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**Author:** Kinuthia, Bethuel Kinyanjui  
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A comparison of technology spillovers from foreign direct investment in Kenya and Malaysia

Introduction

This chapter investigates the existence of productivity spillovers from foreign-owned firms to domestic firms in Kenya and Malaysia. As noted in the previous chapters, these two countries, apart from sharing the same colonial history, ethnic diversity, and strategic location, among others things, have relied to a large extent on FDI for the development of their industrial capabilities over the years. Whereas Malaysia’s industrial development in recent times has been attributed partly to MNEs’ activity,¹ Kenya’s slow growth has been partly blamed not only on its inability to attract large FDI inflows but also its failure to create local linkages with the domestic industries.²

The literature on productivity spillovers or external effects from FDI has argued that domestic firms can benefit from foreign-owned firms by the latter’s breaking up supply bottlenecks, demonstrating new technology, and training workers who later take up employment in local firms. The transfer of these benefits to the local firms can break down monopolistic industrial structure and stimulate competition and efficiency, transfer techniques for inventory and quality control and standardization to their local suppliers and distribution channels, and force local firms to increase their managerial efforts and adopt marketing techniques used by MNEs. These activities may introduce new know-how and intensify competition and hence contribute to productivity gains. If productivity gains outweigh competition losses, there will be positive productivity spillovers. Oth-

¹ See Lall (1995).
² GOK (1994).
erwise, the impact of the foreign presence on the host economy will be negative (Blomstrom & Kokko 1998; Saggi 2002).

More recently, this literature has also acknowledged that productivity spillovers can emanate from the host country; hence, FDI may be motivated by technology sourcing. Firms may decide to invest abroad not only to exploit advantages in their possession, but also to acquire new technological knowledge. The reverse spillovers hypothesis suggests that firms might benefit from technological spillovers when they locate close to market leaders. This, however, tends to be more concentrated in developed countries (Driffield & Love 2003; Wei et al. 2008). The empirical evidence on productivity spillovers has been mixed on the magnitude, direction, and even the existence of knowledge spillovers from FDI. The main reasons for the inconclusive evidence are methodological and related to measurement of spillovers, and more recently to conceptual issues (Gorg & Strobl 2001; Smeet 2008; Mebratie & Bergeijk 2011). In addition, few studies explore the channels of transmission, and as a result the specific mechanisms by which spillovers are supposed to occur are treated as a black box (Gorg & Strobl 2005a).

This chapter attempts to bridge this gap by investigating the presence of knowledge spillovers from foreign-owned firms to domestic firms and their transmission mechanisms in a comparative context, focusing on Kenya and Malaysia. In both countries, the studies are few and do not consider the transmission channels (Menon 1998; Khalifah & Adan 2009; Gachino 2010). This chapter uses firm-level panel data from the manufacturing sector for the period 2000-2005.

The rest of the chapter is organized as follows. In the first section, a review of FDI and the development of the manufacturing sector in both countries is presented. The second section discusses the literature review, while a discussion on data and the empirical estimation follows in the third section. The empirical results are presented and discussed in the fourth section. The last section contains the conclusion and policy implications of this study.

Overview of FDI and the development of the manufacturing sector in Kenya and Malaysia

Kenya and Malaysia have relied on FDI in their industrial development. Figure 5.1 shows that at independence the manufacturing sector in both countries accounted for less than 10 per cent of GDP and that it was largely dominated by firms operating in the light industries, as indicated by Table 3.3 in Chapter 3.
In both countries, the production of manufactured goods during the early period of the 1960s was concentrated mainly in sectors involved in food products, beverage and tobacco, and textile and apparel, which accounted for more than 60 per cent of manufactured output in Kenya and about 30 per cent in Malaysia. In addition, the basic chemical and petroleum sectors also contributed about 14 per cent of manufactured output in Kenya, while rubber and fabricated metal products contributed 44 per cent of manufactured output in Malaysia. These industries existed during this period under the import substitution industrialization strategy (ISI), which involved the domestic production of previously imported goods. Owing to the limited nature of domestic firms in spearheading industrial development in these countries, the governments had relied much on FDI in addition to government-established entities as the initial drivers of the industrial process (Swainson 1980: 123, 211; Alavi 1995: 35).

The growth of the manufacturing sector in both countries began in the 1960s, following the successful implementation of ISI (Figure 5.1). There was a significant change in the composition of manufacturing in GDP in Malaysia after 1967, when the country began the implementation of the export-oriented industrialization strategy (EOI), after it became apparent that ISI was losing its impetus as a growth strategy. By the early 1970s, government efforts to encourage export-oriented industries were in full swing, and free trade zones and licensed manufacturing warehouses were established, with a special emphasis on labour-intensive foreign-owned firms. The ISI, however, was retained in the resource-rich sectors (Kinuthia 2011).
Kenya during this period continued pursuing the ISI, relying much on foreign capital as well as government-established entities. However, the ISI discouraged learning, and most of the firms were inefficient and could not compete internationally, especially after the collapse of the East African Community in 1977. Furthermore, Table 3.3 shows that towards the end of the 1970s, the composition of the manufacturing sector remained unchanged in Kenya, while in Malaysia, the entry of FDI in the electrical and electronic sector was already making significant contributions towards changing the manufacturing structure. In addition, the discovery of oil in the early 1970s in Malaysia also resulted in the manufacture of petroleum and coal products. There was also an increase in the production of basic metals. These features show evidence of industrial transformation taking place and Malaysia beginning to produce intermediate products in addition to consumer goods.

At the start of the 1980s, Malaysia embarked on the second round of ISI, which was later abandoned in 1985 in favour of the EOI. The government also embarked on a liberalization program, which saw the removal of restrictions on FDI and the privatization of state-owned enterprises. This, in addition to other liberalization measures – including the devaluation of the Malaysian ringgit – resulted in massive FDI inflows, mainly into the manufacturing sector. As a consequence, there was a significant increase in the production of manufacturing goods, as shown in Figure 5.1. Furthermore, there was a significant technology shift in the sector towards the production of high-tech manufactured goods, as shown in Table 3.3. By 2011, light industries accounted for less than approximately 10 per cent of manufactured output, and the sector was now dominated by chemical and plastic products and electrical and electronic goods, which together accounted for more than 63 per cent of the output.

In Kenya on the other hand, the 1980s began with the country pursuing SAPs, owing to the economic turmoil experienced in the 1970s attributed to external shocks, fiscal irresponsibility, natural calamities, and the high expenditure associated with the implementation of ISI, all of which had resulted in severe BOP problems (Fahnbulleh 2006). The aim of SAPs was the removal of government involvement in the productive sector, orientation of the manufacturing sector towards exports, and liberalization of the economy. As noted in Chapter 3, these efforts did not yield much success, and the manufacturing sector experienced limited transformation, as shown in Table 3.3. Towards the end of the 1990s, Kenya established export processing zones, aimed at attracting foreign firms to produce manufactured goods for exports. At the same time, there were various pieces of legislation aimed at supporting small and medium enterprises, in anticipation of linkages arising from their interaction with the foreign-owned firms. By 2008, although the share of consumer goods had reduced, there was increased
involvement in the production of cement and chemicals and other minerals, and the manufacturing sector had yet to undergo significant transformation.

Thus, while there is evidence of transformation of the manufacturing sector from the production of light commodities to hi-tech goods in Malaysia, there is limited evidence of transformation in Kenya. In this process, both countries have relied on FDI, which has been obtained mainly from the US and the UK. Japan, Singapore, and Taiwan have also been major sources of FDI in Malaysia, while countries within the EU and more recently China and India have also been important FDI sources in Kenya (UNCTAD 2005; Kinuthia 2010a).

Literature review

Theoretical literature review

Endogenous growth theory views innovation as the main source of productivity growth, although it may be associated with either internal or external factors (Lucas 1988; Romer 1990), and FDI is often considered the strongest conduit for international technology transfer. As noted in Chapter 2, foreign firms may relocate to host countries to enhance their inter-industry flows (in the case of factor differences hypothesis) or to get closer to their customers or suppliers (in the case of proximity-concentration hypothesis). In both cases, foreign-owned firms own unique assets (benefits), some of which cannot be internalized fully, thereby benefiting the domestic firms.

According to Blomstrom & Kokko (1998), productivity spillovers occur because foreign-owned firms, when investing in host countries, bring with them some amount of proprietary technology that constitutes their firm-specific advantage, an advantage that allows them to compete successfully with other MNEs and local firms that presumably have superior knowledge of local markets, customer preferences, and business practices. In addition, their entry disturbs the existing equilibrium in the market and forces the local firms to take action to protect their local market shares and profits. Both of these changes are likely to cause various types of spillovers that lead to productivity increases of local firms. Hence, productivity spillovers are said to take place when they lead to productivity or efficiency benefits in a host country’s local firms and the foreign-owned firms are not able to internalize the full value of these benefits.

Gorg & Strobl (2005b) and Aitken & Harrison (1999) have also observed that foreign-owned firms may be a source of negative productivity spillovers. By producing at lower marginal costs than host countries firms, they have an incentive to increase output and attract demand away from those firms. This will cause host country rivals to cut production, which, if they face fixed costs of production, will raise their average cost. Likewise, to the extent that the presence of MNEs leads to higher wage demand in the economy, this will increase the local
firms’ average costs. Foreign-owned firms may also relocate to host countries in order to source for new technology. This reverse spillovers hypothesis suggests that firms might benefit from technology spillovers when they relocate close to market leaders (Wei et al. 2008).

Studies on productivity spillovers have also shown that the degree of productivity spillovers depends on both the technology gap between the foreign and local firms and the technology capabilities of local firms. Cantwell (1989, 1995) argued that if local firms do not lag too far behind multinationals, they can embark on a catch-up process and benefit from the presence of FDI. Crespo & Fontoura (2007) further observed that domestic firms must have a moderate technology gap vis-à-vis MNEs in order to benefit from the higher technology associated with MNEs. If the technology gap is too small, MNEs will transmit few benefits to the domestic firms. Thus, whether the effects of foreign-owned firms on productivity of host firms is positive or negative is therefore ambiguous and needs to be decided empirically.

Scholars such as Bloomstrom & Kokko (1998), Saggi (2002), Gorg & Greenaway (2004) and Javorcik (2008), in various literature surveys on spillovers have identified several channels through which productivity spillovers may occur. First, productivity spillovers may occur through demonstration/imitation effects. In its simplest form, the demonstration effects argument states that exposure to superior technology of foreign-owned firms may lead to local firms updating their own production methods. This is based on the assumption that it may be too costly for local firms to acquire the necessary information for adopting new technologies if they are not introduced into the local economy by foreign-owned firms. As part of this argument, this literature observes that geographical proximity is a vital aspect especially in developing countries, which might not have many alternatives for absorbing technologies. Since this is largely an industry-level argument related to industry-level variation, research and development (R&D) expenditures by local firms following R&D expenditure by MNEs is one method of checking whether local adoption efforts are encouraged through FDI.

A second important channel of productivity spillovers identified in the literature is through labour turnover. This differs from other channels because knowledge embodied in the labour force moves across firms only through physical movement of workers. The relative importance of labour turnover is difficult to establish because it would require tracking individuals who have worked for foreign-owned firms, interviewing them regarding their future job choices, and then determining their impact on the productivity of new employers. Foreign-owned firms may also poach the best workers from their local competitors and make access to credit more difficult, because they may be lower risk borrowers than their competitors. Both channels create negative pecuniary externalities that af-
fect local firms. While pecuniary externalities have a negative impact on affected local firms, they lead to more efficient outcomes for the economy as a whole. As a result of increased competition in product, labour, and credit markets, resources are re-allocated from less efficient firms to those in a better position to benefit from them. This may in turn benefit consumers through lower prices.

Productivity spillovers may also occur through the competition effect, which is the third channel. The entry of foreign-owned firms increases the level of competition within the industry as long as a share of their output is sold in the host country. Production of goods and services within a liberalized environment lowers both transportation and labour costs. This may lead to a reduction in the prices of commodities, benefiting customers in the host markets. In the long term, this provides an incentive to local producers to improve their performance; it also leads to the exit of worst performers and an increase in the average productivity level in the industry. In the short to medium term, however, weak firms may experience a decline in their performance as the market size shrinks.

The fourth mechanism through which productivity spillovers may occur is through linkages with domestic firms, hence affecting the demand of intermediates. Gorg & Strobl (2005a) observed that MNEs can be expected to have only a minimal effect on the domestic economy if they operate in enclave sectors with no contact with the domestic economy. Hence, it is unsurprising that the importance of backward or forward linkages between MNEs and domestic suppliers or customers has also been emphasized in this literature. These authors have noted that local firms may be able to improve their productivity as a result of forward or backward linkages with MNEs’ affiliates. However, local firms can also influence the productivity of MNEs through such linkages. If expansion of MNEs forces local firms to exit and the MNEs use local inputs less intensely, a negative effect will be observed in upstream sectors as well as industries using these inputs.

A final important productivity spillover channel identified in literature is through exporting. Greenway & Kneller (2008) and Bigsten et al. (2004), among others, observed that firms can raise their levels of productivity once they begin exporting. Here, learning from best practice follows experience in the export markets. Exporters find new ways of improving products and processes. On the other hand, Melitz (2004) and Bernard et al. (2003), among others, have shown that it is more productive producers in an industry who become exporters.

**Empirical literature review**

There exists a rich array of empirical studies investigating the presence of productivity spillovers as well as their transmission channels, and in this section we review the most recent ones. Some studies have found evidence of increased pro-
ductivity in domestic firms through linkages. Jarkovic & Spatareau (2011) found evidence of productivity spillovers through the backward linkages in Romania. In addition, they observed that an investor’s origin may matter for spillovers to domestic producers supplying intermediate inputs, through the distance between the host and source country and the existence of preferential trade agreements. They use several proxies to measure foreign presence in the same sectors and in downstream industries. The level of competition in an industry $j$ was measured using the Herfindahl index, while the share of industry $j$’s output produced by firms with at least 10 per cent foreign equity measured the importance of foreign presence in a sector’s output, which was used as a proxy for horizontal (within sector) spillovers. In addition, vertical (across sector) spillovers were calculated as the proportion of sector $j$’s output used by sector $k$, taken from the input-output matrix pertaining to year $t$.\(^3\) Moreover, since knowledge spillovers from foreign presence may take time to manifest themselves, these measures of foreign presence were lagged one period.

In a similar approach, Du et al. (2011) using panel data for Chinese firms, found evidence of productivity spillovers from foreign-owned firms to domestic firms through backward and forward (vertical) linkages, but not through horizontal linkages. Jordaan (2011), in a cross-sectional analysis, found evidence that FDI firms and Mexican firms do not differ in their use of local suppliers of material inputs and production services. However, FDI firms are significantly more supportive of domestic suppliers than Mexican firms.

Some studies have also found evidence of demonstration effects in addition to the importance of the technology gap. Todo et al. (2011) found evidence of technology diffusion from R&D stock of foreign-owned firms to domestic firms in the same industry in China’s “Silicon Valley”. They also found that the size of knowledge spillovers is larger when the technology gap between source and recipient firms is large. Similarly, Driffield et al. (2010), using firm-level data for multinational investments in Italy, found that R&D and investment in capital-embodied technology played a significant role in determining the nature of inter-firm technology flows. However, they observed that the basis for any spillovers arising from MNE affiliates does not arise from codified knowledge associated with R&D but rather from the productivity of the affiliate.

Other studies have found evidence of other productivity spillovers through other transmissions. Suyanto et al. (2009), also using firm-level data, found evidence for Indonesian chemical and pharmaceutical industries of intra-industry productivity spillovers through competition effects from foreign presence in the industry. In addition, firms with R&D expenditure receive more productivity

\[^3\] \text{Vertical-Origin} = \sum_{k \neq j} \alpha_{kji} \text{Horizontal-Origin}_{ij}
Yasar & Paul (2007) also found evidence that plants with foreign ownership are the most productive, followed by plants that export, especially with other forms of international technology transfer. Eriksson (2011) showed that knowledge spillovers via the mobility of skilled labour are primarily a sub-regional phenomenon in Sweden and that the only inflows of skills that are related to the existing knowledge base of plants and come from fewer than 50 kilometers away have a positive effect on the plant performance.

Menghinello et al. (2010), using firm-level data on Italian firms, found that while inwards FDI does generate a productivity increase in the home country, in particular it is the locations with higher levels of agglomeration and a significant degree of industry specialization which are best placed to benefit from inward investment and the associated new technology. On exporting as a source of productivity spillovers, Alvarez & Lopez (2008), using data for Chile, found strong evidence that domestic as well as foreign-owned exporting firms improved the productivity of local suppliers. They found evidence that positive productivity spillovers are not only generated by the presence of foreign-owned exporting plants but also by the exporting activity of domestic firms.

In Kenya, several studies have examined various aspects of productivity, though not necessarily on spillovers, while others have examined various transmission channels through which foreign-owned firms affect domestic firms. Fukunishi (2009) found no significant gap in the average technical efficiency between firms in Kenya and Bangladesh in the garment industry, although unit costs differed greatly between them, and that productivity had little to do with stagnation of the industry in Kenya. Rasiah & Gachino (2005) found evidence that foreign-owned firms have higher labour productivity means than local firms in textile and garment manufacturing. Similarly, Lundvall & Battese (2000) found evidence of technical efficiency being positively correlated to firm size in food, wood, textile, and metal sectors in Kenya. Pack (1987) also found that total factor productivity of Kenyan firms was less than in developed countries, but as productive as firms in the Philippines.

On the transmission channels, Kamau et al. (2009) observed that within the export processing zones (EPZ) in Kenya, there is evidence of spillovers, where employees leave mainly the garments’ firms after acquiring training and experience, teaming up with local investors to establish other garment factories or even starting their own small-scale garment firms. Graner & Isaksson (2009) also found evidence of export participation yielding learning effects in Kenyan manufacturing firms, while Gachino (2006) found evidence of technology spillovers.

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4 In this study, spillover is defined in terms of the share of foreign firms’ output in 3-digit ISIC industry. The Herfindahl-Hirschman index is used to measure concentration or the competition effect, while R&D is measured as the using dummies variables i.e. 1 if a firm spends on R&D activities during the observed years and 0 otherwise.
from multinational to domestic firms through demonstration effects. However, Phelps et al. (2009) did not find evidence of vertical linkages between foreign firms and local firms in the clothing sectors.

Jenkins (1990) found that foreign entry into the Kenyan footwear industry led to increased competition and changes in the production techniques of local firms. Gershenberg (1987) also found evidence that MNEs in Kenya train indigenous managers and spread know-how in the country. Finally, Langdon (1981), in a study of FDI in the Kenyan soap industry, observed that the entry of foreign MNEs 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, hence improving their productivity.

Similarly, in Malaysia, there are several studies that have examined productivity-related issues in the manufacturing industry, such as Khalifah & Adam (2009) who found no significant difference in labour productivity among wholly foreign-owned firms and locally owned establishments. They also found that their results were sensitive to the different measurements of the extent of foreign holding as well as proxies used for foreign presence whether in terms of net output, capital or labour, which were important in determining the incidence of productivity spillovers from foreign to local establishments. Similarly, Oguchi et al. (2002) found evidence of similar total factor productivity between foreign and domestic firms. Dogan et al. (2011) also found that exporters in Malaysia are more productive than non-exporters and that exporters’ turnover contributes to the aggregate productivity growth. In addition, Mahadevan (2002), using a data envelop analysis technique, found evidence that the annual productivity growth in Malaysia for the period 1981-1996 was low at 0.8 per cent and was driven by small gains in both technical change and technical efficiency. These results were consistent with those obtained by Ahmed (2009) and Menon (1998), who found that productivity growth in the Malaysian manufacturing sector is input-driven rather than total factor productivity growth-driven.

On the transmission mechanisms, Athukorala & Menon (1996) found evidence of limited backward linkages and direct technology transfer from foreign-owned firms to domestic firms, but observed that they appeared to be increasing. In contrast, Iguchi (2008) found evidence of significant linkages between MNEs and local suppliers in the electrical and electronics industry. In addition, they found that subsidiaries’ level of autonomy and local sourcing rates, as well as other factors such as location, are all positively related to the intensity of backward linkages. In addition, Giroud (2007) observed that the impact of FDI in the host country depends to a large extent upon competence of the local firms. The study noted that Malaysia has now reached a second stage in the investment develop-
management path, where there is evidence of creation of linkages and subsequent knowledge and technology transfer.

Although there are a considerable number of studies investigating various aspects of productivity in the manufacturing sector in both countries, few have focused on productivity spillovers and their transmission mechanisms, which is the focus in this chapter. In addition, the existing studies provide mixed evidence of productivity spillovers from various countries and the channels of transmission are not clear. Indeed, as Gorg & Strobl (2005a) have observed, spillovers are difficult to measure since they do not leave a paper trail by which they can be measured or tracked. Hence, the approach taken in empirical literature largely avoids the question of how spillovers occur and instead focuses on the simpler issue of whether or not the presence of foreign-owned firms affects the productivity of domestic businesses. In addition, even the studies that examine productivity spillovers mainly ignore the export and demonstration effect channels (Mebratie & Bergeijk 2011).

This study contributes to this literature by using various measures of foreign presence and spillover proxies to investigate not only for the presence of productivity spillovers but also for the transmission channels, using firm-level panel data for the period 2000-2005 in both countries.

Data and empirical estimation

Data
The datasets used in this chapter are based on annual surveys of manufacturing industries in both countries for the period 2000-2005. In Malaysia this dataset is collected by the Department of Statistics, while in Kenya it used to be collected by the Ministry of Trade and Industry until 2005, when the exercise was stopped for unknown reasons. The surveys cover all establishments above a specific employment cut-off, which varies from industry to industry. The data for the period 2000-2005 was based on a census in Malaysia. In Kenya the dataset was based on a set of registered firms with the Ministry. Firms were registered until the year 2004; hence, in Kenya it is difficult to infer anything about representativeness of the true population.

The principal statistics for each firm compiled include type of ownership, value of gross output, costs of inputs, value added, value of fixed assets, and number of workers. A breakdown of this dataset is contained in Tables 5.1 and 5.2 below. From Table 5.1, it is apparent that Malaysia has more firms in this dataset than Kenya. In addition, there is significant annual fluctuation in the dataset in Malaysia. This is mainly due to the different approaches used by the Department of Statistics in Malaysia for collecting the data. For example, the firm level data collected in the year 2000 and 2005 were based on a census. During this five-
year period, there were approximately 8000 new firms. Firm level data collected between 2001 and 2004 were based on a selected sample of firms and are therefore representative of the manufacturing sector in Malaysia.

A further breakdown is contained in Tables 5.A.1 and 5.A.2 in the appendix to this chapter. For the purpose of this study, firms with at least 10 per cent of their nominal capital owned by foreigners are defined as foreign-owned firms, while the rest are considered locally owned. As de Mello (1997) has observed, this definition is restrictive since FDI comprises 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, in order to remove data fluctuations that might exist owing to inflationary effects over time in the economy. Owing to lack of suitable deflators, the GDP deflator is used to deflate both output and export values and is obtained from the World Development Indicators.

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Notes: (i) K: Kenya, M: Malaysia.
(ii) In years 2000 and 2005 a complete census was conducted in Malaysia.

Finally, Table 5.A.1 in the appendix presents a detailed comparison of the sample and the registered firms with the Ministry in Kenya. On average, the firms used for analysis in this chapter represent about 50 per cent of those registered by the Ministry and were selected on the basis of data availability. However, firm representation varies across sectors. Foreign-owned firms are over-represented in four of the sectors, with more than 50 per cent of the firms contained in the register. They are least represented in the wood and wood products’ sector, with about 31 per cent of the firms contained in the register. Domestic firms, on the other hand, are over-represented in five sectors, with more than 50

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5 This definition was adopted because the Kenyan national authorities use the same benchmark. This definition follows that of OECD and UNCTAD.
6 This approach was followed by Gachino (2006), except that the export values were deflated using export price indices for manufactured goods. Biggs et al. (2004) used firm-specific deflators based on export share-weighted averages of the domestic and international prices to control for variations in the exchange rates.
per cent of firms contained in the register. They are least represented in the food, beverage and tobacco, and textile, apparel, and leather sectors, with 31 per cent of firms in the register.\footnote{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.}

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<tr>
<th>Table 5.2</th>
<th>Characteristics of the firms for the sample period (2000-2005)</th>
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<td>Turnover (US$ '000')</td>
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</tr>
<tr>
<td>Employee</td>
<td>101967</td>
</tr>
<tr>
<td>Export (US$ '000')</td>
<td>101967</td>
</tr>
<tr>
<td>R&amp;D (US$ '000')</td>
<td>101967</td>
</tr>
<tr>
<td>Funds (US$ '000')</td>
<td>101967</td>
</tr>
<tr>
<td>Age</td>
<td>101967</td>
</tr>
<tr>
<td>Value added (US$ '000')</td>
<td>101967</td>
</tr>
<tr>
<td>Capital (US$ '000')</td>
<td>101967</td>
</tr>
<tr>
<td>Direct raw materials (US$ '000')</td>
<td>101967</td>
</tr>
</tbody>
</table>

Source: Author’s calculation based on the dataset.

In addition, Table 5.2 above presents firms characteristics in both countries. Kenyan firms are on average smaller, older, less profitable and fewer than those in Malaysia. In addition, on average wages in Kenya are higher and firms invest more on average in R&D compared to Malaysia. Similarly, Table 5.A.2 presents a detailed comparison of the firms in Malaysia across sectors. Most of the foreign-owned firms are concentrated within the chemical, petroleum, plastic (36) and the fabricated metal products, machinery, and equipment (38) sectors. They are well represented across sectors over the years even during the period between 2001 and 2004, when a complete census was not conducted. This is not the case,
however, when domestic firms are considered. Whereas they are evenly distributed across the sectors, they are under-represented by 45, 49, 44, and 56 per cent in the years 2001, 2002, 2003, and 2004 respectively. This under – and over-representation in the two countries is taken into account when estimating the sectoral-level measures of foreign presence.

**Empirical estimation and variables**

In order to analyze productivity spillovers and their transmission channels, this study specifies a production function of the translog-type following Takii (2005) and Suyanto et al. (2009), which forms the baseline economic model:

$$
\ln(V_{ijt}) = A_{ijt} + \alpha_L \ln(L_{ijt}) + \beta_K \ln(K_{ijt}) + \alpha_{Lk} \left(\ln(L_{ijt})\right)^2 + \beta_{KK} \left(\ln(K_{ijt})\right)^2
+ \gamma_{LK} \ln(L_{ijt}) \ln(K_{ijt}) + \varepsilon_{ijt}
$$

where $V$ is value added, and $L$ and $K$ are the number of workers and capital stock respectively. The square variable of the number of workers ($\ln(L^2)$) and capital stock ($\ln(K^2)$) captures diminishing or increasing returns of both labour and capital, while the interaction of labour and capital captures the substitution effect between the two. $A_{ijt}$ refers to the efficiency level of a firm. At first, the efficiency is assumed to be decomposed into three components: Firm type (whether foreign or domestic); firm-specific factors ($\alpha_i$: the individual effects); and industry – and year-specific factors which are captured using dummies. The firm-specific factors are decomposed into time-invariant factors and time-variant factors. The former are the individual effects, while the latter include several measures of foreign presence. Finally, $\varepsilon_{ijt}$ denotes the error term.

Owing to data availability, three measures of foreign presence are considered in the case of Kenya and four in the case of Malaysia. These measures of spillover channels as well as the variables used in this analysis are defined in Table 5.3 below.

Four spillovers measures of foreign presence are used in this study. First are demonstration effects (RDF). This is proxied by the proportion of expenditure of R&D 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. If a technology is successfully used by foreign-owned firms, domestic firms will be encouraged to adopt it.

---

8 L & K are each divided by their mean value. The translog production function can be regarded as a second-order approximation of arbitrary function at one point. When estimating the translog production function, it is common to use the approximation at point $(L; K) = (1; 1)$. Takii (2005) used the approximation at point (mean of $L$; and mean of $K$) because it appeared to yield better results.

9 This variable has been used by Barrios et al. (2003) and Greenaway et al. (2004).
Table 5.3 Description of variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value added (V)</td>
<td>This is defined as the deflated value of sales minus materials for each firm.</td>
</tr>
<tr>
<td>Capital Stock (K)</td>
<td>The annual net book value of the fixed assets of each firm.</td>
</tr>
<tr>
<td>Employment (L)</td>
<td>The number of employees in the firm.</td>
</tr>
<tr>
<td>RDF</td>
<td>Proportion of expenditure of research and development carried out by foreign firms in a given sector.</td>
</tr>
<tr>
<td>FEM</td>
<td>Proportion of foreign-owned firm employees in a sector.</td>
</tr>
<tr>
<td>FVD</td>
<td>Proportion of foreign-owned firm value addition in a sector.</td>
</tr>
<tr>
<td>DF</td>
<td>Share of the cost of direct raw materials sourced from domestic firms by foreign ownership in a sector.</td>
</tr>
</tbody>
</table>

The second spillover measure is the competition effect (FEM). This captures the possibility of domestic firms hiring workers who have previously worked for foreign-owned firms. These workers have knowledge and experience of the technology and are able to apply this in the domestic firm. However, this may also have a negative impact as foreign-owned firms, through this channel, may attract the best workers from domestic firms by offering higher wages. Competition effects are proxied as the relative weight of foreign-owned firms in total employment in a sector (FEM). This accounts for the relative importance of these firms at the sector level in the domestic market. The greater their relative importance, the stronger the competitive pressure on domestic firms.\(^{10}\) However, it is acknowledged that this is an imperfect measure of competitive effects.

The third measure is the information spillover, which is seen as the relative importance of foreign-owned firms in value addition in a sector (FVD). It is assumed that the greater their importance in the value addition of a given sector, the higher the scope is for domestic firms to benefit from information externalities. Menghinello et al. (2010) have observed that the pull of geographical clustering and the networking of related value-added activities will have an increasing effect on the choice of location by foreign-owned firms. This is commonly referred to as technology sourcing. Under such circumstances, domestic firms are likely to learn through information channels of new ways of improving their productivity. However, it is acknowledged that this proxy is not a perfect measure of information spillovers.

Finally, for Malaysia, the variable DF is included to capture the importance of vertical backward linkages created by foreign-owned firms through purchases of direct raw materials from domestic firms. This variable is proxied by the share of the cost of direct raw materials sourced from the domestic firms by the foreign-

\(^{10}\) Similar spillover measures have been used in several studies, including Aitken et al. (1997) and Greenaway et al. (2004).
owned firms. With increasing returns to scale, the presence of foreign-owned firms may benefit domestic suppliers in several ways: Providing technical support for the improvement of quality patterns, introducing innovations, providing support for the creation of productive infrastructure, etc. (Crespo & Fontoura 2007). Positive coefficients are expected for RDF, FEM, FVD, and DF. These variables are also obtained from the firm-level data.

Equation (1) is estimated without the various spillover channels and is based on the full sample. It establishes whether there is a difference between the productivity of foreign and domestic firms. Several equations are thereafter estimated following after equation (1) one to include the spillover variables. These equations are now based on the domestic firms only, since the objective of the study is to establish the impact of foreign presence on domestic firms. However, owing to the expected correlation between these variables as shown by the correlation matrices in Tables 5.A.5 and 5.A.6 in the appendix, the effect of each one of them on productivity is estimated both separately and jointly. These equations in general take the following form:

$$
\ln(V_{it}) = \alpha_i + \delta_{FD} FDID_{it} + \delta_S S_j + \delta_{YD} YD_i + \alpha_L \ln(L_{it}) + \beta_K \ln(K_{it}) + \\
\alpha_{LL} \ln(L_{it})^2 + \beta_{KK} \ln(K_{it})^2 + \gamma_{LK} \ln(L_{it}) \ln(K_{it}) + \epsilon_{it}
$$

(2)

where FDID dummy is = 1 if the firm is foreign and 0 otherwise. S is the sectoral dummies, while YD is year dummies for the years 2001-2005. The year 2000 has been chosen as the year of reference, and the food, beverage, and tobacco sector (31) has been identified as the sector of reference. Introducing the rest of the variables as defined in Table 5.3 above we obtain equation (3):

$$
\ln(V_{it}) = \alpha_i + \delta_S S_j + \delta_{YD} YD_i + \alpha_L \ln(L_{it}) + \beta_K \ln(K_{it}) + \alpha_{LL} \ln(L_{it})^2 \\
+ \beta_{KK} \ln(K_{it})^2 + \gamma_{LK} \ln(L_{it}) \ln(K_{it}) + \delta_{RDF} RDF_{it} + \delta_{FEM} FEM_{st} \\
+ \delta_{FVD} FVD_{st} + \delta_{DF} DF_{st} + \epsilon_{it}
$$

(3)

where $S_j$ captures the sectoral dummies and the rest of the variables as defined above.

In recent literature, it has been shown that the existence, sign, and magnitude of FDI spillovers to domestic firms depend on a multiplicity of factors related to the characteristics of the foreign-owned firms as well as those of the host countries, sectors, and firms. One important determinant studied in the literature and considered in this study is the technology gap. It is maintained that domestic firms must have a moderate technology gap vis-à-vis foreign-owned firms, in order to benefit from the higher technology associated with foreign-owned firms (Crespo & Fortuna 2005). Following Takii (2005), three measures of technology gap are considered: The average wage gap, the labour productivity gap, and the
capital intensity gap. One possible important cause of spillovers occurs when locally owned firms employ skilled workers away from foreign-owned firms by offering relatively high wages. If the wage gap between the foreign and local firms is large, it is difficult for domestic firms to entice these workers because they cannot offer a large wage premium, and hence spillovers are likely to be small. The median of these gaps is obtained and the data is divided into high and low technology gap using the three measures, and equation (3) is then estimated for each group.

Estimation issues
Several econometric issues arise when estimating the productivity spillovers from FDI. Ordinary Least Squares (OLS) is inappropriate for estimating the impacts of labour and capital on productivity, since the factors of production should be treated endogenously. It is, however, a more important issue for the spillover variables. If this assumption is not fulfilled, it may lead to biased estimates. In the case where FDI is attracted to industries (or sub-sectors) with high productivity growth, estimates using OLS could be biased upwards. Alternatively, foreign firms may be attracted to slow-growing industries in order to gain a greater competitive advantage, which means that the OLS estimates will be biased downwards. In dealing with the possibility of an endogeneity bias, this study following Suyanto et al. (2009) and used lagged measures of spillovers. Lags may be appropriate because spillovers take time to materialize. It is also possible that spillovers may also be flowing from domestic firms to foreign firms. This is taken into account by estimating equation (3) using data on foreign-owned firms and using similar spillover measures for domestic firms in both countries. Finally, the role of outliers is also examined in this study by estimating equation (3) with and without outliers.

Descriptive evidence of productivity spillovers
Prior to the estimation, the presence of productivity spillovers is examined by plotting the dependent variable measuring the share of domestic firms in value added per sector, as presented Tables 5.A.3 and 5.A.4 in the appendix, and the various measures of spillovers across sectors over time, both in level and in difference (Figures 5.2a-5.8a and 5.2b-5.8b, respectively). All the spillover variables are negatively correlated to the dependent variable in levels for the two countries. In addition, the effect of each of the spillover measures on the value addition per sector is different in their levels and in their difference. In Kenya, the change in foreign firms’ expenditure in R&D appears to have a minimal effect on the domestic firms’ value addition. This may suggest limited evidence of demonstration effects. In Malaysia, however, the effect is positive, providing...
evidence of demonstration effects. Similarly, in Kenya the other variables FEM and FVD, both denoting the competition effect and information spillovers, are negative, while in Malaysia these variables as well as the variable measuring backward linkages (DF) are positive. Hence, on the basis of these figures it can be concluded that in Kenya there may be evidence of negative spillovers through competition effects and information spillovers, while in Malaysia there is evidence of positive spillovers from all the measures of spillovers. However, there may be other factors influencing these relationships that have not been captured within the figures, which may affect the conclusion. To account for these factors, it is necessary to test the significance of the spillovers measures within an econometric model, a task undertaken in the next section.
Figure 5.4a  Domestic Firms vs FVD: Kenya

Figure 5.4b  Δ Domestic Firms vs Δ FVD: Kenya

Figure 5.5a  Domestic Firms vs RDF-Malaysia

Figure 5.5b  Δ Domestic Firms vs Δ RDF-Malaysia

Figure 5.6a  Domestic Firms vs FEM: Malaysia

Figure 5.6b  Δ Domestic Firms vs Δ FEM: Malaysia
Empirical results

*Differences in productivity differentials*

The baseline estimation is based on equation (1) above. It aims at establishing whether there is a difference between the productivity of foreign – and domestic-owned firms in the two countries. The estimation is based on a pooled sample, random effects and fixed effects, and the results are presented in Table 5.4 below. The Hausman test is significant, suggesting that it is important to control for significant correlation between time-invariant firm-specific effects and the explanatory variable; hence, the fixed effects model is preferred.

The results based on all the models show that the productivity levels of the foreign-owned firms is different from those of domestic firms in Kenya but not Malaysia, as indicated by the FDI dummy, which is positive and statistically significant at the 1 per cent level. The difference in the levels of productivity between foreign – and domestic-owned firms in Kenya identified above is consistent with findings by Rasiah & Gachino (2005), who found that foreign firms are more productive than domestic firms. It is also consistent with studies in Malay-
sia such as Oguchi et al. (2002) and Khalif & Adam (2009), which do not find any significant difference between the productivity of foreign – and domestic-owned firms. This may indicate that differences in productivity and innovation should not be attributed to foreignness but rather to multinationality. In particular, domestic firms may share many characteristics of foreign-owned firms in a given country and can be at least as productive, innovative and likely to invest in R&D (Driffield & Love 2003; Wei et al. 2008).

### Table 5.4 Regression results for differences in productivity of foreign- and domestic-owned firms

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pooled</th>
<th></th>
<th>Random effects</th>
<th></th>
<th>Fixed effects</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>t value</td>
<td>Coefficient</td>
<td>t value</td>
<td>Coefficient</td>
<td>t value</td>
</tr>
<tr>
<td><strong>Kenya</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LnL</td>
<td>0.60</td>
<td>24.64***</td>
<td>0.62</td>
<td>25.39***</td>
<td>0.64</td>
<td>26.03***</td>
</tr>
<tr>
<td>LnK</td>
<td>0.27</td>
<td>16.26***</td>
<td>0.28</td>
<td>16.65***</td>
<td>0.29</td>
<td>17.09***</td>
</tr>
<tr>
<td>lnL²</td>
<td>-0.08</td>
<td>11.12***</td>
<td>-0.08</td>
<td>11.02***</td>
<td>-0.08</td>
<td>10.82***</td>
</tr>
<tr>
<td>lnK²</td>
<td>0.05</td>
<td>12.91***</td>
<td>0.05</td>
<td>12.87***</td>
<td>0.05</td>
<td>12.84***</td>
</tr>
<tr>
<td>lnLK</td>
<td>-0.11</td>
<td>-10.77***</td>
<td>-0.11</td>
<td>-10.90***</td>
<td>-0.11</td>
<td>-11.10***</td>
</tr>
<tr>
<td>FDI</td>
<td>0.26</td>
<td>16.35***</td>
<td>0.26</td>
<td>16.12***</td>
<td>0.26</td>
<td>16.11***</td>
</tr>
<tr>
<td>constant</td>
<td>1.34</td>
<td>34.84***</td>
<td>1.35</td>
<td>29.03***</td>
<td>1.26</td>
<td>32.11***</td>
</tr>
<tr>
<td>Sector dummy</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Year dummy</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Hausman test</td>
<td></td>
<td></td>
<td>151.53***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>5759</td>
<td></td>
<td>5759</td>
<td></td>
<td>5759</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.88</td>
<td></td>
<td>0.87</td>
<td></td>
<td>0.88</td>
<td></td>
</tr>
</tbody>
</table>

| **Malaysia** |         |   |               |   |              |   |
| LnL         | 1.11   | 57.64*** | 1.03 | 31.91*** | 0.75 | 27.65*** |
| LnK         | 0.11   | 32.09*** | 0.13 | 39.87*** | 0.05 | 12.73*** |
| lnL²        | -0.01  | -5.50*** | -0.01 | 6.28*** | -0.01 | 5.08*** |
| lnK²        | 0.02   | 42.27*** | 0.005 | 11.35*** | 0.001 | 1.16 |
| lnLK        | -0.03  | -18.45*** | -0.02 | -18.53*** | -0.01 | -6.43*** |
| FDI         | 0.13   | 13.67*** | 0.17 | 13.76*** | 0.0004 | 0.03 |
| constant    | 0.59   | 49.30*** | 0.79 | 23.02*** | 2.14 | 26.56 |
| Sector dummy | Yes |   | Yes |   | Yes |   |
| Year dummy  | Yes |   | Yes |   | Yes |   |
| Hausman test |     |   | 13286.15*** |   |   |   |
| Observations | 92405 |   | 92405 |   | 92405 |   |
| R²          | 0.88   |   | 0.88 |   | 0.86 |   |

*** denotes significance at the 1 per cent level.

The coefficients of the labour (L) and capital (K) have the expected positive signs. The positive and highly significant coefficients confirm the expected positive and significant output effects of labour and capital. In contrast, the square
variable of labour \([\ln(L)]^2\) is negative and statistically significant at the 1 per cent level, which indicates diminishing returns to labour. The same is not true of the square capital.

Its estimated coefficient, while positive, is significant in Kenya but not in Malaysia at the 1 per cent level based on the fixed effects model. These results are consistent with those obtained by Takii (2005) and Suyanto et al. (2009) in the case of Indonesia. Furthermore, the estimated coefficients of the interacting variable between labour and capital \((\ln L \times \ln K)\) are negative. These results are consistent with those obtained by Takii (2005). However, the results are inconsistent with those obtained by Suyanto et al. (2009), who found a positive relationship at the 1 per cent level, suggesting a substitution effect between labour and capital.

Productivity spillovers from foreign- to domestic-owned firms

The second estimation is based on equation (3), which includes the various proxies for productivity spillovers. Owing to high correlation between the spillover variables, the effect of each spillover variable on productivity is included separately. The results are presented in Table 5.5. The variables RDF and FVD are found to affect productivity negatively in Kenya but insignificantly at the 5 per cent level, while the effect of FEM on domestic firms’ productivity in Kenya is negative and significant at the 1 per cent level. Hence, in Kenya there is evidence of negative productivity spillovers from foreign firms to domestic firms through the competitive effects.

In Malaysia, on the other hand, there is evidence of positive productivity spillovers from foreign-owned firms to domestic firms through the demonstration effects, as given by the RDF variable, which is positive and significant at the 5 per cent level. There is also evidence of negative spillovers through competition (FEM) and the backward linkage (DF) channels, whose impact on domestic firms’ productivity is negative and significant at the 5 per cent level. The FVD proxy for information spillovers channel is negative but insignificant at the 10 per cent level. Hence, in Malaysia there is evidence of positive productivity spillovers through the demonstration effects. There is also evidence of negative productivity spillovers through the competition and backward linkages channels.

The evidence of negative spillovers through competition effects is consistent with the observations by Gorg & Strobl (2005a) and Aitken & Harrison (1999). It is, however, inconsistent with results obtained by Suyanto et al. (2009) for Indonesia. The result of negative productivity spillovers through backward linkages in Malaysia is inconsistent with findings by Jarkovic & Spatareau (2011) for Romania & Du et al. (2011) for China. Similarly, the evidence of demonstration effects in Malaysia is consistent with results obtained by Todo et al. (2011) for China and Driffield et al. (2010) for Italy.
Table 5.5 Regression results for spillover effects in Kenya and Malaysia

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>t value</th>
<th>Coefficient</th>
<th>t value</th>
<th>Coefficient</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnL</td>
<td>0.62</td>
<td>18.40***</td>
<td>0.62</td>
<td>18.56***</td>
<td>0.62</td>
<td>18.36***</td>
</tr>
<tr>
<td>lnK</td>
<td>0.18</td>
<td>7.22***</td>
<td>0.18</td>
<td>7.15***</td>
<td>0.18</td>
<td>7.26***</td>
</tr>
<tr>
<td>lnL²</td>
<td>-0.14</td>
<td>7.35***</td>
<td>-0.14</td>
<td>7.36***</td>
<td>-0.14</td>
<td>7.39***</td>
</tr>
<tr>
<td>lnK²</td>
<td>0.12</td>
<td>11.97***</td>
<td>0.12</td>
<td>12.06***</td>
<td>0.12</td>
<td>12.01***</td>
</tr>
<tr>
<td>lnKL</td>
<td>-0.21</td>
<td>-7.91***</td>
<td>-0.21</td>
<td>-7.97***</td>
<td>-0.21</td>
<td>-7.95***</td>
</tr>
<tr>
<td>RDF</td>
<td>-0.04</td>
<td>-0.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEM</td>
<td>-0.47</td>
<td>-3.66***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FVD</td>
<td></td>
<td></td>
<td>-0.31</td>
<td>-1.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>constant</td>
<td>1.19</td>
<td>19.71***</td>
<td>1.56</td>
<td>13.32***</td>
<td>1.39</td>
<td>7.18***</td>
</tr>
<tr>
<td>Sector dummy</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Year dummy</td>
<td>Yes</td>
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<td>3720</td>
<td></td>
<td>3720</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.89</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.89</td>
</tr>
</tbody>
</table>

| Malaysia  |             |         |             |         |             |         |
| lnL       | 0.74        | 62.87***| 0.74        | 62.99***| 0.74        | 62.98***|
| lnK       | 0.05        | 12.33***| 0.05        | 12.4*** | 0.05        | 12.38***|
| lnL²      | -0.01       | 5.19*** | -0.01       | 5.14*** | -0.01       | 5.14*** |
| lnK²      | 0.0004      | 0.9     | 0.0004      | 0.85    | 0.0004      | 0.88    |
| lnKL      | -0.01       | -6.27***| -0.01       | -6.29***| -0.01       | -6.29***|
| RDF       | 0.03        | 2.13*** | -0.01       | -0.56   |             |         |
| FEM       | -0.15       | -1.98** | -0.01       | -0.56   |             |         |
| FVD       |             |         | -0.13       | -2.27** |             |         |
| constant  | 2           | 24.64***| 2          | 24.76***| 2.01        | 24.67***|
| Sector dummy | Yes |         | Yes         |         | Yes        |
| Year dummy | Yes       |         | Yes         |         | Yes        |
| Observation| 83829      |         | 83829       |         | 83829      |
| R²        | 0.84        |         | 0.84        |         | 0.84       |

*, ** significance at the 1 and 5 per cent level respectively

Spillover variables, the technology gap and exports

The next estimation aims at investigating the importance of the technology gap in productivity as observed by Cantwell (1989, 1995) and Crespo & Fontoura (2007). Following Takii (2005), three measures of technology gap are used: The average wage gap, the average labour productivity gap, and the capital intensity gap. These indices are calculated as the ratios of averages of foreign – and domestic-owned firms. In addition, productivity can also depend on the exporting behaviour of the firm, as observed by Bigsten et al. (2004) and Greenway &
Kneller (2008). This is examined by introducing a dummy variable if a domestic firm exports or not. These results are reported in Table 5.6.

The coefficients of the spillover variables for firms with high and low technology gap defined in terms of average wage, when considered individually are significant at the 5 per cent level, with the exception of the measure of competition effects (FEM) for Kenya. In Malaysia, however, there is evidence of positive

<table>
<thead>
<tr>
<th>Table 5.6 Spillover variables, technology gaps and exports</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kenya</strong></td>
</tr>
<tr>
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<tr>
<td>Average wage technology gap</td>
</tr>
<tr>
<td>RDFhigh</td>
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<tr>
<td>RDFlow</td>
</tr>
<tr>
<td>FEMhigh</td>
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<tr>
<td>FEMlow</td>
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<tr>
<td>DFhigh</td>
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<td>DFlow</td>
</tr>
<tr>
<td>ALL</td>
</tr>
<tr>
<td>Labour productivity technology gap</td>
</tr>
<tr>
<td>RDFhigh</td>
</tr>
<tr>
<td>RDFlow</td>
</tr>
<tr>
<td>FEMhigh</td>
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<tr>
<td>FEMlow</td>
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<tr>
<td>FVDhigh</td>
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<td>FVDlow</td>
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<tr>
<td>DFhigh</td>
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<td>DFlow</td>
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<tr>
<td>ALL</td>
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<td>Capital intensity technology gap</td>
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<td>FEMhigh</td>
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<tr>
<td>FEMlow</td>
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<td>FEM</td>
</tr>
<tr>
<td>FVD</td>
</tr>
<tr>
<td>DF</td>
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</table>

*** and ** denote significance level at 1 and 5 per cent respectively.
demonstration effects (RDFLOW) and negative competition effects (FEMLOW) for firms with a low technology gap defined in terms of average wage at the 5 per cent level of significance. There is also evidence of negative productivity spillovers through the backward linkages both for firms with a high and low technology gap at the 5 per cent level. There are significant differences between the coefficients of the spillover measure in Malaysia as given by the Chow test, with the exception of the information channel (FVD), while in Kenya there is no significant difference between the coefficients of the spillover measures.

Similar results are obtained when the labour productivity is used as a measure of the technology gap in both countries. The results do not change in Kenya when capital intensity is considered as a measure of technology gap. However, in Malaysia there is evidence that demonstration effects are dominant in firms that have a high technology gap and that negative competition effects are concentrated in firms that have low technology gap.

Thus, there is evidence of negative productivity spillovers from competition effects in both countries across all the three measures of technology gap. However, in Malaysia this is concentrated in firms that have a low technology gap. In addition, there is evidence of positive productivity spillovers through demonstration effects concentrated in firms with a low technology gap defined in terms of average wages and labour productivity in Malaysia. When technology gap is defined in terms of capital intensity, demonstration effects are concentrated in firms with a high technology gap and there is also evidence of negative productivity spillovers through the information channel.

There is also evidence of negative spillovers through the backward linkages for all measures of technology gap. The evidence of productivity spillovers in both high and low levels of technology gaps is inconsistent with findings by Cantwell (1989, 1995) and Crespo & Fontoura (2007). Moreover, as observed in Table 5.6 above, the effect is dependent on how technology gap is measured. Finally, Table 5.6 shows that whereas exporting domestic firms in Kenya have higher impact on productivity than non-exporting firms, in Malaysia this is not the case and the productivity of exporting firms is not different from that of non-exporting firms. It can also be observed that the spillover measures have similar effects on both exporting and non-exporting firms. The results for Kenya are consistent with findings by Bigsten et al. (2004) and Greenway & Kneller (2008), that firms can raise their levels of productivity once they begin exporting. However, this does not appear to be the case in Malaysia. This may be due to the fact that learning is taking place between domestic multinationals and other domestic firms, which seems to be the case through backward linkages and demonstration effects. In addition, these domestic firms appear to benefit foreign-owned firms.
Robustness check

Equation (3) above is estimated using the lags of spillovers in an attempt to deal with the endogeneity issue, following Suyanto et al. (2009). In addition, the evidence of productivity spillovers from foreign-owned firms to domestic firms is further examined by estimating equation (3) for foreign firms, using similar spillover measures used in the analysis but for domestic firms in these countries. The results are presented in Table 5.7 below.

Table 5.7  Robustness check

<table>
<thead>
<tr>
<th>Spillover variables</th>
<th>Lag spillovers Individually</th>
<th>Domestic spillovers to foreign-owned firms</th>
<th>Spillover variables</th>
<th>Coefficient</th>
<th>t values</th>
</tr>
</thead>
<tbody>
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<tr>
<td>LagRDF</td>
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<td>-0.1</td>
<td>RDD</td>
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<tr>
<td>LagFEM</td>
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<td>-1.55</td>
<td>DEM</td>
<td>-0.16</td>
<td>-0.07</td>
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<tr>
<td>LagFVD</td>
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<td>1.03</td>
<td>DVD</td>
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<td>Malaysia</td>
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<tr>
<td>LagRDF</td>
<td>0.03</td>
<td>2.22 **</td>
<td>RDD</td>
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<tr>
<td>LagFEM</td>
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<td>-2.14 **</td>
<td>DEM</td>
<td>-0.06</td>
<td>-0.27</td>
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<tr>
<td>LagFVD</td>
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<td>-0.5</td>
<td>DVD</td>
<td>0.08</td>
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<tr>
<td>LagDF</td>
<td>-0.13</td>
<td>-2.27 **</td>
<td>DD</td>
<td>0.34</td>
<td>2.20 **</td>
</tr>
</tbody>
</table>

*** and ** denote significance at the 1 and 5 per cent level respectively

In Kenya the spillover variables are all insignificant, suggesting that endogeneity is a problem. In Malaysia, the results remain as before – namely, evidence of positive demonstration effects (Lag RDF), negative competition effects (Lag FEM), and linkages effects (Lag DF). These spillover variables are significant at the 5 per cent level. Hence, the concentration of firms in some sectors leads to information sharing which affects the productivity of the domestic firms. In Malaysia, there is evidence of positive productivity spillovers from demonstration effects. However, there is also evidence of negative productivity spillovers from both the competition and the backward linkages channels, which are significant at the 5 per cent level.

The results of the estimation of spillovers from domestic firms to foreign firms as also presented in Table 5.9 above for Kenya and Malaysia. The results suggest that domestic firms do not significantly affect foreign-owned firms’ productivity in Kenya. Hence, it can be concluded that it is the foreign-owned firms that affect the productivity of domestic firms in Kenya. However, in Malaysia there is evidence of domestic firms affecting the productivity of foreign firms positively through the creation of backward linkages with other domestic firms. This reverse spillovers hypothesis suggests that foreign-owned firms might benefit from
technology spillovers when they relocate close to market leaders (Wei et al., 2008).

Finally, the value-added plots Figures 5.9-5.10 a, b, c and d, generated using a linear regression of the dependent variable and each of the spillover variables are presented below and contain outliers’ i.e. a few extreme firms which potentially can change the results. The removal of the outliers does not affect the results and they can therefore be considered robust except for the FVD spillover variable in Figure 5.9c below.

![Figure 5.9(a) RDF: Kenya](image1)
![Figure 5.9(b) FEM: Kenya](image2)
![Figure 5.9(c) FVD: Kenya](image3)

![Figure 5.10(a) RDF: Malaysia](image4)
![Figure 5.10(b) FEM: Malaysia](image5)
![Figure 5.10(c) FVD: Malaysia](image6)
![Figure 5.10(d) DF: Malaysia](image7)

**Conclusion**

This chapter aimed at investigating the existence of productivity spillovers and their transmission channels in both Kenya and Malaysia for the period 2000-2005. Both countries have a long history of relying on FDI in industrial development. The existing literature on productivity spillovers suggests that productivity spillovers may be one of the most important effects that foreign MNEs impart to local firms in developing countries. Yet still, few studies exist in both countries on productivity spillovers and their transmission channels. Three spillover
channels were examined: Demonstration, competition, and information. In addition, the backwards linkage channel was examined for the case of Malaysia.

The results reveal that there is limited evidence of negative productivity spillovers from foreign firms to domestic firms through the competition effects in Kenya. In Malaysia, there is evidence of positive spillovers from foreign-owned firms to domestic firms through the demonstration effects. In addition, there is evidence of negative spillovers through the competition effects as well as backward linkages. There is also evidence of positive productivity spillovers from domestic firms to foreign-owned firms through backward linkages.

Productivity spillovers are found to be dependent on the technology gap. While negative competition effects in Kenya are present in firms with both high and low technology gaps, in Malaysia this is more concentrated in firms with a low technology gap. Only when the technology gap is defined in terms of capital intensity do demonstration effects appear to be significant in firms with high technology gaps. On exports as a spillover channel, the results show that exporters in Kenya are found to be more productive than non-exporters. However, in Malaysia there is no significant statistical difference between the productivity of exporting and non-exporting domestic firms. This seems to suggest that foreign ownership may not always be a source of spillovers. In particular, domestic firms may share many characteristics of foreign-owned firms in a given country and can be at least as productive, innovative and likely to invest in R&D. This seems to be the case in Malaysia where domestic firms are seen to be a source of spillovers both to foreign firms and other domestic firms.

While it can be concluded that policies to enhance the generation of positive spillovers are needed more in Kenya than in Malaysia, we also acknowledge the limitation of this study due to the proxies used to measure spillovers. Indeed, Mebratie & Bergeijk (2011) show that differences according to the method of measurement used can be responsible for the significance or insignificance of spillover results.
# Appendix

## Table 5.A.1  Classification of firms across sectors in Kenya

<table>
<thead>
<tr>
<th>ISIC code</th>
<th>Industry classification</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>Representation</th>
<th>Registered firms</th>
</tr>
</thead>
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<tr>
<td></td>
<td>For Dom For Dom For Dom For Dom For Dom</td>
<td>For Dom For Dom For Dom For Dom</td>
<td>For Dom For Dom For Dom For Dom</td>
<td>For Dom For Dom For Dom For Dom</td>
<td>For Dom For Dom For Dom For Dom</td>
<td>Total</td>
<td></td>
<td></td>
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<tr>
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<td>Food, beverage and tobacco</td>
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<td>79</td>
<td>52</td>
<td>76</td>
<td>59</td>
<td>55</td>
</tr>
<tr>
<td>32</td>
<td>Textile, apparel and leather</td>
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<td>48</td>
<td>53</td>
<td>62</td>
<td>50</td>
<td>64</td>
<td>52</td>
<td>57</td>
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<tr>
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<td>15</td>
<td>63</td>
</tr>
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<td>57</td>
</tr>
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<td>63</td>
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<td>57</td>
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<td>Other manufacturing industries</td>
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<td>56</td>
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<tr>
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<td>Total</td>
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<td>605</td>
<td>345</td>
<td>668</td>
<td>327</td>
<td>647</td>
<td>339</td>
<td>572</td>
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</table>

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

## Table 5.A.2  Classification of firms across sectors in Malaysia

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<th>Registered firms</th>
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### Table 5.A.3  Classification of firms according to value addition in Kenya (%)

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</tr>
<tr>
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<td>29.6</td>
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<td>28.6</td>
<td>71.4</td>
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<td>67.7</td>
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</table>

### Table 5.A.4  Classification of firms according to value addition in Malaysia (%)

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<td>66.8</td>
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<td>74.2</td>
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### Table 5.A.6 Correlation matrix: Malaysia

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