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Effects of innovation strategies on export performance: New empirical evidence from developing market firms

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ABSTRACT

Scholars are increasingly emphasizing the importance of investing in a broad innovation strategy when pursuing competitive advantage and growth in foreign markets. However, the majority of existing studies focus mainly on developed economies with high shares of innovative firms. What remains largely underexplored is the heterogeneous impacts of innovation types on SMEs' performances, especially in developing countries. We fill this research gap by using firm-level data from the lower-middle income country of Nigeria. We empirically explore the individual and joint impacts of technological and non-technological innovations on the export performance of SMEs. First, we find that product innovation has a negative impact, whereas process innovation leads to increased export performance. We also find that marketing innovation has a positive effect on export performance. Besides, the joint effects of product, process, and marketing innovations are significant, albeit with heterogeneous impacts on the export performance. Furthermore, we find that the innovation-export performance relationship is influenced by external innovation collaborations. The findings have implications for an efficient design of public policy instruments that aim to promote firm innovation in developing countries.

1. Introduction

In this paper, we examine the effects of innovation strategies on the export performance of small and medium-sized enterprises (SMEs) in a developing economy. SMEs play a vital role in most economies, accounting for 90% of businesses and more than 50% of employment worldwide. In developing economies, SMEs account for over 90% of all enterprises, employ up to 95% of the enterprise workforce, and generate more than 49% of domestic output (World Bank Group, 2020). Across sub-Saharan Africa (SSA), SMEs are an important driver of growth, accounting for over 90% of all enterprises and 60% of total employment (ITC, 2018). With the emergence of new technologies and digitalization, SMEs in developing economies are evolving and rapidly expanding into foreign markets (Tekin and Hancıoğlu, 2017). Studies suggest that firms from a weak business environment tend to enter foreign markets where efficient institutions allow for increased learning opportunities and technology sourcing (Dunning, 1998). This supports the claim that international expansion enables SMEs to explore new resources and capabilities (Fu et al., 2018). Evidence shows that technology spillover in the context of international expansion allows firms–particularly SMEs from developing countries–to make up for the lack of resources (e.g. technology knowledge, human capital) required for innovation activity (Buckley, 1997; Del Giudice et al., 2019). Thus, the motivation to enhance their technological capabilities in the international markets reflects the critical role of innovation on firm growth (Radicic and Djalilov, 2019).

1.1. Institution and innovation in sub-saharan africa

Innovation is a key driver of competition and dynamic market efficiency. In today's changing global market, firms possessing a strong source of competitive advantages are more likely to survive and achieve superior performance. On this basis, one would expect innovative SMEs to grow faster and become more efficient than non-innovators in the export markets (Ratten, 2015). SMEs have been found as essential generators of innovation. Rosenbusch et al. (2011) argue that their smaller, nimbler structures and entrepreneurial orientation enable them to engage in successful innovation activity. Although the innovation-performance relationship is not straightforward, evidence supports a positive impact of innovation on firm growth (Ramadani et al., 2019), and export performance (Tavassoli, 2018). Research on the innovation effect on firm performance has long been considered of significant

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interest to both managers and policymakers. This explains why the subject has continued to attract academic attention (e.g. Cassiman and Golovko, 2011; Martínez-Román et al., 2019). However, despite their contributions, the extant empirical studies mainly focus on developed economies with high shares of innovative firms. There is a paucity of research in the context of developing economies, in particular the SSA region. Given the differences in institutional environments, we argue that the results obtained from developed economies may be of little relevance in many developing countries (Fernández-Sastre and Montalvo-Quizhpi, 2019). Thus, it is very important to examine the nature, types, and effects of innovation on SME performance in developing economies.

The institution plays an important role in the innovation structure and performance of firms (Jackson and Deeg, 2008). Countries vary in terms of economic size and level of development. Allred and Steensma (2005) suggest that a country's level of development has a direct effect on firms' innovation investments. There are institution-specific factors influencing firms' innovation performance in developing economies. For example, SMEs in developed economies are supported by institutions with advanced legal systems, low levels of bureaucracy, and ease of access to financial services. In contrast, many developing countries, especially the SSA countries, have less-efficient or underdeveloped institutions characterized by political instability, corruption, poor infrastructure, and management (Lee et al., 2015). As a result of these poor institutional arrangements, SMEs in developing economies are finding it difficult to successfully actualize their innovation objectives (Medase and Barasa, 2019).

Precisely, a well-organized financial system is vital for successful innovation and productivity of firms. However, financial systems in most of the developing countries are ill-equipped to facilitate financial flows to the SMEs. Research shows that a higher number of SMEs in SSA lack access to financial resources more than their counterparts in developed economies (Quartey et al., 2017). Without governmental support such as tax preferences, public funding, and subsidy programs, these firms struggle to carry out their innovation activity (Hall and Lerner, 2010). Moreover, financial institutions and capital markets tend to be reluctant to provide finances to SMEs as they lack adequate information and technological knowledge to assess the capacity of these firms. These firms often face the problem whereby they are considered too big for micro-financial support and too small or risky for traditional financiers. Consequently, most of them rely on informal savings and retained earnings. As innovation is capital-intensive, SMEs in SSA find it difficult to realise their innovation capacities.

Furthermore, the legal systems in most developing countries have a negative impact on the business environment. In contrast, an efficient legal system provides security that stimulates technological progress. For example, intellectual property rights (IPR) promote economic growth, innovation, and international competitiveness. However, in most SSA countries, IPR is not fully integrated into the institutional arrangements, thereby hampering innovation, technology transfer, and entrepreneurial activity. As a result, firms in these countries are reluctant to invest in innovation as they are uncertain about the profit potentials of such investments.

Another factor mitigating against the innovation activity of SMEs in SSA countries is the lack of human resources. Good education and technical training can promote knowledge diffusion and innovation capabilities. When compared to developed countries, South Asia, West Asia, and SSA countries have the highest percentage of illiterate adults. Studies show that the standard of a country's educational system is strongly correlated to innovation capabilities. However, many education systems in SSA are unstructured and constrained by several factors such as poor infrastructure, inadequate funding, and a conducive learning environment (Odia and Omofonmwan, 2007). Firms with a larger percentage of qualified technical and managerial staff have more innovative capabilities. Besides, SMEs collaborate with local universities to increase their probability of developing new-to-the-market innovation. While such collaborations enable these firms to strengthen their internal capabilities, SMEs in developing economies do not often enjoy such benefits because of the low standard of the local universities.

In sum, the institutions in SSA countries do not efficiently promote innovation culture and ecosystems. Although SMEs in general experience higher challenges in the business environment than large firms, these constraints are more pronounced in developing economies than in developed economies.

1.2. Purpose and research setting

The combination of these institution-specific factors disproportionately affects the developing country's SMEs' decision to engage in innovative activities and innovation outcomes. As a result, it is pertinent to examine the behaviour of the firms that innovate amidst these constraints. Thus, the work aims at uncovering the effects of innovation strategies on SME export performance. Nigeria is an interesting setting given its place in the African economy. While Nigeria and South Africa make up half of the SSA's GDP, in 2019 Nigeria surpassed South Africa with 2.3% GDP growth, thereby becoming the largest economy in Africa (IMP, national statistical office, Annual GDP for 2019). In 2017, $46.8 billion accrued to Nigeria from the exportation of 45 products, resulting in a positive trade balance of $12.7B in net exports. Nigeria is the 49th largest export economy in the world. Alongside Mexico, Indonesia, and Turkey, Nigeria is among the next most powerful emerging markets in the world. According to the Nigerian Bureau of Statistics (NBS), SMEs are an essential part of the Nigerian economy. They account for 48% of national GDP and account for 96% of all enterprises. They contribute about 50% of industrial jobs and approximately 90% of the manufacturing sector (PwC et al., 2020).

To achieve our aim, we base our analysis on a sample of 248 SMEs in the manufacturing sector. First, in contrast to previous studies that relied on innovation inputs such as R&D investment as proxies for innovation (Aw et al., 2007), we use innovation output variables to better understand the competitive capacity of the firms under study. Scholars suggest that productivity in the export markets to a large extent depends on the firm's ability to introduce new or improved products and production methods, rather than mere R&D investments (Ganotakis and Love, 2011). Moreover, relying solely on R&D investment as a measure of innovation has a disadvantage of underreporting the innovative behavior of firms that do not have a separate R&D department, which nonetheless innovate (Wakelin, 1998). This is particularly true for developing countries, which are dominated by SMEs. Thus, by using innovation output variables as measures of technological innovations, we contribute to this stream of research by offering new evidence from developing country SMEs. As most of the existing evidence focused on large manufacturing firms in industrialized economies (Higón and Driffield, 2011), our study enhances our understanding of the dimension of technological innovation that affects export performance of SMEs in developing economies.

Second, the traditional view of innovation is increasingly criticized for ignoring other types of innovations (Grimpe et al., 2017). Technological innovation does not fully explain the innovation activities of firms (Geldes et al., 2016). Mothe and Nguyen (2010) called for more studies explaining the impact of other types of innovation on firm performance. Radicic and Djalilov (2019) note that the lack of empirical evidence on the effect of non-technological innovation is even more prominent in the context of SMEs. To fill this research gap, we integrate the significance of marketing innovation on export performance. Thus, by focusing on technological and non-technological innovations, we offer a more comprehensive analysis of what innovation types have more significance on the firm's performance. As there are relatively few studies adopting a broad perspective of innovation in the context of developing economies, our study is among the first in SSA to provide empirical evidence on both the individual and joint effects of innovation types on SME export performance. Second, research

suggests that export success depends on the interplay between a firm's strategy and environmental factors (Zeithaml, 1988). By exploring the various impacts of innovation types on export performance, we enhance our knowledge of the dynamics of technology and market domains in the context of SMEs' competitive strategy.

This paper consists of five sections: Section 2 presents a literature review and develops hypotheses. Section 3 presents data and methods. Section 4 shows the results of the empirical analysis. Section 5 provides discussion, managerial implications, and the limitations leading to future research directions. Finally, Section 6 provides the conclusion.

2. Theoretical background and hypotheses development

Exporting is one of the most common modes of international market entry (Sousa, 2004). It allows for greater strategic flexibility and production efficiency. Exporting is attractive to SMEs in developing economies because of its low level of commitments and investment risks (Lu and Beamish, 2006). Moreover, it is rapidly becoming a vital instrument for firm growth because of the evolution of the competitive business environment (Golovko and Valentini, 2011). However, success in the export market can be very challenging as it is determined by a variety of factors (Venkatraman, 1989). Cavusgil and Zou (1994) argue that export performance depends on a firm's ability to strategically manage the interplay of internal and external forces. This is consistent with the contingency theory, which posits that export performance is dependent on the context in which a firm operates (Robertson and Chetty, 2000). These authors suggest that firms possessing appropriate internal factors (e.g. strategic orientations or characteristics) can efficiently respond to the external conditions in the export markets (Yeoh and Jeong, 1995). The rapid environmental changes in the global market are making competition more intense, especially for the SMEs. Given their specific disadvantage when compared to large firms, SMEs must constantly seek strategies that enable them to grow in the export markets (Audretsch and Belitski, 2013). This has even more implications for SME exporters originating from weak institutional environments (LiPuma et al., 2011). As a result, it is imperative for these firms to adopt strategies that allow them to respond effectively to the contingency factors in the export markets (Cavusgil and Zou, 1994).

Although no single strategy is appropriate for all contexts (Rueket et al., 1985), a large portion of literature identified innovation as a fundamental tool for responding to export market contingencies (Azar and Ciabuschi, 2017). Innovation is the generation, development, and implementation of ideas into new products or services, new process technologies, new marketing techniques, and new organizational structures (Damanpour and Aravind, 2012). Changes in the global market environment are creating an intense challenge to SMEs. This challenge is even more pronounced for developing country SMEs as they must constantly innovate to survive and grow in the export markets. For example, for Nigerian SMEs to remain competitive in a business environment characterized by macroeconomic and institutional instability, they must adopt an efficient innovation strategy (Medase and Barasa, 2019). That is, a strategy that enables them to introduce new products, production methods, and novel marketing practices.

Innovation is a multifaceted construct, cutting across the technological and non-technological spheres. Technological innovation refers to the use of new technology to produce changes in products or services, and also to how products and services are produced (Damanpour, 1987). As global competition is driving technological innovations, SMEs are leveraging the advantage of flexibility and adaptability to commercialize disruptive products at the expense of large firms (Carayannopoulos, 2009). Radicic and Djalilov (2019) show that SMEs investing in technological innovation perform better in the export markets. Similarly, Becker and Egger (2013) find that technological innovation positively affects the exporting activities of German firms. Since product and process innovations are related to the development or application of new technologies, we understand them as technological innovation (OECD, 2005). First, product innovation is the introduction of goods or services that are new or have had their features and intended uses significantly improved. It includes significant improvements in technical specifications, components, and materials, software in the product, user-friendliness, or other functional characteristics (Oslo Manual, 2005). In the Schumpeterian model of creative destruction, product innovation is pivotal to firm productivity. For example, SMEs can create a competitive advantage by introducing technologically advanced products with novel and unique features that meet the market's demands. Through horizontal and vertical product differentiations, SMEs can successfully enter new foreign markets as well as increase shares in existing markets (Becker and Egger, 2013). Second, process innovation refers to the implementation of a new or significantly improved production or delivery method. It includes a significant change in techniques, equipment, and/or software (Oslo Manual, 2005). The aim of process innovation is to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products (Ganotakis and Love, 2011). SMEs producing new products at a lower price can increase their efficiency and consequently, perform better in the export market than non-innovating firms (Becker and Egger, 2013).

However, although technological innovation drives competitive advantage, it is not sufficient for managing contingency factors in today's global market. Research shows that firms can create and sustain a competitive advantage via non-technological innovation (Mothe and Nguyen, 2012). Foroudi et al. (2016) suggest that an adoption of marketing innovation can lead to changes in product, pricing and promotion strategy, and in turn, improve firm performance. Marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion, or pricing (Oslo Manual, 2005). It represents ways through which a firm addresses customers' demands, opens up new markets, and positions products on markets to increase its sales (Gunday et al., 2011). Grimpe et al. (2017) argue that marketing innovation is neither subordinate to nor a mere 'mechanism for exploiting technologically novel products commercially'. This highlights the fundamental role of marketing innovation as a source of competitive advantage. In other words, the competitiveness of a firm goes beyond mere ownership of technology (Patterson et al., 2003). It also includes a firm's ability to respond to the market environment through the 'knowledge gathered from customers and competitors in the process of market research' (Grimpe et al., 2017: 362). Such knowledge embodied in a new marketing strategy results in superior performance in the export market. This re-echoes Drucker's claim, "that any business enterprise has two–and only two–basic functions: marketing and innovation" (Drucker, 1954: 40).

Taken together as effective adaptive tools, SMEs engaging in technological and marketing innovations are more likely to grow in the export markets. The issue of engaging in complementary innovation strategies has become very important because of the increasing number of external factors in the export markets (Azadegan and Wagner, 2011). One would expect developing country SMEs adopting well-balanced innovation types to respond to these demands efficiently. They can respond to the 'market-change' by introducing new products or implementing production processes, which allows them to exploit opportunities. In turn, they can respond to the 'technological-change' by implementing a new marketing strategy that creates new distribution channels or enhances the efficiency of existing distribution channels (Abernathy and Clark, 1985).

2.1. Technological innovation and export performance

Product and process innovations lead to high productivity and growth (Love and Roper, 2015). Even though they are often considered as technological innovation, new products and processes can be linked

to purely organizational practices (OECD, 1996) or marketing strategies (Grimpe et al., 2017). However, in this study, we conceive them as technological innovation because of their technical specifications and functional characteristics. Prior research shows that firms investing in product and process innovations can achieve a twofold competitive advantage, namely differentiation strategies and cost efficiency (Grant, 1991). Vernon (1966) suggests that productivity is driven by technological innovation induced by product competition. Over time, products are affected by technological changes and short product life cycles. The success of SMEs in export markets largely depends on their ability to develop high-quality and improved products and production processes (Cassiman and Golovko 2010).

Previous empirical studies carried out in the context of developed economies supported a positive relationship between product innovations and exporting. For example, Tavassoli (2018) shows that product innovation has a positive effect on the export intensity of SMEs. Cassiman et al. (2010) show that product innovation not only positively affects SMEs' export performance but also induces non-exporting SMEs to undertake an international strategy through export activities. Caldera (2010) shows for Spanish manufacturing firms that product and process innovations are positively related to export performance. Similarly, Van Beveren and Vandenbussche (2009) show that the combination of product and process innovation, rather than either of the two in isolation, increases export propensity in Belgium.

Nevertheless, empirical evidence on the effect of product and process innovation is mixed (e.g. Landesmann and Pfaffermayr, 1997). The majority of the prior studies conducted in developed economies show that product innovation has a stronger impact on export performance than process innovation (Nassimbeni, 2001), whereas others, though few, show that process innovation has more impact in determining export performance (López Rodríguez and García Rodríguez, 2005). One possible explanation for this may be due to the context or the country where the studies were conducted. For example, Roper and Love (2002) showed that in the United Kingdom, product innovation is positively related to the propensity to export. However, in Germany, they found a negative relationship. Likewise, in a two-wave study in Estonia, Masso and Vahter (2008) find that only product innovation increased productivity in the first wave, whereas process innovation positively affected productivity in the second wave.

Given institution-specific challenges facing SMEs in SSA, we deem it important to examine innovation strategies of these firms as well as identify the dimension of technological innovation that has the greatest effect on their export performance. In the context of emerging markets in countries such as South Africa, Brazil, and India, researchers found that firms with a higher rate of exports over total sales are less likely to engage in technological innovation (Cui et al., 2016). However, in a study carried out in Pakistan, Wadho and Chaudhry (2018) found that export is positively associated with innovation performance, and manufacturing firms exporting to developed countries are more likely to participate in innovation. For example, in a study of Brazilian firms, Goedhuys and Veugelers (2008) found that product innovation leads to superior sales growth rates when it is combined with process innovation. They highlighted that process innovation alone leads to low performance. In Bangladesh and Pakistan, Waheed (2011) found that process innovation has more impact on firm productivity than product innovation. However, the effect of product and process innovation on export performance of SMEs in SSA is largely unclear. Given that technological innovation is a source of competitive advantage, we expect SMEs in SSA investing in both product and process innovations to increase their ability to meet market demands; and consequently, achieve better export performance (Zahra et al., 2000). Therefore, we propose the following hypotheses:

H1a. There is a positive relationship between product innovation and export performance.

H1b. There is a positive relationship between process innovation and export performance.

2.2. Marketing innovation and export performance

Marketing innovation has been identified as a significant source of competitive advantage (Cruz-Ros et al. 2017). It constitutes a fundamental factor for assessing the success of exporting firms (Tan and Sousa, 2015). Marketing innovation enables firms to create new, and differentiated products, and a strong brand image that is difficult for competitors to imitate (Murray et al., 2011). Firms involved in marketing innovation can develop a unique customer-value via market research, intelligence dissemination, and responsiveness to the market (Kohli and Jaworski, 1990). Few studies have analyzed the effect of innovations on export performance in the case of SMEs. This paucity of literature is even more evident in the case of marketing innovations (Valle, 2016). The extant studies did not examine the impact of marketing innovation on firm performance in isolation, but rather in conjunction with other innovation types such as products and processes and organizational innovations (Bodlaj et al., 2018). These studies found that organizational innovations, along with product innovations, stimulate marketing innovations in SMEs, which in turn, have a positive impact on their export. Unlike these studies, we argue that marketing innovation alone can positively affect the export performance of SMEs. This is because marketing innovation provides firms with a unique strategy for reacting to consumers' needs (Keskin, 2006). Leonidou et al. (2002) show that firms use novel export-marketing strategies to manage the interaction of internal and external factors and consequently, realize their export objectives. Gupta et al. (2016) reveal that marketing innovation related to brand image contributes to firm competitiveness. Moreover, Ozkaya et al. (2015) suggest that firms with marketing innovation capabilities can secure profitable positioning and greater performance. A recent study found an inverse U-shaped relationship between innovation in marketing and the level of international expansion (Bortoluzzi et al., 2018). However, what seems to be clear is that regardless of prior empirical evidence, new studies are needed to analyze the relationship between marketing innovation and SME export performance, especially in the context of developing economies. On this basis, we propose that:

H2. There is a positive relationship between marketing innovation and export performance.

2.3. Joint effects of technological and marketing innovations on export performance

Technological innovation and marketing innovation are key strategies for growth. Research suggests that export success largely depends on a firm's ability to explore broad innovation strategies. However, firms vary in terms of size, strategic focus, and resource capabilities (Joo et al. 2018). These factors have implications on the firm's innovation activity and export performance. For example, SMEs from developing economies have to decide whether or not, and how much to invest in technology and market domains. That is, they have to make a trade-off between them. This raises the challenge of achieving a balance

between the two domains, especially for firms facing additional institutional constraints (Song et al., 2005). Prior research suggests that focusing on an aspect of innovation allows a firm to manage its organizational requirements effectively; and allot its resources properly (Bhoovaraghavan et al., 1996). Studies show that a firm pursuing a single-innovation strategy can create new products, enter new markets, and increase its productivity (Rodil et al. 2016). Nevertheless, firms are increasingly investing in different types of innovations, either simultaneously or complementarily (Karlsson and Tavassoli, 2016). Recent empirical evidence reveals that the combination of innovation types has a positive impact on firm performance (Azar and Ciabuschi, 2017). For example, in a study of Italian firms, Aldieri et al. (2019) find that both process and product innovation have positive effects on a firm's economic productivity, especially when they are jointly conducted. Also, they show that introducing a new product on the market increases productivity if complemented by marketing innovations.

Since no single innovation is universally superior, we expect SME exporters from SSA engaging in technological and marketing innovation simultaneously to achieve a better export performance (Evangelista and Vezzani, 2010). For example, a firm producing new products may require a new marketing strategy to introduce these products to the export markets (Wadho and Chaudhry, 2018). In turn, such a firm can generate new products through product designs, packaging, product promotion, or distribution strategies (Grimpe et al., 2017). Lee, Lee, and Garrett (2019) find that the relationship between new products and firm performance is increased with the introduction of marketing innovation. Technological and marketing innovations can reinforce each other leading to cumulative positive effects on firm performance (Geldes et al., 2016). On this basis, we argue that SMEs from SSA simultaneously investing in technological and marketing innovations can achieve greater export performance due to their synergistic effects (Hervas-Oliver et al., 2014). Therefore, we propose that:

H3. The joint effect of technological and marketing innovation is positively related to export performance

2.4. The role of innovation cooperation on export performance

The relationship between innovation and export behavior is *a priori* unclear, because the direction of causality may also run from export to innovation as suggested by the endogenous growth model (Grossmann and Helpman, 1991). The importance of international exposure on growth strategy is likely to be more profound on SMEs than large firms due to their resource constraints (Ardito et al., 2019). The internationalization strategy represents a vital learning opportunity for SMEs to enhance technological resources and grow in the export markets (Dikova et al., 2015). SME exporters can improve their innovation performance and consequently, achieve higher returns from innovation by expanding into more markets. In a study of Korean mining and manufacturing firms, Hahn and Choi (2013) find that exporting positively affects innovation and vice versa, thus leading to greater productivity. One of the possible explanations of this bi-directional effect is linked to the interactions between firms and external agents as posited by innovation networks (Baptista and Swann, 1998) and open innovation (Chesbrough 2003) theorists. These authors suggest that the export market promotes the interaction between firms and their environment. Firms collaborating with external partners in the export markets can improve their technical knowledge. Innovation collaboration is very attractive to SMEs due to their limited resources. Through external relationships, SMEs can counter the liability of smallness, which inhibits internal R&D activities. SMEs collaborating with external agents in the export markets can absorb external ideas relevant to developing technological innovations. Moreover, a firm can develop a novel marketing strategy or open up new markets from the information gathered from external agents.

Furthermore, given the aforementioned institution constraints in SSA, there is a sound reason to expect the SMEs from this region to increasingly engage in external innovation collaborations. This is in line with the claim that these firms expand into foreign markets to enhance their innovation performance and export objectives (Lou et al. 2010). Such collaborations give them access to facilities and specialist knowledge lacking in their home markets. Also, these firms can learn about the designs of new products or product packaging and promotion from their external partners. Thus, their international expansion captures the importance of the co-evolution of export activity and collaborative innovation. In a recent study, Moreno-Menendez (2018) reveals that export activities and innovation cooperation follow a two-way path, thus suggesting a mutual influence of the variables on firm performance.

However, despite the extensive literature, there is still a paucity of empirical evidence supporting the co-evolution of exporting and innovation collaboration in developing economies, especially in SSA. Lewandowska et al. (2016) argue that the wide adoption of innovation collaboration strategies among firms in transition and emerging economies highlights its crucial role in international competitiveness. Following this overall positive impact, we argue that SMEs in SSA collaborating with external agents with superior knowledge and technologies are likely to be more innovative. Nevertheless, the impact of collaboration on innovation activities depends on the number of external sources (Laursen and Salter, 2006). SMEs with a high level of presence in foreign markets can draw from a wider array of technological resources from external partners (Capaldo and Messeni, 2015). The knowledge accruing from such international exposure can enable SMEs to develop new products, processes, marketing strategies or upgrade existing ones and consequently respond to changing market environments. As a result, we expect a higher number of external partners to influence the impact of innovations on export performance.

H4. The higher the number of innovation partners, the more positive the innovation-export performance relationship.

Fig. 1

3. Data and methodology

3.1. Sample

For our empirical analysis, we used the Nigerian Innovation Survey (NIS). The survey was Nigeria's part of the African Science, Technology and Innovation (ASTII), supported by the New Partnership for Africa's Development (NEPAD). The questionnaire was developed based on the Guidelines for Collecting and Interpreting Innovation Data proposed by the OECD Oslo Manual (2005). The dataset includes data from wave 1 (2005-2007) and wave 2 (2008-2010) of the NIS. The sample was randomly selected based on the list of enterprises obtained from the National Bureau of Statistics (NBS) and the Nigerian Stock Exchange. The survey was first carried out in 2008 (including a sample of 1000 firms) and then repeated in 2011 (including a sample of 1500 firms). The final pooled sample includes 1359 firms, an overall response rate of 54.3 percent. The sampling data adopted a multistage systematic random method. The firms were stratified based on sector (manufacturing and service sectors) and employee size. We selected a sample of manufacturing firms based on the Industrial Classification of all Economic Activities (ISIC revision 3.1). We focus on firms in the manufacturing sector, which leaves us with 890 firms in both waves (519 firms, wave 1 and 371 firms, wave 2).

We selected the manufacturing sector due to its importance to the Nigerian economy. The manufacturing sector has a high proportion of SMEs compared to other sectors such as the construction, agriculture, mining, service, transport, and storage sectors. According to NBS, SMEs in the manufacturing sector reported the highest number of entities with exportable products at 1176 entities compared to other sectors –

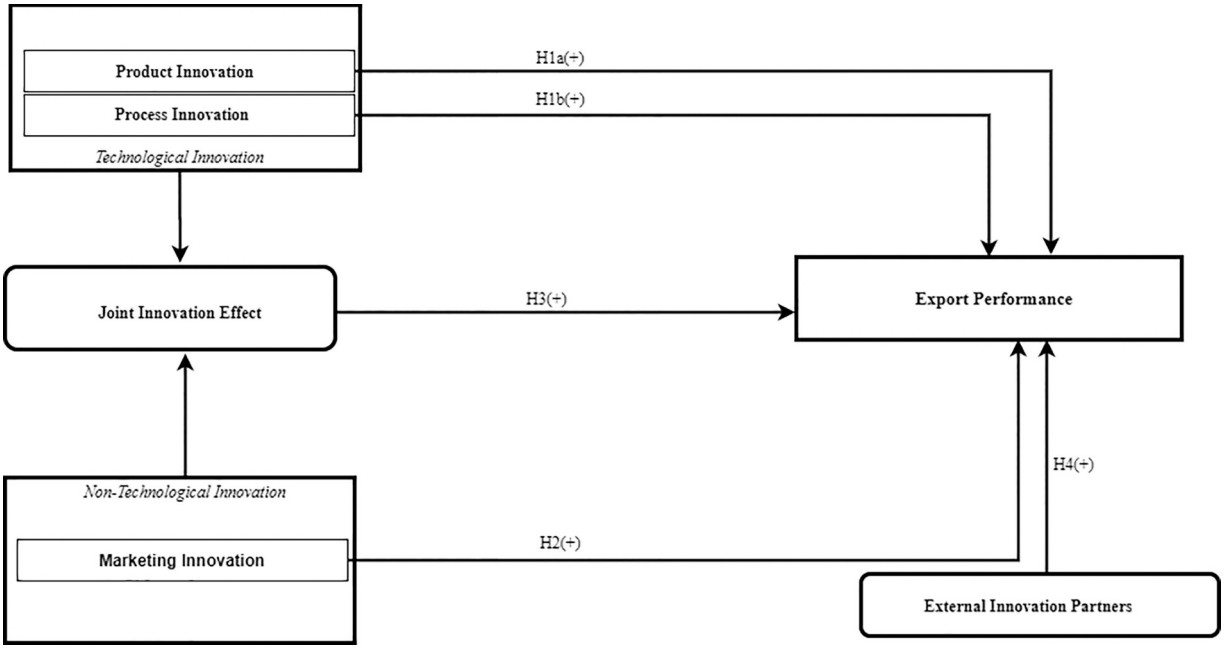

Fig. 1. Conceptual framework.

accommodation and food services (124 entities), wholesale/retail trade (540), transport and storage (341 entities), education (95 entities), agriculture (13 entities), construction (13 entities), and other service activities (24 entities) (Survey of MSMEs, 2017). Furthermore, we only selected firms that participated in both waves to capture their innovation activities as it takes time for innovation output to show its effect on firm performance. This approach is in line with prior work (Fritsch and Slavtchev, 2007). From this, a total of 361 firms was realized. Given the various, sometimes conflicting definitions of SMEs, we adopted the European Union definition of SMEs as it provides a good basis for comparison purposes. Hence, from this sample, we focused on small enterprises (10 – 49 employees) and medium-sized enterprises (50 – 250 employees). Thus, we eliminated firms with less than 10 employees (micro-enterprises) and over 250 employees (large firms), which reduced the sample to 248 manufacturing SMEs. Finally, the innovation-related data were merged with export data obtained from the World Development Indicator (WDI, 2018), which is the World Bank's premier compilation of cross-country comparable data.

3.2. Model specification

We adopted the Stock and Watson (1993) Dynamic Ordinary Least Square (DOLS) model. We chose this model because it corrects for possible simultaneity bias present among regressors. Precisely, it proposes a parametric approach for estimating long-run equilibriums in systems possibly integrated of different orders but still cointegrated (Stock and Watson 1993). According to Al-Al-Azzam and Hawdon (1999), the DOLS estimation procedure has certain advantages over alternative approaches like the OLS because it produces more robust estimates. The presence of leads and lags of different variables with integration vectors eliminates the issue of simultaneity bias within the sample. The estimates of DOLS have both better sample properties and provide a superior approximation to normal distribution. Besides, the inclusion of the leads and lags ensures that the error term is independent of past innovations in stochastic regressors and present in the equation. Following Masih and Masih (1996a), we specify our model thus:

$$Y_t = \alpha_0 + \beta X_t + \sum_{j=-q}^{p} \Phi\theta\Delta X_{t-j} + \varepsilon_t \quad (1)$$

Y_t is the dependent variable, X_t is the matrix of explanatory variables;

β is the cointegrating vector representing the long-run cumulative multipliers, while p and q are the lags and leads in the model.

$$\begin{aligned} \text{EXPPERF}_t \;=\; & X_t M' + \sum_{i=-m}^{i=m} \varnothing_i \Delta\text{COOPNIGUNI}_{t-i} \\ & + \sum_{i=-n}^{i=n} \omega_i \Delta\text{COOPRESINS}_{t-i} + \sum_{i=-j}^{i=j} \delta_i \Delta\text{MARKINNO}_{t-i} \\ & + \sum_{i=-i}^{i=l} \theta_i \Delta\text{PROCESINNO}_{t-i} \\ & + \sum_{i=-i}^{i=l} \rho_i \Delta\text{PRODUCINNO}_{t-i} + \sum_{i=-i}^{i=l} \sigma_i \Delta\text{FIRMAGE}_{t-i} + \varepsilon_t \end{aligned} \quad (2)$$

Where

$$M = [C, \alpha, \rho, \beta, \gamma, \tau, \theta],$$

$$X = [1, LEXPPERF_t\ COOPNIGUNI_t\ MARKINNO_t\ PROCESSINNO_t\ PRODUCTINNO_t\ COOPRESINS_t\ FIRMAGE_t]$$

3.3. Variables

3.3.1. Dependent variable: export performance

Researchers have used a variety of constructs for measuring export performance ranging from economic and non-economic measures. We adopt the former approach as it permits us to capture values acquired by firms through their innovation activities in the export markets. The export value index contains the export variables, namely (1) export sales growth, (2) export profitability and (3) export intensity used by Sousa and Bradley (2008).

3.3.2. Independent variables

3.3.2.1. Product innovation. Product innovation is the development and commercialization of new products or the improvement of existing products. It follows market orientation, which can ultimately lead to competitive advantage associated with differentiation (OECD, 2005; Ramos et al., 2011). In our model, we included it as one of the regressors (PRODCUTINNO).

3.3.2.2. Process innovation. Process innovation is the adoption of a new

production process, which significantly improves productivity, rationalization and cost structure. Normally, it responds to an internal orientation, and acts on cost efficiency (OECD, 2005; Ramos et al., 2011). In our model, we included it as a regressor (PROCESSINNO).

3.3.2.3. Marketing innovation. Marketing innovation is the implementation of new marketing methods involving significant changes to a firm's marketing mix in product design or packaging, product placement, product promotion or pricing (OECD 2005; Aksoy, 2017). It is included in our model as one of the regressors (MARKINNO).

3.3.2.4. Innovation collaborations. Innovation collaboration is an access to complementary technological resources through partnerships with external organizations. It enables faster development of innovations, improves market access, promotes economies of scale, and allows firms to share costs and risks (e.g. Cassiman and Veugelers, 2002). While firms cooperate in several ways, we followed prior authors who emphasized the role of research institutions in the development of cutting-edge business innovations (Antonelli and Fassio 2018). Thus, we used collaborations with universities in Nigeria (COOPNIGUNI), and collaborations with public research institutions abroad (COOPRESINS).

3.3.3. Control variable

We controlled the analysis by including the age of the firms under consideration. Studies show that age affects a firms' innovation capabilities as well as their decisions to collaborate with external partners to enhance their innovation performance (Rothaermel et al., 2006). We considered age as the number of years that elapsed from the year the firm was established to the year of surveys (FIRMAGE).

4. Empirical findings and discussion

When dealing with time-series data, it is imperative to test for the stationarity of the variables in the model through pre-estimation tests. This is important because non-stationary data may create spurious results for standard OLS regressions. Thus, the result of this test and that of the Stock Watson Dynamic OLS model are presented in this section of the paper.

4.1. Stationary and lag length test

We begin our analysis by determining the order of integration of the variables employed in the study. There are several procedures to test for unit roots Hadri, 2000), we used the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979). The result from Table 4.1 shows that all the variables in the model are all integrated of order I ((1), that is, all the variables became stationary after first differencing, except for firm age which was stationary at its level form. The decision rule for no unit root is that the ADF test statistics must be greater than the Mackinnon critical value for the series to be stationary or have a P-value that is less than the 5% level. Therefore, the results in Table 4.1 shows that all series were stationary after first difference apart from firm age.

Table 4.1
Unit root test.

Variable	ADF Test Statistic	Mackinnon Critical Value @5%	P-value	Order of Integration	Assessment
EXPPERF	-4.12330	-2.95402	0.0000	I(1)	Stationary
MARKINNO	-5.74456	-2.95402	0.0000	I(1)	Stationary
PRODUCTINNO	-5.41307	-2.95402	0.0001	I(1)	Stationary
FIRMAGE	-4.49659	-2.95112	0.0011	I(0)	Stationary
COOPNIGUNI	-5.93934	-2.95402	0.0000	I(1)	Stationary
PROCESSSINNO	-5.74456	-2.95402	0.0000	I(1)	Stationary
COOPRESINS	-5.56776	-2.95402	0.0001	I(1)	Stationary

Table 4.2
Cointegration test.

Hypothesized No of CE(s)	Eigenvalue	Trace Stat	0.05 Critical val	Prob**
None*	0.825588	168.2481	125.6154	0.0000
At most 1*	0.750836	110.6191	95.75366	0.0032
At most 2	0.550729	64.76079	69.81889	0.1185
At most 3	0.407202	38.35651	47.85613	0.2867
At most 4	0.325271	21.10075	29.79707	0.3514
At most 5	0.197376	8.117092	15.49471	0.4530

4.2. Cointegration test

Testing for cointegration allows us to check whether relationships are empirically meaningful. By applying the Johansen test (Johansen, 1991), we find evidence of cointegration among the variables in the model as shown in Table 4.2 below. The decision rule for cointegration is based on the trace statistics being greater than the critical value at the 5% level of significance. This shows that there are at least 1 co-integrating equations present.

4.3. The Stock-Watson DOLS long-run model

Given the presence of cointegration in the model, we established a long-run relationship among the variables. The results of the Stock-Watson dynamic model are shown in Table 4.3. The Stock-Watson DOLS parameter estimates were modeled including 1 lag and 1 lead ($j = \pm 1$) of the equilibrium error without changing the results to any significant degree. According to Newey and West (1987), standard errors in small samples are robust and they allow for valid inferences to be made on coefficients entering as regressors in models both in levels and in log forms.

From the regression summary in Table 4.3 (Model 1), we find a positive relationship between product innovation and export performance. Since the t-value of 0.67394 is less than the critical t-value at the 5% level of significance, we rejected (H1a). However, the results reveal a statistically significant relationship between process innovation and export performance (H1b). It is significant at a 5% level with t-values of 2.36502. Hence, a 1% increase in process innovation leads to an increase in export performance by 809.6%.

Furthermore, we find evidence for a positive relationship between marketing innovation and export performance at the 5% level of significance with *t*-values of 2.79906. Moreover, a 1% increase in marketing innovation leads to an increase in export performance by 39.5%. The results support (H2). Regarding (H3), we adopted a second model as shown in Table 4.3 (Model 2) above. We looked at the combined effect of technological and marketing innovations on export performance among manufacturing firms in Nigeria. The summary of the results shows that only technological innovation (product innovation significant at the 10% level, while process innovation is significant at the 5% level) had a positive and significant impact on export performance. Marketing innovation, on the other hand, had a negative and insignificant effect. However, their combined effect is above 100%, resulting in 1324% increases in export performance in Nigerian Manufacturing firms.

Finally, in (H4) we analyzed two types of cooperation, namely, collaboration with public research institutions (outside Nigeria) and collaboration with universities (within Nigeria). The results from Model 1 show that only collaborations with public research institutes abroad had a positive and significant impact on export performance. These results show that an increase in the number of collaborations with public research institutes positively contributes to export performance. Precisely, a 1% increase in cooperation leads to an increase in export

Table 4.3
Stock-Watson Dynamic OLS Long-run Parameter Estimates of Innovation Types and Export Performance in Manufacturing Firms in Nigeria. $M = [C, \alpha, \rho, \beta, \gamma, \tau, \theta]$, $X = [1, LEXPPERF_t COOPNIGUNI_t COOPRESINS_t MARKINNO_t PROCESSINNO_t PRODUCTINNO_t FIRMAGE_t]$

Variable	Coefficient Model 1	t-statistic Model 1	Coefficient Model 2	t-statistic Model 2
Constant	-87.2534	-5.9915	-39.266	-3.61376
PRODUCTINNO	0.144876	0.67394	0.63579	1.92022
COOPNIGUNI	-9.16478	-1.0604		
PROCESSINNO	8.096430	2.36506	13.2427	3.82126
MARKINNO	0.395071	2.79906	-0.07265	-0.45645
COOPRESINS	10.14865	3.48923		
FIRMAGE	0.010585	0.20390		
Sum of square resids	0.95747		0.88355	
R-squared Adjusted	0.88014		0.81001	

Stock-Watson DOLS: Dependent Variable: LEXPPERF

performance by 1014.86% with a t-statistic of 3.489 at the 5% level of significance. Meanwhile, cooperation with Nigerian universities had a negative and insignificant impact on export performance.

5. Discussion

This paper investigates the significance of different types of innovation on export performance in the context of a developing country. Despite the substantial evidence found among firms in the developed economies, it is still unclear whether it can be sufficiently extended to developing economies, especially Africa. The institutional factors characterizing the SSA countries make such a generalization doubtful (Lee et al., 2015). These factors are more likely to exert negative impacts on their innovation activity and performance. In light of this background, we based our empirical analysis on a sample of Nigerian manufacturing SMEs and confirmed the role of innovation as an effective tool for achieving growth in export markets (Azar and Ciabuschi, 2017). Our study reveals that technological and non-technological innovations have heterogeneous impacts on the export performance of these firms.

First, while research suggests that product innovation increases competitive advantage and market shares of firms (Love and Roper, 2015), we find an insignificant relationship between product innovation and export performance of firms. Possibly, these results could be explained not only by weak institutional factors but also by the paucity of highly technically-skilled personnel and resource constraints prevalent among SMEs (Geldes et al., 2016). This is particularly true for manufacturing firms since the availability of these factors is vital for successful innovation, especially in the early phase of product development (Adam, 1982; Medase and Barasa, 2019). Second, we find a statistically significant association between process innovation and export performance. This finding is in line with evidence from both industrialized (Caldera, 2010) and developing (Gunday et al., 2011) economies. Prior evidence shows that process innovation is critical to successful market entry and higher profits in the export markets (Guillen, 2005).

Third, scholars are increasingly emphasizing the need for including non-technological innovation in the evaluation of innovation performance of firms (Mothe and Nguyen, 2010). To this end, we tested the impact of marketing innovation on export performance. The positive and significant results we found are consistent with prior evidence both from emerging and developed economies (Ozkaya et al., 2015). These findings show that the impact of marketing innovation on export performance cannot be substituted by technological innovation. Fourth, research suggests that technological and non-technological innovations complement each other, leading to greater performance (Hervas-Oliver et al., 2014). We estimated the joint effect of product, process, and marketing innovations on export performance. While the overall jointed effect is significant, our results show that technological innovations have a greater impact on export performance than marketing innovation. This finding confirms prior evidence from developed economies, which suggests that firms do not benefit from engaging in a dual-innovation strategy simultaneously (Grimpe et al., 2017). Since such a strategy requires investing in both technology and market domains, firms with limited resources might be better off with a single-innovation strategy. This is particularly true for developing country firms.

Finally, since innovation-export performance is largely contingent on how a firm interacts in its environment, we examined the possible effects of external innovation collaborations. Firms can develop or improve their innovation capabilities by collaborating with external science-based partners both in the home and foreign markets respectively. We tested the impact of innovation collaborations with Nigerian universities. We find that it is negatively related to export performance. However, our results show that collaborations with public research institutions abroad have a positive impact on export performance. Thus, while the former collaborations fail to support prior evidence from developed and emerging markets, the latter highlights the importance of science-based partners in the development of business innovations (Antonelli and Fassio 2018). Taken together, our study not only demonstrates that innovation is a vital growth strategy, especially in meeting market demands but also it shows that innovations have heterogeneous effects on export performance of firms.

5.1. Policy implications

The findings from this study have several important policy implications at the governmental level. Even though product innovation is linked to productivity both in developed and other emerging markets, our findings revealed a negative impact on export performance. As a result of its importance, we recommend that governments, both at national and regional levels, should introduce instruments that promote internal capabilities and innovation development. For example, the government can provide a SME-targeted innovation-fund that can stimulate product innovation activities. They should design and implement more policy interventions to alleviate the financial constraints faced by SMEs by improving financial market functioning. Similarly, they can offer low tax for innovative SMEs and promote intellectual property rights as a means of incentivizing product innovation investments. Second, our findings reveal that innovation collaborations with Nigerian universities have a negative impact on export performance. We recommend that the Nigerian government should invest more in local universities and public innovation centers. For example, they can provide more infrastructure, research funds, and a conducive learning environment. In other words, if innovation collaborations with foreign universities led to greater export performance, then policies that support local universities and research institutions will encourage SMEs to collaborate with them. We believe that these measures can boost

innovation and promote national productivity and export activities of SMEs.

5.2. Managerial implications

The study has some implications for SME managers. The challenges related to adapting to the fast-changing international market conditions can be managed by investing in both technology and market domains. Given that innovation has a heterogeneous impact on firm performance, SME managers should adopt a combination of innovation types that enables them to respond efficiently to the changing environment. For example, they can invest both in process innovation and marketing innovation as they have been shown to have significant impacts on export performance. Both innovation types will enable them to achieve cost-efficiency, address customers' needs, and open up new markets. Nevertheless, the managers should also be aware of the challenge of managing the trade-off between the technology and market domains. This has even more implications for SMEs in developing countries such as Nigeria due to their additional financial and human resource constraints. Managers should be careful not to spread their limited resources too thin by investing in a set of innovation types that does not fit their internal characteristics. Taken together, managers should not narrow their strategy to a particular innovation type when they can benefit from other options. However, they should be aware of the challenges of combining both product and market options given the resources and organizational requirements.

5.3. Limitations

The study has several limitations, which need to be recognized. First, while a growing body of literature shows that organizational innovation is an important factor when explaining firm performance (Hervas-Oliver et al., 2014), we could not include it in our analysis due to lack of access to an adequate dataset. Thus, we call for more research examining the impact of organizational innovation in the context of developing country firms. Second, even though we found significant support for most of our hypotheses, we cannot generalize our findings to other SSA countries due to the specificity of individual markets. However, we hope that this paper will trigger more studies on the relationship between innovations and export behavior. For example, cross-country studies of innovation behavior will enhance our understanding of export patterns of firms in SSA. Similarly, we focused on manufacturing firms, it will be interesting to consider the impacts of innovation types on a cross-industrial level. Taken together, cross-country and cross-industrial studies will improve what we know about the impacts of innovation strategies on SME performance in SSA. Third, for innovation collaborations, we used research institutions. Such a narrow measurement can limit the role of external partners in innovation development. Thus, future research is required to better analyze the roles of different types of collaboration (e.g. suppliers, customers, competitors) on the innovation performance of African firms.

6. Conclusion

Despite these limitations, this study makes several contributions to the innovation-performance literature, especially in the context of developing economies (e.g. Tekin and Hancıoğlu, 2017; Wadho and Chaudhry, 2018). First, we find an overall positive impact of technological innovations on export performance. However, unlike the majority of the empirical evidence in developed economies, our results show that process innovation plays a more important role in export performance than product innovation. This finding deviates from large evidence supporting the greater impact of product innovation on performance (Wakelin 1998). It also departs from the prevailing claim that firms engaging in process innovation in isolation run the risk of low performance (Goedhuys and Veugelers, 2012). This means that process innovation can have an exclusive impact on export performance. In this sense, we contribute to the existing literature by reinforcing the importance of cost-efficiency when pursuing international growth. Moreover, the negative results on product innovation suggest that the impact of technological innovation on firm performance is context-based. As SMEs in developing economies tend to behave differently, there is a need for more studies examining the innovation barriers and how these firms use product innovation strategy when pursuing growth in foreign markets.

Second, the impact of marketing innovation on SMEs' performance is still underexplored. Previous research focused mainly on the complementary or indirect effect of marketing innovation. In addition to providing evidence from developing market SMEs, we contribute to the literature by supporting a direct impact of marketing innovation on export performance (Mothe and Nguyen Thi, 2010). This finding is very important as it shows that developing market SMEs are increasingly reacting to the changing market environment not only through technological innovations but also through novel marketing initiatives (Grimpe et al.2017). Given the significant results obtained in this study, we call for more studies to examine the impact of various aspects of marketing innovation (i.e. product strategy, price strategy, and promotion strategy) on opening up new markets.

Third, there are still limited studies on the individual and joint impacts of product, process, and marketing innovation, especially in the developing countries. To the best of our knowledge, this study is among the first studies in SSA. Existing studies in this region place more emphasis on determinants of innovation and innovation barriers (Osoro et al., 2017), rather than on the innovation-export performance relationship. Thus, our study contributes to the literature by enhancing our understanding of the heterogeneous impacts of technological and non-technological innovation on SME export performance. This finding is important because it opens up the issue of additional competence, namely ambidexterity (Popadić and Černe, 2016). Firms investing in a combination of innovation strategies need to be ambidextrous to achieve high performance. However, there is still a paucity of studies investigating the effect of innovation ambidexterity in the context of developing economies. Thus, we call for more studies focusing on how developing country SMEs develop such second-order competences, especially in the areas of technology and market domains (Danneels, 2008).

Fourth, our results on innovation collaboration reinforce the importance of open innovation in the context of developing markets. Prior studies show that firms can improve their innovativeness and productivity by collaborating with science-based partners in the foreign markets. Our study shows that a firm's institutional background shapes its choice of external innovation partners. Nigerian SMEs preferred external innovation collaborations from abroad to local external innovation collaboration. Thus, we contribute to the literature by showing that firms are selective about their external partners. That is, they do not equally prioritize all types of innovation collaborations. Besides, the strong support for innovation collaboration (outside Nigeria) further uncovers a key internationalization motivation of developing economies firms. Namely, they expand to more efficient institutions where they can collaborate with external partners to enhance their innovation capabilities. Finally, future studies could investigate the criteria and mechanism underlying how developing markets firms select and manage their external relationships in foreign markets.

We, the authors of the above manuscript, hereby declare that we have no conflict of interest.

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