What Specific Modes of Internationalisation Influence SME Innovation in Sub-Saharan Least Developed Countries (LDCs)?

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Abstract

Small and medium sized enterprises (SMEs) located in the least developed countries (LDCs), operate in distinctively hostile institutional environments compared to those in developed economies. Better understanding of the determinants of SME innovation in such environments is important for the development of private sector in LDCs, because innovative SMEs are crucial for sustainable economic growth. Yet, determinants of SME innovation in LDCs have hardly been studied. Considering the potential relevance of internationalization for SME innovation in LDCs, as means of overcoming domestic environmental constraints, this paper investigates the influence of foreign technology licensing, exports and imports on SME innovation in LDCs. The study employs data from 1,058 manufacturing SMEs from Sub-Saharan LDCs - Djibouti, Tanzania, Uganda, Zambia and the Democratic Republic of Congo. The findings suggest that foreign technology licensing is found to be positively and statistically associated with SME product and process innovations in Sub-Saharan LDCs. Findings are compared with those from developed economies in order to identify distinctive features. The implication is that SMEs in Sub-Saharan LDCs need to be supported by different policies compared to developed economies. The results also show that R&D, firm size, sectoral characteristics and access to finance are important determinants of SME innovation.

Key words - Innovation, SMEs, Internationalization, Least developed countries (LDCs) and Sub-Saharan Africa

1. Introduction

The simple but powerful idea that internationalization is important for the performance of small and medium sized enterprises (SMEs) is by no means a completely new phenomenon. Since the 1980s, some scholars have found strong evidence of the importance of internationalization in positively affecting firm performance (Grant et al., 1988; Filippetti et al., 2012; Almodovar et al., 2014) although the evidence with regards to SMEs in particular points to a rather mixed response. This is because internationalization over time will result in increasing competition in the domestic market, which, for weaker firms, will represent a threat as well as opportunities for those businesses willing and able to exploit them. The point to stress is that not all SMEs will be in a position to take full advantage of these increased opportunities. A similar point can be made with regards to innovation because, contrary to what logic might suggest, the evidence base does not show a consistent relationship between innovation and SME performance. This is because the role of innovation, the nature of innovation and indeed the level of internationalization, varies between industrial sectors. For example, if one compares clothing with food products the level of internationalization is much greater in the case of clothing but in neither case is radical innovation realistic for the vast majority of SMEs. In the case of clothing innovation is likely to involve a firm moving upwards in the supply chain and/or seeking to develop an innovative approach to servicing their customers. In the case of food products for most SMEs innovation is likely to involve an innovative mindset on the part of the SME that is based on a high level of adaptability to customer needs and often a collaborative approach to innovation with their customers. Internationalization can be defined as the expansion of firms across country borders into geographic locations that are new to the firm (Kafouros, et al., 2008). In other words internationalization is the process of increasing involvement of enterprises in international markets. This definition suggests that firms can utilize different modes of internationalization For example foreign markets can be exploited through export activity from the existing domestic base although, in some cases, firms may choose to locate sales and marketing offices and/or production plants overseas as part of their market development strategy. In addition, internationalization of a business supply base is sometimes part of a strategy seeking to reduce costs. However a point to stress is that, although some firms will actively seek to exploit new foreign markets by using these kind of techniques, some firms will not do so and may seek to bury their heads in the sand. At the same time, as internationalization increases, it is likely to be increasingly difficult to effectively follow such a strategy.

In some instances internationalization may contribute to a higher level of innovation in a business or may simply be associated with it. Key factors here include definitions of what constitutes innovation and the evidence base of the practices influencing innovative performance in both large enterprises and SMEs. Innovation is important to local, regional and national economies since it represents an opportunity to gain a competitive advantage which is potentially more sustainable than that based mainly on price (Porter, 1990). SMES are often said to be a source of innovation at an aggregate level, on the basis that they are more flexible, more dynamic and more sensitive to shifts in demand than larger companies. At the same time, this is an area where, even in the more developed economies, the variation between individual businesses is enormous. On the one hand the most dynamic higher-technology businesses may perform a role as a motor driving a regional economy, as in the case of Cambridge (UK) or Boston (USA) (Audretsch and Kelbach, 2007; Acs et al., 2009). Alongside this there are typically many conservatively managed, traditional manufacturing SMEs operating in niches relatively untouched by technological change where innovation is not an issue for most managers.

In discussing innovation it is important to distinguish between SMEs and larger enterprises, indeed the range of size variation within the SME category itself needs to be visited because, typically, there are important differences between small businesses and medium-sized firms which begin to take on much more of the formalization in management and in organizational structure, that is typical in a larger organization. In practice most innovation in SMEs is likely to involve firms making incremental changes based on generic technologies rather than on more radical and fundamental change. It can be argued that very few small firms introduce what are fundamentally new products within their industry and hardly any introduce products that are new to the economy as a whole. For SMEs, innovation typically takes the form of creating some form of creative and innovative management in relation to the product portfolio, focusing on the development of new products or services. This is likely to be linked to a strategy of differentiating one's firm from that of competitors, whilst making oneself more valuable to customers, supported by attempts to increase productivity on the supply side. By contrast, competitive advantage based on lower domestic costs or temporary price advantages is typically not sufficient for sustained long-term growth. At best it provides some basis for market entry and an opportunity to earn resources that must be invested into upgrading the firms. The measurement of innovation at the firm level typically involves some distinction between innovation that is simply new to the firm, which some would see as being essentially modernization. The second level is innovation that involves something new at the national market level and thirdly, more fundamental innovation, which is introducing something new to the global market. Clearly, the latter is much more difficult for an SME to achieve, essentially for resource related reasons. In a developing or transition economy context, most innovation will be either the introduction of products or processes that are new to the firm or the national market or forms of organization that are new to the firm They are much less likely to be in a position to develop and launch products or services that are genuinely innovative internationally. This should not be seen as a problem however, because often successful innovation at the national market level in LDCs requires something different or something adapted from a more developed economy context (Goedhuys and Sleuwagen, 2010). These strategies need to be linked to the generation of greater turnover and, ultimately, profitability. However since the study on which this paper is based involves drawing data from the World Bank Enterprise Survey, the indicators used to measure innovation must be considered as given since the authors were not involved in designing this survey.

A number of authors have produced evidence to support the positive influence of internationalization on innovation at the firm level (Kafouros, et al., 2008; Lecerf, 2012), this has attracted the interest of a number of developing countries interested in understanding effective ways of encouraging firm innovation through internationalization, especially for SMEs (UNCTAD, 2007). At the same time, very few studies have focused on small firms;, as most of this literature is concerned with the importance of internationalization for innovation in larger enterprises (e.g. Zahra et al., 2000; Wolfe and Pett, 2006) there is a scarcity of firm level studies on the influence of internationalization on SME innovation even in developed economies. This is because most of the literature on the importance of internationalization for innovation focuses on large enterprises (Hitt et al., 1994; Kafouros, et al., 2008). Yet, even in developed economies, utilization of external resources is particularly important for small firm innovation, because they often have limited internal resources needed for innovation (Abubakar and Mitra, 2007; Audretsch and Kelbach, 2007; Acs et al., 2009) and firms in poor countries are even more resource constrained. LDCs are developing countries with the lowest indicators of economic development and the lowest levels of human capital of all the countries in the world (UNCTAD, 2011). This makes them distinctively challenging environments for developing SME innovations, especially considering that such countries are

poor at producing sufficient levels of knowledge needed for innovation (Acs and Virgill, 2010; UNCTAD, 2011). Thus, LDCs can be characterized as hostile environments.

Hostile environments can be defined as environments that pose a threat to SME performance (Covin and Slevin, 1989; Welter et al., 2012). Hostile environments are more commonly found in developing countries because clearly SMEs in developing countries are typically more resource constrained than their counterparts in more mature market economies. They are also faced with weaker domestic markets. Hostile environments have underdeveloped institutional settings, such as economic and educational institutions that can constrain small firm performance (Covin and Slevin, 1989; Welter et al., 2012). Therefore, an interesting perspective of hostile environments of LDCs that has practically been missed by the SME literature is whether and to what extent internationalization can play a role in enhancing the innovativeness of SMEs in such difficult environments, considering that their domestic environments under-produce the knowledge needed for innovation. This is particularly import for Sub-Saharan Africa, considering that the overwhelming majority of LDCs, 34 out of 48, are located in Sub-Saharan Africa (UN, 2015). In other words, an intriguing question is whether there are specific modes of internalization that influence SME innovation in Sub-Saharan LDCs, in comparison to their counterparts in developed economies? Therefore, this raises the following major research question:

- ***What specific modes of internationalization significantly influence SME innovation in hostile environments i.e. Sub-Saharan Africa's LDCs?***

Examining this question is important because the efforts of many policy makers in LDCs towards supporting SME innovation is often hindered by the dearth of empirically informed knowledge base on which to develop innovation policies that fit their specific contexts, leaving them with no option but to rely on policies from developed economies, whether or not these are appropriate to what is likely to be a very different business environment. In other words, should policy makers in Sub-Saharan LDCs even consider supporting SME innovation through internationalization? If so, what are the modes of internationalization that are associated with SME new product and process innovations in LDCs? These are some of the unanswered questions that policy makers in LDCs may need answers to, in order to perform their jobs more effectively. Therefore, this research could help provide answers to some of the above questions, and in so doing contribute to the development of empirical knowledge that could guide innovation policies in LDCs.

The article is organized as follows: Section 2 presents a critical review of literature on the determinants of SME innovation, with a specific focus on developing countries, in order to identify gaps and new research issues. Section 3 of the paper then builds a conceptual framework for examining the influence of different modes of internationalization on SME innovation in Sub-Saharan LDCs. Section 4 discusses the research methodology and section 5 presents the results and discusses the findings. Finally, section 6 concludes the paper, by presenting the contributions to knowledge and implications for innovation policy in Sub-Saharan LDCs.

2. Theoretical backgrounds and literature review

This paper builds on the literature concerned with internationalization and innovation focusing particularly on SMEs. In addition to the literature on internationalization and innovation, the paper also draws on institutional theory on hostile environments for SMEs so as to establish the context of the research (Acs and Virgill, 2010; Welter et al., 2012). First, a review of the

literature on internal and external factors influencing/constraining small firm innovation is carried-out, with a particularly focus on the hostile institutional environments in Sub-Saharan LDCs. The traditional view of innovation is a linear one; in other words a firm invests in knowledge, particularly in R&D, in order to endogenously create new knowledge and ideas. However, whilst this approach has been confirmed by a large number of studies, it connects knowledge input with innovative outputs. The relationship has proved to be considerably weaker at the firm level especially for small firms (Acs, 2002). Therefore, we discuss both internal and external factors influencing innovation.

2.1 SME Innovation Systems in Developed Countries: National Systems of Innovation Approach

The traditional view of innovation in developed economies is that firms invest in research and development (R&D) in order to generate new knowledge. Therefore firms that invest more in R&D are viewed as having greater capacity to generate new knowledge and therefore innovation (Acs, 2002). This perspective is formalized in the knowledge production model (see Griliches, 1979). However, critical reviews of a large number of empirical tests of the model suggest that the knowledge production model is more applicable to large firms and rather than small firms (Audretsch, 1998; Acs, 2002). This is because for small firms, the innovation searching function provided by R&D within the large firms is often low or sometimes non-existent due to unpredictable and relatively short life of small firms that is characterized with diseconomies of scale (Audretsch and Kelbach, 2007; Acs et al., 2009). Small firms tend to be more internally resource constrained, and therefore their innovative activities tend to be more influenced knowledge factors that are external to them (Acs, 2002; Abubakar and Mitra, 2009).

Therefore, the idea of national systems of innovation was developed so as to analyze the institutional factors external to firms, that enable firms to learn and create the new knowledge needed for innovation (Freeman, 1995; Ernst, 2002; Hu et al., 2014). The central argument is that innovation takes place in as a socially embedded interactive process (Freeman, 1995; Ernst, 2002) especially for small firms due to their greater resource constraints (Keeble and Wilkinson, 1999; Acs, 2002). In such, productive systems of SMEs, information and knowledge collection for innovation often take place in a social context, way outside each firm (Audretsch, 1998). Thus, for SMEs, it has been suggested that the institutional environment in which the small firms operate is important for developing their innovation capacity (Capello, 1999; Keeble et al., 1999). Therefore, there is an increasing recognition by institutional theories that innovative behavior of small firms, needs to be interpreted in the context in which it occurs (Welter and Smallbone, 2011). Institutions are the "rules of the game in a society" (North 1990), which when operating efficiently and stable can reduce uncertainty and risk for small firm innovation, but when inefficient can be hostile. Hence, in all countries, the development of small firm innovation and the behavior of entrepreneurs is considered to be influenced by the appropriateness and operation of the institutional environment (Baumol et al., 2007). From an innovation perspective, these institutions include the educational institutions that produce the knowledge, human capital, and research needed for small innovation (Keeble et al., 1999; Acs, 2002) and the financial institutions that provide the finance needed for innovation to happen (Florida and Kenney, 1988). In developed countries where research by higher education institutions is highly developed, such as the United States (US) and United Kingdom (UK), scholars argue that small firm innovation is enhanced by favorable institutional conditions (Keeble et al. 1999; Acs, 2002; Audretsch and Kelbach, 2007; Acs et al., 2009). Illustrious examples of the effect of knowledge production institutions on small firm innovation include the roles of Stanford University in Silicon Valley (US) and Cambridge University in Silicon-

fen (UK) (Saxenian, 1994; Keeble et al., 1999; Audretsch and Kelbach, 2007; Acs et al., 2009).

The second important characteristic of national systems of innovation is the focus on the existence of institutions in a 'national' economy that create opportunities for knowledge creation and innovation, thereby underpinning the innovation capacity of a country (Freeman, 1995; Ernst, 2002). These national institutions and organizations can be broadly subdivided into knowledge generation and knowledge exploitation subsystems (Ernst, 2002; Jiao et al. 2016). Knowledge generation subsystem refers to network of institutions that generate the knowledge needed for innovation (e.g. R&D organizations and higher education institutions). Knowledge exploitation subsystems on the other hand refer to institutions and organizations that exploit knowledge for generating innovative outputs (e.g. small firms, large firms and financial institutions that network for knowledge exploitation) (Freeman, 1995; Ernst, 2002; Jiao et al. 2016). As such, SMEs situated in a developed country with advanced knowledge generation institutions (especially R&D) are viewed as having greater access to knowledge resources needed for innovation. Several empirical studies in developed economies provide support these arguments (e.g. see Rothwell 1977, Pavitt, 1984; Furnman et al., 2002 Acs et al., 2016). Yet, although the importance of national institutions in increasing the likelihood of innovation in developed economies has empirical support especially from research in developed countries, many researchers question the role of national institutions in enhancing the innovation capacity of firms in developing countries, especially the poorest countries (Lall, 2000; Ernst, 2002). In the next section therefore, we discuss critical differences between innovation systems of developed and developing countries.

2.2 Differences between innovation systems of developed and developing countries

Ernst (2002) identified some critical weaknesses in the innovation system theory that need to be tackled so as to improve the relevance of the theory for developing countries. A critical weakness is the neglect of the international perspective of innovation. National innovation system theory relies fundamentally on a key argument in defending its focus on linkages at the national level. The argument is that knowledge needed for innovation is often tacit in nature and therefore needs face-to-face interaction; and face-to-face interaction is enhanced by co-location of producers and users. Therefore the national system of innovation theory assumes a strong domestic knowledge base that is accessible to firms in a country through interaction of key actors (Andersen, 1992). Nevertheless, this argument is criticised to be less applicable for developing countries. Hence, although this assumption is true of many developed countries, it is not universal, because it does not reflect the reality of the institutions in developing countries, especially LDCs, which are often weak and inefficient (UNCTAD, 2011, 2016). Therefore for LDCs, which have highly underdeveloped institutions (UNCTAD, 2011, 2016), it is hard for one to argue that linkages at the national level are more effective and crucial than linkages at the international level.

Consequently, researchers classify the institutional environments in which small firms operate into hostile and non-hostile environments (Covin and Slevin, 1989; North and Smallbone, 2000; Welter et al., 2012). From an innovation perspective, an institutionally hostile environment is an environment that threatens small firm innovation (North and Smallbone, 1990; Kotey, 2014). Hostile environments have poor institutional settings (such as educational institutions) and the relative lack of exploitable opportunities (Covin and Slevin, 1989; Acs and Virgill, 2010; Welter et al., 2012). Non-hostile environments, in contrast, provide better institutional environment with greater exploitable opportunities (Covin and Slevin, 1989; Eisenhardt and Tabrizi, 1995; Acs and Virgill, 2010; Welter et al., 2012). Innovating in a hostile environment is difficult for small firms (Kotey, 2014). The adverse effect of

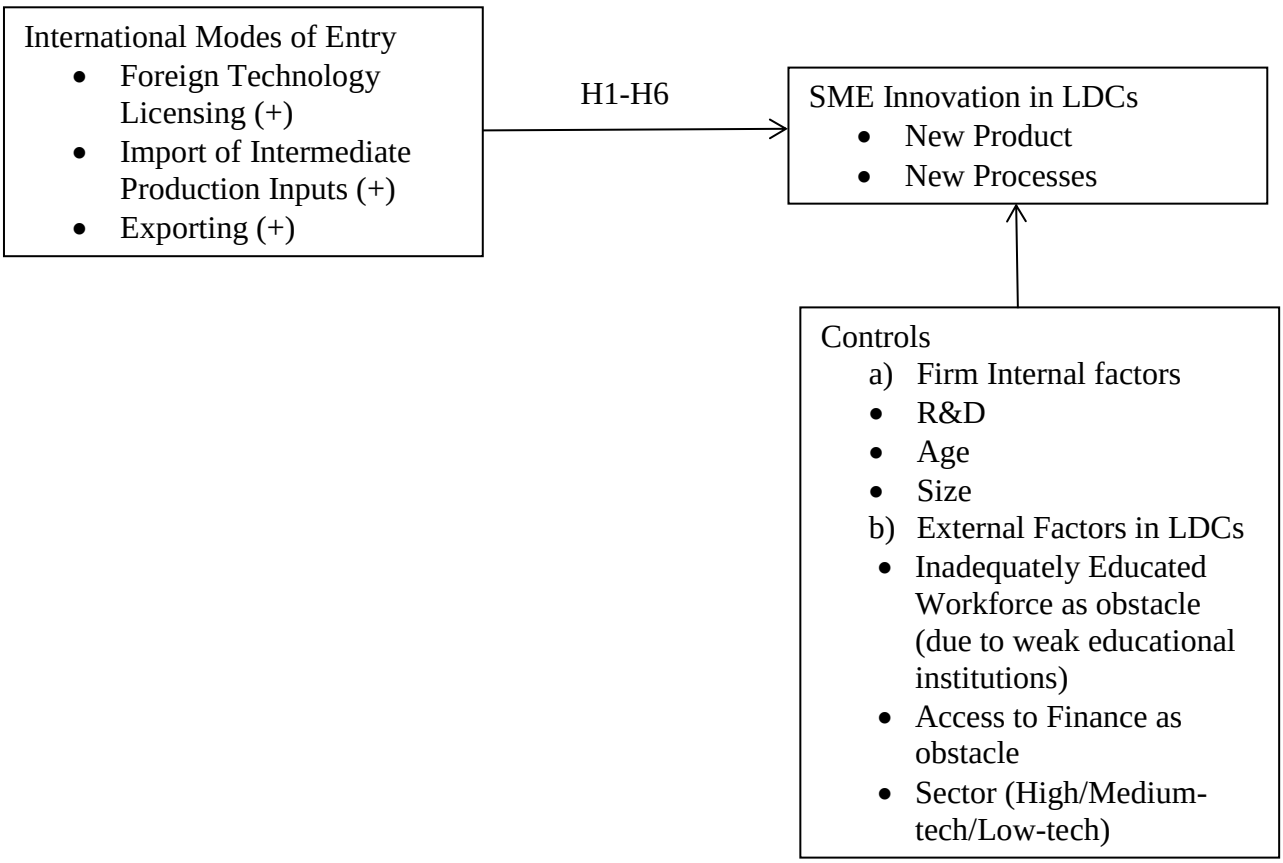
environmental hostility may present a great threat to small firms due to their limited resource base and limited external resources within their environments (Kotey, 2014). Examples of such institutionally hostile environments are Sub-Saharan LDCs, which have the most underdeveloped institutional environment in the world (UNCTAD, 2011, 2016).

Therefore, Ernst (2002) argues that developing economies have some major features that are not accounted for by national innovation system theorists, which are: 1) they have weak and unstable institutions that impede learning efficiency. This suggests low intensities of knowledge production and knowledge spillovers in the domestic environment (Acs and Virgill, 2010; UNCTAD, 2011, 2016); 2) such limited domestic knowledge base means that firms located in developing countries have to try to utilise foreign knowledge sources to compensate for domestic deficiencies (Lall, 2000. Consequently, initially at least, firms located in developing economies often have very limited opportunities for building an innovation system based primarily on domestic resources. For a substantial amount of time therefore, firms in such hostile environments have to primarily depend on international knowledge sources for learning and building innovation capability (Ernst, 2002). In the next section, we develop a conceptual framework that addresses differences between developed and developing countries in relation to internationalisation modes SME innovation. In particular, we focus on LDCs in Sub-Saharan Africa, since they have most underdeveloped institutions (UNCTAD, 2011, 2016) and are therefore mostly likely to have different system and pattern of innovation.

3. Conceptual framework: SMEs' internationalisation modes as strategies for increasing likelihood of innovation in LDC's hostile environment

This section provides theoretical explanations for the effects of the three modes of internationalisation on SME innovation in Sub-Saharan LDCs as hostile environments. Following key papers published in *Technovation*, Radas and Bozi (2009), Kafouros, et al. (2008), Keizer et al., (2002), and others (Mansfield, 1988; Bierly, 1996), we divide factors influencing innovation into *internal* factors (e.g. internal R&D) and *external factors* (which take place when firms bring in knowledge/technology from outside source). Figure 1 outlines the conceptual model from which our hypotheses are derived. The model is discussed below, including the uniqueness of our approach. We first start by defining Sub-Saharan African LDCs as hostile institutional environments for SME innovation (section 3.1). We then conceptualize innovation in LDCs (section 3.2) and then discuss the specific international modes that increase the likelihood of SME innovation in LDCs (section 3.3).

Figure 1: Conceptual model: International modes of entry and SME innovation in LDCs



Notes: Following Radas and Bozic (2009), Hausman (2005), Hansen (1992), Griliches (1979) and Acs and Audretsch (1987), we control for firm internal factors such as R&D, Age and Size since these variable are found to influence firm innovation. We control for the effect of different environmental factors that could constrain/influence innovation in LDCs. Finally, we control for the sector that the firms operate (see Acs, and Audretsch, 1987; Audretsch and Kelbach, 2007; Acs et al., 2009).

3.1 Sub-Saharan LDCs as hostile institutional environments for SME innovation

Sub-Saharan Africa, as the world's poorest region continues to face serious problems of poverty. The majority of Sub-Saharan African countries (34 out of 49 countries) are LDCs (UN, 2015). Therefore, as mentioned earlier, 34 out of the 48 countries in the world that are currently defined by the United Nations (UN) as LDCs are in Sub-Saharan Africa. LDC is defined by the UNCTAD (2011, 2016) as a country that meets the following three criteria: (a) a criterion of "low-income", which is based on a three year average estimate of the gross national income (GNI) per capita of the country. There is a threshold of $905 for possible cases of addition to the list, and a maximum of $1,086 for graduation from LDC status; (b) a criterion of "human assets weakness", based on a composite index termed the Human Assets Index, that is based on indicators of school enrolment, literacy, nutrition and health; (c) a criterion of "economic vulnerability", based on a composite index referred to as the Economic Vulnerability Index. The index is established on indicators of economic smallness, economic remoteness, natural shocks, trade shocks and exposure to shocks. Consequently, an LDC is a country characterized by very challenging environments and major institutional deficiencies (Cuervo-Cazurra and Genc, 2008; UNCTAD, 2011, 2016). Institutions such as higher

education institutions, which are viewed as particularly important for innovation (Acs, 2002; Acs and Virgill, 2010) tend to be deficient in LDCs (UNCTAD, 2011, 2016). Higher education institutions (HEIs) can be particularly important for innovation because education often gives individuals the necessary skills needed to be able to develop innovative activities (Verheul et al., 2002). The human capital generated by HEIs influences innovation in at least two main ways: 1) it increases the ability of entrepreneurs in SMEs to find *what to produce* and; 2) enhances the capacity of SMEs to develop the *technology used for innovation*. Therefore, Mambula (2002) argues that when entrepreneurs have knowledge difficulties (such as in LDCs where there is dearth of human capital due to poor educational institutions) for making new discovery, they tend to enter "well established sectors rather than seeking new production and new market niches." (Mambula, 2002: p.63). This dearth of educational human capital is often problematic in Sub-Saharan LDCs, which have the lowest levels of education in the world (UNCTAD, 2011, 2016). Thus, even though evidence from surveys in Sub-Saharan LDCs, such as Burkina Faso, Cambodia, Ethiopia, Madagascar, Malawi, Niger, Rwanda, Senegal, Uganda, Vanuatu, Zambia and other LDCs, suggest that many enterprises are set up in such LDCs and sometimes even survive (e.g. Mead and Liedholm, 1998), the problem is that in environments where educational institutions are not well developed, the contribution of SMEs to innovation and economic development is often limited (Acs et al., 2008; Naude, 2010). Therefore, in hostile environments of Sub-Saharan LDCs, the prevalence of underdeveloped educational and financial institutions (UNCTAD, 2011, 2016; World Bank, 2013) could hinder innovation. Beyond speculations however, to date, there is hardly any empirical investigation of factors that influence SME innovation in LDCs, particularly the role of different modes of internationalization.

3.2 Conceptualizing SME innovation in LDCs

According to North and Smallbone (2000), one of the major issues to consider in defining innovation is the question of whether the term innovation mainly refers to radical breakthroughs that are new to an economy or industry or whether changes that are new to the firm itself can be included. A considerable number of the early studies on SMEs and innovation (such as Freeman, 1971) tend to embrace the view that innovation involves making radical changes by transforming a new idea or invention into a marketable product or process. Empirical work based on data from Science Policy Research Unit (such as Pavitt et al., 1987; Thwaites and Wynarczyk, 1996) considers innovation mainly as major technical advances in an industrial context. On the other hand, Porter (1990), p. 45, sees innovation as an attempt `to create competitive advantage by perceiving or discovering new and better ways of competing in an industry, and bringing them to market'. Hence, a perspective on innovation that stresses mainly the commercialization of ideas that are new to the firm certainly means that most innovation in practice can be incremental rather than just radical (North and Smallbone, 2000).

This paper acknowledges the value of `incremental innovation' because SMEs are more likely to be making more incremental changes to generic technologies rather than radical technological breakthroughs (Rosenberg, 1992; Goedhuys and Sleuwaegen, 2010), especially when located in developing countries (Goedhuys and Sleuwaegen, 2010). This is because a majority of firms in developing countries operate considerably below the technological frontier, and therefore firms' innovation efforts in such countries are principally concerned with absorbing, adapting, mastering and ultimately improving technologies developed elsewhere (Goedhuys and Sleuwaegen, 2010). Therefore, as an indication of innovation effort of SMEs, this paper focuses on the fact that SMEs develop and launch a product or process that is at least an incremental innovation i.e. new or significantly improved products and processes (Radas and Bozi, 2009; Goedhuys and Sleuwaegen, 2010). The use of product and process

innovation as key indicators of SME innovation is well documented in SME research (Radas and Bozi, 2009), even in hostile environments (North and Smallbone, 2000; Goedhuys and Sleuwaegen, 2010). This definition of innovation is also in accordance with Schumpeter's definition of innovation, as involving new products and new processes (Schumpeter, 1934).

3.3 External factors: Internalization modes as strategies for SMEs in LDCs to better deal with innovation development under the current hostile restrictions

High costs of R&D and shorter product life cycles make the achievement of innovations very difficult (Kafouros, et al., 2008) especially for small firms due to their limited internal resources (Audretsch, 1998; Wolfe and Pett, 2006). As such, the development of innovations for small firms often requires resources that are external to the firm (Keeble et al., 1999; Keizer et al., 2002). Although firms may acquire external knowledge from their local or domestic environments (Keeble et al., 1999; Simmie, 2002), when located in hostile environments that under produce knowledge needed for innovation, this could be difficult (Kotey, 2014). In conditions of domestic institutional deficiencies, some scholars suggest that internationalization may play a role in helping firms acquire knowledge inputs from foreign sources thus overcoming domestic constraints (Baumol et al., 2007). However, while suggestions by Baumol et al. (2007) may be plausible, this perspective has not been developed beyond mere suggestions, and therefore lacks both conceptual clarity and empirical support. Neither do we know which international modes matter for SME innovation in LDCs; especially Sub-Saharan LDCs. Therefore there is still a lack of theoretical conceptualization of how internationalization can influence SME innovation in LDCs, and a lack of any empirical work (to the best of the authors' knowledge) on the influence of internationalization on SME innovation in LDCs. According to Zahra et al. (2000), Kafouros, et al. (2008) and Radas and Bozi (2009), there are at least three main international modes entry that can influence firm innovation. These are: foreign technology licensing, imports of intermediate production inputs and exporting. This paper discusses these three modes of entry and argues for their role in enhancing SME innovation in Sub-Saharan LDCs.

3.3.1 Foreign technology licensing

In difficult environmental contexts that lack a strong knowledge base, some large firm studies suggest that licensing of foreign technologies could be considered as a possible source of frontier technologies and knowledge (Kim, 1990; Kim, 1999). Yet from an SME perspective, to the best of the authors' knowledge there is a serious lack of studies that have examined the influence of foreign technology licensing on SME new product or new product innovations, particularly in LDCs, likely because of the lack of SME data on foreign technology licensing. For developed countries however, Zahra et al. (2000) in a study on SMEs in the US, concluded that licensing of foreign technology does not influence SME technological learning (measured as depth, breath and speed of learning) in a developed country. On the other hand, a number of large firm studies in newly industrialized countries (such as Korea) suggest the importance of technology licensing for firm innovation (see Table 1), although they are mostly limited to large firms (e.g. Kim, 1999), rather than SMEs. For example, a study by Kim (1999) on Korea found that licensing foreign technologies by large firms can help firms build technological capabilities, especially when technology is not within the capacity of local firms (Kim, 1999). Another study by Kim (1990) on Korea, found that although technology licensing is an effective means of knowledge transfer for large firms in developing countries, it tends to become less effective for more developed countries. Therefore, in general, for large firms in developing countries (non-LDCs), the influence of foreign technology licensing on innovative capacity has been demonstrated by many empirical studies (Kim, 1990; Kim, 1999: see Table 1 for a review).

Table 1: Previous studies on the influence of licensing of foreign technology and firm innovation

Author	Context	Contribution	Gaps
Wang et al. (2015)	China	Conditions around licensee have a positive impact on the relationship between the technology attributes and licensee innovation performance	1,2
Nepelski and Prato (2015)	China	Even though China has a large international technology sourcing deficit, the transfer of technology from foreign countries to China is intensifying	1,2
Wang and Li-Ying (2014)	China	The positive relationship between inward technology licensing and new product development performance of a licensee firm is moderated by firms' absorptive capacity	1,2
Mukherjee and Mukherjee (2013)		Licensing influences innovation under a two-part tariff licensing contract	1,2
Buenstorf and Geissler (2012)	Germany	The differences between foreign and domestic licensing were not found to be consistently significant in inventions	1,2
Tsai and Wang (2009)	Taiwan	Inward technology licensing does not significantly influence innovation performance	1
Fukugawa (2009)	Japan	Employing more Ph.D. scientists influences licensing of patents	1
Kafouros, et al (2008)	U.K.	Licensing can have a positive influence on large firm's capacity for innovation.	1,2
Zahra et al. (2000)	U.S.	For SMEs in developed economies, technology licensing is not very effective in enhancing learning	1
Kim (1999)	Korea	When technology is not within the capacity of local firms, firms can rely on foreign licensing	1,2
Liu (1997)	China	In China, innovation is influenced by the synergy between investment in R&D and foreign technology	1
Kim (1990)	Korea	Technology licensing is an effective means of knowledge transfer for large firms in developing countries, but it tends to become less effective for developed countries	1,2

Notes: (Gap 1) - Not focused on LDCs; (Gap 2) - Not focused on "foreign technology licensing by SMEs."

However, two of the major gaps found in the studies on the influence of foreign technology licensing and innovation, as it relates to the research problem of this paper are: 1) the studies are by-and-large are not focused on LDCs; 2) they are also mostly focused on large firms (e.g. Kim, 1999; Kafouros et al., 2008) rather than SMEs. Consequently, there is a lack of empirical studies of this phenomenon in LDCs. As such, in this paper it is argued that since LDCs by definition lack strong domestic knowledge production due to poor educational institutions (Acs et. al. 2008; UNCTAD, 2011, 2016) the use of domestic knowledge for SME innovation will likely be highly constrained. However, it can be argued that SMEs in LDCs can overcome such institutional deficiencies in their domestic environment by acquiring innovation inputs from foreign sources. In particular, it is argued here that SMEs in LDCs that place emphasis on licensing foreign technologies can be expected to have greater innovation performance in comparison to those that don't license foreign technologies. This is because foreign technology licensing can give firms access to superior technological inputs that are not available in their domestic environments (Kim, 1999; Kafouros et al., 2008). This gives such SMEs in LDCs greater flexibility to develop and introduce new products or new processes that rely on superior technologies, and also reduces the need for the SMEs to conduct their own R&D. One anecdotal example is a firm at the frontier of the mobile-money revolution in Africa, called Safricom,

located in Kenya (a low-income developing country). The firm licensed the 'M-Pesa money transfer technology' from Vodafone UK, which enabled the company to launch an innovation that has made the company one of the pioneers of mobile money transfer (Mas and Ng'weno, 2010). M-Pesa is considered today as one of the most successful innovations in Africa (Mas and Ng'weno, 2010). Also, another anecdotal example is one of Africa's leading providers of pay-as-you go solar energy in Kenya, known as M-Kopa. The firm's success in innovation relies on its ability to use foreign solar technology, which it then adapts to local needs of the country (Miller, 2012). Consequently, licensing of foreign technologies by SMEs in LDCs should enhance their innovation learning as manifested in new products and new processes. These lead us to following hypothesis:

- ***H_1: Foreign technology licensing*** *increases the likelihood of new product innovation by SMEs located in Sub-Saharan LDCs.*
- ***H_2: Foreign technology licensing*** *increases the likelihood of new process innovation by SMEs located in Sub-Saharan LDCs.*

3.3.2 Imports of intermediate production inputs

Research in developed economies suggests that international activity through the importation of intermediate inputs can help to establish and sustain channels of communication that stimulate cross-border learning of production methods and product design (Keller, 1999). This is because imports can enhance firms' exposure to new products and possibly processes (Filippetti et al., 2012); since new knowledge tends to be embedded in products and new machinery and their accessibility through imports can facilitate learning in countries beyond the one where they were produced (Filippetti et al., 2012). Furthermore, the firm engaged in importing intermediate production inputs may have to modify its production processes to accommodate intermediate inputs. Many authors have studied the importance of imports for international technology diffusion and innovative activities of firms, although most of them are macro rather than micro-level studies and have no clear focus on LDCs or SMEs. For example, Coe and Helpman (1995) are among the first to provide such evidence. In a study of 21 countries of the Organization for Economic Co-operation and Development (OECD) and Israel, they found that the level of imports in a country is important for international technology diffusion. Also, another study by Sjöholm (1996) in Sweden found positive correlation between bilateral import and patent citations. Similarly, a study by Schneider (2005) on 47 countries finds that high-tech imports from developed countries are positively correlated with US patents. Several other macro-level studies have also found that imports matter (Coe et al., 1997; Keller, 1999; Xu and Wang, 1999; Keller, 2002; see Table 2).

Nonetheless, two of the major gaps in the literature as it relates to the research problem of this paper are: 1) the studies are mainly not focused on LDCs; 2) they are also largely not focused on SMEs. As such, there is a lack of empirical evidence on the importance of imports of intermediate inputs for SME innovation in LDCs. Therefore, based on the above literature, it is argued here that SMEs in Sub-Saharan LDCs can overcome some of the deficiencies in their domestic environment's technology and knowledge production (Acs et. al. 2008; UNCTAD, 2011, 2016) by importing more advanced technologies from other countries. Accordingly, one can argue that SMEs in LDCs that import production inputs are more likely to introduce innovations than SMEs in LDCs that don't import. This leads us to the following hypotheses;

- ***H_3: Import of intermediate production inputs*** *increases the likelihood of new product innovation by SMEs located in Sub-Saharan LDCs.*
- ***H_4: Import of intermediate production inputs*** *increases the likelihood of new process innovation by SMEs located in Sub-Saharan LDCs.*

Table 2: Previous studies on the influence of imports on firm innovation

Author	Context	Contribution	Gaps
Bloom et al. (2015)	12 European countries	Innovation increased within firms that are more exposed to increases in Chinese imports.	1,2
Lu and Ng (2012)	China	Competitive pressure from imports is the mechanism through which imports spur incremental innovation	1,2
Paunov (2011)	Ecuador	Firms' importing activities influence product innovation	1,2
Fu et al. (2011)	Brazil, India and China	International technology can only be delivered with parallel indigenous innovation efforts	1,2
Damijan and Kostevc (2010)	Spain	Firms learn primarily from import relations, which allows them to innovate products and processes and to dress up for starting to export	1
Narayan and Bhat (2009)	India	There appears to be a relationship that is substitutive between import of technology and in-house R&D	1,2
Liu and Buck (2007)	China	Learning by importing and exporting influence innovation in indigenous Chinese firms	1,2
Schneider (2005)	47countries	The imports of high-tech from developed countries are positively correlate with US patents	1,2
Blind and Jungmittag (2004)	Germany	Both imports and FDI have highly significant positive effects on product and process innovations in service industry	1,2
Madanmohan et al. (2004)	Indonesia	Acquiring technology that matured mainly to boost production capacity or improve product quality has very little effect on the development of technological capability	1,2
Keller (2002)	U.S.	Even though knowledge is local, technological knowledge needed for innovation has become more global	1,2
Xu and Wang (1999)	21 OECD countries	Import composition effect is robust when one considers capital goods trade instead of all-manufacturing goods trade	1,2
Keller (1999)	G7 Countries	Imports matter if a country obtains a high share of its total imports from one particular country e.g. Canada, which imports about 80% from the US	1,2
Coe et al. (1997)	77 developing countries	Imports is important for international technology diffusion in country	1,2
Sjöholm (1996)	Sweden	The correlation between Swedish patent citations and bilateral import is positive	1,2
Sikka (1996)	India	Instead of just importing the technology, Indian industry is prefers to import the technological products, so that they can acquire the tried and tested technology with a demand-market and avoid payment of royalty	1,2
Coe and Helpman (1995)	21 OECD countries plus Israel	Overall level of imports in a country is important for international technology diffusion	1,2
Bertschek (1995)	Germany	Import share and FDI both have positive effect on product and process innovations	1,2

Notes: (Gap 1) - Not focused on LDCs; (Gap 2) - Not focused on SMEs.

3.3.3 Exporting

Another mode of entry into international markets that can influence innovation is exporting (Kafouros et al., 2008; Almodovar et al., 2014). This is because it allows firms to react to foreign customer demands and regulations of host governments, which can trigger new products or processes (Kafouros et al., 2008; Filippetti et al., 2012; Almodovar et al., 2014). A

number of researchers have found evidence that exporters tend to innovate more than non-exporters especially when operating in technologically lagging industries (Salomon and Shaver 2005; Salomon and Jin, 2008). Hence, one key finding from this perspective is that exporting leads to enhanced innovation Kafouros et al., 2008; Filippetti et al., 2012; Almodovar et al., 2014: see Table 3).

Table 3: Previous studies on the influence of exports on firm innovation

Author	Context	Contribution	Gaps
Almodovar et al. (2014)	Spain	Learning related to exporting is more pronounced than that associated with a firm's FDI activities	1,2
Chang et al. (2013)	37 countries	Exports are positively associated with triadic patents	1,2
Altomonte, et al. (2013)	Many European countries	Strong relationship between internationalization and innovation at the firm level.	1,2
Filippetti et al 2012	42 Countries	Competing in international markets increases the scope of learning and the need to innovate	1,2
Higon and Driffield (2011)	UK	Businesses that export have high levels of innovation (product and process innovations)	1
Sun and Du (2010)	China	Exports have positive and significant impact on new product development	1,2
Salomon and Jin (2008)	Spain	Firms in lagging industries learn more from exporting than those firms in leading industries	1,2
Castellani and Zanfei (2007)	Italy	Exporters show intermediate innovative performance	1,2
Salomon and Jin (2005)	Spain	Exporting is associated with innovation	1,2
Ariffin and Figueiredo (2004)	Brazil and Malaysia	Technological capability-has been upgraded through exports	1,2
Barioset al. (2003)	Spain	Exporting makes firms more easily aware of potential innovations	1,2

Notes: (Gap 1) - Not focused on LDCs; (Gap 2) - Not focused on SMEs.

Nevertheless, again, there are two of the major gaps related to studies on the influence of exporting on firm innovation, as it relates to the research problem of this study: 1) the previous studies are not focused on LDCs; and 2) previous studies are mostly focused on large firms (e.g. Salomon and Jin, 2008) rather than SMEs. Therefore, there is a lack of empirical studies on this phenomenon in LDCs. Accordingly, considering that SMEs in Sub-Saharan Africa lag behind technologically (Goedhuys and Sleuwaegen, 2010) and that firms in lagging industries tend to learn more from exporting than those firms in leading industries (Salomon and Jin, 2008), it can be argued that SMEs in Sub-Saharan LDCs that participate in exporting can be expected to be associated with more innovative activities. This is because by participating in foreign markets through exports (Almodovar et al. 2014), international SMEs in LDCs are more likely to react to demands of foreign customers by developing new products or improving their production processes so as to meet foreign tastes and quality demands. This gives the exporting SMEs in LDCs greater incentive to create new products or improve their processes in comparison to their counterparts that don't export. Thus, these give rise to the following hypotheses:

- ***H_5:*** *Exporting increases the likelihood of new product innovation by SMEs located in Sub-Saharan LDCs.*
- ***H_6:*** *Exporting increases the likelihood of new process innovation by SMEs located in Sub-Saharan LDCs.*

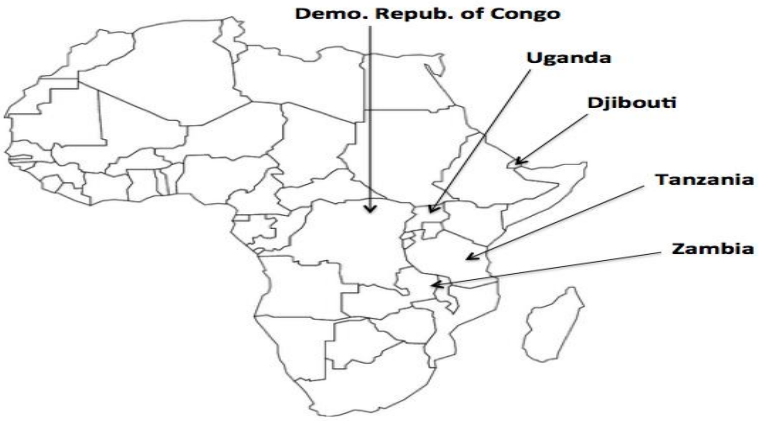
3.4 Differences between Sub-Saharan LDCs and developed countries in relation to internationalisation modes and SME innovation development

We have developed hypotheses about the role of three modes of internationalisation on SME innovation in LDCs. The hypotheses developed suggest some differences between innovation systems of developed and developing countries, especially the internationalisation modes that matter for innovation. More specifically, while developed countries have strong domestic institutions and can generate the new knowledge and technology needed for SME innovation at the national level (Freeman, 1995; Ernst, 2002), in contrast, SMEs in Sub-Saharan LDCs have weaker domestic institutions (UNCTAD, 2011, 2016) and therefore are likely to rely more on foreign technology licensing for innovative activities as means of overcoming domestic institutional weaknesses. Also, since developed countries are more globalized, exports and imports are more likely to have stronger influence on the innovative activities of SMEs in developed countries relative to those in Sub-Saharan LDCs. This is because SME exports in Sub-Saharan LDCs are smaller, due to the strong competition from Asian countries particularly China (UNCTAD, 2011) and also because Sub-Saharan Africa has lower levels of innovation (Goedhuys and Sleuwagen, 2010). Further, although imports from developed countries have bigger impact on innovation (Schneider, 2005), Sub-Saharan LDCs tend to import more from developing countries, rather than developed countries (UNCTAD, 2011, 2016); which suggests lesser importance of exports and imports for SME innovation in Sub-Saharan LDCs relative to their counterparts in developed countries. In summary, we expect that for Sub-Saharan LDCs, foreign technology licensing will have stronger influence on SME innovation in comparison to exports and imports. In contrast, although beyond the scope of our empirical research, we expect that for developed countries, exports and imports will have stronger influence on SME innovation relative to foreign technology licensing. Consequently, the importance of different internationalisation modes for SME innovation development most likely varies between Sub-Saharan LDCs and developed countries.

4. Research methodology

The paper uses recently collected firm-level data from the World Bank Enterprise Surveys (WBES, 2013). The survey was conducted using a harmonized questionnaire, which allows pooling of the datasets from different countries. The pooling of the datasets generated a sufficiently large number of firms for conducting more advanced analyses. The advantage of using a database such as WBES is that it enables relatively large sample sizes to be used for statistical analysis. The main disadvantage, however, is that one has no control over the specific variables that are available for inclusion in the study. However, the WBES database is commonly used in many firm level studies on developing countries, because of its being one of the only large scale firm level data that is collected through random sampling. Examples of studies based on WBES include Eifert et al. (2008), Goedhuys and Sleuwagen (2010), Jensen et al. (2010), Aterido et al. (2011), Alby et al. (2012), Page and Soderbom (2015) etc. Since this paper is focused on developing countries with major institutional deficiencies, the paper only collects data from Sub-Saharan LDCs. This is because out of a total of 48 LDCs in the world, 34 are in Sub-Saharan Africa (UN, 2015). Also, a critical review of literature on SME internationalization in Africa (see Ibeh, 2011), suggests that the overwhelming majority of the African papers on internationalization don't even focus on LDCs. Therefore, hardly any study has examined the influence of internationalization on SME innovation in terms of new products and new processes in LDCs, thus making it even more important to study Sub-Saharan African LDCs. Accordingly, the WBES (2013) has data on five Sub-Saharan African LDCs, which are: Djibouti, Tanzania, Uganda, Zambia and the Democratic Republic of Congo (see Figure 2).

Figure 2: Map of the Sub-Saharan LDCs in the sample



4.1 Sampling and sampling criteria

4.1.1 Sampling method

The WBES 2013 is a firm-level survey of a representative sample of an economy's private sector. The sampling methodology for the Enterprise Surveys is stratified random sampling (see WBES, 2017 for more information about the sample representativeness). For stratified random sample, all population units are grouped within homogeneous groups and simple random samples are selected within each group. This allows computation of estimates for each strata with a specified level of precision. The Enterprise Survey sampling weights handle the varying probabilities of selection across different strata. The strata of the surveys include business sector, firm size, and geographic region in a country.

4.1.2 Sampling criteria and size

After pooling the data from WBES 2013 for the five LDCs, this paper imposes additional criteria in order to construct a sample of firms appropriate for the research problem: a) the firms must be SMEs (firms with less than 250 employees including both full-time and part-time employees) (European Commission, 2005); b) the SMEs must be private companies i.e. not state owned; c) the SMEs must not be foreign owned i.e. based on the commonly used threshold of 10% for foreign ownership (e.g. Nachum and Keeble, 2003); d) the SMEs must be located in Sub-Saharan LDCs; the SMEs must belong to manufacturing sector (because there are clear distinctions in innovation patterns between manufacturing and business service sectors) (Hughes and Wood, 2000) and manufacturing sector innovations are easier to measure. Based on the sampling criteria, a random sample of 1,058 manufacturing SMEs in the LDCs is selected from a total of 3,029 firms contained in the 2013 WBES data of the 5 countries.

4.2 Measures

Data on three types of variables were collected from the survey for the 5 countries: (i) dependent variables, new product and new process innovations as proxy for innovation; (ii) internationalization variables, namely foreign technology licensing, exports and import of intermediate production inputs; and (iii) a number of control variables related to firm internal and external factors.

4.2.1: Dependent variables: product and process innovation

Following Goedhuys and Sleuwaegen (2010) and Altomonte et al. (2013), this paper defines innovation as follows:

- *New product innovation:* taking the value of one if a firm has introduced a new or significantly improved product in the survey year and/or past three years and zero if not.
- *New process innovation:* taking the value of one if a firm has a new or significantly improved method of manufacturing product in the survey year and/or past three years and zero if not.

The use of product and process innovation as valid indicators of SME innovation is well documented in SME research, even in hostile environments (North and Smallbone, 2000; Goedhuys and Sleuwaegen, 2010). The measures are also in line with Schumpeter's conceptualization of innovation as involving new products, new services, new processes etc. (Schumpeter, 1934).

4.2.2 Internationalization variables

In terms of international modes of entry, the paper focuses on foreign technology licensing, exports and import of production inputs. Following Altomonte et al. (2013), this paper defines these different modes of internationalization as follows:

- *Foreign technology licensing*: taking the value of one if a firm has used technology licensed from a foreign owned company in the survey year and/or past three years and zero if not.
- *Exporting:* taking the value of one if a firm has sold abroad, directly from its home country, some or all of its own products/services in the survey year and/or past three years and zero if not.
- *Import of intermediate production inputs*: taking the value of one if a firm has purchased at least part of its intermediate goods from abroad in the survey year and/or past three years and zero if not.

4.2.3 Control and clustering variables

So as to ensure rigorous tests of the hypotheses, this study employs a range of control variables on other factors that may influence SME innovation in LDCs.

4.2.3.1 Firm level controls

First we control for firm level ***R&D*** (Griliches, 1979; Radas and Bozic, 2009). The WBES (2013) measures R&D with asking the following question: "during the last three years, did this establishment spend on formal R&D activities?" Thus R&D is a binary variable that takes the value of 1 if a firm has conducted formal R&D in the last three years and the value of 0 in other case.

Also, since firm age can influence innovation (Hansen, 1992), control is applied for ***firm age***. This is measured as the number of years since the establishment began operations up to the year of the survey (World Bank Enterprise Survey, 2013).

We also control for ***firm size*** (Acs, and Audretsch, 1987), which is measured as the number of employees (including full-time and part-time employees) in the last fiscal year (World Bank Enterprise Survey, 2013). Firms are sorted into three size groups: micro firms (0–9 employees), small firms (10–49 employees) and medium-sized firms (50–249 employees).

4.2.3.2 Firm external controls

4.2.3.2.1 Environmental factors hostile to innovation in LDCs

The main hostile factors that we control for are; ***inadequately educated workforce in the***

environment as obstacle (which is a result of underdeveloped higher education institutions in LDCs) and difficulty of ***access to finance as obstacle***. The World Bank Enterprise survey (WBES) data suggests that access to finance is excessively difficult for SMEs in LDCs, with 41 percent of SMEs in LDCs reporting access to finance as a major constraint, while the corresponding figure for those in middle-income countries (MICs) is 30 percent and only 15 percent in high-income countries (HICs) (see IFC, 2011). In order to measure these two variables, the WBES (2013) asks firms to issue their perception on inadequately educated workforce and access to finance as obstacles. The answers are constrained to the following five options: (1) No Obstacle, (2) Minor Obstacle, (3) Moderate Obstacle, (4) Major Obstacle, and (5) Very Severe Obstacle. We merged categories 2 and 3 into "minor/moderate obstacle" and categories 4 and 5 into "major/severe obstacle".

4.2.3.2.2 Sector

Also, control for ***Industrial sector*** was added because R&D intensity of an industry can affect small firm innovation (Acs, and Audretsch, 1987; Hughes and Wood, 1999). Concentration of firms in an industry, particularly high-technology industries, facilitates spillovers between firms, and therefore learning and innovation (Glaeser et al. 1992; Audretsch and Kelbach, 2007; Acs et al., 2009). Hence, this paper classifies the industrial sectors into medium to high-tech (taking the value of 0 if the observation belongs to these categories) and low-tech (taking the value of 1) using the International Standard Industrial Classification (ISIC) codes identified by OECD (2011). OECD (2011) provides a definition of low-tech, medium tech and high-tech sectors based on industrial R&D intensity. Industrial R&D intensity relates to the direct R&D expenditures as a percentage of production (gross output), which is estimated after converting countries' R&D expenditures and production using GDP PPPs (purchasing power parity) (OECD, 2011). Table A1 in Appendix presents the sectoral classification based on OECD (2011).

4.2.3.2.3 Size of cities in LDCs (the clustering variable)

We expect that the rate of innovation is higher in cities that are more populous at least two reasons. One, the inputs needed for innovation are more readably available, abundant and cheaper in more populous places, as suppliers of innovative of inputs choose to locate in cities (Orlando and Verba, 2005). Second, more people in one place create more opportunities to learn from others i.e. knowledge spillovers, which means that knowledge generated within innovative firms is somehow transmitted to other firms through non-market mechanisms (Sedgely and Elmslie, 2004; Strumsky et al., 2005). For example, Sedgely and Elmslie (2004) find a positive relationship between the concentration of population in an area and innovation. At the level of the city, Strumsky et al. (2005) also find positively relationship between population concentration and patenting.

So as to measure the different sizes of cities, the WBES (2013) asks firms to issue their perception of the size of the city they operate in. The set of answers are constrained to the following five options: (1) Capital City, (2) City with population of over 1million other than capital city, (3) 250,000 – 1000,000, (4) 50,000 – 250,000, and (5) Less than 50,000. We expect that errors from cities of similar sizes to be correlated and hence, robust standard errors that allow cluster correlation are used. This allows us to see which international modes of entry are robust enough to be significant for SME innovation in all city sizes.

5. Descriptive statistics

Table 4 presents the descriptive characteristics of the sampled SMEs. A considerable number of the manufacturing SMEs report having new product (58 percent) and new process (about 52 percent) innovations. As for the international modes of entry, import of production inputs (about 50 percent) appear to be the most popular, followed by technology licensing (about 31 percent). Only a small proportion reported exporting their products (about 7 percent). In terms of the firm characteristics, the average age of the SMEs in our sample is about 15 years. 55 percent of the firm are micro; the remaining are small-sized firms (33 percent) and medium sized firms (12 percent). About 22 percent reported conducting formal R&D during the research period, thus suggesting that considerable number of firms with internal R&D. In terms of environmental hostility, 30 percent reported inadequately educated workforce as major/very severe obstacle, while 47 percent reported access to finance as minor/moderate obstacle and 22 percent had no obstacle. About 72 percent of the firms included in our sample are categorised as low-tech. Additionally, we observe that most of the sampled firms are located in large cities, particularly cities with population over 1 million – other than capital (about 54 percent) and cities with population of 250,000-1,000,000 (about 40 percent). Finally, about 6 percent of our sample is from Djibouti, 35 percent from Tanzania, 35 percent from Uganda and 24 percent are from Democratic Republic of Congo. After imposing the restrictions outlined in section 4.1.2 on our sample and cleaning the data, we lost the observations from Zambia. Hence, the analysis is concentrated on the remaining Sub-Saharan African LDCs.

6. Results and Discussion

In the light of the interest in innovation in LDCs, this paper investigates the international modes of entry that matter for SME innovation. The presentation of results is divided into two parts 1) international modes of entry 2) other factors. For each of the innovation variable, we estimate a probit model since the variable we want to explain takes only two possible values. The model is estimated by maximum likelihood techniques (Stock & Watson, 2012) and we report marginal effects at the sample mean values of the regressors. For the binary independent variables, the marginal effects measure discrete change. Marginal effects for continuous variables, however, measure the instantaneous rate of change. To increase the robustness of the results, first we analyze the data using a non-robust model, including a range of controls, presented in Columns 1 and 2 of Table 5. Secondly, we analyze the data with a robust model that takes into account the clustering of responses according to the size of cities that the SMEs are located in, shown in Columns 3 and 4 of Table 5. This is because some of our control variables, such as access to finance, access to an educated workforce and sector membership may be influenced by SMEs being located in larger cities or in smaller conurbations. This would potentially mean that responses from SMEs in cities would not be independent of each other. As a precaution against this, clustered standard errors are used (see e.g. Cameron and Trivedi, 2009; Cameron and Miller, 2015).

Table 4: Descriptive statistics

Variables	**%**	**Mean (Std. dev.)**
Dependent variables:		
New products	58.298	
New processes	51.604	
International Modes of Entry:		
Foreign Technology Licensing	30.962	
Imports of Production Inputs	49.651	
Exports	6.695	
Firm Internal Factors:		
R&D	21.897	
Age		14.878 (10.357)
Firm size (Medium-sezed firm)	12.552	
Micro firm	54.254	
Small firm	33.194	
Firm External Controls:		
Inadequately Educated Workforce (No obstacle)	22.176	
Minor/Moderate	47.420	
Major/sever	30.404	
Access to finance (No obstacle)	9.623	
Minor/Moderate	40.167	
Major/sever	50.209	
Low-tech sector	71.827	
Size of Cities in LDCs (City with population of over 1million other than capital city)	53.696	
Capital City	5.858	
250,000 – 1000,000	39.609	
50,000 – 250,000	0.837	
Country:		
Sub-Saharan African LDCs (Democratic Republic of Congo)	23.710	
Djibouti	5.858	
Tanzania	35.146	
Uganda	35.286	

Notes: Observations: 717

6.1 International modes of entry and SME innovation in LDCs

6.1.1 Foreign technology licensing

The analysis begins by investigating whether foreign technology licensing significantly influences SME new product and process innovations in Sub-Saharan LDCs. Foreign technology licensing is found to have a positive and statistically significant relationship with both new product and new process innovation (the marginal effects are statistically significant at 0.05 level in Columns I and II). Specifically, we find that foreign technology licensing increases both the probability of new product and new process innovation by 15 percentage points. The results on the relationship between foreign technology licensing and new product/process innovation are robust not just in the standard model but also when we use a cluster estimator (Columns III and IV). However, the statistical significance weakens in the new product innovation model (Column III), with the marginal effect of foreign technology licensing to be statistically significant at the 0.10 level. Overall, these results provide empirical support for *H1 and H2.*

From a new process innovation perspective, SMEs in Sub-Saharan LDCs seem to follow a model that is closer to that of newly industrialized countries, such as Korea, where studies of large firms have shown the importance of foreign technology licensing for innovation (e.g. Kim,, 1999, 2000). On the other hand, the finding that foreign technology licensing have weaker statistical association with new product innovation by SMEs in LDCs may be because the relationship between foreign technologies and product innovation in developing countries follows a three stage-trajectory, as postulated by Kim (1980, 1999), which are acquisition, assimilation and improvement. In the early phase of industrialization (which seems to fit the Sub-Saharan LDCs more), developing countries tend to acquire mature foreign technologies from developed economies (Kim,, 1999, 2000). Production at this first stage (acquisition), is simply an assembly of foreign inputs in order to produce mainly standard, undifferentiated products (Kim,, 1999, 2000), which is in accordance with our empirical evidence. It is at the later stages of assimilation and improvement, that there is higher tendency for foreign technology licensing to have more significant on product innovations. Hence, while the adoption of foreign technology has a significant influence on LDC manufacturing firms' abilities to significantly improve their production processes it may have less ability to significantly impact on new product innovation. The finding that foreign technology licensing is at least significant for SME new process innovation in Sub-Saharan LDCs is in contrast with finding for SMEs in developed countries (Zahra et al., 2000), which does not find significance of foreign technology licensing. However, in a study of large firms in Korea, Kim (1990) explains that while technology licensing is an important means of knowledge transfer for firms in developing countries, it tends to become less important for more developed economies; and that could explain the differences in our findings with Zahra et al. (2000).

Table 5: The relationship between internationalization and new product/process innovation

Model:	**(I) New products**		**(II) New processes**		**(III) New products**		**(IV) New processes**	
	ME	Std. Err.	ME	Std. Err.	ME	Robust Std. Err.	ME	Robust Std. Err.
International Modes of Entry:								
Foreign Technology Licensing	0.151***	0.053	0.155***	0.055	0.151*	0.081	0.155***	0.018
Imports of Production Inputs	0.112***	0.043	0.073	0.044	0.112	0.069	0.073	0.072
Exports	-0.047	0.093	-0.116*	0.087	-0.047	0.122	-0.116	0.106
Firm Internal Factors:								
R&D	0.312***	0.040	0.253***	0.046	0.312***	0.064	0.253***	0.050
Age	-0.001	0.002	-0.000	0.002	-0.001	0.002	0.000	0.003
Firm size (Medium-sized firm)								
Micro firm	-0.213***	0.071	-0.288***	0.070	-0.213***	0.033	-0.288***	0.044
Small firm	-0.126	0.077	-0.214***	0.073	-0.126**	0.056	-0.214***	0.072
Firm External Controls:								
Inadequately Educated Workforce (No obstacle)								
Minor/Moderate	-0.014	0.051	-0.079	0.052	-0.014	0.035	-0.079	0.071
Major/sever	0.080	0.056	0.052	0.059	0.080	0.128	0.052	0.107
Access to finance (No obstacle)								
Minor/Moderate	0.197***	0.069	0.095	0.074	0.197***	0.033	0.095	0.065
Major/sever	0.159**	0.073	0.034	0.075	0.159*	0.093	0.034	0.031
Low-tech sector	-0.030	0.044	-0.007	0.045	-0.030***	0.008	-0.007	0.022

Country:								
Sub-Saharan African LDCs (Democratic Republic of Congo)								
Djibouti	0.028	0.090	0.129	0.090	0.028**	0.012	0.129***	0.023
Tanzania	0.026	0.064	0.083	0.066	0.026	0.118	0.083**	0.035
Uganda	0.238***	0.048	0.299***	0.050	0.238**	0.088	0.299***	0.055
Log likelihood	-415.962		-431.021		-415.962		-431.021	
LR chi2(15)	143.950***		131.190***				131.190***	
Pseudo R2	0.148		0.1321		0.148		0.1321	
Obs. Probability	0.582		0.516		0.582		0.516	
Pred. probability	0.606		0.523		0.606		0.523	
Observations	718		717		718		717	

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. For robustness check, we also estimate the model using a logit model, but the results are similar (results are available upon request).

6.1.2 Imports

Secondly, we examine the effects of imports of intermediate inputs on SME innovation in LDCs. We find a significant influence of imports on product innovation in Column I of Table 5, but this finding is not repeated in Column III when clustering by city is taken into account. Hence, the evidence for $\boldsymbol{H_3}$ is mixed. Furthermore, we find no significant influence of imports of intermediate goods on SME process innovation in Sub-Saharan LDCs both in the non-robust and robust models (see Columns II and IV). So, we could not find support for $\boldsymbol{H_4}$. These finings imply that in contrast to developed economies, where imports of intermediate goods are considered important for innovation (Schneider, 2005; Damijan and Kostevc, 2010; Bloom et al., 2015), for Sub-Saharan LDCs, importing does not seem to have a significant influence on new process and new product innovations by manufacturing SMEs. This is likely because Sub-Saharan LDCs tend to import more from developing countries, rather than developed economies (UNCTAD, 2011, 2016); and imports from developed economies have greater impact on innovation (Schneider, 2005). LDCs imports are mostly driven by a mounting prominence of Southern markets (UNCTAD, 2011, 2016). For example, analysis by UNCTAD suggests that LDCs' imports bill rose from $42 billion in 2000 to nearly $144 billion in 2009, with developing countries expanding their market share by approximately10 percentage (UNCTAD, 2011, 2016). Hence, our findings support the conclusion reached by Schneider (2005), who based on a country level study in USA, found that imports from developed countries are positively related to US patents. Thus, considering that imports from developed countries have greater impact on innovation (Schneider, 2005), Sub-Saharan LDCs imports from developing countries could explain why we found that imports have no significant impact on SME innovation.

6.1.3 Exports

Thirdly, we investigate the influence of exports of production inputs on manufacturing SMEs' new process and product innovations in Sub-Saharan LDCs. The results from the standard models suggest no significant impact of exports on SME innovation in LDCs with respect to product innovation (Column I) and negative but weak statistical association with process innovation (Column II). However, allowing for within-cluster correlation of errors, the marginal effects of both new product and new process innovation are statistically insignificant. Therefore, we could not find support for both $\boldsymbol{H_5}$ and $\boldsymbol{H_6}$.

These findings suggest that unlike in developed economies, where learning from international customers through exports is considered important for innovation (Zahra et al., 2000; Kafouros et al., 2008; Higon and Driffield, 2011; Altomonte, et al., 2013; Almodovar et al., 2014), for Sub-Saharan LDCs exporting does not seem to contribute significantly to manufacturing SMEs' new process and new product innovations. This is likely because SMEs in LDCs seem to have relatively small level of exports for manufactured products, due to the overwhelming competition from Asia and especially China (UNCTAD, 2011). Hence, exports of manufactured outputs are still relatively small (only 7 percent in our sample); and that could be the reason why exports play a small role in influencing SME innovation in LDCs, unlike SMEs in developed economies. Therefore, although competing in international markets is argued to increase firms' scope of learning and the need to innovate because of demands of international customers (Kafouros et al., 2008; Filippetti et al., 2012; Altomonte, et al., 2013; Almodovar et al., 2014), for manufacturing SMEs in Sub-Saharan LDCs, learning from international customers is very limited due to very low levels of exports.

6.2 Other factors

Regarding ***internal factors***, the data shows that firm level spending on formal R&D is the most consistent significant factor positively associated with new product and new process innovations in all the models developed (statistically significant at 0.01 level). This finding is in line with the literature on determinants of innovation (Griliches, 1979; Radas and Bozic, 2009), as R&D is considered as one of most important factors explaining innovation. This implies that in Sub-Saharan LDCs, where external resources are very scarce within their domestic environments (UNCTAD, 2011, 2016), firms often have to rely on their internal R&D in coming up with new product and new process innovations. A more interesting finding as it relates to internal factors is the finding that firm size is associated with both new product and new process innovations in all the models that we developed (Columns I-IV) suggesting that larger SMEs are more likely to undertake innovation than smaller SMEs. In other words, the larger the firm size, the more innovative the firm is; which contrasts with findings in developed economies where smaller size is associated with more innovation (Acs, and Audretsch, 1987). One logical explanation for the difference is that in developed economies, innovative small firms acquire external knowledge spillovers more easily from research universities, public and private research institutions (Audretsch and Kelbach, 2007; Acs et al., 2009). In contrast, in Sub-Saharan LDCs, the knowledge infrastructure is undeveloped (UNCTAD, 2011, 2016), which implies lower external knowledge spillovers. In such hostile environments, small firms will often therefore have to rely on their internal R&D capabilities and resource advantages that size brings to be more innovative. Further, unlike in developed economies where firm age is negatively associated with innovation (Hausman, 2005), we found age to have no statistically significant impact on both new product and new process innovations. This could be because SMEs in Sub-Saharan LDCs have high reliance on internal R&D, and the accumulation of knowledge internally through R&D takes time, even in developed economies (Antonelli, 2007), Therefore, with the dearth of external knowledge resources in Sub-Saharan LDCs (UNCTAD, 2011, 2016) to make up for such long process of R&D, firm innovation process in such hostile environments takes longer, thereby reducing the effect of age on innovation.

As regards, ***external factors***, the results suggest that the perception of external access to finance as an obstacle is consistently positively associated with new product innovations (Columns I and III). This is understandable because it suggests that innovation may be perceived by SMEs in Sub-Saharan LDCs as a way of increasing revenues internally to overcome the dearth of external finance in their environments. However, we find no significant statistical association between lack of adequately educated workforce and innovation. Additionally, the cluster estimator suggests that operating in a low-tech sector decreases the probability of new product innovation by 3 percentage points (see Column III).

Finally, the results also show that Uganda and Djibouti, and to a lesser extent Tanzania, are more likely to innovate than Democratic Republic of Congo.

7. Conclusion

Previous studies have examined internationalization and its role in enhancing innovation, particularly in developed economies and large firms. However, they have generally overlooked the question modes of internationalization that matter for SME innovation in LDCs. This paper takes a different perspective from previous research and focuses on investigating the modes of internationalization that influence SME new product and process innovations in Sub-Saharan LDCs. Specifically, three international modes of entry: foreign technology licensing, import of intermediate inputs and exports are empirically examined. The results discussed above produce

some powerful insights with implications for theory and policy.

7.1 Contributions to knowledge

The following novel and original conclusions can be drawn with respect to the question stated at the beginning of the paper (see section 5 for discussion).

1. *Foreign technology licensing* - First, the paper contributes to knowledge by showing that foreign technology licensing is associated with manufacturing SME new product and mostly with new process innovation in Sub-Saharan LDCs. The paper contributes to the literature on foreign technology licensing and innovation (Wang et al., 2015; Wang and Li-Ying, 2014; Mukherjee and Mukherjee (2013; Kafouros et al., 20 08; Kim, 1999; Kim, 1990) from an SME perspective, by being likely the first to empirically examine whether SMEs in Sub-Saharan LDCs with foreign licensed technology are more likely to introduce new product and process innovations.
2. *Imports of Intermediate inputs*- Secondly, also contributes to knowledge by showing that the imports of intermediate inputs does not have a significant influence on new product and new process innovations for manufacturing SMEs in Sub-Saharan LDCs. This contributes to the literature on the influence of imports on innovation (Bloom et al., 2015; Lu and Ng, 2012; Paunov, 2011; Bloom et al., 2015; Lu and Ng, 2012; Paunov; 2011; Keller, 2002; Xu and Wang, 1999; Keller, 1999; Coe et al., 1997) by being likely the first to empirically examine whether SMEs in Sub-Saharan LDCs that import are more likely to introduce new product and process innovations.
3. *Exports* - Thirdly, further the study also contributes to knowledge by showing that import of intermediate production inputs does have a significant influence on the new product and process innovations for manufacturing SMEs in Sub-Saharan LDCs. Therefore, this paper contributes to the literature on exports and innovation (Almodovar et al., 2014; Chang et al., 2013; Altomonte, et al., 2013; Salomon and Jin, 2008) by being to the best of the author's knowledge the first to empirically test whether exporting by manufacturing SMEs in LDCs is associated with new product and process innovations.
4. *R&D* - Fourthly, we show that R&D has positive and statistically significant impact on both new product and new process innovations. The effect is large in magnitude increasing the probability of new product innovation by 31 percentage points and the probability of new process innovation by 25 percentage points. This finding provide further support to existing work (e.g. Griliches, 1979; Radas and Bozic, 2009) suggesting that R&D is one of most important factors explaining innovation.
5. *Firm size* - Fifthly, our findings provide strong evidence between firm size and innovation. In particular we find that smaller SMEs are less likely to innovate compared to larger SMEs.
6. *Access to finance as an obstacle* – Sixthly, we show that firms facing problems with accessing financial support are more likely to innovate than firms that have no obstacle suggesting that innovation can been seen as a mean of increasing firms revenues and overcoming liquidity constraints.
7. Low-tech sector – Finally, we find that firms operating in the low-tech sector are less likely to innovate, although the effect is found to be small in magnitude.

Overall, this paper has been able to extend the literature on internationalization and innovation in fresh ways, by focusing on SMEs in Sub-Saharan LDCs and providing a large sample empirical test of the phenomenon. In addition, the results suggest that of all the international modes of entry tested, foreign technology licensing seems to be the main factor that significantly associated with manufacturing SME innovation in Sub-Saharan LDCs.

7.2 Implications for policy

Several implications for policy can be drawn from this study. First, since at this stage of development, not all the modes of internationalization seem to have significant influence on manufacturing SME innovation in LDCs, policy makers in Sub-Saharan LDCs, may need to be more selective in choosing which mode of internationalization to support, in order to enhance innovation. More specifically, at least in the short term, foreign technology licensing seems the most viable of three modes examined, at least for new process innovation. In the long term however, it is possible that as levels of exports of manufactured products by SMEs in Sub-Saharan increases, the impact on innovation may increase, but this is likely to be a long-term process. Also, at least in the short term, supporting SME innovation through internationalization is more likely to yield results for older firms, rather than younger firms. Hence, the idea that mainly young entrepreneurial firms should be supported does not necessarily hold true for SMEs in Sub-Saharan LDCs.

7.3 Limitations and implications for future research

Since this research is based on large set of cross-sectional data, future research can try to find out if the results are similar with longitudinal. Also, this study is focused on manufacturing SMEs in Sub-Saharan LDCs; therefore care must be taken in extending the findings to the service sector or other LDCs. Future research can try to examine if the findings are similar for service sector SMEs and Asian LDCs.

Appendix

Table A1: High-technology, Medium technology and Low-technology

Sectors	R&D Intensity
High-technology Aircraft and spacecraft (353); Pharmaceuticals (2423); Office, accounting and computing machinery (30); Radio, TV and communciations equipment (32); Medical, precision and optical instruments (33).	4.3
Medium-high-technology Electrical machinery and apparatus, n.e.c. (31); Motor vehicles, trailers and semi-trailers (34); Chemicals excluding pharmaceuticals (24 excl. 2423); Railroad equipment and transport equipment, n.e.c. (352 + 359); Machinery and equipment, n.e.c. (29).	
Medium-low-technology Building and repairing of ships and boats (351); Rubber and plastics products (25); Coke, refined petroleum products and nuclear fuel (23); Other non-metallic mineral products (26); Basic metals and fabricated metal products (27-28).	
Low-technology Manufacturing, n.e.c. Recycling (36-37); Wood, pulp, paper, paper products, printing and publishing (20-22); Food products, beverages and tobacco (15-16); Textiles, textile products, leather and footwear (17-19).	0.3

Source: OECD (2011)

References

Abubakar, Y. and Mitra, J., 2007. Developing a culture for entrepreneurship in the East of England: the value of social and human capital. *Industry and Higher Education*, *21*(2), pp.129-143.

Abubakar, Y. A., and Mitra, J., 2009. Innovation performance in European regions: comparing manufacturing and services ICT subsectors. *International Journal of Entrepreneurship and Innovation Management*, *11*(2), pp.156-177.

Acs, Z.J. and Audretsch, D.B., 1987. Innovation, market structure, and firm size. *The review of Economics and Statistics*, pp.567-574.

Acs, Z.J. and Virgill, N., 2010. *Entrepreneurship in developing countries* (pp. 485-515). Springer New York.

Acs, Z.J., 2002. *Innovation and the Growth of Cities*. Cheltenham: E. Elgar.

Acs, Z.J., Desai, S. and Hessels, J., 2008. Entrepreneurship, economic development and institutions. *Small business economics*, *31*(3), pp.219-234.

Acs, Z. J., Szerb, L., and Autio, E., 2016. The global entrepreneurship index 2016. In Global Entrepreneurship and Development Institute. Online. Available at: https://thegedi.org/2016-global-entrepreneurship-index/ (Accessed: 16th December 2016)

Altomonte, C., Aquilante, T., Békés, G. and Ottaviano, G.I., 2013. Internationalization and innovation of firms: evidence and policy. *Economic policy*, *28*(76), pp.663-700.

Ariffin, N. and Figueiredo, P.N., 2004. Internationalization of innovative capabilities: counter-evidence from the electronics industry in Malaysia and Brazil. *Oxford development studies*, *32*(4), pp.559-583.

Aterido, R., Hallward-Driemeier, M. and Pagés, C., 2011. Big constraints to small firms' growth? Business environment and employment growth across firms. *Economic Development and Cultural Change*, 59(3), pp.609-647.

Alby, P., Dethier, J.J. and Straub, S., 2012. Firms operating under electricity constraints in developing countries. *The World Bank Economic Review*, p.lhs018.

Andersen, E. S., 1992. Approaching national systems of innovation from the production and linkage structure. *National systems of innovation: Towards a theory of innovation and interactive learning*, pp.71-96.

Audretsch, B., 1998. Agglomeration and the location of innovative activity. *Oxford review of economic policy*, *14*(2), pp.18-29.

Barrios, S., Görg, H. and Strobl, E., 2003. Explaining Firms' Export Behaviour: R&D, Spillovers and the Destination Market. *Oxford Bulletin of Economics and Statistics*, *65*(4), pp.475-496.

Baumol, W.J., Litan, R.E. and Schramm, C.J., 2007. Good capitalism, bad capitalism, and the economics of growth and prosperity. *Bad Capitalism, and the Economics of Growth and Prosperity*.

Bertschek, I., 1995. Product and process innovation as a response to increasing imports and foreign direct investment. *The Journal of Industrial Economics*, pp.341-357.

Bierly, P. and Chakrabarti, A., 1996. Generic knowledge strategies in the US pharmaceutical industry. *Strategic management journal*, *17*(S2), pp.123-135.

Bloom, N., Draca, M. and Van Reenen, J., 2015. Trade induced technical change? The impact of Chinese imports on innovation, IT and productivity.*The Review of Economic Studies*, p.rdv039.

Calof, J.L. and Viviers, W., 1995. Internationalization behavior of small-and medium-sized South African enterprises. *Journal of Small Business Management*, *33*(4), p.71.

Cameron, A.C. and Miller, D.L., 2015. A practitioner's guide to cluster-robust inference. *Journal of Human Resources*, *50*(2), pp.317-372.

Cameron, A.C. and Trivedi, P.K., 2009. Microeconometrics with STATA.*StataCorp LP: College Station, Texas*, pp.521-552.

Capello, R., 1999. Spatial transfer of knowledge in high technology milieux: learning versus collective learning processes. *Regional studies*, *33*(4), pp.353-365.

Castellani, D. and Zanfei, A., 2007. Multinational companies and productivity spillovers: is there a specification error?. *Applied Economics Letters*, *14*(14), pp.1047-1051.

Chang, C.L., Chen, S.P. and McAleer, M., 2013. Globalization and knowledge spillover: international direct investment, exports and patents.*Economics of Innovation and New Technology*, *22*(4), pp.329-352.

Chowdhury, S.K., 2006. Investments in ICT-capital and economic performance of small and medium scale enterprises in East Africa. *Journal of International Development*, *18*(4), pp.533-552.

Coe, D.T. and Helpman, E., 1995. International R&D spillovers. *European economic review*, *39*(5), pp.859-887.

Coe, D.T., Helpman, E. and Hoffmaister, A.W., 1997. North-South R&D Spillovers. *Economic Journal*, *107*(440), pp.134-49.

Cuervo-Cazurra, A. and Genc, M., 2008. Transforming disadvantages into advantages: developing-country MNEs in the least developed countries.*journal of international Business Studies*, *39*(6), pp.957-979.

Damijan, J.P. and Kostevc, Č., 2010. Learning from trade through innovation: Causal link between imports, exports and innovation in Spanish microdata, *SSRN Discussion Paper No. 264/2010*

Eifert, B., Gelb, A. and Ramachandran, V., 2008. The cost of doing business in Africa: Evidence from enterprise survey data. *World Development*, *36*(9), pp.1531-1546.

Eisenhardt, K.M. and Tabrizi, B.N., 1995. Accelerating adaptive processes: Product innovation in the global computer industry. *Administrative science quarterly*, pp.84-110.

Ernst, D., 2002. Global production networks and the changing geography of innovation systems. Implications for developing countries. *Economics of innovation and new technology*, *11*(6), pp.497-523.

Filippetti, A., Frenz, M. and Ietto-Gillies, G., 2012. The role of internationalization as a determinant of innovation performance: an analysis of 42 countries. *Available at SSRN 2114289*.

Florida, R. and Kenney, M., 1988. Venture capital and high technology entrepreneurship. *Journal of Business Venturing*, *3*(4), pp.301-319.

Freeman, C., 1995. The 'National System of Innovation'in historical perspective. *Cambridge Journal of economics*, *19*(1), pp.5-24.

Freeman, C., 1971. The Role of Small Firms in Innovation in the United Kingdom. Report to the Bolton Committee of Enquiry on Small Firms. *London: HSMO*.

Fu, X., Pietrobelli, C. and Soete, L., 2011. The role of foreign technology and indigenous innovation in the emerging economies: Technological change and catching-up. *World development*, *39*(7), pp.1204-1212.

Furman, J. L., Porter, M. E., and Stern, S. (2002). The determinants of national innovative capacity. *Research policy*, *31*(6), 899-933.

Fukugawa, N., 2009. Determinants of licensing activities of local public technology centers in Japan. *Technovation*, *29*(12), pp.885-892.

Glaeser, E.L., H.D. Kallal, J.A. Scheinkman, and A. Shleifer, 1992. Growth in Cities, Journal Political Economy, 100 (6), pp. 1126-1152.

Goedhuys, M. and Sleuwaegen, L., 2010. High-growth entrepreneurial firms in Africa: a quantile regression approach. *Small Business Economics*, *34*(1), pp.31-51.

Grant, R.M., Jammine, A.P. and Thomas, H., 1988. Diversity, diversification, and profitability among British manufacturing companies, 1972–1984.*Academy of management Journal*, *31*(4), pp.771-801.

Griliches, Z., 1979. Issues in assessing the contribution of research and development to productivity growth. *The bell journal of economics*, pp.92-116.

Gumede, V. and Rasmussen, V., 2002. Small manufacturing enterprises and exporting in South Africa: a preliminary assessment of key export success factors. *Journal of Small Business and Enterprise Development*, *9*(2), pp.162-171.

Hansen, J.A., 1992. Innovation, firm size, and firm age. *Small Business Economics*, *4*(1), pp.37-44.

Hausman, A., 2005. Innovativeness among small businesses: Theory and propositions for future research. *Industrial Marketing Management*, *34*(8), pp.773-782.

Higón, D.A. and Driffield, N., 2011. Exporting and innovation performance: analysis of the annual small business survey in the UK. *International Small Business Journal*, *29*(1), pp.4-24.

Hinson, R. and Sorensen, O., 2006. E-business and small Ghanaian exporters: Preliminary micro firm explorations in the light of a digital divide.*Online Information Review*, *30*(2), pp.116-138.

Hitt, M.A., Hoskisson, R.E. and Ireland, R.D., 1994. A mid-range theory of the interactive effects of international and product diversification on innovation and performance. *Journal of management*, *20*(2), pp.297-326.

Hu, J. L., Yang, C. H., & Chen, C. P., 2014. R&D efficiency and the national innovation system: An international comparison using the distance function approach. *Bulletin of Economic Research*, *66*(1), pp. 55-71.

Hughes, A. and Wood, E., 2000. *Rethinking innovation comparisons between manufacturing and services: the experience of the CBR SME surveys in the UK* (pp. 105-124). Springer US.

Ibeh, K.I. and Young, S., 2001. Exporting as an entrepreneurial act-An empirical study of Nigerian firms. *European Journal of Marketing*, *35*(5/6), pp.566-586.

Ibeh, K.I., 2001. On the Resource-based, Integrative View of Small Firm Internationalisation: an Exploratory Study of Nigerian Firms. In *Multinationals in a New Era* (pp. 72-87). Palgrave Macmillan UK.

Ibeh, K.I., Ibrahim, E. and Ezepue, P.O., 2007. Factors stimulating initial export activity: Any difference for Nigerian firms?. *Journal of African business*, *8*(2), pp.7-26.

Ibeh, K.I.N., 1999. Entrepreneurial orientation, environmental disincentives and export involvement of Nigerian firms. *Journal of International Marketing and Exporting*, *4*(1), pp.26-39.

IFC, 2011. SME Finance Policy Guide, International Finance Corporation (IFC). Online. Available at: http://www.ifc.org/wps/wcm/connect/f3ef82804a02db409b88fbd1a5d13d27/G20_Policy_Report.pdf?MOD=AJPERES (Accessed: 8th February, 2016)

Jaffe, A.B., Trajtenberg, M. and Henderson, R., 1993. Geographic localization of knowledge spillovers as evidenced by patent citations. *the Quarterly journal of Economics*, pp.577-598.

Jensen, N.M., Li, Q. and Rahman, A., 2010. Understanding corruption and firm responses in cross-national firm-level surveys. *Journal of International Business Studies*, *41*(9), pp.1481-1504.

Jiao, H., Zhou, J., Gao, T., and Liu, X., 2016. The more interactions the better? The moderating effect of the interaction between local producers and users of knowledge on the

relationship between R&D investment and regional innovation systems. *Technological Forecasting and Social Change*, *110*, pp.13-20.
Kafouros, M.I., Buckley, P.J., Sharp, J.A. and Wang, C., 2008. The role of internationalization in explaining innovation performance. *Technovation*,*28*(1), pp.63-74.
Keeble, D., and Wilkinson, F., 1999. Collective learning and knowledge development in the evolution of regional clusters of high technology SMEs in Europe. *Regional studies*, *33*(4), pp.295-303.
Keizer, J.A., Dijkstra, L. and Halman, J.I., 2002. Explaining innovative efforts of SMEs.: An exploratory survey among SMEs in the mechanical and electrical engineering sector in The Netherlands. *Technovation*, *22*(1), pp.1-13.
Keller, W., 1999. *How trade patterns and technology flows affect productivity growth* (No. w6990). National Bureau of Economic Research.
Keller, W., 2002. Geographic Localization of International Technology Diffusion. *American Economic Review*, 92(1): 120-142.
Kim, A., 1990. Technological adaptation and innovation in newly industrialized countries: The case of Korea, Thesis, MIT
Kim, L., 1980. Stages of development of industrial technology in a developing country: a model. *Research policy*, *9*(3), pp.254-277.
Kim, L., 1999. Building technological capability for industrialization: analytical frameworks and Korea's experience. *Industrial and corporate change*, *8*(1), pp.111-136.
Kim, L. and Nelson, R.R., 2000. *Technology, learning, and innovation: Experiences of newly industrializing economies*. Cambridge University Press.
Kobrin, S.J., 1991. An empirical analysis of the determinants of global integration. *Strategic Management Journal*, *12*(S1), pp.17-31.
Kogut, B., 1985. Designing global strategies: Comparative and competitive value-added chains. *Sloan management review*, *26*(4), pp.15-28.
Kotey, B., 2014. Small business innovation in the hostile environment of Australia's drought stricken rural communities. *Australasian Journal of Regional Studies*, *20*(2), p.325.
Kuada, J. and S∅ rensen, O.J., 1999. Upstream and downstream processes of internationalisation: some Ghanaian evidence. *Journal of Euromarketing*,*7*(4), pp.7-41.
Lall, S., 2000. Technological change and industrialization in the Asian newly industrializing economies: achievements and challenges. *Technology, learning and innovation: Experiences of newly industrializing economies*, pp.13-68.
Lecerf, M.A., 2012. Internationalization and innovation: the effects of a strategy mix on the economic performance of French SMEs. *International Business Research*, *5*(6), p.2.
Liu, X. and Buck, T., 2007. Innovation performance and channels for international technology spillovers: Evidence from Chinese high-tech industries. *Research policy*, *36*(3), pp.355-366.
Liu, X. and White, R.S., 1997. The relative contributions of foreign technology and domestic inputs to innovation in Chinese manufacturing industries.*Technovation*, *17*(3), pp.119-125.
Lobo, J. and Strumsky, D., 2008. Metropolitan patenting, inventor agglomeration and social networks: A tale of two effects. *Journal of Urban Economics*, *63*(3), pp.871-884.
Lu, Y. and Ng, T., 2012. Do Imports Spur Incremental Innovation in the South?. *China Economic Review*, *23*(4), pp.819-832.
Madanmohan, T.R., Kumar, U. and Kumar, V., 2004. Import-led technological capability: a comparative analysis of Indian and Indonesian manufacturing firms. *Technovation*, *24*(12), pp.979-993.
Mambula, C., 2002. Perceptions of SME growth constraints in Nigeria.*Journal of Small Business Management*, *40*(1), p.58.

Mansfield, E., 1988. The speed and cost of industrial innovation in Japan and the United States: External vs. internal technology. *Management Science*,*34*(10), pp.1157-1168.

Mas, I. and Ng'weno, A., 2010. Three keys to M-PESA's success: Branding, channel management and pricing. *Journal of Payments Strategy & Systems*,*4*(4), pp.352-370.

Mead, D.C. and Liedholm, C., 1998. The dynamics of micro and small enterprises in developing countries. *World development*, *26*(1), pp.61-74.

Miller, D., 2012. *Selling solar: the diffusion of renewable energy in emerging markets*. Routledge.

Moodley, S., 2003. E-commerce and export markets: Small furniture producers in South Africa*. *Journal of Small Business Management*, *41*(3), p.317.

Mtigwe, B., 2004. Expositions of African entrepreneurial firm internationalization behavior. Proceedings of the 5th International Conference of the International Academy of African Business and Development, Georgia State University, Atlanta, Georgia, April 7–10.

Nachum, L. and Keeble, D., 2003. MNE linkages and localised clusters: foreign and indigenous firms in the media cluster of Central London. *Journal of International Management*, *9*(2), pp.171-192.

Narayanan, K. and Bhat, S., 2009. Technology sourcing and its determinants: A study of Basic Chemical industry in India. *Technovation*, *29*(8), pp.562-573.

Naudé, W., 2011. Entrepreneurship is not a binding constraint on growth and development in the poorest countries. *World Development*, *39*(1), pp.33-44.

Nepelski, D. and De Prato, G., 2015. International technology sourcing between a developing country and the rest of the world. A case study of China. *Technovation*, *35*, pp.12-21.

Nkamnebe, A. D., 2004. Anatomy of informal exporting in Nigeria's non-oil sector. Proceedings of the 5th International Conference of the International Academy of African Business and Development, Georgia State University, Atlanta, Georgia, April 7–10.

North, D. and Smallbone, D., 2000. The innovativeness and growth of rural SMEs during the 1990s. *Regional studies*, *34*(2), pp.145-157.

North, D.C., 1990. *Institutions, institutional change and economic performance*. Cambridge university press.

Obben, J. and Magagula, P., 2003. Firm and managerial determinants of the export propensity of small and medium-sized enterprises in Swaziland.*International Small Business Journal*, *21*(1), pp.73-91.

Okello, J.J. and Swinton, S.M., 2007. Compliance with international food safety standards in Kenya's green bean industry: Comparison of a small-and a large-scale farm producing for export. *Applied Economic Perspectives and Policy*, *29*(2), pp.269-285.

Okpara, J.O. and Koumbiadis, N.J., 2011. Strategic export orientation and internationalization barriers: evidence from SMEs in a developing economy.*Journal of International Business and Cultural Studies*, *4*, p.1.

Okpara, J.O., 2009. Strategic choices, export orientation and export performance of SMEs in Nigeria. *Management Decision*, *47*(8), pp.1281-1299.

Orlando, M.J. and Verba, M., 2005. Do only big cities innovate? Technological maturity and the location of innovation. *Economic Review-Federal Reserve Bank of Kansas City*, *90*(2), p.31.

Owusu-Frimpong, N., and Mmieh, F., 2004. An evaluation of the perceptions and marketing practices of non-traditional exporters in Ghana. Proceedings of the 5th International Conference of the International Academy of African Business and Development, Georgia State University, Atlanta, Georgia, April 7–10.

Page, J. and Söderbom, M., 2015. Is small beautiful? Small enterprise, aid and employment in Africa. *African Development Review*, *27*(S1), pp.44-55.

Paunov, C., 2011. Imports, Innovation and Employment after Crisis, OECD

Pavitt, K., 1984. Sectoral patterns of technical change: towards a taxonomy and a theory. *Research policy*, *13*(6), pp.343-373.

Pavitt, K., Robson, M. and Townsend, J., 1987. The size distribution of innovating firms in the UK: 1945-1983. *The Journal of Industrial Economics*, pp.297-316.

Porter, M. 1990. *The Competitive Advantage of Nations*, Methuen, London.

Radas, S. and Božić, L., 2009. The antecedents of SME innovativeness in an emerging transition economy. *Technovation*, *29*(6), pp.438-450.

Rosenberg, N., 1992. Science and technology in the twentieth century.*Technology and Enterprise in A Historical Perspective. Oxford*.

Rothwell, R., 1977. The characteristics of successful innovators and technically progressive firms (with some comments on innovation research). *R&D Management*, *7*(3), pp.191-206.

Rutashobya, L. and Jaensson, J.E., 2004. Small firms' internationalization for development in Tanzania: Exploring the network phenomenon. *International Journal of Social Economics*, *31*(1/2), pp.159-172.

Tsai, K.H. and Wang, J.C., 2009. External technology sourcing and innovation performance in LMT sectors: An analysis based on the Taiwanese Technological Innovation Survey. *Research Policy*, *38*(3), pp.518-526.

Salomon, R. and Jin, B., 2008. Does knowledge spill to leaders or laggards? Exploring industry heterogeneity in learning by exporting. *Journal of International Business Studies*, pp.132-150.

Salomon, R. M., & Shaver, J. M. (2005). Learning by exporting: new insights from examining firm innovation. *Journal of Economics & Management Strategy*, *14*(2), 431-460.

Saxenian, A., 1996. *Regional advantage*. Harvard University Press.

Schneider, P.H., 2005. International trade, economic growth and intellectual property rights: A panel data study of developed and developing countries.*Journal of Development Economics*, *78*(2), pp.529-547.

Schumpeter, J.A., 1934. *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle* (Vol. 55). Transaction publishers.

Sedgley, N. and Elmslie, B., 2004. The geographic concentration of knowledge: Scale, agglomeration, and congestion in innovation across US states. *International Regional Science Review*, *27*(2), pp.111-137.

Simmie, J., 2002. Knowledge spillovers and reasons for the concentration of innovative SMEs. *Urban Studies*, *39*(5-6), pp.885-902.

Sjöholm, F., 1996. International transfer of knowledge: the role of international trade and geographic proximity. *Weltwirtschaftliches Archiv*,*132*(1), pp.97-115.

Sun, Y. and Du, D., 2010. Determinants of industrial innovation in China: Evidence from its recent economic census. *Technovation*, *30*(9), pp.540-550.

Thwaites, A. and Wynarczyk, P., 1996. The economic performance of innovative small firms in the South East region and elsewhere in the UK.*Regional Studies*, *30*(2), pp.135-149.

UN(2015) About LDCs. Online. Available at: http://unohrlls.org/about-ldcs/ (Accessed: 27th October 2017)

UNCTAD, 2007. Global players from emerging markets, UNCTAD. Online. Available at: http://unctad.org/en/Docs/iteteb20069_en.pdf (Accessed: 5th February 2016)

UNCTAD, 2011. The Least Developed Countries Report 2011, UNCTAD. Online. Available at: http://unctad.org/en/docs/ldc2011_en.pdf . (Accessed: 5th February 2016)

UNCTAD, 2011. The Least Developed Countries Report 2011, UNCTAD. Online. Available at: http://unctad.org/en/docs/ldc2011_en.pdf . (Accessed: 5th February 2016)

UNCTAD, 2016. The Least Developed Countries Report 2016, UNCTAD. Online. Available at: http://unctad.org/en/PublicationsLibrary/ldc2016_en.pdf (Accessed: 4th October 2017)

Wang, Y. and Li-Ying, J., 2014. When does inward technology licensing facilitate firms' NPD performance? A contingency perspective. *Technovation*,*34*(1), pp.44-53.

Wang, Y., Zhou, Z., Ning, L. and Chen, J., 2015. Technology and external conditions at play: A study of learning-by-licensing practices in China.*Technovation*, *43*, pp.29-39.

WBES (2017) Survey methodology. Online. Available at: http://www.enterprisesurveys.org/Methodology (Accessed: 27th October, 2017)

Welter, F. and Smallbone, D., 2011. Institutional perspectives on entrepreneurial behavior in challenging environments. *Journal of Small Business Management*, *49*(1), pp.107-125.

Welter, F., Smallbone, D., Slonimski, A., Linchevskaya, O., Pobol, A. and Slonimska, M., 2012. *Enterprising families in a hostile environment for entrepreneurship* (No. 2012-1). Jönköping International Business School.

Wolff, J.A. and Pett, T.L., 2006. Small-Firm Performance: Modeling the Role of Product and Process Improvements*. *Journal of Small Business Management*, *44*(2), pp.268-284.

World Bank (2013) Micro, Small, and Medium Enterprise (MSME) Finance. World Bank. Online. Available at: http://www.worldbank.org/en/results/2013/04/05/msme-finance-expanding-opportunities-and-creating-jobs (Accessed: 30th April 2013)

Xu, B. and Wang, J., 1999. Capital goods trade and R&D spillovers in the OECD. *Canadian Journal of Economics*, pp.1258-1274.

Zahra, S.A., Ireland, R.D. and Hitt, M.A., 2000. International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance. *Academy of Management journal*,*43*(5), pp.925-950.

Zelekha, Y., Avnimelech, G. and Sharabi, E., 2014. Religious institutions and entrepreneurship. *Small Business Economics*, *42*(4), pp.747-767.