Do Domestic Firms Learn to Export from Foreign-Owned Firms? Evidence from Kenya

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Abstract

Attracting inflows of foreign direct investment (FDI) has been a major concern of most governments in developing countries. FDI is believed to bring many benefits to the host countries in terms of productivity, employment, and technology, among other benefits. This paper investigates the existence of export spillovers in Kenya for the period 2000-2005 using firm level panel data. More specifically, the paper analyses export spillovers in the manufacturing industry and the channels of transmission of such spillovers. Using a linear probability fixed effects model, the results show that foreign-owned firms may positively affect the decision of domestic firms to export through the demonstration effects. However, FDI could result in negative spillovers through the competition effects. There is also evidence of self-selection, where only the most productive firms venture into the export market. Therefore, policies aimed at encouraging firms increase their productivity will increase domestic firms' participation in the export market.

Keywords: foreign firms, domestic firms, export spill-overs, Kenya

1. Introduction

This paper investigates the existence of export spillovers and their transmission mechanisms from foreign-owned firms to domestic firms in Kenya. According to Blomstrom and Kokko (1998), export or market access spillovers refer to benefits which accrue to domestically-owned firms in host countries arising from foreign direct investment (FDI) through export operations of foreign-owned firms. Such benefits may pave way for local firms to enter the same export market, either because they create transport infrastructure, or because they disseminate information about foreign markets that can be useful to local firms. These spillovers may be transmitted both through technology and the market mechanism, making them pecuniary externalities. This paper focuses on export spillovers related to information, competition and imitation. For the purpose of this study, firms with at least 10% of their nominal capital owned by foreigners are defined as foreign-owned firms while the rest are considered locally-owned.

In recent times, literature on spillovers has acknowledged that exports could be an important source of spillovers. By their very nature, they comprise a pure form of technology spillovers. Starting with the paper by Bernard and Jensen (1995), a wide range of studies has found that exporting firms usually perform better than domestic market-oriented firms. Regarding this issue, the ongoing debate in the international trade literature is based on this crucial question: do successful firms export, or does exporting lead to higher firm productivity? Up to now, two different but not mutually exclusive types of answers have been found in the literature: the first is mostly in favour of the self-selection of better firms into export markets (e.g. Bernard and Jensen, 1999) and the other is in favour of the learning by exporting hypothesis (e.g. Van Biesebroeck, 2005).

However, literature on the role played by foreign firms or other external sources in influencing the export performance of local firms is rather scarce. Moreover, studies looking for export spillovers differ in several important aspects, among which are issues of the definition of export spillovers and/or the level of data disaggregation, causing econometric results to show mixed evidence. For example, Aitken et al. (1997); Greenaway et al., (2004); Kneller and Pisu, (2007); Greenaway and Kneller, (2008) and Koenig et al. (2010) all find the existence of export spillovers. On the other hand, Barrios et al. (2003) and Bernard and Jensen (2004) find no evidence of export spillovers. Other studies suggest that export spillovers from FDI in the host country depend

on the characteristics of domestic firms and industries in terms of human capital participation, financial market development, and the technology gap (Anwar and Nguyen, 2011; Keller and Pisu, 2005). Furthermore, Gorg and Strobl (2005) emphasize the importance of linkages for allowing technology and pecuniary externalities from FDI to occur. Therefore, although reasonable attempts have been made to understand whether foreign firms are a source of export spillovers, the findings remain largely inconclusive. Moreover, only a few studies have devoted considerable attention to understanding their transmission channels.

Using a developing country's experience, this paper enhances this debate by focusing on export spillovers in Kenya and explores the possibility of foreign-owned firms affecting trade through their impact on domestic firms using firm level panel data for the period 2000-2005.

The rest of the paper is organized as follows. In the next part of this section an overview of FDI and the manufacturing sector in Kenya is presented. Section two presents a review of the literature on export spillovers. A discussion of the theoretical framework, the empirical model and the data used is presented in section three. A descriptive analysis and the econometric results follow in section four while the final section contains the conclusion and policy implication of the study.

FDI and the development of the manufacturing sector in Kenya

Kenya is a relatively big country with a total land area of 580,367 square kilometres. It has a population of approximately 40 million people and is located strategically along the East African coast. Foreign investment has been of considerable significance in financing development in Kenya not only in the manufacturing but also in the primary and tertiary sectors. Before independence in 1963, the bulk of FDI went to primary production and plantations. The few manufacturing industries established up to World War II were mainly for basic processing of agricultural exports and the processing of food for the local market. After the War, British manufacturing firms began to invest directly in manufacturing, in part because of the competition from non-British trading firms, which threatened Britain's share in the Kenyan market (Rweyemamu, 1987).

After independence, FDI within the manufacturing sector increased significantly partly due to a government policy which restricted it from the traditional agricultural sector, allowing for resettlement of the landless citizens. This resulted in a 50% increase in industrial output between the period 1964 and 1970. The 100% increase in the annual level of investment was foreign-owned. This growth happened within an import substitution environment implemented since early 1950s. The government used a combination of tariffs and quotas supplemented by foreign allocation measures such as overvaluing exchange rates to maintain import costs low and favourable credit and interest rate policies intended to subsidize the manufacturing consumer goods (Swainson, 1980: 119; Gachino, 2006). A summary of the various policies and

institutions established to increase exports and attract FDI in the manufacturing sector are presented in Appendix Table A1.

Figure 1: Selected Kenya's growth rates
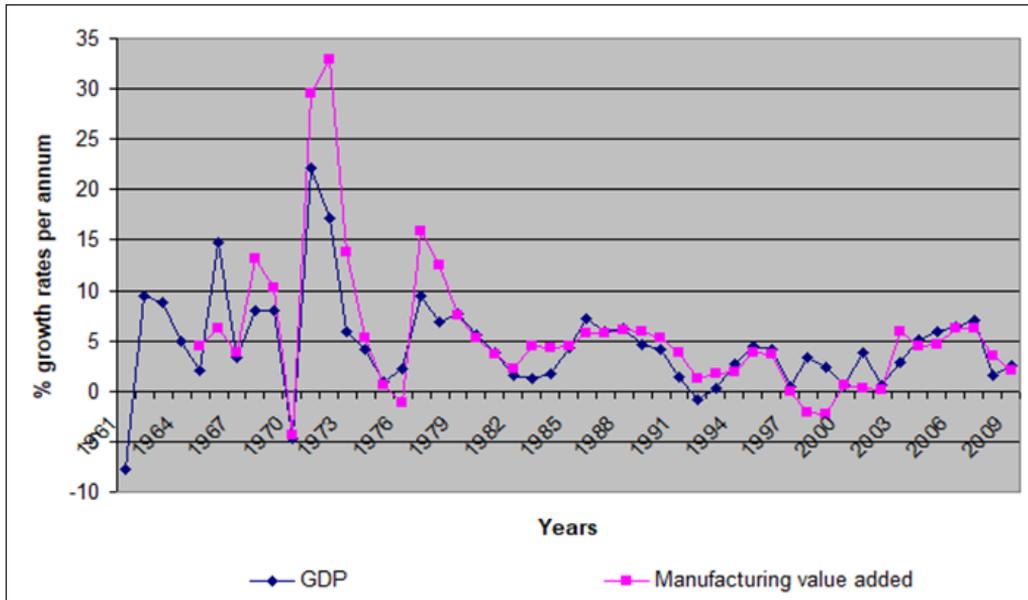
Source: World Development Indicators 2010

According to Figure 1 above, Kenya's performance began to falter in the 1970s due to several reasons, among them the oil crisis, decline in coffee prices, poor macroeconomic management, collapse of the East African Community, drought and the world economic recession in the early 1980s. Consequently, Kenya experienced deterioration in the terms of trade and increase in cost of external capital. Ensuing economic distortions resulted in severe structural constraints and macroeconomic imbalances (Fahnbulleh, 2006). Moreover, the inward looking policies pursued at the time under the import substitution strategy made it difficult for firms to effectively participate and compete in the export markets (Government of Kenya, 1994).

Further, the economic stagnation in the mid-1980s and 1990s affected Kenya's industrialization process, with consequent effects on labour productivity (Gachino and Rasiah, 2003). Political instability in neighbouring countries, particularly Uganda, also drew away markets and investments from Kenya. In addition, macroeconomic constraints arising from the collapse of the IMF's Structural Adjustment Programmes (SAPs) in 1986 (Mwega and Ndung'u, 2002), massive destruction of infrastructure due to El Nino rains, and weak institutions all contributed to economic stagnation (Phillips and Obwana, 2000; Todaro, 2000; Rasiah and Gachino, 2005). Therefore, although Kenya introduced a number of instruments to promote FDI and export-oriented industrialization during this period, these factors slowed down the development of the manufacturing sector.

Figure 2: FDI and manufactured export
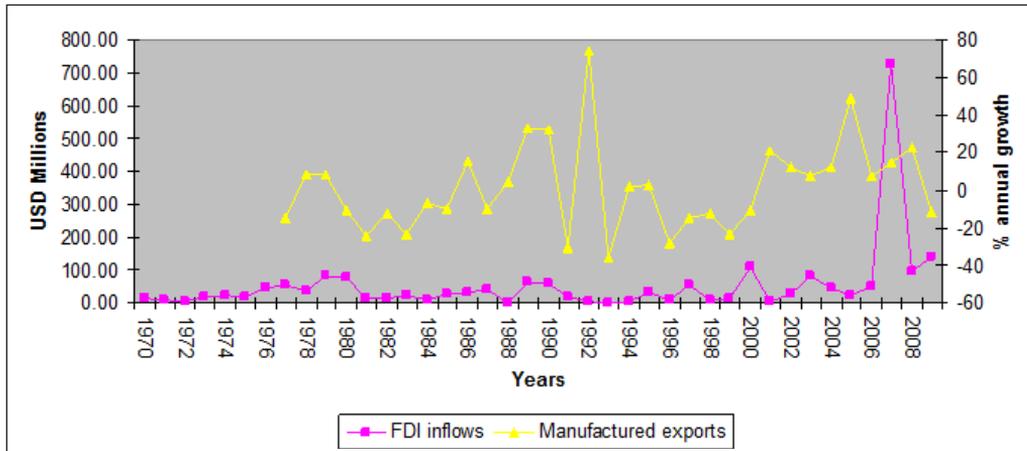
Source: World Development Indicators, 2010

The government in the 1990s focused on exports promotion. First, tariff bands were reduced during this period. Second, free-trade zones were established, Kenya Export Trade Authority was revived, and the Kenya Exports Promotion Council was established. Third, Kenya signed the African Growth and Opportunities Act (AGOA) in 2000 which allowed duty – and quota-free – access to the US, giving the export processing zones (EPZs) a new impetus as the number of gazetted EPZs rose from 19 in 2000 to 43 in 2004 to 94 in 2013 (Kinuthia, 2013). The contribution of EPZs to the national economy has been rising steadily over the years. Articles of apparel and clothing, the bulk (80%) of which originate from EPZ were Kenya's third largest merchandise export contributor after tea and horticulture. During the year 2013, coffee earnings declined and articles of clothing overtook coffee in export earnings (EPZ, 2013).

Moreover, regional integration measures, specifically the revival of the East African Community (EAC) and the wider Common Market for Eastern and Southern Africa (COMESA), also boosted export performance, particularly of manufactured products. Recorded exports to COMESA increased from an average of 15% for 1990-1992 to 34% in 1996-1998 (Glenday and Ndii, 2000). However, while the size of Kenya's export trade was respectable in regional terms, the country had yet to position itself as a major exporter of manufactured goods, and the structure of the manufacturing sector has remained unchanged.

Foreign-owned firms in Kenya since the 1970s have invested in a wide range of sectors. Most notably, they have played a major role in floriculture and horticulture, with close to 90% of flowers being controlled by foreign affiliates. In the manufacturing sector, FDI has concentrated on the consumer goods sector such as food and beverage industries. This has changed in the recent years with growth of the garment sector because of the African Growth and Opportunities Act (AGOA). Of the 34 companies involved in AGOA, 28 are foreign, and most of them concentrated in the Export Processing Zones (EPZs). FDI is also distributed in other sectors including services,

telecommunication among others. About 55% of the foreign firms are concentrated in Nairobi while Mombasa accounts for about 23%, with the remainder going to other parts of Kenya. The main form of FDI establishment has been through "greenfield" investments[2]. The traditional sources of foreign investments in Kenya are Britain, United States of America (USA), Germany, South Africa, Netherlands, Switzerland and more recently China and India (Todaro, 2000); Onjala, 2008; Kamau et al., 2009).

Statement of the problem

The World Bank (1998: 18) report has noted that, "improving the policy and business environment to create conditions favourable to trade, especially exports, is one of the most important ways for countries to obtain knowledge from abroad."To achieve this objective, multinational corporations (MNCs) are important vehicles through which modern technology, interpreted broadly to include product, process, and distribution of technology, and management and marketing skills may be acquired. Foreign investment can result in benefits in host countries even if the MNCs decide to carry out their foreign operations in wholly-owned affiliates, since technology is to some extent a public good. These benefits take the form of various types of externalities which can be either productivity spillovers or market access spillovers, the latter being the concern of this paper.[3]

In Africa, considerable attention has been devoted to understanding the challenges facing the manufacturing sector. However, although many studies have focused on manufactured exports,[4] few have given attention to export spillovers arising from multinational activity.[5] This is in spite the observation by several scholars that greater export orientation of manufacturing industries should be promoted as an important element of growth strategy of Sub-Saharan Africa due to the unexploited potential gains within the sector (World Bank, 2000; Bigsten et al., 2004). This is because the manufacturing sector in many African countries, Kenya included, has remained largely uncompetitive internationally, failing to play a dynamic role in the industrialization process. Kenya's development plan of 1994-1996 described the industrial sector using the following words:

> "…the industrial sector continues to be inward oriented, excessively import dependent, capital intensive and incapable of absorbing an adequate proportion of the rapidly increasing labour force. The net effect is the existence of structures that are fairly inefficient by world standards, and are not integrated. Manufacturing has not been dynamic, in terms of raising productivity, or entering international markets; it has not deepened its structure or developed adequate local linkages." pp.147

Thus, the economic reforms and government policies pursued over the years to create linkages and spillovers do not seem to have achieved much. In addition, studies on Kenya examining various aspects of spillovers between foreign and domestic-

owned firms provide mixed evidence. For example, Gershenberg (1987) finds evidence of multinationals contributing to the dissemination of managerial know-how to domestic firms. Similarly, Rasiah and Gachino (2005) find evidence of productivity spillovers while Kamau et al. (2009) find evidence of spillovers through labour mobility in the garments sector. However, Phelps et al. (2008) find no evidence of any linkages created by foreign firms to domestic firms in the textile industries. Hammounda et al. (2006) also show that Kenya's top ten commodities have not broken the manufacturing range where there is generally more evidence of dynamism, hence the need to deepen and expand diversification. Yet still, in spite of its poor performance over the past two decades, Kenya still benefits from a more diversified economy than most of its neighbours and remains a regional hub for manufacturing and services. Given this mixed evidence, there is need to investigate whether foreign-owned firms influence the exporting behaviour of domestic firms, a task embarked on in this paper.

Objectives

The overall objective of this study is to generate knowledge on how FDI can result in export spillovers in developing countries in the manufacturing sector.
   The specific objectives of the study are:

1. To investigate the existence of export spillovers from foreign firms to domestic firms.

2. To examine the channel of transmission of such export spillovers.

Justification

The existing literature on FDI and export spillovers is new and most of it focuses on developed countries. This study will contribute to this literature by introducing a developing country's perspective focusing on Sub-Saharan Africa, which has been under-researched. It is also relevant to policy makers in Kenya in view of the current initiative for structural transformation as documented in the Vision 2030. Through this Vision, Kenya hopes to increase its competitiveness both regionally and globally following other second-generation Newly Industrializing Countries such as Malaysia, Indonesia and Thailand which 35 years ago were at the same stage of development as Kenya today. In addition, it will offer several insights towards understanding the role that FDI in Kenya could play in the industrialization process. Furthermore, the study is timely in that its findings will contribute to the ongoing international debate on the best intervention and policy measures that are necessary in achieving the millennium development goals. In terms of innovativeness, the study is highly justified in that the scope of analysis is based on firm level data in Kenya.

2. Foreign direct investment and export performance

Theory

Within the international trade literature, it has been recognized that foreign-owned firms can directly benefit the trade performance of the host economy through their own exporting activity (Blake and Pain, 1994; Barry and Bradley, 1997). However, from a theoretical view, few insights have been provided for export spillovers. Krautheim (2008), building on network theory, shows how the exchange of information between firms exporting to the same industry reduces the individual fixed cost to export and increases the probability of exporting. Rauch and Watson (2003) also show that when a commercial relationship begins, there might be uncertainty for the buyer on the ability of the supplier to successfully fill larger orders. The agglomeration of exporters can increase the buyer's information on the quality of the suppliers favouring larger orders.

In addition, Melitz (2004) and Bernard et al. (2003) have shown that firms display considerable heterogeneity regarding the extent to which they serve the foreign markets. They suggest that firms that export are larger and more productive than those that do not. This is accounted for by firm heterogeneity and fixed export costs. Because of fixed cost charges, only productive firms find it profitable to sell goods abroad. This may imply that export spillovers from foreign-owned firms may affect domestically-owned firms through mechanisms that raise their productivity.

Export spillovers may take many forms. First, domestic firms can learn from the exporting activities of foreign subsidiaries in the host country through information externalities. Foreign subsidiaries may have easier access to information on foreign markets because they form part of a multinational enterprise. Exporting involves fixed costs, which might include the establishment of distribution networks, creation of transport infrastructure, investment in advertising to gain public exposure, research about foreign markets to gain intelligence on consumers' tastes, market structure, competitors, regulations and so on. These will be lower for foreign-owned firms as they already have knowledge and experience of operating in foreign markets and can benefit from network economies and know-how of managing international marketing, distribution and serving of their products. Other channels of diffusion of information on foreign market conditions are trade associations and other industry organizations of which foreign-owned firms are prominent members. A transfer of this knowledge would constitute information spillover (Greenaway et al., 2004; Aitken et al., 1997; Blostrom and Kokko, 1998).

A second channel of export spillover is through the competition effect. Gorg and Greenaway (2004) observe that unless an incoming firm is offered monopoly status, it will produce competition with indigenous firms. If indigenous firms are unable to imitate the multinational's technology and production processes, the entry of the foreign-owned firm puts pressure on them to use existing technology more efficiently, yielding productivity gains. They also observed that greater competition leads to a reduction in X-inefficiency and is analogous to one of the standard gains from arm's length trade and is frequently identified as one major source of gain. In addition, competition may increase the speed of adoption of new technology. Increased efficiency of firms because of competition allows them to start exporting. However, foreign-owned firms can result in negative spillovers in case the domestic firms cannot learn to compete with them.

Exports spillovers can also occur through the demonstration or imitation effects, which is the third channel. Greenaway et al. (2004) and Fosfuri et al. (2001) observe that significant contributions of MNCs to the available stock of technology knowledge may result in imitation by domestic firms, thereby benefiting them. Gorg and Greenaway (2004) note that this is common for new products and processes. An important mechanism is reverse engineering whose scope depends on product/process complexity, with simple manufactures and processes easier to imitate than more complex ones. Similarly, the same principle applies for managerial/organizational innovations, though these are easier to imitate. Therefore, any upgrading to local technology deriving from imitation could result in spillover, with consequential benefits for the productivity of local firms.

Proximity to foreign affiliates might be conducive to stronger export spillovers since it facilitates the acquisition of those knowledge parts and competencies, and so on, that might lead to exports (Kneller and Pisu, 2007, Aitken et al.,1997). Blomstrom and Kokko (1998) and Gorg and Strobl (2005) further observe that the export operations of foreign-owned firms may influence local firms in other additional ways. For example, direct effects occur when local firms are employed as suppliers and sub-contractors to the foreign-owned firms. Although local suppliers do not always export under their own name, they too can benefit from access to foreign markets. This may allow them to expand output and achieve economies of scale. Through this kind of linkage, it is likely that export-oriented foreign-owned firms provide knowledge about various aspects, including foreign market conditions such as foreign preferences of design, packaging and product quality. This information can be used profitably in the supplier companies' other operations. If the knowledge gained as a supplier to a foreign-owned firm helps a company establish own direct exports to a foreign market, then we have export spillovers.

Empirical evidence

Following the work of Bernard and Jensen (1995;1999) focusing on the characteristics of exporting firms and non-exporters using US data for the period 1976-1987, many studies have been conducted using firm level data. The main conclusion from these studies is that exporters exhibit superior characteristics than non-exporters in every

dimension. This evidence supports the hypothesis that exporting is an activity undertaken by successful establishments. According to this view, good/successful firms become exporters because they can meet the sunk costs involved in exporting activities, and the increased competition faced in the foreign market forcing them to raise productivity (Clerides et al., 1998; Melitz, 2004). However, some studies have shown that firms can also become productive after having entered the export market, receiving some sort of learning by exporting effect such as Blalock and Gertler (2004) for Indonesia, Mengistae and Patillo (2002), Bigsten et al. (2004) and Van Bisebroek (2005) for sub-Saharan Africa.

Aitken, et al. (1997) further identified the various kinds of firms that may choose to serve the foreign or the domestic market. Using cross sectional firm level data for Mexico, they concluded that fixed costs decrease due to information externalities which result from local concentration of exporting activity and MNCs' performance in particular. Information externalities were measured as decomposition of the geographic concentration of industry into different elements, namely each location's overall concentration of economic activity (defined as the state-industry share of national industry employment, relative to the state share of national manufacturing employment), the concentration of local exporting activity (defined as state-industry share of national industry exports, relative to the state share of national manufacturing exports) and the concentration of the MNCs exporting activity (defined as share of state-industry MNE exports in national industry exports, relative to the state share of national manufacturing exports).

Similarly, Kokko et al. (2001) found that the likelihood of exporting increased with the presence of foreign firms established since 1973, the more outward-oriented period in Uruguay. They used three variables as proxies for export spillovers. First, was the share of all foreign firms in the total output of the four-digit industry to which the locally-owned firms belonged, while the other two measures were the shares of output of foreign firms established before and after 1973.

Greenaway et al. (2004) also found evidence of export spillovers from foreign firms on domestic firms export decision and their export propensity through increased competition in the UK. Three channels of export spillovers were examined. Information spillovers were measured by the relative importance of MNCs export activities in a sector scaled by the relative importance of MNC exports in total exports, i.e. (MNE exports in industry i/total exports in industry i) / (total MNE exports/total exports). The second channel explored was through the imitation/demonstration effect measured by the expenditure of foreign-owned firms' R&D in UK. Third, they examined competition effect channel measured in terms of the relative weight of MNCs in total employment in a sector.

Alyson (2006) in a similar approach found that the probability of a domestic firm exporting was positively correlated with the proximity to MNCs in China. Export spillovers were measured in terms of the concentration of local export activity and multinational export activity. The former was measured as the province-industry-firm type share of national industry exports normalized by the provincial share of national

manufacturing exports. The latter was measured by the share of provincial industry MNCs exports in national industry exports, relative to the province share of national manufacturing exports.

Moreover, Ruane and Southerland (2005) found that the decision by host country enterprises to enter the export market was positively associated with the presence of foreign-owned enterprises in their sector. However, they also found that the export intensity of host country enterprises is negatively associated with the export sales ratios of foreign-owned enterprises. This may imply that foreign-owned firms producing exclusively for exports are a source of negative export spillovers to domestic firms in Ireland.

Kneller and Pisu (2007) found evidence in UK that the decision to start exporting is positively associated with the presence of foreign firms in the same industry and region. In addition, export-oriented firms seemed to be the source of export spillovers. They also observed that the decision concerning how much to export is affected positively by foreign firms in downstream industries and by those in the same industries and region that do not export. They developed an index capturing the presence of foreign firms in each industry and the forward and backward linkages between domestic and foreign-owned firms. The horizontal measure was defined as the ratio of total production of foreign-owned firms operating in a given sector in a given time relative to the total output of the same sector in the same year and different regions. Using information from input-output tables for UK, backward and forward linkages were computed in a similar manner. In a similar approach, Anwar and Nguyen (2011) using data from Vietnam for the year 2000 found that horizontal and forward linkages were the two main channels of export spillovers from FDI.

Barrios, et al. (2003) in contrast, in a panel estimation using data from Spain, found that R&D spillovers either from MNEs or domestic firms did not appear to affect the likelihood of whether domestic firms become exporters, although there was evidence that foreign firms benefit from R&D spillovers from other MNEs located in the same sector. However, their results suggested that R&D spillovers exert positive effects on firms' export ratios for both domestic and foreign firms. They found no evidence that firms benefit from spillovers through exporting activities of other firms. Likewise, they found no evidence that domestic firms benefit from export spillovers from MNCs, although foreign firms did appear to benefit from the export activities of other MNCs located in the same sector. However, in a similar approach, Abor et al. (2008) found that FDI is important in influencing the export decisions and performance of Ghanaian firms.

In Kenya, several studies have investigated various spillover effects arising from the presence of foreign-owned firms even though not necessarily focusing on export spillovers, with mixed findings. Langdon (1981), in a study of FDI in the Kenyan soap industry, reports that the entry of foreign MNCs also introduced mechanized production, and local firms found themselves unable to sell handmade soap in the urban markets. Instead, they were forced to introduce mechanized techniques to stay in business. Gershenberg (1987) also found evidence that multinational enterprises

in Kenya train indigenous managers and spread know how. Similarly, Jenkins (1990) found that foreign entry into the Kenyan footwear industry led to increased competition and changes in the production techniques of local firms. Rasiah and Gachino (2005) also found evidence of superior technology, productivity and export intensity levels of foreign firms compared to local firms. Gachino (2006), furthermore, found evidence that foreign presence generated positive technology spillovers in Kenya's manufacturing industry through demonstration effects.

Likewise, Kamau et al. (2009) observed that within the Export Processing Zones (EPZs) in Kenya, there is evidence of spillovers, where employees leave mainly the foreign-owned garments firms after acquiring training and experience to team-up with local investors to establish other garment factories or even starting their own small scale garment firms. Graner and Isaksson (2009) found evidence of learning effects from export participation by manufacturing firms in Kenya. In addition, they show that exporters are more efficient than non-exporters. Were and Mugerwa (2009) also found that exporters in the manufacturing sector paid higher wages at the start of the liberalization period, but domestic competition has since reduced the effect. On the other hand, Phelps et al. (2008) found that although the African Growth and Opportunity Act (AGOA) has created opportunities in the textile industries, there have been limited backward linkages and lack of growth of competitive local cotton and textile industries. This has left the industry vulnerable to the terms on which AGOA grants Kenyan firms access to the United States market.

In conclusion, several observations can be made concerning the empirical literature on export spillovers. First, most of the studies except for Barrios et al. (2003) and Abor (2008) are based on cross-section analysis. However, such an approach may suffer from inefficient parameter estimates leading to inaccurate inferences of model parameters since it disregards cross period correlations. In addition, it is difficult to control for the impact of omitted variables leading to biased or unreliable estimates. Moreover, contemporaneous correlation across the cross-section does not imply causation, and thus these models may suffer from endogeneity biases. Furthermore, these problems are difficult to address satisfactorily since suitable instruments are often not available. Second, the proxies used to measure export spillovers also do not adequately capture spillovers since they are unobservable in nature (Gorg and Strobl, 2005). Spillovers may take different forms and therefore different proxies may be needed to capture them. In addition, positive impact of foreign presence may take time and may also be negative initially because of, for example, competition of markets, workers and so on, before turning positive.

Finally, even with the studies that have used panel analysis, their analysis is based on random effects rather than fixed effects. This may lead to incorrect inferences in case there are individual specific effects which are correlated with the explanatory variables. To address the challenges observed in the above studies, this study uses a panel approach using a probit estimation model. In addition, the Hausman test is used to establish the presence of fixed effects. Moreover, various measures of export spillovers are considered.

3. Theoretical framework

Following after Aitken et al. (1997) and Greenaway et al. (2004), this study begins with the choice facing a representative domestically-owned firm between serving the domestic market, exporting, or both, to maximize its profit. This model has been used to analyze data in both developed and developing countries, and is therefore adequate for the Kenyan case. Alternative models used to analyze FDI spillovers include specifying a Cobb Douglas production function as used by Bigsten et al. (2004) and Gachino (2006).

$$\max{}_{qd,qf} \; P_d q_d + P_f q_f - h(q_d + q_f) - m_d(q_d) - m_f(q_f) \tag{1}$$

$$\text{Such that } q_d, q_f \geq 0$$

where subscripts d and f refer to the foreign and domestic markets, respectively.

This is a basic profit function dependent on prices, quantities sold in each market and costs. q refers to quantity of output and P to price. The cost function of this firm is assumed to be decomposable into two components; h ($\bullet$) refers to production costs, md ($\bullet$) and m f ($\bullet$) refer to distribution costs for domestic and foreign markets, respectively, and $m_f \succ m_d$.[6] These costs are assumed to be increasing and convex in their arguments. Spillovers are modelled as foreign-owned firms having a cost reducing effect on domestically-owned firms. The distribution costs are assumed to be market-specific and are, in exports, a decreasing function of the local concentration of export activity.

For empirical purposes, firms' costs are assumed to be consisting of two parts, production and distribution, and have simple functional forms as follows:

$$h(q_d + q_f) = \frac{a}{2}(q_d + q_f)^2 + g(q_d + q_f) \quad m_i(q_i) = \frac{b_i}{2} q_i^2 + c_i q_i \tag{2}$$

where i = f , d . A, g, b^i, and c_i are scalar parameters. G and c are functions of cost variables the firm takes as given in making its output decision:

$$g = g(X, \phi, \delta) \ , \ c_d = c_d(X, Z_d) \ \text{and} \ c_f = c_f(X, Z_f, \omega_E, \omega_E) \tag{3}$$

where X represents cost variables that are common to production in both markets and Z_i represents those that are specific to the production for market i. ω_E and ω_{EF} are, respectively, total export activity and total foreign firms export activity which are assumed not to affect the distribution cost of serving the domestic market. and δ represent the relative importance of foreign firms in the domestic market and the total innovation activities carried out by the foreign firms. Information spillovers imply that for the representative firm:

$$\frac{\partial m_f(q_f)}{\partial \omega_E} \leq 0 \qquad\qquad \frac{\partial m_f(q_f)}{\partial \omega_E} \leq 0 \tag{4}$$

Thus, the higher the concentration of total export activity and total foreign firm export activity, the more the domestic firms can benefit in terms of information externalities which in turn reduce the distribution costs of selling abroad. Competition effect and imitation/demonstration effect are also introduced and captured by and δ, respectively, obtained as follows:

$$\frac{\partial g(q_f + q_d)}{\partial \phi} \leq 0 \qquad\qquad \frac{\partial g(q_f + q_d)}{\partial \delta} \leq 0 \tag{5}$$

The greater the importance of foreign firms in the domestic market, the stronger the competition pressure, causing the domestic firms to reduce production costs. Also, the more technologically-intensive the foreign firms activities in the host country, the larger the imitation potential for domestic firms to increase their efficiency in production.

The first order conditions for profit maximization using equation (1) above for a representative domestic firm are derived as follows:

$$q_d = \frac{1}{a + b_d} \left[P_d - q_f - g(X, \phi, \delta) - c_d(X, Z_d) \right] \tag{6}$$

$$q_f = \frac{1}{a + b_f} \left[P_f - q_d - g(X, \phi, \delta) - c_f(X, Z_f, \omega_E, \omega_E) \right] \tag{7}$$

For estimation purposes, we rewrite these equations as:

$$q_{dj} = \alpha_1 P_d + \alpha_2 q_{fj} + \alpha_3' Z_{dj} + \alpha_4' X_j + \alpha_5 \phi + \alpha_6 \delta + \varepsilon_{dj} \qquad (8)$$

$$q_{fj} = \beta_1 P_f + \beta_2 q_{dj} + \beta_3' Z_{fj} + \beta_4' X_j + \beta_5 \phi + \beta_6 \delta + \beta_7 \omega_E + \beta_8 \omega_{EF} + \varepsilon_{fj} \qquad (9)$$

where j is the index for the firm, Z_{ij} is a (1 x K) vector of cost variables specific to market i, X_j is a (1 x J) vector of cost variables common to both markets, α_3 and β_3 are (1 x K) vector of coefficients. α_4 and β_4 are (1 x J) vector of coefficients, and ε_{ij} is a normally distributed error term for market i and firm j, with zero mean and a constant variance. From equation (6) and (7), α_2 and β_2 are negative.

In theory, the optimal choice of output may be zero in either market. In practice, some firms produce zero exports but all firms produce positive quantities for the domestic market. Accordingly, the study then considers the possibility of corner solutions for the variable q_{fj}. To do so, the study although following Aitken et al. (1997) departs in the definition of the latent variable q^*_{fj} such that:

$$\begin{cases} q_{fj} = q_f^* & if \quad q_f^* > 0 \\ q_f = 0 & if \quad q_f^* \leq 0 \end{cases}$$

Equations (8) and (9) are transformed to reveal the determinants of the optimal quantity of output to be exported as follows:

$$q^*_{fj} = \frac{1}{1 - \beta_2 \alpha_2} \begin{bmatrix} \beta_1 P_f + \beta_2 (\alpha_1 P_d + \alpha_3' Z_{jl}) + \beta_3' Z_f + (\beta_2 \alpha_4' + \beta_4')X_j + (\beta_2 \alpha_5 + \beta_5)\phi \\ + (\beta_2 \alpha_6 + \beta_6)\delta + \beta_7 \omega_E + \beta_8 \omega_E + \varepsilon_j \end{bmatrix} (10)$$

where $\varepsilon_j = \beta_2 \varepsilon_{jl} + \varepsilon_f$.

Since our interest is in the firm's export decision, the study focuses the estimation on the probability that a firm will export and estimate the dummy variable y_j which indicates whether or not a firm has positive exports, which gives the consistent estimates of the parameters in the two equations.

$$
\begin{cases} y_j = 1 \\ y_j = 0 \end{cases} \quad \text{if} \quad \begin{matrix} q^*_{fj} > 0 \\ otherwise \end{matrix} \quad (11)
$$

Greenaway et al. (2004) argues that this approach is advantageous in that it addresses certain issues such as endogeneity of regressors.

Using equation (10), the probability that firm j has positive exports is estimated as follows:

$$
\Pr(y=1) = \Pr \left(\begin{matrix} \gamma_1 P_f + \gamma_2 P_d + \gamma_3 Z_{dj} + \gamma_4 Z_{fj} + \gamma_5 X_j + \gamma_6 \phi + \gamma_7 \delta + \gamma_8 \omega_E \\ + \gamma_9 \omega_{EF} + \mu_j \geq 0 \end{matrix} \right) \quad (12)
$$

where $\gamma_1 = \dfrac{\beta_1}{1 - \beta_2 \alpha_2}, \gamma_2 = \dfrac{\beta_2 \alpha_1}{1 - \beta_2 \alpha_2}, \gamma_3 = \dfrac{\alpha'_3}{1 - \beta_2 \alpha_2} \ldots\ldots\ldots\ldots\ldots \gamma_9 = \dfrac{\omega_{EF}}{1 - \beta_2 \alpha_2}$ and

$$
\mu_j = \frac{\varepsilon_j}{1 - \beta_2 \alpha_2}
$$

From equation (12), the probability of a firm exporting is a function of the price of the goods, firm-specific production costs, distribution costs in the foreign and domestic markets, exporting activity in the country, and several aspects of the presence of multinationals such as their exporting activities, technological innovation activities and competitive pressure activities. Equations (4) and (5) imply that $\Pr(y_j = 1)$ is increasing in Φ, δ, ω_E and ω_{EF}. The distributional assumption of on ε_{dj} and ε_{fj} imply that ε_j and are normally distributed, which permits equation 12 to be a binary probit.

Empirical model

Building on the framework above, an empirical model is developed to analyze the effects of foreign-owned firms on export behaviour of domestic firms. The export behaviour is considered as involving the decision to export. In the estimation of equation (12), both firm and sector-specific variables are considered, which are assumed to impact on the production and/or distribution costs. These costs are not observed and, therefore, a set of variables that may be considered reasonable proxies has been chosen. The choice of the variables is guided by the existing literature on the determinants of exports. The definition of the variables is presented

in Table 1 below. The export decision (in general) used in this paper is estimated as follows:[7]

$$EX_{it} = \gamma_0 + \gamma_1 W_{it} + \gamma_2 PT_{it} + \gamma_3 TURN_{it} + \gamma_4 LP_{it} + \gamma_5 FUNDS_{it} + \gamma_6 R\&D_{it} +$$
$$\gamma_7 RDF_{st} + \gamma_8 FEM_{st} + \gamma_9 FEX_{st} + \gamma_{10} AGE_{it} + \gamma_{11} AGE2_{it} + \gamma_{12} Dummy_{st} + \mu_{it}$$

(13)

Subscripts i and s refer to the firms and sector while t refers to the year or time.

Variables

In the export decision equation (13), EX is a dichotomous variable which takes the value of 1 or 0 depending on whether the firm decides to export or not.[8] The rest of the variables are discussed below.

Firm specific variables

Several variables are included to reflect a firm's heterogeneity as follows. W is defined as the ratio of total wages (remuneration) to the number of employees in each firm. A positive relationship between average labour remuneration and the probability of a firm being an exporter would capture the importance of skills for competitiveness of the Kenyan firms' production in the world market. A negative relationship, on the other hand, would suggest that high labour cost discourages exports. This is consistent with export production as being labour-intensive in developing countries. PT is the firm's profitability measured as profit before tax, which reflects its ability to meet fixed costs associated with entering the export market. PT is expected to be positively associated with the export decision.

There is a well-established link between firm size and exports and, therefore, firm turnover (TURN) is included. It is expected that relatively large firms are more capable of absorbing any fixed costs associated with entering an export market and to exploit economies of scale in the exporting process. Firm's expenditure on research and development (R&D) is an important determinant of its export behaviour. A firm that invests more in R&D is expected to export more. Barrios et al. (2003) use research and development intensity as the ratio of R&D expenditure/sales.

It is also expected that there may be a relationship between the age of the firm and the export decision. Older firms may have accumulated experience and economies of scale and would be at a better advantage to export. To control for this effect, the age variable is included as used by Roberts and Tybout (1997) and Barrios et al.(2003). The impact of age is, however, not necessarily linear and to account for this, the square of age is included (Power, 1998). Finally, in the export decision equation, we control for shareholders' funds per unit of output available to the domestic firm

(FUNDS) measured as the ratio of the shareholders' funds to turnover. This captures the domestic firms' financial capacity to meet the extra costs associated with setting up export operations. Barrios et al. (2003) use research and development intensity as the ratio of R&D expenditure/sales. These variables are obtained from the firm level dataset.

Table 1: Description of explanatory variables

Variable	Description
EX	Dichotomous variable taking the value of 1 if the domestically-owned firm exports and 0 otherwise
W	Average wage per employee
PT	Firm's profit before tax
TURN	Firm's turnover
LP	Ratio of value added per employee
FUNDS	Ratio of shareholders' funds to turnover
R&D	Firm's research and development expenditure
RDF	R&D expenditure by foreign-owned firms in sector j/ total expenditure in R&D in sector j
FEM	Ratio of foreign-owned firms in employment in sector j to total employment in sector j
FEX	Ratio of foreign-owned firms exports in sector j to total exports in sector j
Age	Current year - year of establishment
Age^2	Square of Age

Spill-overs variables

Building on the theoretical model developed earlier, export spillovers are measured using three proxies. First is the proportion of expenditure of Research and Development carried out by foreign-owned firms in a given sector (RDF). This captures the contribution of foreign-owned firms to the available stock of technological knowledge, on the assumption that the more innovation activities carried out by these firms, the larger the potential for imitation from which domestic firms can benefit. Second is the relative weight of foreign-owned firms in total employment in a sector. It accounts for the relative importance of these firms at the sector level in the domestic market (FEM). The greater their relative importance, the stronger the competitive pressure on domestic firms. Similar spillover measures have been used in several studies, including Aitken et al. (1997) and Greenaway et al., (2004). However, other measures of spillovers include vertical and horizontal industrial linkages as used by Kneller and Pisu (2007).

Third is the relative importance of foreign-owned firms export activities in a sector (FEX). It is assumed that the greater their importance in the exports of a given sector, the higher the scope for domestic firms to benefit from information externalities. This variable was also used by Aitken et al. (1997) and Barrios et al. (2003). However,

they weigh the variable with the ratio of total exports of foreign-owned firms to total exports. There is no convincing justification for that approach hence, in this study, no adjustment is made on the variable. Positive coefficients are expected for RDF, FEM and FEX. There may also be a possible link between export spillovers and productivity. More productive firms are also more likely to export and, therefore, one can expect more export spillovers for high productivity firms. Moreover, this may suggest the need for an interaction term.

Thus, omitting firm productivity could lead to an over-estimation of export spillovers and therefore, a labour productivity variable (LP) is included. Three main approaches have been used in literature to measure total factor productivity. The first technique uses the semi-parametric approach of Levinsohn and Petrin (2003) by taking unobserved firm specific-productivity shocks into account where the unobserved shock is measured using intermediate inputs. The second method is the estimation of a semi-parametric and non-linear least squares regression of Buettner (2003) which also considers endogenous R&D in the total factor productivity calculation. Finally, it can be measured using a simple labour productivity measure which is calculated from the ratio of value added over total labour. In this study, the last measure is used due to data availability. These variables are also obtained from firm level dataset.

Given the choice of variables in this study, there is a possibility of some of them being endogenous; for example the ratio of total wages to employees. While this is recognized as a potential problem, recent literature on firm level determinants of exporting suggest that this is unlikely to be a serious problem (Bernard and Jensen, 1999; Clerides et al., 1998; Greenaway et al., 2002). Moreover, following after Aitken et al. (1997), the model is estimated for a sample restricted to domestic firms. In addition, as a robustness check, a sample restricted to foreign-owned firms is estimated using spillover variables from domestic firms. This is important in the estimation since there may also be a possibility that spillovers may emanate from domestic to foreign-owned firms, rather than from foreign to domestic-owned firms as hypothesized in this paper. In addition, spillovers from domestic firms are expected to be much weaker than from foreign-owned firms, and therefore any evidence otherwise would suggest that the model is mis-specified.

Estimation procedure

Equation 13 is first estimated for all the firms to establish the determinants of their export behaviour in Kenya. A second equation is estimated to establish whether these determinants differ depending on whether firms are domestic or foreign-owned.

These two estimations do not have the spillover variables. A final estimation is based on whether the presence of foreign-owned firms affects the export behaviour of domestic firms. These estimations are based on an unbalanced panel which contains firm level data for the period 2000 to 2005. A caution while using an unbalanced sample is to ensure that the causes of the missing observations are not endogenous to the

model. This has been partly addressed by controlling for variations across sectors, years and ownership using dummies. In addition, Wooldridge (2009: 488-489) observes that the inclusion of fixed effects in panel estimation allows attrition to be correlated with the unobserved effect. The idea is that, with the initial sampling, some units are more likely to drop out of the survey. As robustness check, equation 13 is estimated using a balanced sample and the results remain unchanged.

First, a pooled probit is estimated using the total sample of all firms pooled over the six years. However, this model assumes constant coefficients in the intercepts and the slopes. If there are significant unobserved, time invariant firm-specific effects that are correlated with the explanatory variables, then the simple pooled regression may produce biased and inconsistent estimates. Second, a random effects model is estimated. This model, although allowing for individual effects, assumes that they are uncorrelated with the explanatory variables, hence the effect is random. However, this model may generate inconsistent estimates if the individual unobserved effects are correlated with the explanatory variables. Under such circumstances, a fixed effects model is preferred, holding all other factors constant.

4. Data analysis and econometric results

Data sources

The firm level data used in this study was obtained from the annual surveys conducted by the Ministry of Industrialization. These surveys began in 1988 and collected annual data on information pertaining to all firms operating in the Kenyan manufacturing industry but, for unknown reasons, were discontinued after 2005. This is a rich data set containing many firm characteristics and is based on the international standard of industrial classification (ISIC). The information collected includes firm ownership, year of establishment, domestic and exports sales, domestic and imported raw materials, capacity utilization and value of utilities consumed, fixed assets and capital investment by nationality, detailed information on employees, research and expenditure and much more. To the best of my knowledge, this data set has only been used by Gachino (2006) who investigated the existence of technology spillovers from multinationals to domestic firms for the period1994-2001. A balanced panel of 420 firms was created comprising of firms that showed consistent time series responses to all the relevant questions over the entire period of study, making a panel of 3,360 observations. He found evidence of productivity spillovers from foreign-owned firms to domestic firms, through demonstration effects.

Table 2 presents a breakdown of the data set used in terms of ownership for the period 2000-2005. This period was chosen because in 2000 a new international classification of data was adopted by the Ministry in addition to being dictated by data availability. Some firms were, however, dropped because they missed many observations which were of interest in this study. All the firms whose data was available were included in the analysis regardless of whether this data was available for consecutive years or not. Some studies have focused on firms whose data for at least three consecutive years were available. Bigsten et al. (2004) argue that this is the minimum period necessary to control for unobserved company effects in the econometric analysis and use for Africa. Also, Greenaway et al. (2004) used this approach. In this study, this was regarded as necessary since it is considered necessary to exploit the unbalanced panel data set to the fullest.

Table 2:   Classification of firms according to ownership

	2000	2001	2002	2003	2004	2005
Foreign	317	345	327	339	365	352
Local	605	668	647	572	584	649
Total	922	1,013	974	911	949	1,001

For the purpose of this study, firms with at least 10% of their nominal capital owned by foreigners are defined as foreign-owned firms while the rest are considered locally-owned. This definition was adopted because the Kenya national authorities use the same benchmark. This definition follows that of OECD and UNCTAD. In addition, the study also considers firms with at least 50% threshold of foreign nominal capital. As de Mello (1997) has observed, this definition is restrictive since FDI comprises of bundles of capital stocks, know-how, and technology, among other things which are not taken into account. Furthermore, firms today can exercise various forms of control over distance enterprises without direct ownership (Winder, 2006). Data deflation is a necessary condition especially in time series analysis to remove data fluctuations that might exist due to inflationary effects over time in the economy. Due to lack of suitable deflators, the GDP deflator is used to deflate both output and export values. This approach was followed by Gachino (2006) except that the export values were deflated using export price indices for manufactured goods. Bigsten et al. (2004) use firm-specific deflators based on export share-weighted averages of the domestic and international prices to control for variations in the exchange rates.

Finally, Appendix Table A2 presents a detailed comparison of the sample and the registered firms with the ministry. This list contained firms that had registered until 2005. In 2000, the list contained 922 registered firms. This figure increased to 1,013firms in 2001, 974 firms in 2002, 911 firms in 2003, 949 in 2004 and 1,001 in 2005. For each year, firms that presented most of the information were considered. On average, the firms used for analysis in this paper represent about 50% of those registered by the Ministry. However, firm representation varies across sectors. Foreign-owned firms are over represented in four of the sectors with more than 50% of the firms contained in the register. They are least represented in the wood and wood products sector, with about 31% of the firms contained in the register. Domestic firms, on the other hand, are over-represented in five sectors, with more than 50% of firms contained in the register. They are least represented in the food, beverages and tobacco, and the textile, apparel and leather sectors with 31% of firms in the register. This representation is taken into account when estimating the sectoral level measures of foreign presence. There is no way of establishing the sampling frame used and, therefore, the register may or may not be representative of firms. Besides, to the best of my knowledge, the number of firm establishments in Kenya is unknown.

Descriptive analysis

Appendix Table A3 provides a sectoral breakdown of the direct exporting behaviour of both foreign-owned firms and domestic firms. Virtually all the sectors under consideration have foreign presence mainly involved in exporting. The proportion of firms engaged in exporting increased considerably among the domestic firms especially in wood and wood products after 2003. It can also be observed that there is a continuous change in the proportion of firms, both foreign and domestically-owned participating in the direct export market. Appendix Table A4 further provides information on the value of exports as a percentage of firm's turnover conditional to all exporting firms. Most of the foreign-owned firms in the food, beverage and tobacco; textile, apparel and leather; and in the non-metallic mineral products generate a significant amount of their revenue from exports. In addition, the percentage of firms participating in the export market has been changing over the years. Based on the export shares, it can be concluded that most firms in Kenya serve the domestic market. In addition, it can be observed that domestic firms are increasing their participation in the export market, with revenues from exports increasing significantly from 2000 to 2005 in all sectors.

Table 3:   Mean characteristics of the firms for the period 2000-2005

Variables	Foreign owned firms		Domestic owned firms	
	Exporters	Non Exporters	Exporters	Non Exporters
Average Wage (kshs, 000)	309	302	263	198
Profit(kshs, million)	39.400	5.823	54.165	3.599
Turnover(kshs, million)	408.475	62.227	420.141	48.949
Labour productivity (kshs, million)	1.115	0.902	0.824	0. 511
Employees	113.75	13.27	71.73	14.54
Funds	0.09	0.1	0.06	0.06
Age (yrs)	27.41	18.56	27.29	18.45
R & D (kshs, million)	5.822	0.318	5.334	0.058

Appendix Table A5 presents a correlation matrix of the variables of study while, Table 3 above presents the mean values of different characteristics across all firms. The different spill-over variables have high correlations, and this can make the estimates less reliable if included simultaneously, hence they are included separately in the estimations. In addition, the turnover variable was highly correlated with profitability, hence it was dropped. In Table 3, a comparison is made between foreign and domestic firms. In addition, each group is further categorized based on whether firms participate in the export market or not. For all the firms, exporters have higher turnover, profits, employment, average wages, labour productivity and expenditure on R&D. They are also older compared to non-exporters. There are notable differences

between exporting and non-exporting foreign-owned firms, with the former having higher productivity, expenditure in R&D, and profitability compared to the latter. In addition, these firms are on average nine (9) years older than the non-exporting firms. These features support the existing body of empirical work which has documented the superior characteristics of exporting firms relative to those solely producing for the domestic market.[9]

It can be further observed from Table 3 that exporting foreign-owned firms have higher labour productivity, employment, R&D expenditure and more resources compared to exporting domestic firms. However, domestic-owned exporting firms have lower average wages, higher turnover and profitability. Foreign-owned non-exporting firms are also superior to domestic-owned non-exporting firms. They pay higher wages, and have higher turnover, expenditure on R&D and profitability. These results are consistent with findings by Graner and Isaksson (2009) and Rasiah and Gachino (2005) on superiority of exporting firms over non-exporting firms in Kenya.

Finally, prior to panel estimations, the descriptive evidence for spillovers is analyzed.[10] Figures 3(a)-5(a) present the relationship between different proxies of foreign presence and exporting domestic firms (percentage) in levels across sectors over time, while figures 3(b)-5(b) present the same relationship in difference. From figures 3(a) and (b), the expenditure of R&D by foreign-owned firms varies negatively with domestic firms exporting both in levels, but positively in difference. This suggests that there may be spillovers through the demonstration effects. Similarly, in figures 4(a) and (b), there is a negative relationship between the employment share of foreign-owned firms in sectors and the percentage domestic firms exporting both in levels and difference. This provides evidence of negative spillovers through the competition effects. Finally, based on figures 5(a) and (b), there is evidence of a positive relationship between the concentration of foreign-owned firms in a sector and the percentage of domestic firms exporting in difference but not in levels.

Thus, from the figures and especially figures 3(b)-5(b) which control for sector differences, there is evidence for positive demonstration and information spillovers and negative competition spillovers. However, a full regression is needed to check whether the correlation is due to other factors. The existence of spillovers may be anecdotally evidenced by the increased participation of firms in the Kenya Association of Manufacturers (KAM), whose membership has been growing over the years at 15%, attaining a membership of 600 firms. More than 60% of the foreign firms in this study are members of KAM while the remainder are domestic firms. Due to the concealed nature of the firm level data, it is not possible to link the firms to their KAM membership. However, it can be inferred from the growing participation of firms that KAM provides a forum through which both foreign and local firms could interact, hence a possible channel for export spillovers.

Thus, this may be one channel through which domestic firms may be influenced by foreign-owned firms. Secondly, some foreign firms and domestic firms have closed their operations or relocated to other areas, which may be evidence of negative spillovers.[11] Therefore, based on the preliminary findings, it is difficult to

rule out the evidence of export spillovers. Thus, having established the possibility of export spillovers, it is now plausible to test their significance through an econometric analysis.

Figure 3(a): Domestic firms exporting vs RDF	Figure 3(b): Δ Domestic firms exporting vs Δ RDF
Figure 4(a): Domestic firms exporting vs FEM	Figure 4(b): Δ Domestic firms exporting vs Δ FEM
Figure 5(a): Domestic firms exporting vs FEM	Figure 5(b): Δ Domestic firms exporting vs Δ FEX
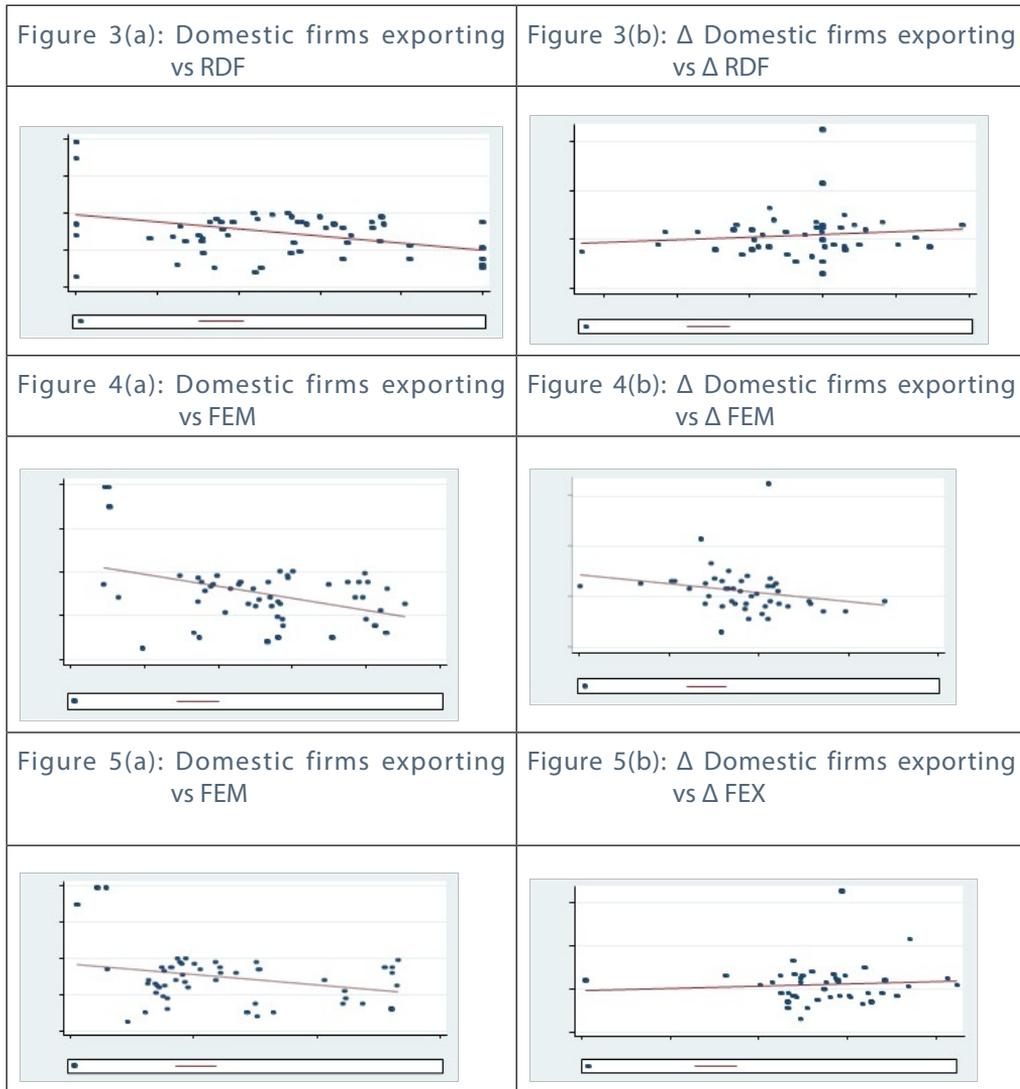
Econometric results

Determinants of exports in Kenya

The results of the first estimate are presented in Table 4 below. The pooled results and the random effects panel estimation are presented in the first two columns. In addition, the Hausman test suggests that there is need to estimate the fixed effects

model since the results of the coefficients are statistically different. This means that there is significant correlation between the time invariant firm-specific effects and the explanatory variables. In a pooled probit, the entire cross period correlation is assumed away and the panel is treated essentially as a cross-section. The random effects model maintains the homoscedasticity (unit variance) assumption but extends the pooled model by allowing the cross period correlation, in their case to be equal for all period pairs. The Fixed effects probit estimator can be severely biased due to the incidental parameter problem. To avoid this problem, we use the linear probability model (Neyman and Scott, 1948; Angrist et al, 2008). Based on the Hausman test result on Table 4, the fixed effects estimation is necessary.

The results based on the fixed effects model suggest that average wages, labour productivity, employment,[12] expenditure on R&D and the age of the firm are all significant at the 1% level, and are all important determinants of exports in Kenya. This implies that firms are likely to be exporters the older and larger they get, results that are consistent with those obtained by Robert and Tybout (1997) and Barrios et al. (2003) in their analysis of the decision to export by Columbian firms and Spanish firms, respectively. Moreover, the results suggest that it is the more productive firms that export in Kenya, which is consistent with findings by Graner and Isaksson (2009) and with the self-selection argument (Clerides et al., 1998; Melitz, 2004).

Table 4:   Determinants of decision to exports in Kenya

ev	Pooled		Random effects(a)		Fixed effects(a)	
	Coef.	Z value	Coef.	Z value	Coef.	Z value
wages	-0.9	-2.76***	-0.3	-2.89***	-0.3	2.83***
profit	0.01	3.00***	0.00	1.07	0.00	0.91
labour productivity	0.66	5.21***	0.19	6.99***	0.19	7.11***
rd	0.05	2.07**	0.01	8.01***	0.01	8.51***
funds	-0.07	-0.49	-0.06	-1.02	-0.06	-0.94
age	0.26	9.68***	0.06	15.2***	0.06	15.1***
age2	-0.004	-7.14***	-0.001	-10.15***	-0.001	-10.4***
Textile, Apparel and Leather	0.25	3.14***	0.08	3.93***	0.08	3.83***
Wood & wood products	0.75	6.39***	0.22	6.63***	0.23	6.82***
Paper & paper products	-0.97	-4.82***	-0.21	-6.22***	-0.2	-6.15***
Chemical, petroleum and plastics	-0.08	-0.7	0.04	1.24	0.04	1.31
Non metallic mineral products	-0.53	-3.16***	-0.11	-2.93***	-0.11	-2.88***
Basic metal industries	-0.48	-3.29***	-0.06	-1.52	-0.04	-0.84

Table 4 Continued

ev	Pooled		Random effects(a)		Fixed effects(a)	
	Coef.	Z value	Coef.	Z value	Coef.	Z value
Fabricated metal products, machinery & equip	-0.83	-5.55***	-0.16	-5.22***	-0.16	-5.25***
Other manufacturing industries	-0.51	-3.08***	-0.07	-1.67*	-0.02	-0.43
2001	-0.02	-0.38	-0.01	-0.61	-0.01	-0.4
2002	-0.3	-7.16***	-0.07	-6.48***	-0.06	-5.98***
2003	-0.23	-4.12***	-0.05	-3.04***	-0.05	-3.25***
2004	-0.35	-5.38***	-0.08	-4.73***	-0.09	-5***
2005	-0.5	-6.69***	-0.12	-6.74***	-0.12	-6.52***
_cons	-3.98	-14.66***	-4.05	-11.45***	-0.52	-11.68***
Log likelihood	-2386.82					
LR Chi^2(20)	2154.68		10255.8		F(20,131)	570.4
Prob> Chi^2	0.00		0.00			0.00
Hausman test			124.28			
Prob> Chi^2			0.00			
Observations	5770		5770			5770

***,**,* represent the level of significance at 1, 5 and 10 percent. a was estimated using a linear probability model. Omitted sector and year: food, beverage and tobacco and 2000 respectively.

The effect of age is also allowed to be non-linear and the quadratic term is negative and significant at the 1% Table 4 and consistent with results by Power (1998) and Barrios et al. (2003). The average wage coefficient is negative and significant at 1%. The negative sign is in contrast with findings by Aitken et al. (1997); Barrios et al. (2003); Bernard and Jensen (2004); and Cole et al. (2010) where export production is considered relatively skill-intensive due to high wages. The negative wage coefficient obtained in this study provides evidence of labour-intensive export-oriented foreign-owned firms, which would be interested in cost effectiveness including low wages.[13] The results are, however, consistent with findings by Were and Mugerwa (2009) who found that while better wages were important in attracting workers to the export sector at the beginning of trade liberalization in Kenya in the 1990s, increased competition for skilled workers raised wages more generally across the manufacturing sector, while also forcing firms to reduce labour. This was done mainly through the substitution of casual labour, and this could be a potential source of wage inequality in Kenya. However, when the natural logarithms of the value variables are included in the empirical model, wages become positive but not significant as shown in Appendix Table A8.

The funds variable is negative and insignificant at the 5% level, which contrast Greenaway et al. (2002) findings of a positive and significant influence of the funds variable on the export decision by domestic firms in the UK. This is perhaps because the variable does not measure the working capital of the firms per se, but rather the initial start-up capital in Kenya. The sectoral dummies are all negative and significant in comparison with the food, beverages and tobacco sector which is omitted, except for textile, apparel and leather and wood and wood product sectors. Similarly, the year dummies are all negative and significant except for the year 2001 in comparison to the year 2000. This may suggest a loss of Kenya's competitiveness in the export market as observed by UNCTAD (2005). In Appendix Table 8A, it is shown that exclusion of exit and entry of firms does not affect the results.

Determinants of the decision to export in domestic and foreign-owned firms in Kenya

The second estimate is aimed at establishing whether the determinants of exports in Kenya are dependent on firm ownership and why. The results presented in Table 5 suggest that determinants of exports are different between foreign and domestic firms. The results suggest that the determinants are not only different between the firms, but also that the impact of these variables is different as given by the test of the equality of the coefficients as presented in the last two columns of Table 5. The wages variable, although important for both firms has a greater impact on the domestic firms than the foreign-owned firms at 1% and 5% significant levels, respectively. The profit variable is positive and significant for the domestic firms at the 1% level of significance. It is, however, positive though not significant for foreign-owned firms. This may imply that domestic firms would prefer to succeed locally first before they can venture into the export market. As Bernard et al. (2003) have observed, this may be accounted for by the fixed costs involved. A firm must be able to meet these costs before it can find it profitable to sell goods abroad. Therefore, exporting firms tend to be larger and productive. This is, however, not the case with foreign firms, most of whom have international exposure and information on export markets.

The R&D variable is positive and significant at the 1% level for both domestic firms and foreign firms. The funds variable is negative and significant at the 5% level for both foreign and domestic firms. Similarly, the age variable is significant and do not have a different impact for both groups of firms. However, the age square variable is negative for both groups of firms but it is only significant for the foreign-owned firms. Therefore, these differences suggest the heterogeneous nature of the firms.

Table 5:   Determinants of the decision to export by domestic and foreign owned firms in Kenya (linear probability fixed effects model)

ev	Domestic		Foreign		coefficient	
	Coef.	t values	Coef.	t values	equality test	Prob> Chi2
wages	-0.5	-4.29***	-0.31	-2.12**	12.65***	0.00
profit	0.7	3.96***	0.25	1.03	21.77***	0.00
labour productivity	0.2	4.25***	0.09	3.47***	12.67***	0.00
rd	0.01	5.75***	0.002	2.91***	26.14***	0.00
funds	-0.58	-2.95***	-0.12	-2.41**	9.02***	0.00
age	0.03	5.12***	0.07	15.8***	0.77	0.38
age2	-0.00003	-0.21	-0.0009	-11.62***	3.41*	0.06
Textile, Apparel and Leather	0.03	0.92	0.06	1.17		
Wood & wood products	0.23	5.53***	0.10	0.91		
Paper & paper products	-0.26	-7.8***	-0.17	-1.64		
Chemical, petroleum and plastics	0.04	1.5	0.02	0.29		
Non metallic mineral products	-0.18	-4.27***	-0.02	-0.18		
Basic metal industries	-0.18	-3.94***	-0.04	-0.41		
Fabricated metal products, machinery & equip	-0.17	-5.85***	-0.17	-5.11***		
Other manufacturing industries	-0.16	-3.07***	-0.02	-0.18		
2001	0.01	0.68	-0.05	-2.61**		
2002	-0.05	-4.33***	-0.09	-4.04***		
2003	-0.03	-1.97**	-0.11	-5.7***		
2004	-0.08	-3.68***	-0.13	-6.8***		
2005	-0.10	-4.63***	-0.17	-7.49***		
constant	-0.17	-2.53**	-0.31	-3.29***		
F(20,131)	304.48		F(20,70)	12296.54		
Prob> Chi2	0.00			0.00		
Observations	3725			2045		
R^2 within	41.05			31.46		
between	62.39			52.73		
without	42.86			35.06		

***,**,* represents the level of significance at the 1, 5 and 10 percent. Omitted sector and year: food, beverage and tobacco and 2000 respectively

Foreign firms and the export decision of domestic firms

The third estimate examines whether the presence of foreign-owned firms affects the exporting behaviour of domestic firms and if yes, through which channels. The three channels considered (the demonstration effects, competition effects and the information spillovers) have been analyzed both individually and jointly. The results are presented in Table 6 and indicate that foreign firms do affect domestic firms' export decision positively through the demonstration effects (rdf) and negatively through the competition effects (fem) in estimation 1 and 2, respectively. There is also evidence of negative information spillovers (fex) in estimation 3 but only significant at the 10% level. However, when all spillover proxies are jointly included, information spillovers become insignificant as presented in estimation 4.

Therefore, there appears to be evidence of demonstration effects in Kenya. Langdon (1981) and Gachino (2006) found similar results. This seems to suggest that domestically-owned firms in some sectors are influenced by the R&D expenditure of foreign-owned firms. This is mainly through the imitation or copying their new products or easy processes. Indeed, Greenaway et al. (2002) has found that in UK, there are significant spillovers from R&D activities of foreign firms to domestic firms, but not from the R&D activities of domestic firms to other firms. However, Barrios et al. (2003) observed that R&D spillovers, whether from domestic or multinational firms do not appear to encourage exporting activities from domestic firms in Spain.

The negative effects from the competition channel suggest that foreign-owned firms in Kenya may have introduced stiff competition in the Kenyan markets, which negatively affected domestic firms in the short run. This is in contrast with the findings by Greenaway et al. (2002), who found that the relative importance of multinationals in the domestic markets is positively and significantly associated with a higher probability that domestic firms is exporting. The lack of information spillovers also suggests that concentration of foreign firms in given sectors does not necessarily benefit domestic firms. Similarly, Barrios et al. (2003) failed to find evidence of spillovers from exporting activities of foreign-owned firms on domestic firms in the same sector, but in contrast found evidence that domestic firms located in export-oriented sectors are more likely to be exporters. Moreover, as Ruane and Southland (2005) have observed, it is likely that foreign-owned firms producing exclusively for exports can be a source of negative export spillovers. However, Aitken et al. (1997) and Greenaway et al. (2002) found statistically significant information spillovers from exporting activities of multinationals.

There is also a possibility that export spillovers may be transmitted through productivity. To investigate this hypothesis, namely whether technology (productivity) gap matters for spillovers, data on the labour productivity variable is separated using its median in terms of high and low productive firms. The productivity measure is then interacted with the spillover variables and tested for its significance. The results are presented in Table 7.

Table 6: Effect of Foreign Firms Presence on domestic firms' decision to export (linear probability fixed effects model)

ev	1		2		3		4	
	Coefficient	t value	Coefficient	t value	Coefficient	t value	Coefficient	t value
wages	-0.49	-4.27***	-0.49	-4.41***	-0.49	-4.3***	-0.49	-4.37***
profit	0.80	4.55***	0.78	4.42***	0.77	4.4***	0.80	4.55***
labour productivity	0.20	4.27***	0.20	4.25***	0.20	4.23***	0.20	4.23***
rd	0.01	5.81***	0.01	5.67***	0.01	5.72***	0.01	5.81***
funds	-0.56	-2.78***	-0.57	-2.94***	-0.56	-2.91***	-0.55	-2.76***
age	0.03	12.98***	0.03	13.03***	0.03	13***	0.03	12.99***
rdf	0.24	9.82***					0.26	9.89***
fem			-0.49	-4.02**			-0.63	-3.64***
fex					-0.15	-1.84*	0.02	0.14
Textile, Apparel and Leather	0.05	1.77*	-0.13	-2.45**	0.00	-0.01	-0.15	-2.52**
Wood & wood products	0.38	8.92***	0.01	0.17	0.13	1.55	0.11	1.56
Paper & paper products	-0.25	-7.59***	-0.39	-11.83***	-0.30	-6.67***	-0.42	-12.17***
Chemical, petroleum and plastics	0.04	1.26	-0.08	-1.84*	-0.01	-0.23	-0.11	-2.30**
Non metallic mineral products	-0.22	-5.13***	-0.21	-5.18***	-0.18	-4.26***	-0.26	-6.47***
Basic metal industries	-0.11	-2.47**	-0.35	-6.36***	-0.22	-4.11***	-0.33	-6.12***
Fabricated metal products, machinery & equip	-0.16	-5.79***	-0.35	-6.25***	-0.21	-4.79***	-0.40	-7.15***
Other manufacturing industries	-0.11	-2.06**	-0.34	-5.88***	-0.23	-3.01***	-0.33	-5.06***
2001	0.02	1.3	0.00	0.14	0.00	0.33	0.01	0.75
2002	-0.01	-0.48	-0.07	-5.66***	-0.06	-4.63***	-0.03	-1.93*
2003	0.03	1.38	-0.05	-2.83***	-0.04	-2.27**	0.01	0.65
2004	-0.03	-1.1	-0.10	-4.41***	-0.09	-3.78***	-0.05	-1.95*

Table 6 Continued

ev	1		2		3		4	
	Coefficient	t value	Coefficient	t value	Coefficient	t value	Coefficient	t value
2005	-0.03	-1.33	-0.13	-5.55***	-0.11	-4.57***	-0.06	-2.51**
constant	-0.37	-5.92***	0.19	1.91*	-0.05	-0.65	0.09	0.88
F(20,131)	259.94		262.83		245.82		F(22,131)	245.82
Prob>Chi2	0.00		0.00		0.00			0.00
R2 within	41.60		41.16		41.09			41.76
between	63.03		62.01		62.3			62.67
without	43.40		42.94		42.88			43.53
Observation	3725		3725		3725			3725

***, **, * represents the level of significance at the 1, 5 and 10 percent. Omitted sector and year: food, beverage and tobacco and 2000 respectively

Table 7:   Interaction of spillover variables with labour productivity

Variable	Individually		Jointly		Coefficient
	coefficient	Z value	coefficient	Z value	
rdf*high	0.13	4.52***	0.11	3.28***	
rdf*low	0.26	10.17***	0.33	13.60***	44.23***
fem*high	-0.41	-3.34***	-0.54	-2.56**	
fem*low	-0.26	-1.99**	-0.62	-3.51***	0.43
fex*high	-0.20	-2.40**	0.02	0.11	
fex*low	-0.06	-0.71	-0.05	-0.41	0.41
all					27.25***

*** and **, significance level at 1% and 5%, respectively

The results seem to suggest that demonstration effects are also dependent on labour productivity but not necessarily concentrated in firms with higher productivity. This result is true when the variables are analyzed both individually and jointly together with other spillover variables. Similarly, the negative spillovers from competition effects affect both firms regardless of their productivity. Finally, information spillovers are also negative individually but when considered jointly, the coefficient of the large firms becomes positive though not significant. In addition, the equality test shows that the coefficients of the interaction term between the spillover variables and firms productivity are not different, with the exception of the demonstration effects. The results thus confirm a possible link between productivity and export spillovers.

Robustness check

To establish robustness of the spillover measures, equation 13 is estimated using additional measures of spillovers. Demonstration effects are re-estimated following after Barrios et al. (2003) who measured R&D spillovers as the ratio of the research and development expenditure by both foreign and domestic firms to their sales or turnover (rdf1). Competition effects can also be measured following Aitken et al. (1997) who measure the export activity of multinationals as the ratio of foreign-owned firms' exports in sector j over total exports in j, relative to the importance of the foreign-owned firms' exports in total exports(fem1). The results presented in Table 8 below support the evidence of demonstration effects and negative competition effects from foreign-owned firms to domestic firms. In addition, an estimation on the impact of domestic presence on foreign-owned firms exporting behaviour finds using rdd, dem and dex (defined as before but now for domestic firms) for the demonstration, competition and information spillovers channels do not find evidence of export spillovers from domestic firms as presented in Table 8 with the exception of the demonstration effects at the 5% level of significance, further confirming that export spillovers are mainly generated by foreign-owned firms in Kenya and that there is no model mis-specification.

Table 8:   Robustness check

New spillover measures			Domestic firm spillovers to FDI		
Variable	Coef	t value	Variable	Coef	t value
rdf1	3.07	5.64***	rdd	0.05	2.15**
fem	-0.34		dem	-0.12	-0.78
1	-9.58***		dex	-0.02	-0.70

***, * significance level at 1% and 10%

    Moreover, although not reported here, higher degree of FDI at least 50% equity ownership do not have significant spillover effects. Finally, the added-variables plots for the exports decision and the measure of foreign presence are generated using a linear probability regression model with firm dummies and presented in figures 6(a)-6(c) below. Upon removing the outliers, the results do not change and therefore they can be regarded as robust.
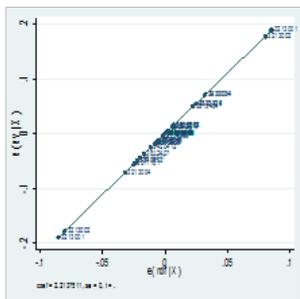
Figure 6(a): RDF   Figure 6(b): FEM   Figure 6(c): FEX
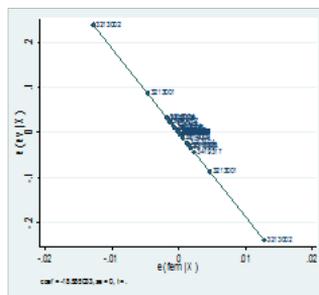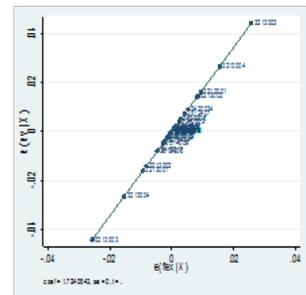
5. Conclusion and policy implications

The aim of this paper was to investigate whether domestic firms are influenced to export by foreign-owned firms. It was noted that although there are many studies addressing export spillovers, few studies especially in Africa have attempted to specifically explore the special link between foreign and domestic-owned firms. In Kenya, there is no study that has investigated export spillover effects from foreign-owned firms to domestic firms. The literature on spillovers suggests that foreign-owned firms operating in host countries can be important sources of export spillovers. This is because they can create transport infrastructure or disseminate information about foreign markets that can be useful to local firms. In addition, this literature has identified various channels through which these spillovers take place. This paper examined three important channels of spillovers, namely information externalities, demonstration effects and competition effects. Using firm level panel data for the period 2000-2005, a firms' export decision linear probability fixed effects model was estimated, with the main aim of identifying the main determinants of exports in Kenya. A second estimate was aimed at establishing whether the determinants of exports varied between domestic and foreign firms and why. A final estimate examined whether the foreign-owned firms influence the export decision of the domestic firms.

The results revealed that firms' decision to export in Kenya is influenced by average wages, profitability, labour productivity, funds, firms' research and development expenditure and the age of the firm. These variables varied between domestic firms and foreign firms, indicating heterogeneity between them. Whereas foreign firms export decisions were influenced less by profitability, domestic firms were influenced more by profitability. All the other variables were significant although their coefficients were not the same. Therefore, it does appear that only domestic firms that have succeeded locally venture into the export market, hence evidence of self-selection. This is, however, not the case with foreign firms who have already acquired international exposure and export contacts.

The results also reveal that indeed, foreign firms influence the export decision of domestic firms positively through demonstration effects. There is also evidence of negative spillovers from competition and limited information effects. This may suggest that these spillovers are temporal, such that as domestic firms become experienced in the export market, they no longer need to rely on foreign-owned firms, only in

exceptional circumstances. In addition, foreign-owned firms with higher degree of foreign equity do not appear to be sources of large export spillovers.

However, the results are not robust and should be interpreted cautiously otherwise the conclusion may be misleading.

What implications does this have for policy? At the outset, this paper acknowledged the extensive policy competition between governments to attract foreign direct investment. This is based on the assumption of externalities being present. In this paper, we have noted Kenya's long term commitment to attracting foreign direct investment as shown through the pursuit of various policies and institutions. However, these efforts do not appear to have yielded much fruit because FDI in Kenya compared to other countries especially the newly industrialized countries from South East Asia remain very low. In addition to aggressive efforts aimed at increasing FDI inflows in the manufacturing sector in Kenya, there is need for the government to assist firms increase their labour productivity if they are to venture into the export market.

Notes

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2. Greenfield investment is s a type of foreign direct investment (FDI) where a parent company builds its operations in a foreign country from the ground up. See World Bank https://openknowledge.worldbank.org/handle/10986/13941

3. It is important to note that export/market spillovers are mainly by exporting firms, hence if FDI targets the domestic market in a host country, such spillovers are not expected to arise.

4. Examples of such studies include Bigsten et al. (2004), Clerides et al. (1998) and Rasiah and Gachino (2005).

5. See Abor et al. (2008).

6. The separation of production and distribution costs captures the idea that some costs, such as those related to design, advertising, and transportation are market-specific.

7. Several estimations will be made with some of the variables to answer various questions.

8. The paper focuses on direct exports only and not indirect exports due to data constraints.

9. See Bernard and Jensen (1999).

10. These are indirect measures of spillovers as data on direct spillovers is not available, hence the results ought to be interpreted with caution.

11. Some foreign firms have relocated due tough conditions of doing business that have characterized the country for a long time. Some of the reasons as stated by

UNCTAD (2005) include problems of corruption and governance, inconsistency in economic policies and structural reforms, and the deterioration of public services and infrastructure.

12.   Shown in Appendix Table A6.

13.   It may suggest that in a labour surplus economy, exporting firms can obtain cheap labour and demand the most from them.

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Appendix

Table A1: Industrial policies and institutions established to promote the manufacturing sector in Kenya

Year	FDI policy/ Institution	Purpose
1954	Industrial and Commercial Development Corporation (ICDC)	To promulgate industrial capabilities by promoting more participation of indigenous Kenyans in industry and commerce.
1958	Protective tariff system	In support of ISI
1963	Development Finance Company of Kenya	A government owned investment company aimed at promotion of industrialization after independence. It was accorded priority to economically viable projects deemed to have the necessary capacity to promote economic development.
1964	Foreign Direct Investment Act	Through this Act, foreign-owned firms were issued with a "certificate of Approval Enterprise" which guaranteed the right to repatriate profits, loans, interest on their loans and the "approved proportion of the net proceeds of sale of all or part of the approved enterprise".
1967	Trade Licensing Act	To encourage MNCs to assist African businessmen to secure types of trade and trading zones for African retail traders and wholesalers.
1967	Kenya Industrial Estates	To encourage the entry of the indigenous firms into the manufacturing industry. It was formed as a supportive institution to assist indigenous firms to develop technical skills.
1968	New Projects Committee	Established to serve as a bargaining forum between the government and multinational corporations (MNCs) on all investment aspects.
1971	Capital Issues Committee	To vet all issues of capital stocks with a view to cutting down capital flows from Kenya due to the nationalization threat.

Table A1 Continued

Year	FDI policy/ Institution	Purpose
1973	Industrial Development Bank	Aimed at furthering industrial and economic development by promoting, establishing, expanding, modernizing the medium and large-scale enterprises.
1974	Export Compensation Manufacturers Act	To promote export of non-traditional products under the ISI strategy.
1974	Kenya Bureau of Standards	To promote manufactured goods competitiveness both local and external by raising their quality.
1979	Kenya Industrial Research Institute(KIRDI)	To promote the national industrial innovative process through the development of a sufficient national capacity in disembodied and embodied industrial technologies for the attainment of self-sustaining industrialization process.
1981- 1982	Replacement of quantitative restrictions with equivalent tariffs, tariff reduction and rationalization Enhancement of the export compensation scheme	To promote free movement of imports and exports of manufacturers.
1983	Investment Advisory Centre (IAC)	To replace the New Projects Committee of 1968 and attract FDI in Kenya.
1986	Manufacturing under bonds Investment Promotion Centre (IPC)	To promote exports. To promote private investment in Kenya and replace IAC.
1990	Export processing zones and other schemes	To promote the export oriented industrial investment.
1992	Exports Promotion Centre/ Council	To formulate market strategy, promote an export culture and to identify export opportunities regionally and internationally.
1992	Export Programme Offices	A kind of duty drawback schemes administered by Treasury.
2000	African Growth and Opportunity Act (AGOA)	To promote export of textiles to the US.
2001	Kenya Industrial Property Institute	It is the main agency in charge of granting and enforcing property rights and trademarks
2004	Kenya Investment Authority	To replace IPC and introduced mandatory investment thresholds and restrictive screening procedures for all foreign investment.

Table A2: Classification of firms across sectors

ISIC Code	Industry Classification	2000		2001		2002		2003		2004		2005		Rep		Registered firms by		
		For	Dom	For	Dom	For	Dom	For	Dom	For	Dom	For	Dom	For	Dom	For	Dom	Total
31	Food, beverage and tobacco	54	73	57	79	52	76	59	55	61	62	57	67	0.53	0.31	107	224	341
32	Textile, apparel and leather	47	48	53	62	50	64	52	57	55	51	53	55	0.45	0.31	114	179	293
33	Wood and wood products	15	64	17	65	14	61	15	63	14	62	12	66	0.31	0.54	47	118	165
34	Paper and paper products	26	63	24	67	25	63	27	59	27	61	23	67	0.45	0.70	56	90	148
35	Chemical, petroleum and plastics	42	87	46	92	43	87	40	89	41	87	45	91	0.37	0.40	117	222	349
36	Non -metallic mineral products	29	47	33	53	32	55	31	52	37	53	34	56	0.80	0.54	41	98	139
37	Basic metal industries	31	56	35	59	30	52	33	57	38	55	31	58	0.63	0.55	52	103	165
38	Fabricated metal products, machinery and	22	56	23	63	25	57	25	59	27	58	26	62	0.40	0.42	61	142	203
39	Other manufacturing industries	51	111	57	128	56	132	57	81	65	95	71	127	0.59	0.60	101	186	287
	Total	317	605	345	668	327	647	339	572	365	584	352	649			686	1,362	2,058

Key: For=Foreign; Dom = Domestic; Rep = Representation = ratio of average for the period 2000-2005 to the sampling frame per sector

Table A3:   Classification of exporting firms across sectors (percentages of firms)

ISIC Code	Industry Classification	2000		2001		2002		2003		2004		2005	
		Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic
31	Food, beverage and tobacco	70	25	65	32	68	35	71	39	72	35	69	35
32	Textile, apparel and leather	80	28	76	34	73	40	74	37	76	38	74	40
33	Wood and wood products	90	5	70	28	73	34	25	79	16	79	20	70
34	Paper and paper products	75	10	73	15	80	10	79	8	85	12	88	10
35	Chemical, petroleum and plastics	65	34	67	38	70	32	64	35	65	32	70	34
36	Non-metallic mineral products	90	12	81	15	90	22	85	18	74	15	73	28
37	Basic metal industries	57	24	68	27	59	25	72	35	64	28	75	25
38	Fabricated metal products, machinery and equipment	68	35	64	21	58	19	72	24	65	18	58	26
39	Other manufacturing industries	67	38	66	35	58	26	64	31	58	37	63	33

Table A4:   Classification of exporting firms across sectors (exports as a percentages of sales)

ISIC Code	Industry Classification	2000		2001		2002		2003		2004		2005	
		Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic
31	Food, beverage and tobacco	72	10	58	12	62	21	65	22	64	18	61	23
32	Textile, apparel and leather	57	15	59	19	60	27	55	25	62	37	58	32
33	Wood and wood products	15	10	21	30	16	35	10	32	13	37	15	35
34	Paper and paper products	20	14	18	25	19	28	22	30	18	32	21	28
35	Chemical, petroleum and plastics	47	33	52	37	28	19	45	22	36	27	42	32
36	Non-metallic mineral products	68	15	62	17	70	16	69	20	72	18	67	22
37	Basic metal industries	32	8	41	12	37	10	45	13	40	15	45	17
38	Fabricated metal products, machinery and equipment	25	10	28	15	26	11	35	15	28	12	27	13
39	Other manufacturing industries	45	26	38	22	35	25	42	31	34	38	40	31

Table A5:   Correlation matrix

VARIABLES	WAGES	PROFIT	TURNOVER	LABOUR~P	R&D	FUNDS	AGE	RDF	FEM	FEX
WAGES	1									
PROFIT	-0.1553	1								
TURNOVER	-0.1497	0.8587	1							
LABOURPROP	0.3255	0.2871	0.2917	1						
R&D	-0.1444	0.6255	0.619	0.2558	1					
FUNDS	-0.035	-0.0059	-0.0101	-0.031	0.0142	1				
AGE	-0.1802	0.4757	0.4979	0.3331	0.5068	0.1005	1			
RDF	0.0096	0.017	0.0356	0.047	0.0379	0.0603	0.0075	1		
FEM	0.0463	0.0701	0.1276	0.117	0.0735	0.0807	0.0942	0.5706	1	
FEX	0.0659	0.04	0.0914	0.1274	0.048	0.0675	0.116	0.5871	0.8329	1

Table A6:   Determinants of decision to exports in Kenya (Using employment instead of profit)

ev	Pooled		Random effects		Fixed effects	
	Coef.	Z value	Coef.	Z value	Coef.	Z value
wages	-0.003***	0.029	-0.003***	0.00	-0.003***	0.00
Employee	0.008**	0.004	0.001***	0.004	0.001***	0.004
labour productivity	0.0002***	0.00	0.0002***	0.01	0.002***	0.00
rd	0.00***	0.08	0.00***	0.08	0.00***	0.00
funds	-0.05	0.04	-0.05	0.04	-0.05	0.04
age	0.06***	0.003	0.06***	0.003	0.06***	0.02
age2	-0.001***	0.05	-0.001***	0.05	-0.001***	0.00
Sectors	Yes		Yes		Yes	
Yes	Yes		Yes		Yes	
_cons	-0.51	0.04***	-0.57	0.04***	-0.56	0.04
LR Chi²(20)	185.52		3596.81		171.3	
Prob> Chi²	0		0		0	

Table A7:   Determinants of decision to exports in Kenya (Using logs)

Variables	Pooled		Random effects(a)		Fixed effects(a)	
ev	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lwage	0.00	0.02	0.02	0.02	0.01	0.02
lprofit	0.02***	0.01	0.02**	0.01	0.02**	0.01
lLabour productivity	-0.01	0.02	0.01	0.02	0.02	0.02
lresearch development	0.02*	0.01	0.02***	0.01	0.02***	0.01
lfunds	-0.02**	0.01	-0.02	0.01	-0.01	0.01
age	0.02	0.01	0.02**	0.01	0.01***	0.01
age2	0.00	0.00	0.00	0.00	0.00	0.00
Sectors	Yes		Yes		Yes	
Years	Yes		Yes		Yes	
constant	0.41***	0.17	0.34***	0.17	0.29***	0.17
F (19,755)	2.47		55.38		3.14	
Prob. >F	0.00		0.00		0.00	
Observations	775		775		775	

Table A8: Determinants of decision to exports in Kenya excluding exit and entry of firms

ev	Coef.	Std Er.
wages	-0.03***	0.00
profit	0.00***	0.00
Labour productivity	0.02***	0.00
Research development	0.00***	0.00
funds	-0.06	0.04
age	0.06***	0.00
age2	0.00***	0.00
Sectors	Yes	Yes
Years	Yes	Yes
_cons	-0.50***	0.04
F(20, 4843)	166.18	Yes
Prob > F	0.00	Yes
Observation	4864	0

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