comprehensive meta-analytic study on the relationships between supplier integration, as a component of the purchasing-supply management (PSM) practices, and firm performance, Zimmermann and Foerstl (2014) concluded that supplier integration provides the strongest impact on the focal firm's operational performance compared to market and financial performance. Furthermore, the meta-analysis revealed that supplier integration practices that focus on relational practices are likely to lead to higher performance compared to those that emphasize non-relational practices.

We define competitive operational capability as the realized gains in capabilities within the operational functions that firms achieve relative to their competitors in selected markets (Kristal, Huang, and Roth 2010; Rosenzweig, Roth, and Dean 2003; Vanpoucke, Vereecke, and Wetzels 2014). Operational capabilities have typically been defined to include four components: cost, delivery, flexibility, and quality. Further, combinative capabilities imply the ability to excel in all four competitive capabilities simultaneously (Kristal, Huang, and Roth 2010). Unlike Kristal, Huang, and Roth (2010), we study individual capabilities as opposed to combinative capabilities. Although competition in the Ghanaian environment is increasing, the type of dynamism that suggests the beneficial effects of combinative capabilities is not likely to be observed in that environment. While prior research suggests that firms in Ghana are likely to emphasize capabilities simultaneously (Amoako-Gyampah and Meredith 2007), the ability to achieve those capabilities relative to competitors might be questionable. Hence, studying individual capabilities is more relevant in this context. While arms-length short-term relationships might provide cost benefits, long-term relationships and collaborative actions are expected to lead to the development of unique capabilities that provide achievements in quality, delivery, cost efficiency, and flexibility (Droge, Jayaram, and Vickery 2004). These unique capabilities become embedded in the structural and infrastructural components of the firm's assets, leading to competitive advantage (Tan, Kannan, and Narasimhan 2007).

The Relational View Theory is based on the principle that sharing of critical operations and other information with suppliers, as well as making joint investments that either enhance information visibility or facilitate the streamlining of processes, moves the relationships between focal firms and suppliers from one that might be considered to be adversarial to one of mutual cooperation with resultant benefits for both parties (Klein, Rai, and Straub 2007; Hvolby, Trienekens, and Steger-Jensen 2007). For focal firms, in particular, the gains in resources from the relationships will enable them create more value than the gains from arms-length and non-relational practices that might be easier to imitate (Zimmermann and Foerstl 2014). Moreover, the integration of a firm's structural and infrastructural assets with those of its suppliers will enable the suppliers to gain greater understanding of the firm's supply needs and performance goals (Handfield

et al. 2015). RV theory also suggests that strong relationships move the supplier integration from one that is focussed on transactional activities to those focussed on innovative activities that enhance capabilities in the form of increased product mix flexibility, product quality, reliable delivery, and cost reduction (Droge, Jayaram, and Vickery 2004; Hartmann, Kerkfeld, and Henke 2012; He et al. 2017). Accordingly, we hypothesize that:

> H1a: Supplier integration positively influences a focal firm's competitive cost capability.

> H1b: Supplier integration positively influences a focal firm's competitive delivery capability.

> H1c: Supplier integration positively influences a focal firm's competitive flexibility capability.

> H1d: Supplier integration positively influences a focal firm's competitive quality capability.

4.3. Competitive operational capability and firm performance

Capabilities are complex routines that determine the efficiency with which firms transform inputs into outputs (Collis 1994). In fact, capabilities enable a firm's assets or resources and process to be deployed and configured, respectively, in a more advantageous manner, enhancing its competitiveness and superiority over competitors. Competitive capabilities represent things a firm does uniquely well within its operations to compete and prosper in the marketplace (Morash, Droge, and Vickery 1996; Tan and Peng 2003). Moreover, the resource-based view of the firm suggests that a firm can use its operational resources to differentiate itself in the market place since, in reality, firms possess different mix and amount of resources, internally. Several studies have established the relationship between operational capabilities and firm performance (Cleveland, Schroeder, and Anderson 1989; Roth and Miller 1992; Vickery, Droge, and Markland 1993; Rosenzweig and Roth 2004; Tan, Kannan, and Narasimhan 2007; Nath, Nachiappan, and Ramanathan 2010). The general consensus is that operational capabilities in the form of cost, delivery, flexibility, and quality do impact the performance of firms, where performance is generally measured in terms of productivity, market performance, and financial performance.

The operations capabilities that result from the structural and infrastructural decisions that firms make often require time before benefits become evident. These operational capabilities over time become embedded in processes, become routines, and lead to competencies that become difficult to imitate, providing competitive advantage to the partnership firms (Kristal, Huang, and Roth 2010; Barney 2001a; Zimmermann and Foerstl 2014, Eisenhardt and Martin 2000). Improvements in cost capabilities enable firms to reduce operational costs and subsequently lower prices, enhancing chances of gaining market share. Firms can, therefore, increase their profitability levels with increased cost capabilities. Similarly, improvements in flexibility capability will enable firms to become competitive in the marketplace because of the ability to adjust quickly to changing customer needs in the form of volumes, features, mix of products, and services. Investments in technology, processes, and procedures that improve product and service

deliveries are expected to contribute to overall firm performance. For example, it is well known that the use of routeing technology that minimises left turns by UPS delivery trucks not only reduces fuel costs (and increases profitability) but also contributes to delivery speed and dependability (Mayyasi 2014). Enhancing quality capabilities means improvement in design quality that meets or exceeds customer expectations, improvements in process control that lead to reductions in defect rates, less warranties, and less rework eventually contributing to firm performance in terms of market share, profitability and sales growth. Based on these arguments, we state our hypotheses formally as:

> H2a: A firm's competitive cost capability will have a positive influence on the firm's performance.

> H2b: A firm's competitive delivery capability will have a positive influence on the firm's performance.

> H2c: A firm's competitive flexibility capability will have a positive influence on the firm's performance.

> H2d: A firm's competitive quality capability will have a positive influence on the firm's performance.

4.4. Supplier integration and firm performance

Supplier integration practices, through the sharing of key attributes, close collaboration, and interaction, can lead to the development of unique capabilities that are valuable; rare in the business environment; time-consuming to implement; difficult to imitate, and non-substitutable thus, providing competitive advantage to the partnering firms (Kristal, Huang, and Roth 2010; Barney 2001a; Zimmermann and Foerstl 2014). Improved interactions between focal firms and their suppliers tend to lead to a greater understanding of the environment in which the firm (focal) operates and over time enable the supplier to respond better and faster to the focal firm's needs to improve the focal firm's performance (Handfield et al. 2015; Huo 2012; Hvolby, Trienekens, and Steger-Jensen 2007; Wong, Boon-Itt, and Wong 2011). Some of these improvements result from joint projects and investments as well as from suggestions made by suppliers which can be translated to market and financial performance of the firm. Past research also suggests that increased process integration and information sharing (elements of supplier integration) have the potential to enhance the economic performance of partners in that relationship (Huo 2012; Schloetzer 2012; Leuschner, Rogers, and Charvet 2013; Zimmermann and Foerstl 2014; Tsinopoulos and Mena 2015; Ataseven and Nair 2017).

From a relational view theory perspective, enhanced relationships such as partnerships may lead to an increase in sharing of resources (i.e. information on production schedules, cost data, product design, shifting market data, inventory levels, etc.) among the partners (Saeed, Malhotra, and Grover 2011). Current literature on supply chain management posits that sharing of resources leads to trust and commitment which subsequently contribute to enhanced performance (Nyaga, Whipple, and Lynch 2010; Leuschner, Rogers, and Charvet 2013). For example, process integration systems such as Collaborative Planning, Forecasting and Replenishment (CPFR)

implemented by firms and their suppliers ensure visibility along the supply chain and can facilitate better production scheduling, leading to reduction in production costs, improved lead times, delivery performance, increased profitability, sales growth and market share (Hvolby, Trienekens, and Steger-Jensen 2007). In addition, improved supplier lead time information can facilitate focal firms' ability to adjust to changes in production volumes, achieve higher mix flexibility and increased market share.

Supplier integration provides suppliers the needed incentives to make non-contractual investments in innovation, and information sharing with the focal firm (Bakos and Brynjolfsson 1993; Zhu, Krikke, and Caniëls 2018), forming a partnership with the suppliers. Bakos and Brynjolfsson (1993) argue that focal firms who encourage suppliers to make such investments related to integration stand to gain in ways that offset their reduced bargaining power and other disadvantages associated with the use of few suppliers. Thus, we state our hypothesis as follows:

> H3: Supplier integration will have a positive influence on firm performance.

4.5. The mediating role of operational capability

Hypotheses 1, as argued above, suggests that SI impacts operational capability. Similarly, we have suggested in Hypothesis 2 that operational capability has a significant influence on firm performance. And using past findings and theory, we have argued that SI has a direct impact on firm performance although this last condition is not necessary to establish mediation (Zhao, Lynch, and Chen 2010). These relationships implicitly suggest that supplier integration's impact on FP might be mediated by the focal firm's operational capabilities. That is, while supplier integration is expected to have a positive association with firm performance as postulated by H3, we assert that the impact of supplier integration on firm performance is strengthened by operational capability. Collaborative practices between firms and their suppliers in the form of supplier integration are expected to have a positive impact on firm performance. However, that impact might not be direct. Moreover, it is possible that the strength of such a relationship might be enhanced, if the purported integration works synergistically with the cost, delivery, flexibility, and quality capabilities of firms. This line of research is consistent with the arguments of researchers (e.g. He et al. 2017; Yu 2015; Vanpoucke, Vereecke, and Muylle 2017; Tsinopoulos and Mena 2015) who argued that the SI–FP link is influenced by specific conditions and those conditions provide explanations for the mixed findings in the literature. Specifically, Vanpoucke, Vereecke, and Muylle (2017) noted 'under the right set of conditions, integration-performance relationships improve performance' (512). One such condition might be the presence of operational capabilities.

In addition, we rely on the Dynamic Capability Theory (Teece, Pisano, and Shuen 1997) to provide justification for the mediating effect of the operational capability on firm performance. The theory is based on the premise that firms do not rely on their internal resources alone to build capabilities especially in periods of rapid technological or economic changes. The theory suggests firms that are able to sense, shape, and seize opportunities such as might arise from supplier integration and are able to maintain or enhance their capabilities will achieve superior competitive advantage. Thus, firms can use the integration of processes, implementation of new

technology and information sharing to build or enhance their operations capabilities in the form of cost, delivery, quality and flexibility and subsequently use these capabilities enhance their performance. The operational capabilities become assets that are used to strengthen the impact of supplier integration on the firm's performance. Thus, we propose that operational capability will mediate the relationship between supplier integration and firm performance and our formal hypothesis is:

> H4a: Operational capability in the form of cost will mediate the relationships between supplier integration and firm performance.

> H4b: Operational capability in the form of delivery will mediate the relationship between supplier integration and firm performance.

> H4c: Operational capability in the form of flexibility will mediate the relationships between supplier integration and firm performance.

> H4d: Operational capability in the form of quality will mediate the relationships between supplier integration and firm performance.

5. Research method

We empirically examined the hypotheses in our study using confirmatory factor analysis and a covariance-based structural equation modelling (SEM) approach. Confirmatory factor analysis provides a more robust test of discriminant and constructs validity than other approaches. Also, as noted by Iacobucci, Saldanha, and Deng (2007), structural equation models are superior to regression when testing for mediation. Data analyses were conducted with STATA SE version 14.0.

5.1. Sample and survey instrument

The sample population consisted of executives from firms in the Greater Accra Metropolitan Area (GAMA) and the Sekondi–Takoradi Metropolitan Area (STMA) of Ghana as key respondents for their organizations. These areas were chosen because they are home to about 40% of the total establishments (manufacturing and service firms) in Ghana (Ghana Statistical Service 2016). Lately, the Sekondi–Takoradi Metropolitan Area (STMA) has become a hot-bed of industrial activity in Ghana because of the recent discovery of oil off-shore of that region (Western Region of Ghana). We used items shown to be valid and reliable from established studies to develop the survey instrument. We piloted the instrument prior to finalizing it for the main study. This was done to check the questions' appropriateness across industries, identify issues in the survey design, and fine-tune survey wording for clarity and readability. This process was completed with the help of 3 professors in operations strategy and supply chain management, and 5 MBA students. We incorporated their feedback into the revised survey instrument to minimize common method biases in responses (Podsakoff et al. 2003).

Over a 3-month period in late 2014 and early 2015, a large-scale data collection effort was undertaken to obtain sufficient data for analyzing the proposed hypotheses. Collecting data from

international locations, especially those in developing country environments, can be particularly challenging in regard to data accuracy, the sample population, and response rates. We document our data collection processes here to provide confidence in the data and to help other researchers in similar environments. We recruited graduate students pursuing an executive MBA programme at a national university in Ghana, to distribute the survey questionnaires personally to executives and managers of major manufacturing and services firms. Neither the students nor the companies were pre-selected for the survey. However, we did not use a purely randomized approach to the data collection because that would have resulted in a very low response rate. In later sections of the paper we document the rigorous approach used to address potential concerns on common method variance. The target respondent for the survey was someone who was qualified as determined by his/her role and was very knowledgeable about supply chain management practices in his/her firm and could, therefore, show reasonable confidence in answering detailed related questions pertaining to the firm's operations. The students also had the responsibility of collecting and returning the completed surveys to the researchers. Although some of the students were equally qualified to complete the questionnaires given their positions within their organizations, the researchers preferred that the questionnaires were completed by other qualified individuals within their organizations so as to minimize respondent bias. As shown in Table 1, over 50% of the respondents have been with their companies for more than 5 years and most held titles such as Chief Executive Officer, General Manager, Managing Director, Operations/Supply Chain Manager, etc. While no incentive was offered to the students, the instructors reminded students of the importance of the study and the need to preserve the integrity of the process. The researchers telephoned a sample of the respondents, who had provided their contact information as part of the survey, to express gratitude for their participation. The respondents were assured of the anonymity of their responses and their firms in any published results.

In all, 250 surveys were distributed and a total of 185 were returned, resulting in a response rate of 74%. The data analysis (discussed later) is based on 149 completed responses, after the removal of partially completed surveys, representing a usable response rate of 59.6%. This high level of response rates provides assurance of the absence of systematic bias from the respondents (Klein, Rai, and Straub 2007) and is consistent with prior operations management research (Tu et al. 2006). Table 1 shows that the demographic profile of our respondents is comparable to the distribution of firms collected in the same environment by other researchers (e.g. Amoako-Gyampah and Meredith 2007). Also, we did not specifically target any groups of firms such as SMEs for the data collection. Doing so would have reduced the sample population significantly. To ensure our analysis and results are not influenced by how big or small a firm is, we controlled for the potential impact of firm size on our findings. Based on the insignificant effect of firm size in our analysis, we are confident that the relationships between SI and FP are not influenced by firm size and that the results are generalizable.

5.2. Survey measures

Our survey included multiple-item measures adapted from leading studies in the literature. Not only did we conduct construct validity and discriminant validity tests for all the constructs, but we also tested the internal consistency for the constructs in this study. Supplier integration in this context refers to the extent to which a firm establishes long-term contracts with major suppliers, shares information with those suppliers, and pursues joint investments with the suppliers. Three

items were used to measure supplier integration and were adapted from (Swink, Narasimhan, and Kim 2005; Flynn, Huo, and Zhao 2010; Qi, Zhao, and Sheu 2011). For each item, respondents were asked to indicate the appropriate response on a 7-point Likert-type scale ranging from 1 = not at all, to 7 = a great extent. A sample of the questions asked is 'For the past two years, to what extent has the firm invested resources (money, time, and/or people) to establish long-term contracts with suppliers?'

Table 1. Sample profile of firms and demographic data.

	Frequency (%)		Frequency (%)
A. Firm size		B. Fixed assets	
No. of employees		Fixed assets (millions)	
Less than 50	57 (38.3)	Less than 10	44 (29.5)
50–99	20 (13.4)	11–25	30 (20.1)
100–199	17 (11.4)	26–50	12 (8.1)
200–499	17 (11.4)	51–75	11 (7.4)
500–1000	12 (8.1)	76–100	37 (24.8)
More than 1000	15 (10.1)	More than 100	1 (0.7)
Not specified	11 (7.3)	Not specified	14 (9.4)
Total	149 (100)	Total	149 (100)
C. Ownership structure		E. Top 7 positions of respondents	
Ownership		Position	
Wholly Local	87 (58.4)	Operations manager	26
Joint Venture	37 (24.8)	CEO	21
Wholly Foreign	25 (16.8)	Manager	15
Total	149 (100)	Managing director	14
		General manager	10
		Director	10
D. Respondent's # of years with firm		Technical manager	10
No. of years		All Others	33*
Less than 5	52 (34.9)		
5–9	53 (35.6)		
10–13	19 (12.8)		
14–20	6 (4.0)		
More than 20	2 (1.3)		
Not specified	17 (11.4)		
	149 (100)		

*Several others had 5 or less respondents.

For the competitive capability measures we employed items used in prior research (Swink, Narasimhan, and Kim 2005; Kristal, Huang, and Roth 2010; Schoenherr et al. 2012). We defined and operationalized cost as the firm's ability to compete on total production costs and raw material costs (Miller and Roth 1994). Delivery was measured with order fulfilment speed and delivery speed. Flexibility was based on the ability to modify operational processes to swiftly accommodate changes (production volumes or product mix) while quality was measured with product features and product performance (Miller and Roth 1994). For the capability items, respondents were asked, 'Over the past two years, how does your company's performance compare with your competitors on a 7-point Likert-type scale?' (1 = far worse, 7 = far better). We used three widely adopted measures: (1) market share, (2) sales growth, and (3) profitability to capture firm performance (Swink, Narasimhan, and Kim 2005; Qi, Zhao, and Sheu 2011). These measures were also captured using a 7-point Likert-type scale, ranging from 1 = far worse to 7 = far better. Past research (e.g. Zhang, Chen, et al. 2018; Flynn, Huo, and Zhao 2010; Wong,

Boon-Itt, and Wong 2011) have often used several items to measure supply chain, operational capability and firm performance-related constructs, In our study and consistent with prior research (e.g. Swink, Narasimhan, and Kim 2005; Ward and Duray, 2000; Amoako-Gyampah and Acquaah 2008) we relied on fewer items (as compared to other studies, e.g. Wong, Boon-Itt, and Wong 2011) because of concerns about the length of the survey instrument and the length's potential influence on response rates. Managers in Ghana are not used to providing responses to survey questions for research purposes. At the same time, the confirmatory factor analysis results (presented later) indicated that the loadings of the items were high and significant, and furthermore all the measures either met or exceeded the minimum reliability and validity thresholds.

5.3. Control variables

Two control variables that could influence the level of performance for the firm were employed in this study. We controlled for firm size since it affects a firm's ability to process information related to both changing environments. In other words, the size of a firm might impact the firm's ability to adapt to changes in resource availability (e.g. shortfalls in electric power) within the operating environment. In fact, small firms are likely to have more flexible operations than larger firms, causing a greater impact on firm performance for small firms compared to large firms. At the same time, small firms might not have the resources needed to integrate their processes with those of their suppliers. Firm size was measured as the number of employees at the firm (Dalbor, Kim, and Upneja 2004). Lastly, we controlled for ownership structure of the firm since the governance structure (i.e. wholly local, joint venture, and wholly foreign) may influence a firm's performance.

5.4. Common method variance

We tested for the existence of common-method variance within the data because our data were obtained from single respondents. Two tests were performed. First, we performed the conservative version of Harman's (1967) single factor test, as suggested by Malhotra, Kim, and Patil (2006) to examine if a significant amount of variance was common across all items. Our result shows poor fit for the single factor (χ^2 (119) = 583.022, RMSEA = 0.190, TLI = 0.621, CFI = 0.567, and standardised RMR = 0.119). In fact, the chi-square difference test between our hypothesized model and the single factor model was highly significant ($\Delta\chi^2$ = 425.46; Δdf = 16; $p < 0.000$). Second, we used the marker–variable technique to test for common method variance (Lindell and Whitney 2001). This technique was employed in a post hoc manner since we did not define a marker variable *a priori* (Lindell and Whitney 2001). Using the second lowest correlation (0.0464) as a more conservative estimate of a proxy marker–variable, we computed common method variance (CMV) adjusted correlations (Lindell and Whitney 2001). The results do show that all previously significant correlations remained statistically significant even when CMV was controlled. Thus, common method variance does not appear to have a substantial effect on the results in our study. We present in Table 2, the correlations among the observed indicator items.

Table 2. Descriptive statistics and Pearson correlations among the observed variables.

	Mean	SD	CC1	CC2	QC1	QC2	DC1	DC2	FC1	FC2	SI1	SI2	SI3	FP1	FP2	FP3
CC1	4.14	1.16	1.00													
CC2	3.97	1.28	0.62**	1.00												
QC1	4.68	1.33	0.43**	0.45**	1.00											
QC2	4.89	1.33	0.41**	0.44**	0.74**	1.00										
DC1	4.66	1.30	0.49**	0.46**	0.50*	0.57**	1.00									
DC2	4.74	1.44	0.47**	0.41**	0.42**	0.47**	0.78**	1.00								
FC1	4.45	1.34	0.37**	0.31**	0.26**	0.34**	0.52**	0.58**	1.00							
FC2	4.21	1.44	0.39**	0.39**	0.25**	0.30**	0.42**	0.52**	0.61**	1.00						
SI1	4.09	1.70	0.13	0.15*	0.20*	0.12	0.189*	0.21**	0.20*	0.21**	1.00					
SI2	4.41	1.69	0.12	0.15*	0.19*	0.14*	0.14	0.24**	0.31**	0.31**	0.74**	1.00				
SI3	3.16	1.73	0.02	0.00	0.09	0.04	−0.07	−0.03	0.05	0.10	0.56**	0.50**	1.00			
FP1	4.32	1.44	0.30*	0.19*	0.29**	0.29**	0.19*	0.32*	0.44**	0.46**	0.35**	0.44**	0.17*	1.00		
FP2	4.42	1.37	0.35*	0.27**	0.42**	0.40**	0.39**	0.41*	0.50**	0.43**	0.30**	0.35**	0.09	0.73**	1.00	
FP3	4.4	1.34	0.35*	0.26**	0.29**	0.26**	0.33**	0.38**	0.45**	0.39**	0.25**	0.24**	0.10	0.60**	0.73**	1.00

CC: cost capability; DC: delivery capability; FC: flexibility capability; QC: quality capability; SI: supplier integration; FP: firm performance; **$p < 0.01$; *$p < 0.05$

6. Data analysis and results

Studies from less developed countries often suffer from relatively small sample sizes and questions of validity. Thus, we use several approaches to ensure the accuracy of the results and to assure confidence in our findings. In accordance with Anderson and Gerbing (1988) two-stage approach, we first utilized the confirmatory factor analysis (CFA) to establish the psychometric properties of the measurement model. That is, we assessed the first-order reflective measurement model to investigate the reliability and validity of the constructs. Second, we applied structural equation modelling (SEM) to evaluate the hypothesized structural performance implications. We also followed up with Preacher and Hayes (2004) bootstrapping approach for our mediation tests to strengthen the findings from the SEM approach.

6.1. Measurement analysis

We used confirmatory factor analysis to validate and confirm the measures used in this study and to provide guidance for model re-specification (Gerbing and Anderson 1988; Straub 1989). Fit indices for the measurement model were χ^2 (62) = 89.95, RMSEA = 0.062, CFI = 0.971, TLI = 0.957 and standardised RMR = 0.051, indicating good model fit. These indices exceeded the threshold levels suggested by Hu and Bentler (1999). To assess the reliability of the study constructs, we used the composite reliability and average variance extracted (AVE) statistics (Fornell and Larcker 1981; Hair et al. 1998). Composite reliability is a measure of the internal consistency of the construct, indicating the extent to which items reflect a common underlying construct (Nunnally and Bernstein 1994). The AVE provides a measure of the variance captured by the construct's indicators compared to measurement error. All our composite reliability values are greater than 0.70 (see Table 3), indicating acceptable reliability levels (O'Leary-Kelly and Vokurka 1998; Fornell and Larcker 1981). The average variance extracted (AVE) values for all constructs in our model exceeded the 0.5 threshold (Fornell and Larcker 1981) thus, assuring convergent validity. This result is an indication that measurement items in their respective constructs have more variance in common than not. Further support for convergent validity is provided in Table 3 as all standardized loadings were greater than 0.5 and significant ($p < 0.01$).

We also tested the discriminant validity of our constructs by assessing whether the AVE of each construct was greater than the squared correlation between that construct and other constructs (Fornell and Larcker 1981). These results led us to conclude that our model is of adequate fit and measures were both reliable and valid for further statistical analyses.

Table 3. Measurement model (CFA) results.

	Unstandardized	Standardized	
	Estimate	Estimate	SE
Supplier integration (SI) (CR = 0.849; AVE = 0.660)			
SI1: Sharing information with major suppliers	Fixed at 1	0.905	0.042
SI2: Establishing long-term contracts with suppliers	0.917	0.826	0.047
SI3: Pursuing joint investments with suppliers	0.798	0.701	0.056
Cost capability (CC) (CR = 0.769; AVE = 0.629)			
CC1: Total product costs	Fixed at 1	0.809	0.057
CC2: Raw material costs	1.087	0.776	0.058
Quality capability (QC) (CR = 0.871; AVE = 0.774)			
QC1: Product features	Fixed at 1	0.841	0.042
QC2: Product performance	1.054	0.917	0.038
Delivery capability (DC) (CR = 0.887; AVE = 0.798)			
DC1: Order fulfilment speed	Fixed at 1	0.895	0.031
DC2: Delivery speed	1.095	0.891	0.031
Flexibility capability (FC) (CR = 0.773; AVE = 0.634)			
FC1: Flexibility to change output volume	Fixed at 1	0.846	0.049
FC2: Flexibility to change product mix	0.911	0.743	0.055
Firm performance (FP) (CR = 0.887; AVE = 0.726)			
FP1: Market share of major product/line	Fixed at 1	0.804	0.039
FP2: Growth rate in sales	1.117	0.946	0.025
FP3: Overall profitability of your firm	0.907	0.798	0.038

6.2. Structural model and hypotheses testing

With a satisfactory measurement model, we proceeded to evaluate our hypotheses. Following Srinivasan and Swink (2015), we compared three competing models prior to testing our hypotheses. The first model, the direct effects model as shown in Figure 2, specified both supplier integration and all four operations capability variables, influencing firm performance. This model fit the data reasonably well (χ^2 (78) = 99.544, TLI = 0.964, CFI = 0.976, RMSEA = 0.051, Standardised RMR = 0.051). We then performed a strictly mediated model, Figure 3, containing only paths for indirect effects of supplier integration on firm performance via each of the four operations capability variables. This model also provided a reasonable fit to the data (χ^2 (87) = 121.434, TLI = 0.948, CFI = 0.962, RMSEA = 0.061, Standardised RMR = 0.068). However, the chi-square difference test between the direct effects model and strictly mediated model showed statistical significance ($\Delta\chi^2$ = 21.89, Δdf = 9, $p < 0.01$), indicating the strictly mediated model fits the data better than the direct effects model. Lastly, we tested the full effects model (a combination of both the direct effects model and the strictly mediated model). This model, displayed in Figure 4, provided an acceptable fit (χ^2 (86) = 116.558, CFI = 0.966, RMSEA = 0.057; Standardised RMR = 0.065). Two chi-square difference tests were performed: (1) between the strictly mediated model and the full effects model ($\Delta\chi^2$ = 4.88; Δdf = 1; $p < 0.05$) and (2) direct model and the full effects model ($\Delta\chi^2$ = 17.01; Δdf = 8; $p < 0.05$), all showing statistical significance. Based on the fit indices and the resulting chi-square difference tests in Table 4 we used the full effects model to test our proposed hypotheses.
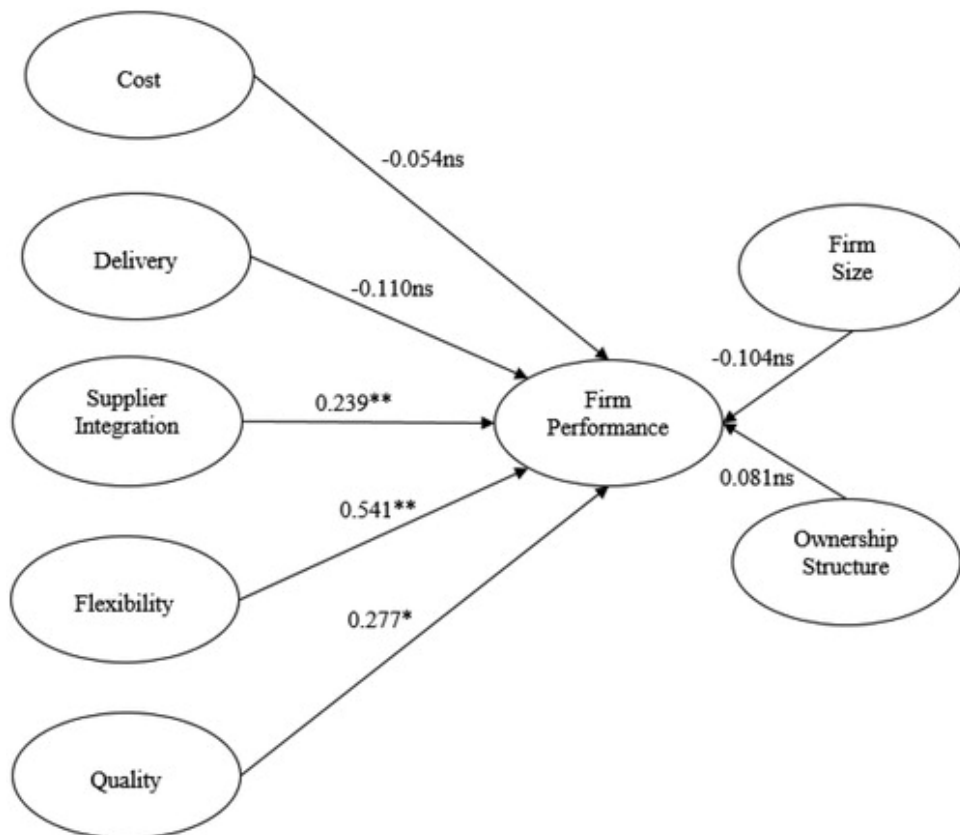
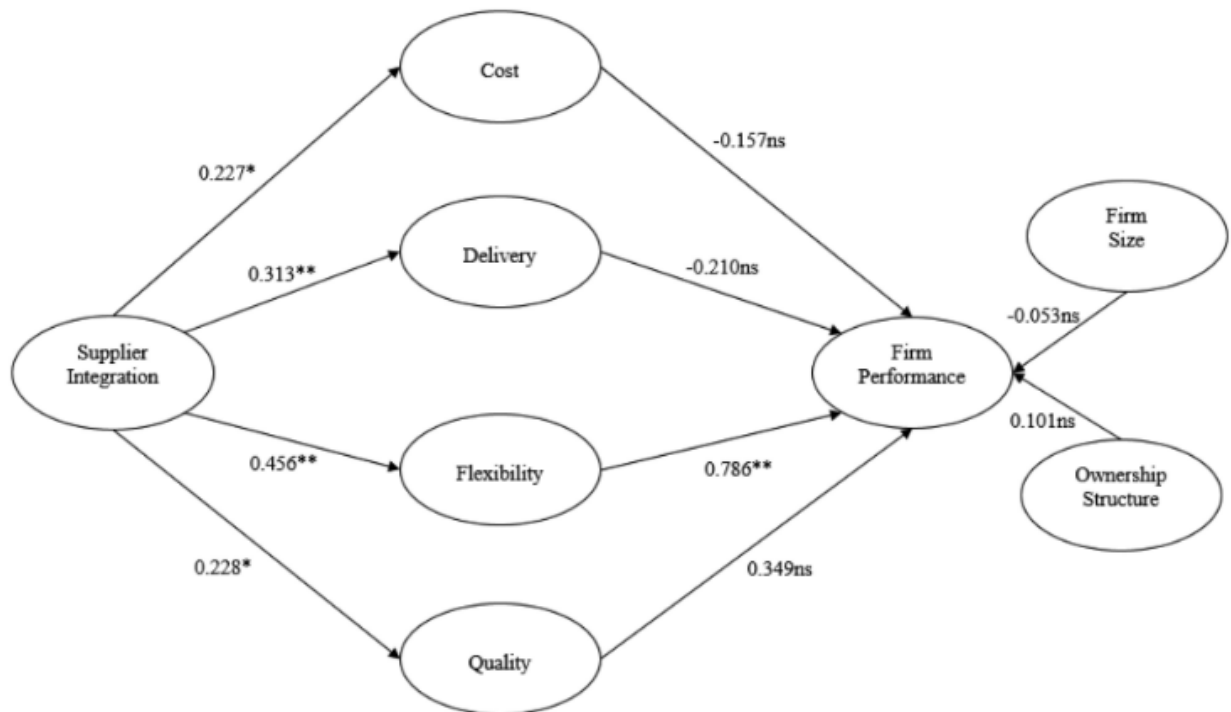**Figure 2.** Direct effects model. **$p < 0.05$; *$p < 0.1$.

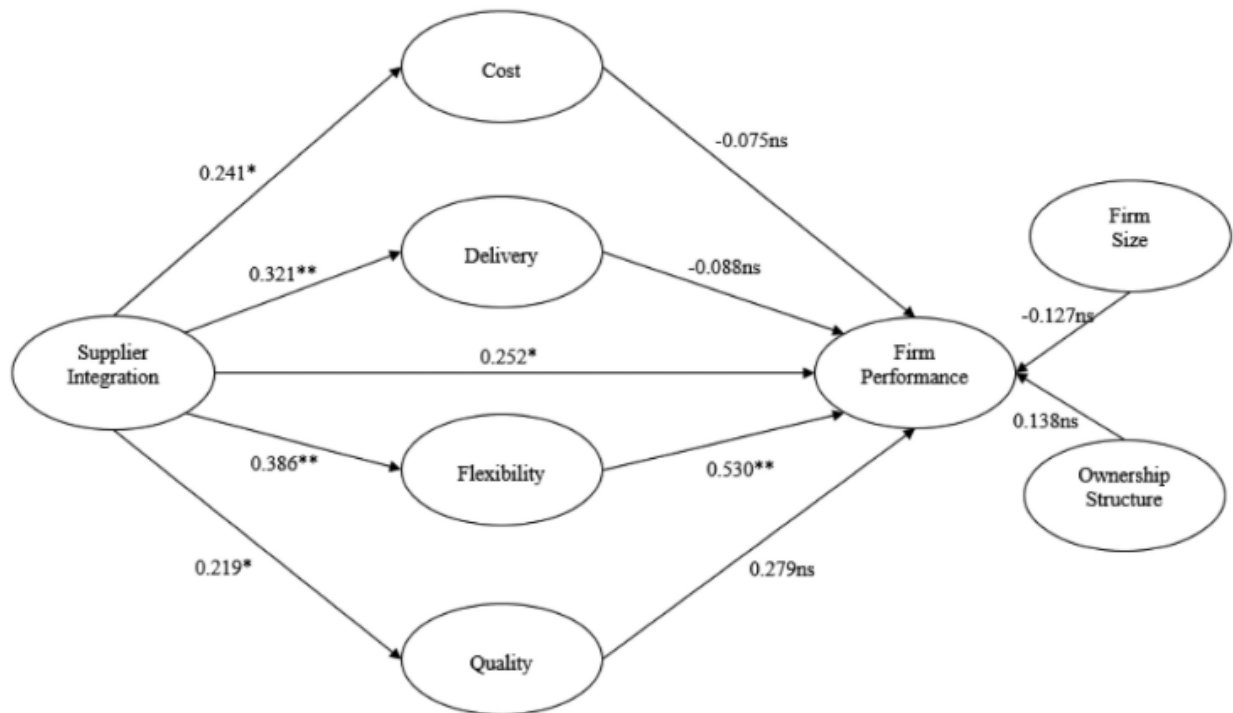**Figure 3.** Strictly mediated model. **$p < 0.01$; *$p < 0.05$.

Figure 4. Full effects model. **$p < 0.01$; *$p < 0.05$.

Table 4. Competing structural model comparisons.

Fit indices	Direct model (M1)	Strictly mediated model (M2)	Full effects model (M3)	Model preference
χ^2 (df)	99.54 (78)	121.43 (87)	116.56 (86)	
RMSEA	0.051	0.061	0.057	
CFI	0.976	0.962	0.966	
TLI	0.964	0.948	0.953	
SRMR	0.051	0.068	0.065	
$\Delta\chi^2$ (df)		(M2 − M1) = 21.89 (9)**	(M3 − M1) = 17.01 (8)*	M3
			(M3 − M2) = 4.88 (1)*	M3

**$p < 0.01$, *$p < 0.05$

According to the full effects structural model in Figure 4, supplier integration positively influences cost capability ($\beta = 0.241$, $p < 0.05$), quality capability ($\beta = 0.219$, $p < 0.05$), delivery capability ($\beta = 0.321$, $p < 0.01$), and flexibility capability ($\beta = 0.386$, $p < 0.01$), supporting H1a, H1b, H1c, and H1d. Regarding the four operations capability variables influencing firm performance, we found only flexibility capability ($\beta = 0.530$, $p < 0.05$) to have a positive influence on firm performance. We did not find cost capability ($\beta = -0.075$, $p > 0.05$), quality capability ($\beta = 0.279$, $p > 0.05$), and delivery capability ($\beta = -0.088$, $p > 0.05$) to have any significant influence on firm performance. While hypothesis H2c is supported hypotheses H2a, H2b, and H2d are not. Moreover, supplier integration ($\beta = 0.252$, $p < 0.05$) was found to have a positive direct influence on firm performance, giving support to hypothesis H3. Notably, neither firm size ($\beta = -0.127$, ns) nor ownership structure ($\beta = 0.138$, ns), as control variables, were found to have significant effects on firm performance.

Table 5. Full effects path coefficients.

Path	Direct	Indirect	Total
SI → CC	0.241*		0.241*
SI → DC	0.321**		0.321**
SI → FC	0.386**		0.386**
SI → QC	0.219*		0.219*
CC → FP	−0.075		−0.075
DC → FP	−0.088		−0.088
FC → FP	0.530*		0.530*
QC → FP	0.279		0.279
SI → FP	0.252*	0.219**	0.471***
SI → CC → FP	−0.057	−0.018	−0.075
SI → DC → FP	−0.060	−0.028	−0.088
SI → FC → FP	0.326*	0.204*	0.530*
SI → QC → FP	0.218	0.061	0.279

$**p < 0.01$; $*p < 0.05$; $***p < 0.001$.

Table 6. Result summary of hypotheses.

Hypotheses	Result
H1a: Supplier integration positively influences a firm's competitive cost capability.	Supported
H1b: Supplier integration positively influences a firm's competitive delivery capability	Supported
H1c: Supplier integration positively influences a firm's competitive flexibility capability.	Supported
H1d: Supplier integration positively influences a firm's competitive quality capability.	Supported
H2a: A firm's competitive cost capability will have a positive influence on the firm's performance.	Not supported
H2b: A firm's competitive delivery capability will have a positive influence on the firm's performance.	Not supported
H2c: A firm's competitive flexibility capability will have a positive influence on the firm's performance.	Supported
H2d: A firm's competitive quality capability will have a positive influence on the firm's performance.	Not supported
H3: Supplier integration will have a positive influence on firm performance.	Supported
H4a: Operational capability in the form of cost will mediate the relationships between supplier integration and firm performance.	Not supported
H4b: Operational capability in the form of delivery will mediate the relationship between supplier integration and firm performance.	Not supported
H4c: Operational capability in the form of flexibility will mediate the relationships between supplier integration and firm performance.	Supported
H4d: Operational capability in the form of quality will mediate the relationships between supplier integration and firm performance.	Not supported

6.3. Mediation test

We examined the mediating impact of the four operations capability variables in our model per the procedure recommended by Zhao, Lynch, and Chen (2010). Though Baron and Kenny (1986) test has been and continues to be the 'go to' test for mediation, methodologists have identified potential shortcomings of that approach (cf. Zhao, Lynch, and Chen 2010; Preacher and Hayes 2004; MacKinnon, Lockwood, and Williams 2004). For example, methodologists have questioned the necessity to demonstrate the direct and significant effect from the initial independent variable *X* to the outcome *Y* variable in Baron and Kenny's (step 1) guided approach. Zhao, Lynch, and Chen (2010) and Preacher and Hayes (2004) argue that the first step (i.e. step 1) in Baron and Kenny (1986) is no longer critical in establishing mediation. In addition, the Sobel test (Preacher and Hayes 2004) which rests on the assumption that the indirect effect is normally distributed is questionable since the distribution of the indirect effect

is known to be non-normal (Edwards and Lambert 2007). Thus, methodologists recommend using the more rigorous and powerful bootstrap test to avoid power problems that could be introduced by asymmetric and other non-normal sampling distributions of an indirect effect (Zhao, Lynch, and Chen 2010; Preacher and Hayes 2004; MacKinnon, Lockwood, and Williams 2004).

Based on the mentioned recommended approaches for testing indirect effects, the results of the tests shown in Table 5 reveal that out of the four operations capability variables flexibility capability ($\beta = 0.204$, $p < 0.05$) partially mediates the influence of supplier integration on firm performance. On the other hand, we did not find cost capability or delivery capability or quality capability to significantly mediate the impact of supplier integration on firm performance. Thus, we find support for hypothesis H4c but not for H4a, H4b, and H4d. Table 6 provides a summary of results from the hypotheses tests.

7. Discussion

Supplier integration is widely recognized as providing benefits to focal firms. Consistent with previous results, we find that supplier integration is beneficial to firm performance as measured by market share increases, sales growth and profitability (Zhang, Chen, et al. 2018; Shou et al. 2017; He et al. 2017; Ataseven and Nair 2017). Firms that invest in supplier integration activities such as joint investments, information sharing, joint decision-making, and process improvements are likely to reap competitive benefits in the form of profitability, sales growth and increases in market share. Our results also show that supplier integration has positive impacts on the focal firm's cost, delivery, flexibility, and quality capabilities. We find that investments in process improvements, information sharing, continuous improvement projects between firms and their suppliers enable focal firms to enhance operational capabilities in the form of cost, delivery, quality and flexibility. In fact, focal firms stand to gain improvements in operational capabilities, if they engage in supplier integration. Our results suggest that the benefits are achieved because integration components, such as information sharing, facilitate the exchange of real-time information about product demand, inventory levels, and replenishment plans, enhancing delivery and flexibility capabilities (He et al. 2017). Supplier integration also provides opportunity for firms to gain the full benefits that might arise from investments in advanced manufacturing technologies to enhance flexibility capabilities (Moyano-Fuentes, Sacristán-Díaz, and Garrido-Vega 2016).

These results are consistent with the findings of independent studies as well as meta-analytic studies (Zhang, Chen, et al. 2018; Shou et al. 2017; Wang and Wei 2007; Ataseven and Nair 2017; He et al. 2017; Alfalla-Luque, Medina-Lopez, and Scharge 2013; Huo 2012; Leuschner, Rogers, and Charvet 2013; Lii and Kuo 2016) that have examined the relationships between supplier integration and operational capabilities. The literature does indicate that supplier integration provides benefits to firms and we provide findings that show that these benefits, in the form of operational capabilities, are also possible for firms in developing country environments.

Providing findings from a non-traditional environment (i.e. with regard to research sites), such as Ghana, allows researchers to retain confidence in the models that have been proposed to explain

phenomena. This is because, although similar findings have been obtained in other countries such as China, Vietnam, and Thailand, (Zhang, Chen, et al. 2018; Wong, Boon-Itt, and Wong 2011) the governance structures, contract enforcing mechanisms, available infrastructure, ownership structures, social and cultural conditions, economic conditions, and the access to technology are likely to be different in each country. All the above-mentioned factors have the potential to influence the manner in which supplier integration impacts operational capabilities (and also how OC impacts firm performance). Lastly, cost efficiencies are among the most widely known benefits of supplier integration (Wang and Wei 2007) and our result does show that supplier integration indeed impacts operational cost capabilities of firms.

Supplier integration enables focal firms to reduce the cost of materials, overhead costs, and overall operational costs. Supplier integration also contributes to improved quality products. A firm can tap into the alliances with its suppliers to improve design quality which results from knowledge gained from the suppliers on alternative materials and trends in material usage (Bunduchi 2013; Tan, Kannan, and Narasimhan 2007; Huo 2012). Integration with suppliers can also lead to process improvements and technology investments that enhance conformance quality and improve responsiveness (Moyano-Fuentes, Sacristán-Díaz, and Garrido-Vega 2016). It has been noted that about 30% of quality problems can be traced directly to suppliers (Paulraj and Chen 2007). Therefore, integrating processes with suppliers provides an opportunity to reduce quality problems. Again, integration with suppliers can enable suppliers to suggest useful ideas to improve the design quality of products or services of the focal firm which can potentially enhance its competitive advantage in the market place. Similarly, awareness of routing technology and the use of distribution techniques such as cross-docking, and unitisation or containerization can enhance a focal firm's own delivery capabilities. Supplier integration also contributes to enhanced flexibility since it provides opportunities to reduce product lead times by shortening product-development processes (Paulraj and Chen 2007).

However, our findings on the impact of operational capability on firm performance were mixed providing an opportunity to explore further the unique contributions of different operational capabilities to firm performance. Improvements in cost capability do not necessarily enhance firm performance. Though this 'unexpected' finding is inconsistent with the literature, it is a revealing testament to the environments in which firms in less developed countries operate. Similar to other less developed countries, Ghana's market is flooded with 'cheap' imports and second-hand (i.e. used and/or pre-owned) goods to such a large extent that firms may find it difficult to translate operational cost efficiencies into price reductions in order to achieve sales growth and increased market share. In addition, profitability is also a difficult challenge for Ghanaian firms who are unable to get the needed supplies while being limited by inadequate infrastructure. Similarly, quality and delivery capabilities appear not to have significant impact on firm performance. For quality, it is possible that it also has become a qualifier in the Ghana market and its capability is no longer rare and imitable within the environment. Dependable and reliable delivery is largely impacted by Ghana's transportation infrastructure. There are not many options with respect to transportation modes and infrastructure. The transportation of freight and people, in Ghana, is mainly by the road mode of transportation. It accounts for about 96% of freight and passenger transport (Ghana Investment Promotion Centre 2019). Although the road is the main mode of transport in Ghana, the quality or condition of the infrastructure is poor and significantly undermines speed. As a result, Ghanaian firms find it difficult to convert delivery

capabilities into competitive advantage because of the inadequate transportation infrastructure in the country. These explanations provide unique insights on why enhancements in operational capabilities do not always translate to improvements in firm performance. The prevailing factors such as infrastructure, competition, consumer preferences – which are usually external or beyond the control of the firms – might limit what firms can achieve from the quality, cost and delivery capabilities.

On the other hand, firm performance is enhanced significantly by flexibility capability. In this study, we have demonstrated that SI contributes to flexibility which subsequently impacts firm performance. We, therefore, contribute to theory by suggesting that when firms enhance flexibility capability through supplier integration efforts they stand to gain benefits beyond what might be directly expected from supplier integration. We also show that supplier integration efforts aimed at enhancing the flexibility of firms are likely to provide more benefits than those that enhance cost, delivery, and quality capabilities. And the impact of supplier integration on flexibility capability is also likely to be stronger than the impact of supplier integration on cost, delivery, and quality capabilities. This is beneficial to managers in Ghana who might be confronted with resource limitations and changing economic situations as described earlier and are thus struggling to decide which aspects of supplier integration to focus on. The observation that cost, delivery, and quality capabilities appear not to influence firm performance does not limit the importance of using integration to improve these capabilities. In fact, as noted by Shou et al. (2017), it will be unrealistic to expect the relationships among supplier integration, operational capability and firm performance to be uniform across all contexts.

These findings and our plausible explanations align with the dynamic capability theory in trying to understand how firms identify and select different capabilities at different time periods (Teece, Pisano, and Shuen 1997). The mixed findings observed in our study, particularly with respect to flexibility as the only operational capability providing a significant mediating role suggest that firms in Ghana, with time, might be adapting their capabilities accordingly as they integrate their processes and other resources with those of suppliers as predicted by the Dynamic Capability Theory (Teece, Pisano, and Shuen 1997). For example, whereas building capabilities in quality might have been appropriate some years ago, strengthening flexibility, might in modern contemporary times be more appropriate. Thus, tapping into supplier relationships to build flexibility capability will enhance the firm's ability to achieve superior performance and long-term competitive advantage (Teece, Pisano, and Shuen 1997).

There are several mechanisms by which supplier integration contributes to firm performance. Among these are information visibility and processing, governance mechanisms, customer and supplier-oriented performance, and operational capability. We focussed on operational capability in this study. While cost, delivery, and quality capability do not mediate the relationship between supplier integration and firm performance, operations capability in the form of flexibility mediates the relationship between supplier integration and firm performance.

We also observed that supplier integration has a direct impact on firm performance, implying a partial mediation (as opposed to full mediation) for operational capability in the supplier integration performance link. This means there could be other variables that mediate the relationship between supplier integration and firm performance. We posit that the presence of

mediators represents a potential explanation for the mixed findings in the literature on why supplier integration in some studies, is found to influence firm performance while in other studies it does not show any relationship. This is a significant theoretical contribution of our study. We also contribute to the knowledge base on supplier integration by reaffirming past findings that suggest that supplier integration is positively associated with both operational capability, and market and economic performance.

8. Conclusion and limitations

The objectives of this research were: (1) to determine if supplier integration has an impact on performance for firms in a less developed sub-Saharan African country and, (2) to investigate the mediating role of operational capabilities, in the form of cost, delivery, quality and flexibility, on the influence that supplier integration has on firm performance. This study extends prior research on supplier integration by exploring how SI contributes to firm performance from the integrative activities between a focal firm and its suppliers in Ghana, a less-developed country. In accordance with these objectives, a research model was developed and tested using data collected from 149 firms. The structural equation modelling findings from our data suggest that a firm's ability to adapt its strategies and enhance collaborative and interactive engagement (i.e. supplier integration) with its key suppliers represents an important enabler of its competitive performance. In addition, our findings also provide evidence that operational capability, in the form of flexibility mediates the influence of supplier integration on firm performance.

8.1. Theoretical contributions

In general, our findings are consistent with those of Shou et al. (2017), Huo (2012), Wong, Boon-Itt, and Wong (2011), among others. Shou et al. (2017) observed direct significant relationships between SI and operational capability in the form of quality, cost, delivery, and flexibility just as we observed. Similarly, Huo (2012) found that supplier integration does not impact firm performance directly but does so through other mediating variables such as supplier-oriented performance, customer-oriented performance, and combinative operational capabilities. Huo (2012) noted that supplier integration capabilities might need to be deliberately utilized in order to achieve firm performance. Our findings suggest that supplier integration capabilities could be used to strengthen operational capabilities which then can be translated into firm performance. This is consistent with the dynamic capabilities theory (Eisenhardt and Martin 2000) which suggests that the usefulness of dynamic capabilities (supplier integration in this case) lies in the resource configurations that they create (operational capabilities), 'not in the dynamic capabilities themselves' (1106).

Also, just as with Lii and Kuo (2016) we found significant relationships between supplier integration and competitive operational capability, between flexibility capability and firm performance, and between supplier integration and firm performance. Excellent integration of processes and activities with supply chain partners subsequently improves operational capabilities of firms producing opportunities for the attainment of superior performance (Srinivasan and Swink 2015; Liao, Hong, and Rao 2010, He et al. 2017; Ataseven and Nair 2017. Huo 2012). These findings lend support to studies that demonstrate that integration activities, such as information sharing, communication, exchange of plans, and joint investments

are necessary in achieving enhanced performance but might not be sufficient without other capabilities pertaining to the focal firm, suppliers, and customers (Vanpoucke, Vereecke, and Muylle 2017); Huo 2012; Zhang, Chen, et al. 2018; Yu 2015). Our study concurs with Eisenhardt and Martin (2000) and Teece, Pisano, and Shuen (1997) who assert that flexibility capability contributes immensely to a firm's performance and sustainability by strengthening the impact of supplier integration on firm performance.

We did not find support for our hypotheses that suggested that cost, delivery and quality capabilities mediate the relationship between supplier integration and firm performance. This is also a significant contribution in that by examining the operational capabilities individually, as opposed to in a combinative manner, we are able to isolate the impact of each capability's mediating role. We also contribute to theory by noting that since the full effects model was preferred over the strictly mediated model, the mediation role of flexibility is only a partial mediation and thus, additional variables may exist for predicting and explaining the impact of SI on FP.

8.2. Managerial implications

Our arguments were based on the tenets of the resource-based view of the firm theory that suggested that for firms to gain a competitive advantage from their capabilities, their resources must be valuable, rare, inimitable, and not easily substitutable or should be able to organize the resources to capture value (Barney 2001a). It appears that the operational capabilities of the firms in Ghana do not have these characteristics and are not providing the performance benefits that would be expected. Also, it is possible that firms in Ghana, while building capabilities in cost, delivery, and quality, have not been able to execute them well to the point where the capabilities become routines or practices that translate to overall firm performance (Eisenhardt and Martin 2000; Tan, Kannan, and Narasimhan 2007, Teece, Pisano, and Shuen 1997). The observation that cost, delivery and quality capabilities appear not to influence firm performance directly does not limit the importance of using integration to improve these capabilities. Firms in Ghana require these capabilities (cost, delivery and quality) obtained from SI to stay competitive in the market place. Firms in Ghana will benefit from investments in supplier integration since supplier integration has the potential to facilitate the ability to obtain materials, reduce transaction costs, bring about process efficiencies, and reduce material and overall operational costs.

As recommended by Tsinopoulos and Mena (2015), supplier integration 'should not be avoided' (1437) by firms since it can lead to improvements in performance. Similarly, supplier integration activities, such as joint investments in new technology, that facilitate information sharing and planning activities, provide avenues for managers in Ghana to change production volumes, the mix of products and product features, and improve the overall competitiveness of their firms (e.g. Lii and Kuo 2016; Palomero and Chalmeta 2014; Shou et al. 2017; Wong, Boon-Itt, and Wong 2011). Integrating production plans, forecasting information, and replenishment decisions with suppliers will enable focal firms improve the reliability and dependability of their delivery capabilities. Investing in integrative processes and information technologies with suppliers to strengthen structural and infrastructural capabilities of focal firms should contribute to quality

performance. Thus, managers should embrace supplier integration because of its potential to improve firm performance, and ultimately enhance competitive advantage.

The results provide useful insights into supply chain management research by extending the theoretical foundation on the relationship between supplier integration and firm performance. Our results indicate that operational capability, in the form of flexibility, is important in supply chain environments because it strengthens the impact of supplier integration on firm performance. This study also contributes to practice because it assures managers that even in developing country environments, investments in supplier integration could enhance their operational capabilities and eventually lead to improved competitiveness in the market place. It is our expectation that managers in Ghana and others in similar environments will be motivated to engage in supplier integration activities based on the findings of this study.

8.3. Limitations and future research

This study is not without limitations. The use of a convenience sample for data collection instead of a random sample makes our results a challenge for generalization purposes. There is a possibility of associated bias in the responses to the survey questions since we had a single respondent from each participating firm and it is rare for one person to be fully cognizant of the workings of entire supply chains. This also limited our data collection to only the focal firm and hence, future studies should consider other players in the chain (Zhu, Krikke, and Caniëls 2018). The use of cross-sectional data limits us from making causal inferences. Replications of this cross-sectional study in other sub-Saharan African countries could add further insights and validation to this study. Our concern for obtaining reasonable response rates led us to be mindful of the length of the questionnaire. Thus, the number of items for some of the constructs were often reduced to two or three. We note that there was no loss of validity in the resultant measures.

With regard to the study variables, there are several variables that impact the SI-FP relationship and are worth examining so as to enhance theory. For example, moderating variables in the form of the industry type, managerial competence, ownership structure, culture, trust among partners, and geographic location of both suppliers and focal firms could be examined to determine if they impact the SI-FP link. It is also reasonable to assume that the exchange mechanisms that occur between partners will not be the same for all firms in all localities given the differences in production systems, collaborative practices and communication processes (Shou et al. 2017). In fact, sometimes the need for and the extent of integration might be imposed on focal firms by relatively large parent organizations from outside the firm's locality (Palomero and Chalmeta 2014). Third, past research already suggests that internal integration impacts external integration so future studies should also look at the relationships among the three components of supply chain integration. Could firms also improve their internal integration based on skills and lessons acquired from external integration? Fourth, this research considers supplier integration as the predictor of firm performance and operational capability as mediators of SI-FP relationship. Future research should examine other possible mediators such as product design or innovation as well as other predictors such as social capital, planning comprehensiveness, governance mechanisms (Srinivasan and Swink 2015), and agile or lean supply chain strategies (Lee 2004;

Lee, Ik-Whan, and Severance 2007) on the relationship between supplier integration and firm performance.

We studied only the four basic operational capabilities (cost, delivery quality and flexibility) as mediators. Other researchers should examine additional capabilities such as innovation, and sustainability either individually or in a combinative manner to see if the impact is different. Given the challenges that firms face, especially those in less developed economies, with regard to integration, it will be informative to examine if different combinations of mediators lead to different outcomes (Lii and Kuo 2016; Shou et al. 2017). Another research opportunity will be examining antecedents of supplier integration such as geographical proximity, innovation, trust between parties, ownership structure and supplier competencies (Shou et al. 2017; Bunduchi 2013; Lii and Kuo 2016). And last, this study did not consider the 'negative' impacts of supplier integration such as the integration costs, the difficulty of switching suppliers and the risks associated with supplier opportunism for focal firms in environments such as those found in Ghana. For example, joint investments in process technologies might tie a focal firm to a specific supplier and make it difficult for the focal firm to consider other suppliers or even consider alternate materials. It is expected that scholars will consider some of the above issues in future studies.

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