

## Knowledge management competences, exporting and productivity

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# **Knowledge management competences, exporting, and productivity: Uncovering African paradoxes**

## **Abstract**

**Purpose** – *This study investigates the importance of relational and conditional knowledge by assessing how service and signaling competences affect manufacturing firms' productivity. These relationships are explored in the context of Africa, where, paradoxically, firms selling abroad must satisfy different market demands than firms that serve only domestic markets.*

**Design/methodology/approach** – *The authors draw on the World Bank Enterprise Survey to perform a cross-sectional analysis of 4,683 manufacturing firms. These surveys cover the period 2009-2017 and 35 different African countries. We define service competence development as co-location with knowledge-intensive business service (KIBS) firms, measured through KIBS density at city level. Signaling is measured through Outward-Looking Competences (OLCs).*

**Findings:** *This paper shows that African exporters differ significantly from their non-exporting counterparts in terms of productivity and competences. External service competence generates productivity gains for exporters but has the opposite effect for non-exporters. Results consistent with previous research also show that signaling competences generate productivity gains, but the effect for firms serving domestic markets is stronger than the effect for exporting firms. We use paradoxes of learning to interpret these results.*

**Research implications/limitations** – *This study detects nuances of the African context that increase our understanding of knowledge management in emerging markets. Our findings would benefit from confirmation in a longitudinal and causal setting.*

**Practical implications** – *African exporting firms should establish mechanisms to develop joint knowledge with external partners (know-with) to enhance their competitiveness, whereas African non-exporters should prioritize building knowledge credibility.*

**Originality/value** – *The study develops a novel empirical approach to analyzing firm competences in Africa. It also shows that contextualization of existing knowledge management theories matters, opening a research avenue to test further existing theories in emerging economies.*

**Keyword:** Knowledge-intensive business services, Relational knowledge, Conditional knowledge, African firms, Contextual paradoxes, Paradoxes of learning.

**Paper type** Research paper

## 1. Introduction

In the developed world Knowledge Management (KM) is considered an important strategy for firms to obtain sustainable competitive advantage in the business environment (Davenport, 1999; Dayan, Heisig and Matos, 2017; King, 2001; Nonaka, 1994; Ofek and Sarvary, 2001; Snyman and Kruger, 2004; Zack, McKeen and Singh, 2009) and to improve innovation performance (Andreeva and Kianto, 2011; Jiménez-Jiménez, Martínez-Costa and Sanz-Valle, 2014; Du Plessis, 2007). Despite the large body of KM literature in developed countries, our understanding of how these models apply to less developed countries is still limited. Taking into consideration that most developing countries have substantial specificities (Meyer and Peng, 2016), it is important for studies to develop appropriate KM theoretical frameworks, managerial models and empirical settings that are relevant for these economies.

Understanding how firms build competences and deploy them is central to KM (Conchado et al., 2015; Del Giudice et al., 2017; Ley et al., 2008). This study focuses on two types of KM competences: (1) the capacity of manufacturing firms to develop relational knowledge by looking into manufacturing firms *knowing with* external specialized service providers (service competences); and (2) the capacity of firms to build a credible and trustworthy knowledge reputation (signaling competences). Previous empirical studies, mostly for developed economies, indicate that both service (Bustinza *et al.*, 2017; Crozet and Millet, 2017) and signaling (Lee et al., 2001) competences increase product firms' competitive advantage and performance. This is in line with Lopez and Esteves (2013) finding that, reconfiguration of firms' internal and external networks is required for organizations to improve the process of knowledge acquisition. Other evidences for developing countries also indicate positive relationship between KM and different measures of firm performance (Cheng and Huang, 2009; Harsh, 2009; Ritika, 2015). This study

contributes to KM literature by examining how internal (signaling) and external (service) KM competences affect firm productivity in Africa.

Although Africa has one sixth of the world's population and has experienced faster economic growth than other regions of the world (Africa Investment Report, 2016), Africa has received limited attention in business research (Angwin *et al.*, 2016). We argue that Africa has significant specificities relative to the “rest of the world” and that they constitute a potential source of paradoxes (Cunha *et al.*, 2016), making it essential to reconcile contradictory yet connected elements through paradox lenses (Smith and Lewis, 2011; Putnam *et al.*, 2016; Cunha and Putnam, 2017). The literature on paradoxes has explored an array of organizational and academic tensions, and its influence on management and KM literatures has increased progressively since the nineties (Schad *et al.*, 2016).

Our study aims to analyze to what extent the relationship between KM competences and productivity in Africa depends on the exporting status of the firm (Villar *et al.*, 2014). There are two specific tensions in this domain: The first is a *service tension*. In business-to-business transactions, foreign consumers demand a customer-centric relationship (Kreye, 2017), while domestic markets are still characterized by a supplier-centric setting (Gomes *et al.*, 2018a). The second is a *signaling tension*. Because different institutional rules govern economic exchanges in domestic and foreign markets in Africa (Vanino and Lee, 2018); the mechanisms for overcoming information asymmetries through signaling are region-specific (Karlan and Zinman, 2009). By assessing the region-specific moderating role of exporting status in the relationship between firm competences and productivity, we aim to contextualize KM theories. This aim responds to recent calls to contextualize management research by testing the relevance of established theories in developing economies (Teagarden *et al.*, 2018).

The empirical analysis uses cross-sectional data for a large sample of African manufacturing firms from the World Bank's Enterprise Survey (WBES). This survey provides a representative sample of firm-level data on different areas for a substantive number of African firms in both manufacturing and service sectors. The uniqueness of the survey allows analyses and comparison of firm level heterogeneities for multiple countries. The richness of the survey has made it a popular choice for studies on developing markets (Jensen *et al.*, 2010; Luo and Bu, 2016; Vendrell-Herrero *et al.*, 2017). The sample used in this study contains information for over 4,000 manufacturing firms, of which approximately one fourth are exporters. The results primarily show that the effects of KM competences differ between exporting and non-exporting firms.

The empirical design underpins additional novelties of this research. First, we link service competences to the exponential growth of external firms providing knowledge-intensive business services (KIBS), a key factor in the consolidation of knowledge-based economies (Muller and Zenker, 2001; Shearmur and Doloreux, 2009; Simmie and Strambach, 2006) and competitive manufacturing fabrics (Lafuente *et al.*, 2017; Seclen-Luna and Barrutia-Güenaga, 2018). For the African context, we find that knowledge-intensive firms, KIBS, co-location has positive effects on labour and total factor productivity among exporters but a negative effect among non-exporters. From a methodological view, this is the first study that associates manufacturing firms' co-location with knowledge-intensive firms in Africa and determines whether this process of external service knowledge acquisition increases productivity for domestic and exporting firms. From a theoretical standpoint, our findings contribute to the literature by challenging traditional views that the benefits of relational knowledge are evenly distributed throughout the business ecosystem (Muller and Zenker, 2001; Shearmur and Doloreux, 2009; Bailey and De Propris, 2014; Corrocher and Cusmano, 2014).

In addition, we argue that African firms can increase productivity by leveraging signaling competences. To test this hypothesis, we resort to the concept of Outward-Looking Competences (OLCs), proposed by Vendrell-Herrero *et al.* (2017). The authors define OLCs as organizational competences that send strong knowledge signals usually acquired by obtaining exclusive licenses or quality certifications and/or developing and using appropriate intra- and internet communication channels. Introducing OLCs into the model contributes to existing KM research as the relationship between OLC and productivity among non-exporters has not been examined in previous studies.

A further novelty of this research is how counter-intuitive results are explained. For instance, the findings show that having access to knowledge negatively impacts productivity of non-exporters', whereas the benefits associated with signaling knowledge competences are specific to non-exporting firms. We use paradoxes of learning (Schad *et al.*, 2016) to explain these findings by arguing that the paradoxes of change vs. stability (Gaetz and Smith, 2008; Farjoun, 2010) and exploration vs. exploitation (March, 1991; Rasich and Birkinshaw, 2008; Lavie *et al.*, 2010) can help reconcile evidence with theory and provide plausible explanations of our counter-intuitive findings.

The remainder of this article is structured as follows. The next section presents our theoretical background and develops the hypotheses. The third section describes the database and variables used in the analysis. In the fourth section, we present the empirical evidence interpreted through paradoxes lenses. The last section provides discussion, limitations, and implications of our findings for future research.

## 2. Theoretical background

KM is important for designing and implementing firm strategy (Dayan, Heisig and Matos, 2017), and empirical evidences suggest that this is positively linked to organizational and financial performance (Zack, McKeen and Singh, 2009). Previous studies on knowledge management have focused largely on organizational (Nonaka, 1994; Paruchuri and Awate, 2017) and procedural (know-how) knowledge (Alavi and Leidner, 2001). However, as noted by Zack (1999), firms can obtain or transfer knowledge through other means, including, declarative (know-about), causal (know-why), relational (know-with) and conditional (know-when). Our study relates closely with relational and conditional knowledge process.

The ‘know with’ process requires firms to establish inter-firm networks by implementing mechanisms for knowledge exchange (Del Giudice and Maggioni, 2014). This process of inter-firm knowledge sharing is particularly important when firms need to incorporate product features (i.e. technologies, services) that go beyond the tradition of the industry (Cruz-González et al., 2014). In the present study, we consider that African firms are technologically underdeveloped (Gomes et al., 2018a) and may need to develop specific KM competences, *service competences*, in order to access knowledge from local technological partners and to meet complex demand expectations.

Similarly, the capacity of knowledge exchange is subject to certain conditions (know-when), such as, source credibility (Isaac and Grayson, 2017). Product value therefore largely depends on the seller’s credibility in transmitting their quality attributes (Poston and Speier, 2005; Scuotto *et al.* 2017). This is especially important in Africa where there are weak institutions and inter-organizational trust issues (Karlan and Zinman, 2009; Vanino and Lee, 2018). Based on this



consideration, we consider that African firms need to develop *signaling competences* in order to gain market credibility.

Table I summarizes the interplay between KM literature, their underlying firm competences, and the contextual relevance of these theories for African firms. Table I also shows the empirical constructs used to measure signaling (outward looking competences) and service (KIBS co-location) competences. The remainder of this section discusses how firm competences are linked to productivity and the moderating role of exporting.

[Insert Table I]

## **2.1 Service competences and firm productivity**

From a meso-level perspective, two theoretical lenses consistently acknowledge the advantages of geographical proximity and human interaction in fostering relational knowledge. The first theoretical approach involves national (Lundvall, 2010) and regional (Cooke *et al.*, 1998) systems of innovation. This theoretical lens postulates that policy-makers must encourage interaction and coordination between economic agents, particularly those developing new knowledge (private laboratories, firms undertaking R&D, universities, etc.) to boost innovation within a territory, otherwise geographical proximity might not have the desired outcomes (Boschma, 2005). Policywise, this interaction is nurtured by formal creation of industrial clusters (Aranguren *et al.*, 2014) and industrial districts (Sforzi and Boix, 2018) in which firms from the same sector share skills, networks and production practices for the benefit of territorial specialization. This theory applies mostly in Europe, where there is a high concentration of SMEs (Floyd and McManus, 2005).

The second theoretical approach is the knowledge spillover theory of entrepreneurship (Audretsch and Lehmann, 2005). This theory argues that territories that are rich in knowledge have more

entrepreneurial opportunities than others, and that these opportunities are usually developed in large incumbent organizations and spill over into society through entrepreneurial projects referred to as corporate spin-offs (Chesbrough and Rosenbloom, 2002). The creation of these new firms enhances territorial development and innovation outcomes through efficient allocation of resources (Acs *et al.*, 2013)<sup>1</sup>. In developed economies, this theory applies mostly to the US, where a high concentration of large corporations can produce a large number of corporate spin-offs (D'Mello *et al.*, 2008).

These two theoretical lenses have an important commonality. The geographical proximity and co-location of innovative firms enhance relational knowledge (Bailey and De Propris, 2014). This literature gains relevance with the development of digital technologies that support the appearance of knowledge-intensive firms, which transfer value-added knowledge to manufacturers in the territory (Muller and Zenker, 2001; Simmie and Strambach, 2006; Shearmur and Doloreux, 2009). Based on the emergence of KIBS, recent studies find that the local manufacturing fabric can develop and add service offerings to products to build a process of *territorial servitization* (Lafuente *et al.*, 2017). The main contribution of this research stream is that it opens the possibility of reorienting industrial policy towards multi-sectoral approaches in which manufacturing firms and knowledge-intensive firms establish formal inter-firm networks (Del Giudice and Maggioni, 2014) by forming part of the same industrial cluster or district.

Recent studies examine this phenomenon in Europe. For instance, Horvath and Rabetino (2018) use a longitudinal data consisting of 121 European regions and show a positive relationship

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<sup>1</sup> The main criticism of this theory is that knowledge that spills over from large organizations can be proprietary. The line separating knowledge dissemination from secret disclosure is very thin. The recent trial involving Google and Uber exemplifies the resulting potential for conflict. In this case, knowledge creation in a large organization (Waymo, a Google subsidiary) flowed into a corporate spin-off subsequently acquired by Uber (New York Times, 2018). Google claims that Uber stole an industrial secret, whereas Uber argues that the knowledge that created its spin-off was simply acquired through the market. Although we acknowledge the importance of determining who is right in this dispute, such examples do not invalidate the knowledge spillover theory of entrepreneurship but strengthen it, as knowledge flowed locally in Silicon Valley until it reached Uber, which knew how to deploy it commercially.

between the entrepreneurial ecosystem and creation of new KIBS. Wyrwich (2018) also use a natural experiment of German reunification to demonstrate that new KIBS firms nurture the manufacturing sector in regions where the business fabric is less developed (e.g., former East Germany). Lastly, Gomes *et al.* (2018b) analyze the relationship between KIBS concentration and service implementation in Spanish and German regions for the period 2010-2014. Their results corroborate a strong positive linkage between these variables.

The meso-level literature can be extended to the micro-level literature that analyzes the make-or-buy decision in service implementation (Bustinza *et al.*, 2018a). This literature has become increasingly relevant after it was shown that 25-50% of manufacturers work in partnership with KIBS to enhance and customize their products (Ceci and Masini, 2011; Bustinza *et al.*, 2018b). A reason for why manufacturers partly or fully outsource the service function from KIBS is to reduce financial investment as well as to gain access to trained employees (Bigdeli *et al.*, 2018; Durugbo *et al.*, 2016; Paiola *et al.*, 2013; Rabetino *et al.*, 2017). Recent empirical research suggests that the benefits of externalizing the service function outweigh some of the drawbacks of externalization. Based on a large survey to multinational manufacturing firms it has been found that product firms knowing with external service providers obtain higher levels of innovation (Vendrell-Herrero *et al.*, 2018) and firm performance (Bustinza *et al.*, 2017b).

The contextual domain of this research (African manufacturers) presents no obstacles to the arguments described above. Since Africa's business fabric is less developed than Europe's, knowledge-intensive firms', KIBS, co-location could help manufacturing firms to design more advanced strategy by building external service knowledge competences (Metz, 2017; Wyrwich, 2018). Based on this reasoning, we formulate the following empirical hypothesis:

*H1: External service knowledge competences (KIBS co-location) are positively linked to*

*product firms' productivity.*

## **2.2 Service competence as an African paradox**

The empirical literature on KIBS co-locations implicitly or explicitly argues that the relational benefits of geographical proximity are distributed evenly within the business network ecosystem (Muller and Zenker, 2001; Shearmur and Doloreux, 2009; Bailey and De Propriis, 2014; Corrocher and Cusmano, 2014). Therefore, firm characteristics such as industry or exporting status should not have a moderating effect on the relationship between service competence and firm productivity. We believe that this result could be different for the case of Africa.

Africa is a growing presence in the global economy (Amankwah-Amoah *et al.*, 2018; Adeleye *et al.*, 2018). The introduction of digital technologies boosted the African economy and improved communication between small enterprises and end consumers (Okolo and Obidigbo, 2014; Boojihawon and Ngoasong, 2018). Yet firms in Africa must still learn technological capabilities to compete in global markets, especially when they aim to deliver services as well as products (Kreye, 2017). These firms can know with external partners (Okpara, 2012) that form part of a cluster association (Gomes *et al.*, 2018b). We therefore argue that African manufacturers face a *service tension* that can be seen as a contextual paradox (Andriopoulos and Lewis, 2009; Smith and Lewis, 2011; Cunha *et al.*, 2016).

While African manufacturers serving foreign markets must add services to their activities in order to be competitive, firms serving only domestic markets can approach customers through transactional relationships. For example, a recent study shows that firms in Senegal and Kenya are still learning about pay-per-use long-term relationships with their providers (Gebauer *et al.*, 2017).

The arguments presented above indicate that African exporters can benefit more than African non-exporters from developing inter-firm networks. As drivers of service (and technological)

knowledge, specialized service providers can enhance firms' business model in Africa, by adding a dimension to its activities that is critical to attracting consumers in external regions. Gomes *et al.* (2018a) demonstrate a positive link between association with a cluster and exporting status, suggesting that exporters rely more on external knowledge. Based on this reasoning, we hypothesize that the relationship between knowledge-intensive firms, KIBS, co-location and productivity is stronger for exporters than for non-exporters in the case of Africa:

*H1a: In Africa, the productivity gains obtained from external service knowledge competences are higher for exporters than for non-exporters.*

### **2.3 Signaling competences and firm productivity**

So far, we have discussed development of external service knowledge competences through knowledge-intensive firms', KIBS, co-location and their link to firm productivity. We now present rationales for the deployment of internal capabilities, specifically those that influence knowledge quality signals—namely, signaling competences.

Adverse selection can hinder economic exchanges (Karlan and Zinman, 2009). Such transactions often involve two parties. One party (usually the buyer) has less information and more worries about an unfair trade. The other party (usually the supplier) has full information. The potential for opportunistic behavior from the second party can lead the first party to withdraw from the transaction in order to avoid being rigged. Adverse selection significantly increases the cost of searching for and screening potential suppliers. The ability to distinguish between 'good' and 'bad' suppliers usually depends on obtaining credible information. It is thus vital that 'good' suppliers deploy signaling competences. Among the various definitions of signaling competences, this study uses the concept of Outward-Looking Competences (OLCs) from Vendrell-Herrero *et al.* (2017) and Gomes *et al.* (2018a). This concept includes quality certifications, acquisition of

licensed knowledge, and easy-to-access information through inter- or intranet communication.

Our expectation is that firms exerting higher levels of OLC will be better equipped to signal production knowledge, which is intrinsically linked to the quality and reliability of their products. As a result, the number of economic exchanges will increase. Based on this reasoning, we hypothesize that firms deploying more OLCs will have higher productivity:

*H2: Signaling competences (OLCs) are positively linked to firms' productivity.*

## **2.4 Signaling competences as an African paradox**

Despite some country heterogeneities, there is a high level of corruption (Gomes *et al.*, 2018a) and weak institutions (Vanino and Lee, 2018) in Africa. We therefore argue that, manufacturing firms in Africa face a *signaling tension* that can be seen as a contextual paradox (Cunha *et al.*, 2016). On the one hand, signaling competences are essential for manufacturing firms in Africa, as weak institutions make it necessary to resolve issues of information asymmetry through private mechanisms (Goedhuys and Sleuwaegen, 2013). On the contrary, disclosing the strength of the company might have negative consequences such as alerting corrupt politicians and consequently increasing bribery fees. In light of this signaling tension, we argue that signaling competences are especially advantageous for exporters because they can obtain the benefits of disclosing good quality signals (i.e. overcome geographical, institutional, economic, and cultural gaps with foreign customers).

This theoretical argument is consistent with previous research. For instance, Amankwah-Amoah's *et al.* (2018, p. 553) contend that signaling competences can enable exporting SMEs in Africa to “develop a capacity to be frugal: an ability to reduce the complexity and cost of producing new products and services for ‘new markets’ with an underlying mind-set of doing more with less.” Signaling competences thus enable exporters to improve their international differentiation with

limited resources. An exporter could, for example, leverage signaling competences to increase its knowledge stock by acquiring patents or licenses from international network partners (Perks and Jeffery, 2006; Shi *et al.*, 2014), thus obtaining conditions essential to competing in international markets.

Recent studies show that OLC is an important factor that can help African non-exporters to access international markets and become exporters (Gomes *et al.*, 2018a). Further, analysis of samples of exporters shows that firms with a foreign market focus increase productivity when they deploy OLCs (Vendrell-Herrero *et al.*, 2017). Based on these arguments, we hypothesize that African exporters increase productivity more than African non-exporters when deploying OLC:

*H2a: In Africa, the productivity gains from deploying signaling competences (OLCs) are greater for exporters than for non-exporters.*

Figure 1 represents visually the empirical relationships hypothesized.

[Insert Figure 1]

### **3. Data collection and methodology**

#### ***3.1 Context and data description***

Africa presents several opportunities for practitioners and academics (Kamoche, 2011; Chikweche and Fletcher, 2014; Uzo and Mair, 2014; Mellahi and Mol, 2015; Angwin *et al.*, 2016). The continent's economy has grown faster than that of the developed world, with an average growth rate of 2% during the economic recession. This growth was fueled in part by a significant increase in foreign investment in the region—roughly 30 times the investment in 1985 (Africa Investment Report, 2016). Despite the growing importance of Africa in the world economy (Amankwah-Amoah *et al.*, 2018; Adeleye *et al.*, 2018), African firms lag behind other regions in

international trade and investment flows (Ibeh *et al.*, 2012). Differences in countries and industries condition African firms' exporting capacity (Grenier *et al.*, 1999; Söderbom and Teal, 2003) and, some liabilities are shared across the continent. Research stresses little international experience, lack of resources for SMEs, limited logistics infrastructure, and high level of informal economic activities as the main factors causing low international exposure of the African economy (Ibeh *et al.*, 2012; Okpara, 2012; Dibben and Wood, 2016). Similar to firms in other regions, African firms are interested in using digital (Okolo and Obidigbo, 2014; Boojihawon and Ngoasong, 2018) as well as information and communication (Luo and Bu, 2016) technologies to enhance commercial exchanges. A striking increase in cluster policy has stimulated certain manufacturing sectors (Gomes *et al.*, 2018a; Ibeh *et al.*, 2012), but the role of knowledge-intensive firms in these economies remains largely unknown. Similar to other studies in KM, this study focuses on survey data, which unlike accounting/financial databases is able to better represent more knowledge nuances (Del Giudice and Della Peruta, 2016). The data is obtained from the World Bank Enterprise Survey (WBES), a survey specifically conducted to gather information on the business climate in developing countries. The WBES has been used extensively in previous international management studies (Cole *et al.*, 2018; Jensen *et al.*, 2010; Luo and Bu, 2016; Vendrell-Herrero *et al.*, 2017; Gomes *et al.*, 2018b). The survey uses a stratified sampling technique based on firm size, geographical region, and sector, and collects detailed information on firm sales, size, age, and export status, as well as other country-specific information. Our study uses survey rounds conducted from 2009 to 2017, partly because the survey uses the same set of questions during this period, thus ensuring consistency between waves and countries. In accordance with our research objectives, we restrict the sample to firms in the manufacturing sector. The final sample used consists of 4,683 manufacturing firms across 35 African countries.<sup>2</sup> The food and beverage

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<sup>2</sup> The countries in our sample are Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African



industry constitute 25% of the sample, followed by textiles (17%), and machinery and equipment industry (only 5%).

### 3.2 Description of variables

The main dependent variable is *labor productivity*, measured as the ratio of firm sales to wage bill, following the approach of Vendrell-Herrero *et al.* (2017). *Labor productivity* is log transformed in all estimations, implying that parameters estimated must be interpreted as elasticities. The first independent variable, service competence, is measured as *KIBS co-location* at the country-city level. The variable is constructed from additional information on service firms available in the WBES dataset, taking particular advantage of the fact that the WBES is conducted in a small number of cities per country. The sample contains 10,016 service firms and differentiates among various service sectors. In deriving our measure of knowledge-intensive firms, KIBS, , we differentiate between service firms in the communication and business sector (1,221 observations) and service firms in other service industries including retailing and restauration (8,795 observations). Service firms in communication and business sector are more knowledge-intensive and have the potential to contribute to the manufacturer's business model. We take the total number of service firms in communications and business as a share of the total number of service firms in each country  $x$ , in city,  $c$ . As some countries in our sample have been surveyed more than once, the KIBS measure takes survey year into account. Our measure of KIBS thus takes the form:

$$KIBS_{xc} = \frac{COMMS_{xc}}{TOTSERVICES_{xc}} \quad (1)$$

The top part of Figure 2 shows the share of KIBS by industry and exporting status. Exporting firms in the machinery and equipment industry have the largest share of KIBS.

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Republic, Chad, Cote d'Ivoire, Democratic Republic of Congo, Eritrea, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Namibia, Niger, Nigeria, Rwanda, Senegal, South Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

[Insert Figure 2 about here]

The other independent variable, signaling competence is measured through *Outward-Looking Competences* (OLC). Based on the rationale provided by Vendrell-Herrero *et al.* (2017), this index measures the extent to which firms use technology in their businesses. The index is constructed using three indicators of production and market knowledge (license, quality certification and website). License is a dummy variable, for which a value of 1 indicates that the firm uses technology licensed by a foreign-owned company and 0 otherwise. Similarly, quality certification takes a value of 1 if the firm currently has an internationally recognized quality certification and 0 otherwise. Lastly, for websites, a value of 1 indicates firms that actively communicate with clients and suppliers using a website, and a value of 0 indicates that firms do not use the website to communicate with clients and suppliers. Following Vendrell-Herrero *et al.* (2017), we weight the different dimensions. The OLC index is measured by assigning the following weights;  $3 \times \text{license} + 3 \times \text{website} + 2 \times \text{quality}$ )/8. The bottom part of Figure 2 shows that firms in the machinery and equipment industry have the greatest OLC. This result may occur because these industries require more investment, are generally bigger, and have the capacity to invest in technology and communications.

*Export status* is an important variable in our analysis. Firms are considered exporters if they report at least 1% of their annual sales in exports. A dummy variable with a value of 1 is assigned if the firm reported sales from exports and 0 if the firm reported no sales from exports. This definition of exporters has been used in previous literature (Cole *et al.*, 2018). 23.7% of firms in our sample are exporters. Figure 2 shows the distribution of knowledge-intensive firms, KIBS, and OLCs for exporters and non-exporters by industry.

Figures 3 to 5 illustrates the distribution of KIBS and OLC by country and export status. Figure 3

shows visible differences in the share of KIBS and OLC among firms in the various countries. Most notable is Mauritania, with a 40% share of KIBS and almost 0.5 in the OLC index. Angola has the smallest share of KIBS but a fairly high OLC index. Figure 3 also shows some interesting geographical pattern: East African countries tend to have more internal capabilities (OLCs), while West African countries have a higher tendency to use external service knowledge (KIBS co-location). For instance, in Kenya and Tanzania OLC is about 0.4 among exporters, whereas in parts of West Africa, OLC is low at around 0.13 and 0.22 in Nigeria and Cote D'Ivoire respectively. The share of KIBS concentration is higher for exporting firms than for non-exporting firms (Figures 4). In Figure 5, most countries have a higher OLC index in the exporting firm subsamples.

[Insert Figures 3 to 5 about here]

Table II provides definitions of the variables used in the study. Table III presents summary statistics of those variables and the results of the differences in means tests for exporting and non-exporting firms. Exporting firms have higher labor productivity than non-exporting firms. The mean differences between these firms are significant, a result consistent with arguments in the literature that more productive firms self-select into exporting (Melitz, 2003). Similarly, the differences in means for KIBS and OLCs in exporting vs. non-exporting firms is statistically significant, with evidence that exporting firms have more highly adapted technology and are located in areas with higher concentrations of KIBS firms. Figure 6, which presents the distribution of labor productivity, reinforces these results visually (KIBS co-location and OLCs by firm exporting status). According to the Kolmogorov-Smirnov test the distributions for these three variables differ for exporting and non-exporting firms, yielding differences statistically significant at 1%. This significant difference in competences and productivity distributions partially justifies

why it is important to estimate separate regressions for exporting and non-exporting firms.

[Insert Tables II & III and Figure 6 about here]

#### 4. Results

We estimate the effects of access to external service knowledge and OLCs on labor productivity using OLS. The equation describing this relationship takes the form;

$$LnProd_i = \beta_1 KIBS_i + \beta_2 OLC_i + \beta_3 X_i + \beta_4 Z_c + \delta_t + \varepsilon_i \quad (2)$$

where  $LnProd$  is the log of labor productivity of firm  $i$ .  $KIBS$  and  $OLC$  are as previously defined.  $X_i$  is a vector of firm characteristics including size, industry, firm age, and manager's experience.  $Z_c$  is the vector of other control variables, including country dummies to reflect differences in economic development and any possible influence of country-specific effects that could affect firm productivity. Year dummies ( $\delta_t$ ) are included to identify the data collection wave and capture time patterns on labor productivity. Following the results of the Kolmogorov-Smirnov test reported in Figure 6, Equation (2) is also estimated separately for exporting and non-exporting firms with the same set of independent and control variables.

Table IV presents the results for the effects of knowledge-intensive firms', KIBS co-location and OLCs on labor productivity for the full sample and subsamples of exporting and non-exporting firms. We estimate Equation (2) with and without variables that capture firm characteristics contained in vector  $X_i$ . Columns (1) to (3) report the results with only country and year dummies. Columns (4) to (6) present the results including all explanatory and control variables. The results are qualitatively comparable, but the relevant parameters are slightly less significant when all explanatory and control variables are included.

[Insert Table IV about here]

Column (1) shows significant positive effects of OLCs on labor productivity for the entire sample but a nonsignificant positive effect of KIBS co-location. Specifically, a 1% increase in the OLC index is associated with 0.77% increase labor productivity.<sup>3</sup> This result is significant at 1%. The results for the full sample support Hypothesis 2 but reject Hypothesis 1. Similar result is obtained when firm-level dummies are introduced in the analysis (see Column 4).

The analysis of exporting and non-exporting firm subsamples provides a better understanding and enables us to test Hypotheses 1a and 2a. The results for exporting firms (Columns (3) and (6)) strongly support Hypothesis 1a, suggesting that KIBS co-location and labour productivity are positively related for exporting firms. Specifically, a 1% in the share of KIBS is associated with productivity increase of 3.4% (Column 6) to 3.7% (Column 3). This result is significant at 1% in Column (3) and 5% in Column (6). This finding is even more important when we compare these parameters with those estimated for the subsample of non-exporters. Non-exporters' productivity decreases significantly as the firm is exposed to higher concentrations of KIBS. KIBS concentration is negatively related to labour productivity of non-exporters (0.34% (Column 5) and 0.37% (Column 2)). This finding opens an empirical paradox, as the KM literature generally conceptualizes exposure to knowledge as neutral or having positive consequences for firm operations but not as damaging firm productivity. The next section provides further discussion of these findings.

With regards to OLC, the results show a positive relationship with labour productivity among both exporters and non-exporters (although it becomes insignificant for exporters when full set of controls are included). The effect is however larger for non-exporters. This result rejects Hypothesis 2a, that OLC should be particularly relevant for exporters. The finding that OLC is not

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<sup>3</sup> The true effect of the OLC index is given by  $\exp(\beta)-1$ , such that, with a coefficient of 0.569, the true effect of a change from 0 to 1 in the OLC index equals 0.766.

significantly related to labour productivity (once firm-level dummies are included) among exporters contradicts existing studies (Vendrell-Herrero *et al.*, 2017). We argue that this result could indicate an empirical paradox and discuss its implications in the next section.

Further robustness checks were performed. Firstly, we used Total Factor Productivity (TFP) based on Olley and Pakes' (1996) method as an alternative measure of firm productivity. The model using TFP as dependent variable including the complete set of controls is shown in Appendix A1. The results are qualitatively the same as those reported in Table IV. Secondly, we use Principal Component Analysis to generate a score that is then used as a measure of OLC. Appendix A2 shows results from this approach. The results from these estimations were similar to those reported in Table IV. Lastly, in results not reported<sup>4</sup>, we used different weights and also equal weights  $(3 \times \text{license} + 3 \times \text{website} + 3 \times \text{quality})/9$  to calculate the OLC index. For the different weights, we experimented with alternative weight assignments. For instance, we allocate 0.4 for license and websites, and 0.2 for quality. We do this for different combinations. The results from these regressions all showed that the current measure of OLC is not sensitive to weight variations.

## **5. Discussion: Interpreting the evidence through paradoxes-of-learning lenses**

In previous sections, we developed contextual paradoxes based on well-documented African specificities. We argued that the nature of African domestic markets requires African exporters to develop different sets of KM competences. As our results do not fully reflect these expectations, we reconcile our theoretical expectations through well-documented paradoxes of learning, a field of research that is intrinsically related to KM (Hislop, Bosua and Helms, 2018).

### **5.1 Paradox 1: Is access to knowledge a liability?**

The first paradox identified in our results suggests that access to knowledge is a liability for

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<sup>4</sup> Empirical evidence explained in the text but not reported in the tables is available upon request.

non-exporting manufacturing firms, even though according to established KM literature additional knowledge should not damage firm operations and productivity (Nonaka, 1994). We argue that this paradox falls under the change vs. stability paradox. In the extensive trajectory of the change vs. stability literature, e.g. Gaetz and Smith (2008), change and stability are usually seen as incompatible, but recent research has found the two to be interdependent and mutually enabling (Farjoun, 2010). For example, based on longitudinal data on invoice processing in various organizations, Pentland *et al.* (2011) establish that routines must be seen as generative dynamic systems, such that repetition leads to variety, not stability. Similarly, in a longitudinal study covering a 10-year period in the insurance industry, Klarner and Raisch (2013) find that regular and progressive change is superior to irregular and unexpected change.

Our sample contains two groups of firms, exporters and non-exporters. Because exporting firms serve various types of consumers, they must adapt continuously to changes in demand. Non-exporting firms, on the other hand, face domestic markets only and thus operate in a more stable environment. The emergence of service business models has produced a sudden change in the business environment, affecting all product firms. Manufacturers that export their products can adapt better to the current conditions, as these organizations work in constantly changing conditions and may have developed some absorptive capacity (Zahra and George, 2002) that enables them to internalize knowledge quickly. Exporting manufacturers use local knowledge-intensive firms to develop their bundles of products and services. Non-exporters, in contrast, may resist change and may not have achieved the same levels of absorptive capacity. In territories with more exposure to service knowledge, non-exporting firms will thus be disadvantaged even when serving less complex domestic markets.

## **5.2 Paradox 2: Is knowledge signaling more important for domestic than for foreign markets?**

The second paradox identified in our results challenges current research arguing that formal signaling knowledge competences are especially important for exporting firms located in emerging markets (Vendrell-Herrero *et al.*, 2017). Our findings indicate that, after controlling for a number of fixed effects, OLC does not create additionalities for African exporting firms. Rather, it generates productivity gains for non-exporters. We explain these findings along the lines of exploration vs. exploitation paradox (March, 1991). The exploration/exploitation duality grounds a solid literature on how organizations deploy ambidextrous competences (Raisch and Birkinshaw, 2008; Lavie *et al.*, 2010). Firms that continuously exploit current knowledge while exploring new innovation opportunities can create a virtuous cycle of innovation linked to long-term success (Andriopoulos and Lewis, 2009; Badawy, 2017). While exploitation is usually linked to short-term increases in performance and productivity, exploration grounds future competitiveness. The ambidextrous capacity of jointly deploying exploration and exploitation competences usually resides in senior leadership, which must develop the ability to engage in complex cognitive processes (Smith and Tushman, 2005).

This paradoxical result might plausibly be explained as follows: Whereas non-exporters use signaling competences to differentiate themselves from other domestic competitors and exploit a competitive advantage, exporters turn to signaling competences to exploit new foreign markets for future gains. This explanation is consistent with the fact that exporters have, on average, higher levels of OLC than non-exporters (see Table III and Figure 6). That exporters and non-exporters use OLC for different reasons may explain the differences in performance obtained for those knowledge competences. Non-exporters use signaling competences to create short-term



advantages and differentiate themselves from local competitors, generating productivity gains in the short run. Since exporters use signaling competences to explore new markets, they may gain productivity at a future stage not observable in our cross-sectional setting.

## **6. Conclusions**

### **6.1 Academic implications**

KM literature has extensively conceptualized and analyzed organizational and procedural knowledge (Nonaka, 1994; Alavi and Leidner, 2001; Paruchuri and Awate, 2017), with little focus on other types of knowledge, including relational and conditional knowledge (Zack, 1999) and their underlying (service and signalling) competences (Conchado *et al.*, 2015). This study fills this research gap by theoretically and empirically examining the interplay between KM competences, firm internationalization and productivity. We do this by employing measures in innovation (KIBS co-location) and international business (OLC) to establish a measurement framework (Nicotra *et al.*, 2018) to test our hypotheses. While these hypotheses have been partially tested in other contexts (Bustinza *et al.*, 2017b; Vendrell-Herrero *et al.*, 2017, 2018), the present research examines these relationships in developing economies, since traditional theories that apply to Western economies may not apply to less-developed countries (Teagarden *et al.*, 2018). More specifically, our study examines these competences in Africa and tests contextual tensions in how firm competences affect productivity. It seeks specifically to determine whether the underdevelopment of African domestic markets (Hopkins, 2014) enables exporting firms to develop a distinctive set of service and signaling competences.

The empirical analysis is based on a sample of manufacturing firms in 35 countries using data from WBES. Consistent with the work of Goedhuys and Sleuwaegen (2013), the results for the full sample illustrate the importance of signaling competence in overcoming problems of

asymmetrical information in Africa. Contrary to innovation theories in favor of building relational knowledge (i.e., territorial servitization, clusters), however, the results reject the hypothesis that external service knowledge increases productivity.

Further interesting results are obtained for the subsample of exporting and non-exporting firms. First, exporting firms benefit from higher external service knowledge competence. We argue that this context-specific result is based on the differences between Africa and foreign markets. This result contributes to the literature by challenging traditional innovation (Shearmur and Doloreux, 2009; Bailey and De Propriis, 2014; Corrocher and Cusmano, 2014) and KM (Del Giudice and Maggioni, 2014; Cruz-González et al., 2014) views that the benefits of building a network ecosystem are evenly distributed throughout the business ecosystem.

Two paradoxical results emerge when considering the moderating role of exporting status. An important contribution of this study is to reconcile evidence and theory by drawing on the growing literature on paradoxes of learning, which are directly linked to KM (Hislop *et al.*, 2018). The first paradoxical result is that access to knowledge may be a liability for African domestic firms. The change vs. stability paradox (Gaetz and Smith, 2008; Farjoun, 2010) suggests a plausible explanation. African firms serving domestic markets may lack absorptive capacities (Zahra and George, 2002) and may not be prepared for radical changes. The second paradoxical result indicates that signaling competences seem to be more valuable for domestic firms, contradicting research in other contexts (Vendrell-Herrero *et al.*, 2017). This paradox is resolved through the exploration vs. exploitation paradox (March, 1991; Raisch and Birkinshaw, 2008; Lavie *et al.*, 2010). Since exporters use signaling competence to explore foreign markets, productivity gains are limited in the short run. Non-exporters, in contrast, use signaling competences to exploit market opportunities, obtaining immediate productivity gains.

## 6.2 Managerial and policy implications

From a theoretical standpoint, our research suggests the strong need for further contextualization of KM theories in Africa. According to the results, manufacturing firms in Africa differ from those included in “Western” models. This conclusion builds on previous findings that criticize the use of theories established to explain Western business environments for the context of Africa (Gomes *et al.*, 2018a). To this end, our contextual results have the potential to influence political and managerial agenda in Africa.

In line with theoretical predictions from agglomeration and systems of innovation (Lafuente *et al.*, 2017; Seclen-Luna and Barrutia-Güenaga, 2018; Sforzi and Boix, 2018), it is important for regional and local governments to consider integrating knowledge-intensive firms into formal and informal manufacturing clusters when designing industrial policies. Our evidence supports the development of more multi-industry clusters to enhance important competences for firms currently exporting or considering exporting in the future.

Our findings can also inform managerial decisions. KM optimal strategy in African manufacturing firms depends on the firm’s exporting status. Our evidence shows that exporting firms must build an inter-firm knowledge-intensive network to enhance their business models. This strategy is linked to higher productivity levels, which has potential to enhance foreign consumer satisfaction levels, and consequently improve sustainable competitive advantage of firms based on superior knowledge (Ofef and Sarvary, 2001). However, access to knowledge-intensive networks could damage productivity of non-exporting firms. Managers of African domestic manufacturing firms may need to build organizational absorptive capacity before turning to external technological/service providers. In addition, managers should prioritize building a trustworthy reputation in the market by developing business practices that leverage production and market

knowledge in the eyes of potential domestic customers. Based on our findings, these practices include the recognition of external quality certification bodies, the acquisition of foreign technology, and the use of webpages.

### **6.3 Limitations and future research**

The empirical analysis is supported by a large and reliable database – WBES. Two of the relevant variables (labour productivity and signaling capabilities) follow standard academic procedure (Vendrell-Herrero *et al.*, 2017; Gomes *et al.*, 2018a) and we have reported additional robustness tests with other measures (TFP) and weights (PCA). We acknowledge that our measure of signaling competences (OLC) focuses on identifying formal competences (licenses, quality certifications, webpage), neglecting other informal competences that also serve to overcome problems of information asymmetry (i.e. trust). We make this empirical choice as informal competences are not observable in WBES. This limitation opens an avenue for further KM studies comparing the effect of formal and informal capabilities on firm productivity.

The approach used to derive a measure of external service competences (KIBS co-location) is new to research in this area of study. We acknowledge, however, that knowing how actual collaboration (know-with process) with KIBS occurs will enhance understanding of how service knowledge is shared. This is important as previous research acknowledges that proximity per se does not necessarily result in knowledge sharing and innovation. There are negative aspects of proximity, including lock-in problem and coordination failure (Boschma, 2005). As the WBES database does not provide information on how collaboration manufactures and KIBS coordinate and share knowledge, this question remains open for future research.

Lastly, our cross-sectional analysis does not capture the dynamic nature of the competences analyzed. Although the relationships are significant, other factors not included in the current

model may also play an important role. Future research will need to corroborate the results in a longitudinal setting to determine some of the causal mechanisms.

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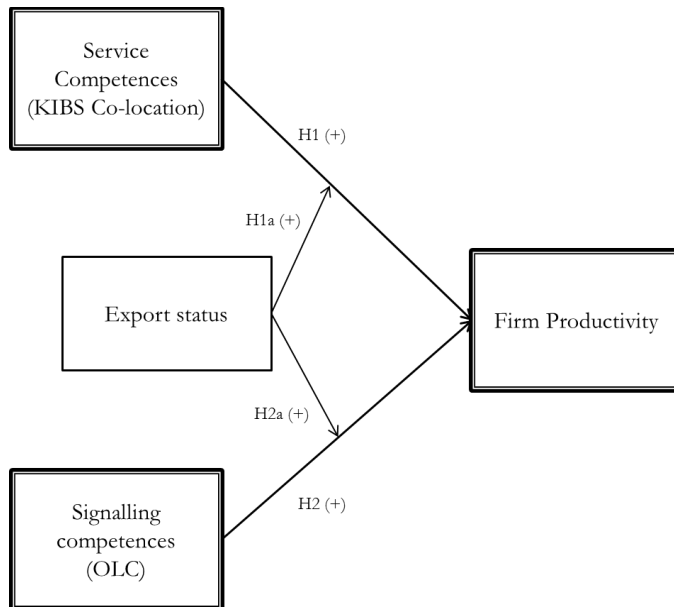
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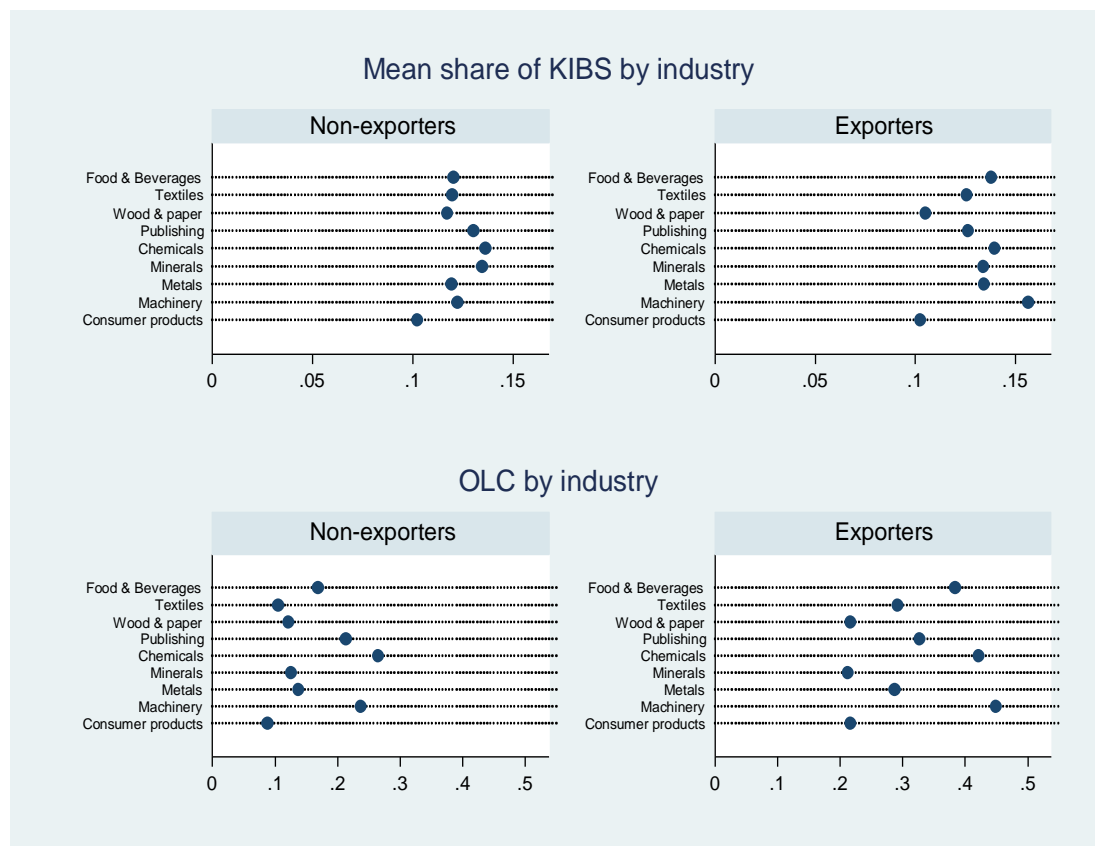
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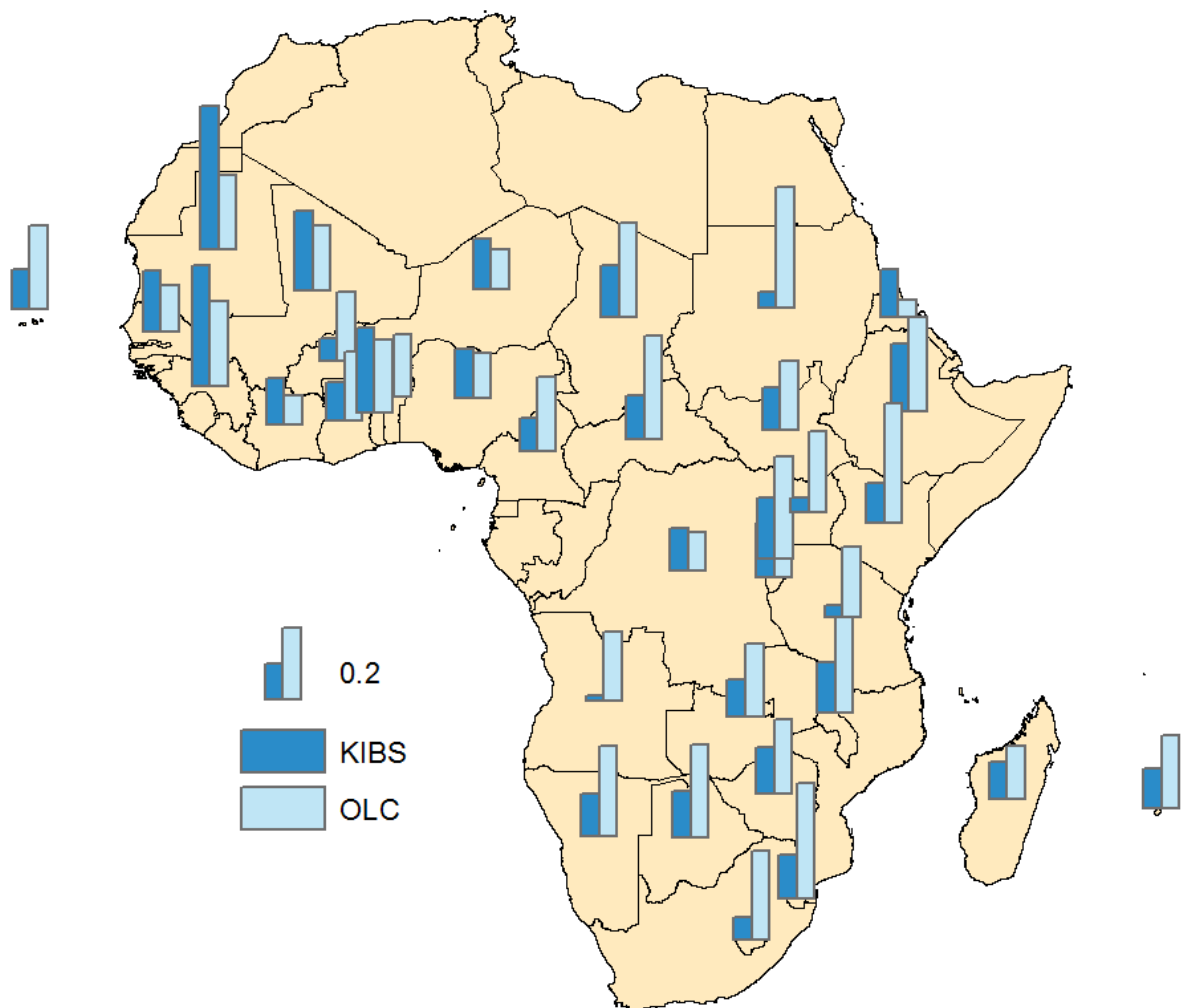
**Figure 1 Hypotheses**



**Figure 2 KIBS and OLC distribution by industry and export status**

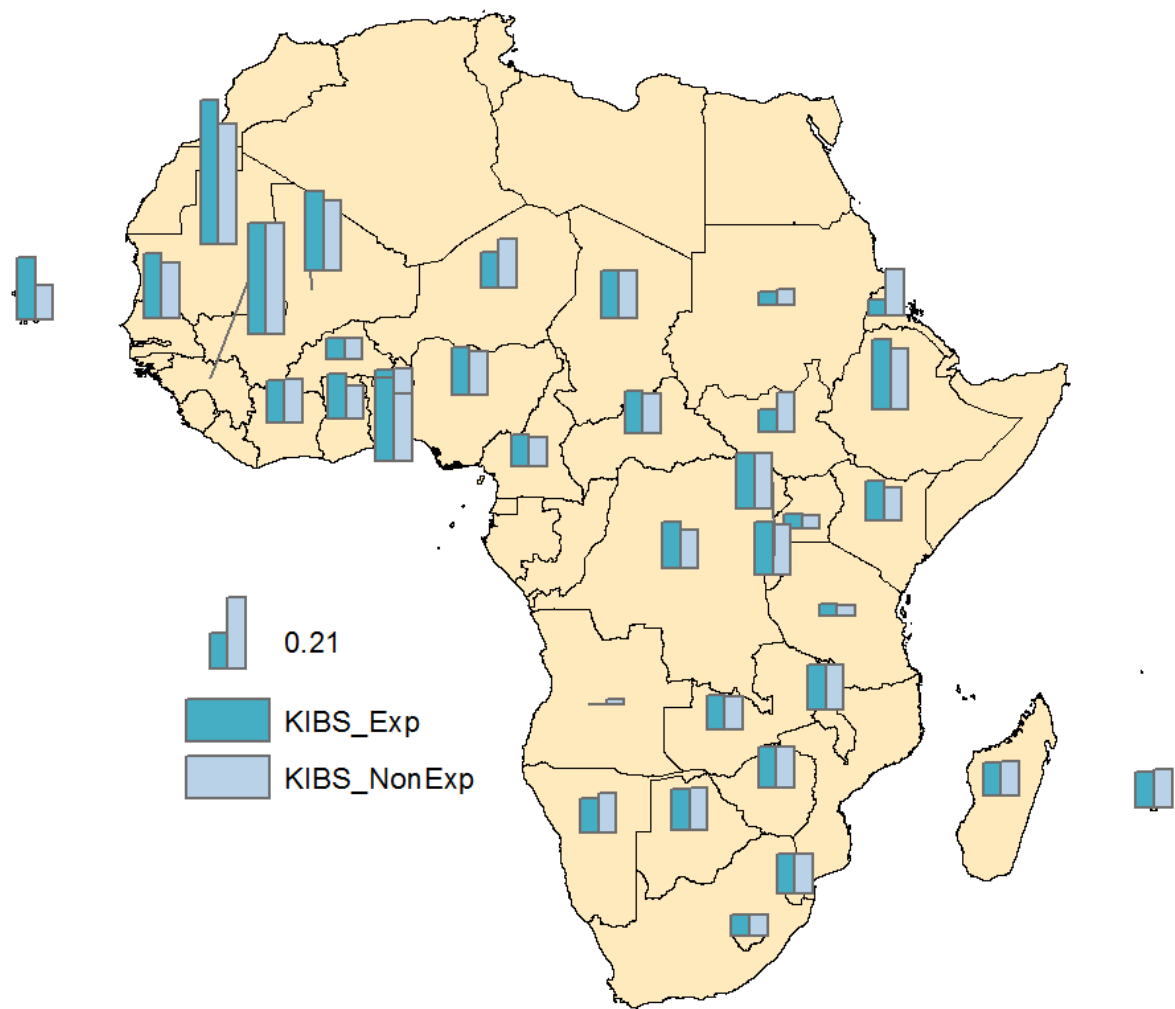


**Figure 3** Share of KIBS co-location and OLCs by country



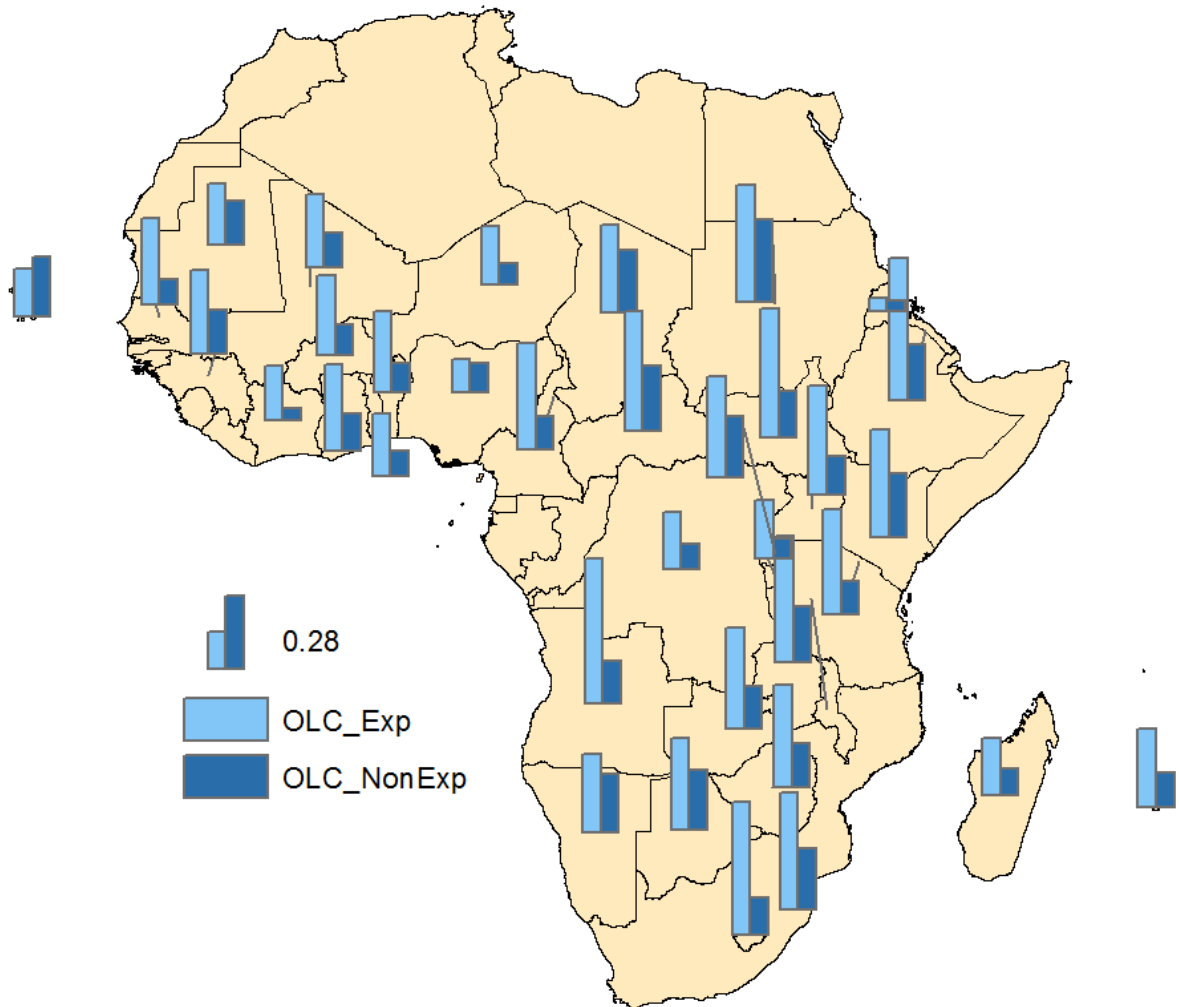
Note: The number 0.2 next to the chart symbol indicates the value represented by the longer bar in the chart. The shorter bar in the chart symbol represents half of that value.

**Figure 4** Share of KIBS co-location by country and export status

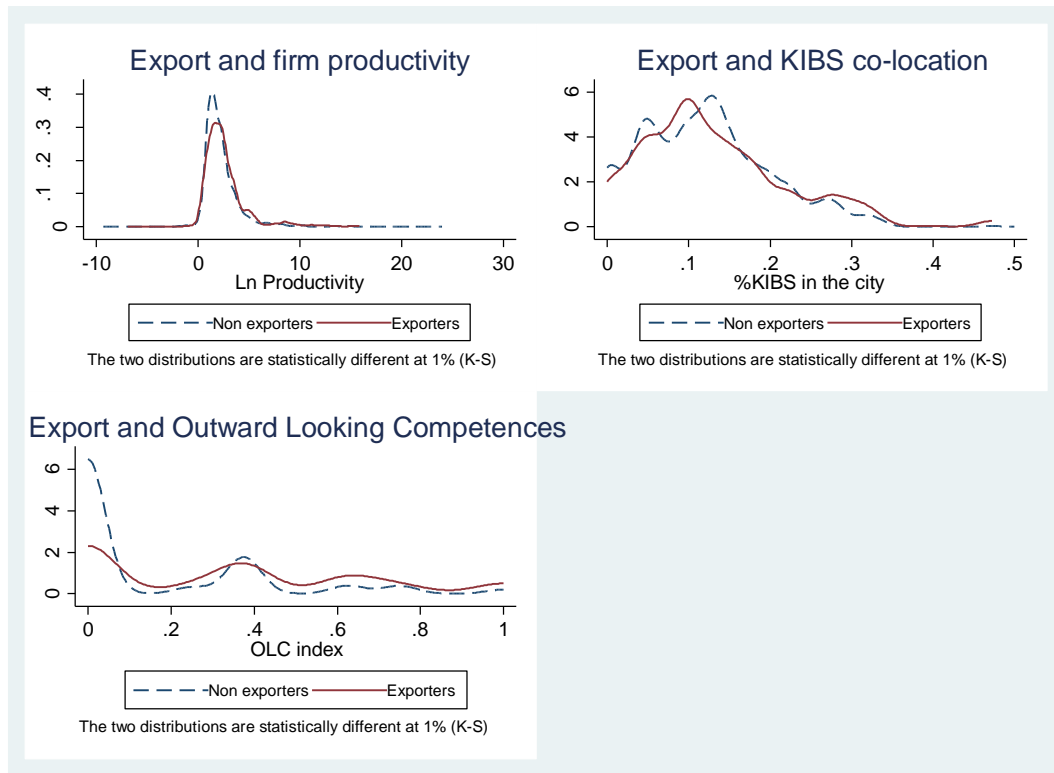




**Figure 5** Share of OLCs by country and export status



**Figure 6** Firm productivity, KIBS co-location, and outward-looking competence distributions for exporters and non-exporters.



## List of Tables

**Table I** Barriers to Knowledge Management in Africa, their underlying firm competences to be developed and empirical constructs used.

| <b>Theory/context/construct</b> | <b>Concept 1</b>  | <b>Concept 2</b>  |
|---------------------------------|---|---|
| Knowledge management literature | Know-with / Knowledge exchange / Access to knowledge            | Know-when / conditional knowledge / Knowledge-credibility |
| African issue                   | Lack of inter-firm collaboration in product-service development | Lack of trust and need to demonstrate knowledge value     |
| Competence to be developed      | Service competence  | Signaling competence                                      |
| Empirical construct             | KIBS co-location  | Outward looking competences                               |

**Table II** Definition of variables

| <b>Variable</b>       | <b>Definition</b>  |
|-----------------------|--|
| Labor productivity    | Log of labor productivity. Measured as ratio of firm sales to cost of labor.   |
| KIBS co-location      | Share of firms in communications and business as total service firms in city where firm is located.  |
| OLCs                  | Index of the extent to which firms use technology.   |
| Export                | Dummy variable. A value of 1 indicates that the firm reported at least 1% of annual sales in export. 0 otherwise.                              |
| Inexperienced manager | Dummy variable. A value of 1 indicates that the manager has at most one year of experience. 0 if more than 1.                                  |
| New firm              | Dummy variable. A value of 1 indicates that the firm has been in existence for less than five years. 0 otherwise.                              |
| Firm size             | Categorical variable for total number of full-time employees in the firm. 1 if 5-19 workers; 2 if 20-99 workers; and 3 if 100 or more workers. |
| Year                  | Dummy variable that captures the survey year.  |
| Industry              | Industry sector of the firm  |

**Table III** Summary statistics

|                       | (1)           |      | (2)       |      | (3)                 |          |
|-----------------------|---------------|------|-----------|------|---------------------|----------|
|                       | Non-exporters |      | Exporters |      | Difference in means |          |
|                       | Mean          | SD   | Mean      | SD   |                     |          |
| Productivity (ln)     | 2.25          | 1.76 | 2.56      | 1.96 | -0.31***            | (-4.93)  |
| KIBS co-location      | 0.12          | 0.08 | 0.13      | 0.09 | -0.01***            | (-3.87)  |
| OLCs                  | 0.15          | 0.25 | 0.33      | 0.33 | -0.18***            | (-19.15) |
| Inexperienced manager | 0.10          | 0.30 | 0.10      | 0.29 | 0.001               | (0.54)   |
| New firm              | 0.12          | 0.33 | 0.06      | 0.25 | 0.06***             | (5.24)   |
| Firm size             | 1.52          | 0.66 | 2.04      | 0.79 | -0.535***           | (-21.65) |
| <i>N</i>              | 3,448         |      | 1,067     |      | 4,515               |          |

*t*-statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table IV** OLS analysis

|   | (1)                 | (2)                 | (3)                | 4)                | (5)                | (6)                |
|---|---------------------|---------------------|--------------------|-------------------|--------------------|--------------------|
|   | Full-sample         | Non-Exporters       | Exporters          | Full-sample       | Non-Exporters      | Exporters          |
| KIBS co-location<br>(Service competences) | 0.0782<br>(0.319)   | -0.462*<br>(0.270)  | 1.542**<br>(0.698) | 0.140<br>(0.354)  | -0.424*<br>(0.238) | 1.481**<br>(0.567) |
| OLCs<br>(Signaling competences)           | 0.569***<br>(0.164) | 0.565***<br>(0.167) | 0.403*<br>(0.237)  | 0.329*<br>(0.171) | 0.322*<br>(0.180)  | 0.288<br>(0.210)   |
| Country FE                                | YES                 | YES                 | YES                | YES               | YES                | YES                |
| Year FE                                   | YES                 | YES                 | YES                | YES               | YES                | YES                |
| Size FE                                   | NO                  | NO                  | NO                 | YES               | YES                | YES                |
| Experience FE                             | NO                  | NO                  | NO                 | YES               | YES                | YES                |
| New firm FE                               | NO                  | NO                  | NO                 | YES               | YES                | YES                |
| Industry FE                               | NO                  | NO                  | NO                 | YES               | YES                | YES                |
| <i>Observations</i>                       | 4,683               | 3,566               | 1,077              | 4,553             | 3,448              | 1,067              |
| <i>R</i> <sup>2</sup>                     | 0.104               | 0.116               | 0.107              | 0.114             | 0.129              | 0.145              |

Dependent variable: Ln Labor productivity

Clustered (by country) Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Appendix

**Table A1. Effects of KIBS and OLC on Total Factor Productivity (TFP)**

|   | (1)<br>Full-sample | (2)<br>Non-exporters | (3)<br>Exporters  |
|---|--------------------|----------------------|-------------------|
| KIBS co-location<br>(Service competences) | -0.562<br>(0.618)  | -1.285*<br>(0.707)   | 1.547*<br>(0.769) |
| OLCs<br>(Signaling competences)           | 0.436*<br>(0.242)  | 0.474**<br>(0.233)   | 0.543*<br>(0.316) |
| Country FE                                | YES                | YES                  | YES               |
| Year FE                                   | YES                | YES                  | YES               |
| Size FE                                   | YES                | YES                  | YES               |
| Experience FE                             | YES                | YES                  | YES               |
| New firm FE                               | YES                | YES                  | YES               |
| Industry FE                               | YES                | YES                  | YES               |
| Observations                              | 4,116              | 3,102                | 980               |
| R-squared                                 | 0.300              | 0.281                | 0.429             |

Dependent variable: Ln TFP. Clustered (by country)

Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table A2. Effects of OLC (measured through Principal Component Analysis, PCA) on labour productivity**

|                     | (1)<br>Full-sample   | (2)<br>Non-exporters | (3)<br>Exporters    | (4)<br>Full-sample   | (5)<br>Non-exporters | (6)<br>Exporters    |
|---------------------|----------------------|----------------------|---------------------|----------------------|----------------------|---------------------|
| KIBS<br>co-location | 0.0683<br>(0.313)    | -0.469*<br>(0.269)   | 1.527**<br>(0.687)  | 0.133<br>(0.350)     | -0.429*<br>(0.238)   | 1.466**<br>(0.556)  |
| OLC: PCA            | 0.132***<br>(0.0349) | 0.131***<br>(0.0359) | 0.0983*<br>(0.0497) | 0.0761**<br>(0.0361) | 0.0741*<br>(0.0389)  | 0.0715*<br>(0.0419) |
| Country FE          | YES                  | YES                  | YES                 | YES                  | YES                  | YES                 |
| Year FE             | YES                  | YES                  | YES                 | YES                  | YES                  | YES                 |
| Size FE             | YES                  | YES                  | YES                 | YES                  | YES                  | YES                 |
| Experience<br>FE    | YES                  | YES                  | YES                 | YES                  | YES                  | YES                 |
| New firm FE         | YES                  | YES                  | YES                 | YES                  | YES                  | YES                 |
| Industry FE         | YES                  | YES                  | YES                 | YES                  | YES                  | YES                 |
| Observations        | 4,683                | 3,566                | 1,077               | 4,553                | 3,448                | 1,067               |
| R-squared           | 0.104                | 0.116                | 0.108               | 0.114                | 0.129                | 0.146               |

Dependent variable: Ln Labor productivity. Clustered (by country). Standard errors in parentheses.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$