Foreign Direct Investment and Productivity of local manufacturing firms - Empirical Evidence from South Africa

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Abstract

South Africa is eager to attract more foreign Direct Investment (FDI) inflows to offset its deficit in domestic savings and accelerate its economic growth. Success in attracting higher FDI inflows may be associated with negative spillovers effects to local firms. To the extent that the growth of local firms is an important development objective for the South African government, this paper presents an in depth firm level cross sectional analysis of the possible effects of FDI to local manufacturing firms in South Africa. Results show that FDI firms are more productive than their local counterparts. Furthermore, evidence of negative intra-industry spillovers effects as well as positive inter-industry spillovers effects is found but insignificant. As such, the paper recommends to policymakers to adopt investment policies that encourage synergies between MNCs and local firms businesses in all manufacturing sectors.

Keywords:

Foreign Direct Investment, Input-Output Table, Technical Coefficients, Spillovers, Productivity

1. Introduction

Foreign Direct Investment (FDI) is commonly defined as a long lasting investment by a foreign investor of at least 10 per cent of ordinary shares or voting powers in the management of a company that is resident in the host country (IMF 1993; OECD, 1996). Hence, FDI may be viewed as an important strategy that developing countries like South Africa may use to reduce their technology gap with developed countries, to reduce its deficit in domestic savings and promote their economic development (Findlay 1978, Strydom, 2007). FDI has also been reported to be an important source of external financing which does not only boost domestic capital formation of recipient countries but also enables the transfer of technology between the home and host countries (Gruben and Mcleod, 1998; Carkovic and Levine, 2002). Multinational corporations (MNCs) are enterprises that control and manage production entities in at least two countries (Teece, 1985). Because of their characteristics, they are regarded as "the chief conduit for foreign direct investment" (Caves, 1971:1).

Agosin and Machado (2005) define FDI as capital inflows that MNCs bring to the host country in the form of sophisticated new technology, managerial skills and product design. By transferring technology, FDI may affect the productivity of local firms. In this regard, Cuyvers (2008) argues that technology transfer from MNCs to local firms, which occurs through the indirect effect of FDI, raises labour productivity of local firms and, thus, it is the most significant spillover effect. In the same breath, Giroud (2013) also points out that through the establishment of linkages in the host country, MNCs may diffuse technology to local firms. Linkages may be defined as "the direct relationships established by firms in complementary activities which are external to 'pure' market transactions" (Lall, 1980: 204). Linkages may be seen as direct relationship between MNCs´ affiliates and local suppliers or MNCs affiliates and local customers.

Following on these successive arguments, it can be discussed that the success in attracting higher level of FDI inflows may be associated with some spillover effects and linkages from which local firms may benefit in order to raise their productivities. Productivity spillovers occur when local firms improve their productivities through the use of MNCs affiliate's technological advantages without incurring any cost that would offset this improvement (Blomström, Kokko and Zejan, 2000). They further define spillover as a situation in which MNCs affiliates are not able to reap all the benefits due to their internalisation advantage in the host country. With a view to reaping all these spillovers benefits, developing countries in

general have put in place investment policies, through for instance fiscal and financial incentives such as holiday tax and; reduction in import tax, that are favourable to attract more FDI in recipient countries (Oman 2000).

In the last two decades, the amount of FDI inflows has considerably increased in South Africa. For example, it has been recorded an increase in FDI inflows from ZAR 81 million in 1997 to 1,016 billion in 2010`(Sandrey 2013:3, Arvanitis 2006:66).

1.1 Rationale of the study

A number of studies have been carried out in developed, developing and emerging economies to determine the extent to which local firms may benefit from the presence of MNCs (FDI) through various spillovers channels, affecting their productivity (Caves, 1974; Globerman, 1975; Haskel et.al, 2002; Barrios and Strobl, 2002; Haddad and Harrison, 1993; Blomström and Wolff, 1994; Blomström and Sjöholm, 1999; Hale and Long, 2006; Aitken and Harrison, 1999; Kinoshita, 2000; Javorcik, 2004; Alfaro and Rodríguez, 2004; Buckley, Clegg and Wang, 2007; Javorick and Spateneanu, 2008; Blalock and Gertler, 2008, Belderbos, 2010, Nhamo, 2011).

However, the findings of these studies have been found to be mixed and inconclusive. This suggests that the extent to which local firms benefit from FDI spillovers may depend on country specific requirements and conditions. Thus, it is important to assess the possible indirect effects of FDI on the productivity of local manufacturing firms in South Africa.

The rationale of this paper is based on the idea that the growth of local firms through the improvement in productivity is an important national development objective for the South African government since these firms are regarded as key drivers of job creation in the country. Hence, the results of this study should assist policymakers to evaluate existing investment policies and to formulate policies that are most likely to attract FDI inflows in South African manufacturing sectors with potential of strong positive spillover effects.

1.2 Problem investigated

Following the above discussion, the main problem raised is that the success in attracting higher level of FDI inflows (or the presence of MNCs) in the host country (South Africa) may be associated with positive or negative spillovers effects that may affect the productivity of local firms. Positive spillovers may occur through technology transfer, for instance when local firms imitate the technologies and production processes of MNCs, or through the improvement in the allocation of resources or efficiency improvement by local firms due to competition

pressure. Negative spillovers may occur for example when MNCs take demand away from local competitors and drive less efficient local firms out of the market.

1.3 Research objective of the study

The primary purpose of this study is to examine whether there is any productivity difference between MNCs and local manufacturing firms in South Africa. In addition, the paper aims to investigate whether there are any horizontal (intra-industry) and vertical (inter-industry) spillover effects from MNCs to local firms.

1.4 Research Hypothesis

In this paper, we hypothesize that because of technology ownership, MNCs will be more productive than local firms. Furthermore, we expect that on one hand, there will be positive inter-industry spillover effects from MNCs to local firms in South Africa whereas on the other hand, there will be negative intra-industry spillover effect from MNCs to local manufacturing firms. The reason is that with MNCs linkages (backward and forward linkages), MNCs are more willing to share technology with local firms in downstream and upstream industries. Nonetheless, for horizontal industry, it is expected that MNCs will be reluctant to share technology with local firms given that these latter are considered as local competitors.

The rest of this paper proceeds as follows: section (2) reviews the literature (both theoretical and empirical) on FDI and productivity spillovers channels (both intra-industry and inter-industry), section (3) explains the methodology. In section (4), the econometric analysis is carried out and, concluding, section (5) also derives recommendations and policy implications.

2. Literature review

2.1 Theoretical literature

Literature postulates that local firms may benefit from FDI technology spillovers, thus improving their productivities through a number of channels. However, the literature distinguishes between intra-industry spillover effect (these occur when MNCs and local firms operate within the same industry) and inter-industry spillover effects (these occur when MNCs transfer technology to local firms(suppliers and customers) via backward and forward linkages) (Diwambuena, Klingelhöfer and Kaggwa, 2014:4). Both forward and backward linkages are defined and discussed later in this pape**r.** Below both the intra-industry and inter-industry spillover channels are explained.

2.1.1 Horizontal or intra-industry spillovers

The literature identifies four channels that allow technology transfer from MNCs affiliates to local firms within the same industry. These channels are (1) demonstration effects, (2) labour turnover, (3) competition effects, and (4) geographical proximity or regional dimension:

The demonstration effects are defined as effects on local firms by observing MNCs. These effects may occur through imitation, innovation and reverse engineering (Suyanto and Bloch, 2009). Imitation occurs when local firms repeat the same technology used by MNCs in their production of output while innovation occurs when a local firm adopts the technology of a foreign firm as a starting point in order to develop improved technologies to be used for its production of goods, e.g. by reverse engineering to discover the processes behind their products (Blankestijn, 2012). Thus, the demonstration effect channel emphasises that local firms may benefit from technology spillovers from MNCs by imitating their production techniques, knowledge, and new technologies so that they will raise their output and decrease their cost of productions (Blomström and Kokko, 1998; Görg and Greenaway, 2004; Alfaro et al., 2004; Aitken and Harrison, 1999). However, Görg and Greenaway (2004:173) argue that the degree of imitation of MNCS technologies by local firms depends on the level of complexity of their products and processes.

The labour mobility (turnover) channel explains that local firms may benefit from technology spillovers from MNCs by hiring workers and managers who were previously employed (and trained) by MNCs affiliates (Gerschewski, 2013:69). These MNCs former employees enable local firms to produce goods more efficiently, hence improving their productivities (Gerschenberg, 1987; Alfaro et al., 2004; Aitken and Harrison, 1999; Meyer, 2004). As an example, Blomström (1989) reports that in Mexico, most managers of local firms start their career in MNCs affiliates. Thus, through the use of management practices acquired at MNCs, these managers may substantially improve the productivity of local Mexican firms.

In addition, Hale and Long (2006) also point out that through learning and interaction activities between local firs employees (managers and engineers) and their MNCs colleagues, local firms may increase their productivities. Hale tries to explain that by interacting with people who are working for MNCs through for instance attending seminars, shows and conferences, local firm's employees are exposed to advanced technologies and management practices used by MNCs affiliates. Thus, they may adopt these new technologies, processes and practices in their own firms and improve their productivity ("network externality effect"). Nevertheless, Glass and Saggi (2002) discuss that MNCs affiliates may limit technology transfer to local firms via

the labour turnover channel by paying higher wages to their workers relative to their local competitors.

With regard to the competition effect channel, according to Caves (1974), the presence of MNCs assists local firms in improving their efficiency in resource allocation in the recipient country. He argues that by entering into a the local market with higher entry barriers, MNCs reduce the market power of local firms, compete for factor inputs with local firms and force local firms to improve the use of their existing resources in the host country. In the same breath, some authors argue that the presence of MNCs helps to improve the technical and allocative efficiency of local firms through competitive pressures (Blomström and Kokko, 1998; Görg and Strobl, 2001; Glass and Saggi, 2002). They stress that the entry of MNCs in monopolistic market is expected to raise competition in the host country, force local firms to protect their market share and profits, hence becoming more efficient. The explanation could be that competition enhances the pace of imitation of new technologies by local firms (Görg and Strobl, 2004:174).

However, the competition effect may also have adverse effects on the productivity of local firms in the host country. This effect is referred to as "the market stealing effect" by Aitken and Harrison (1999). It is argued that because MNCs have ownership of specific advantages over local firms, they are able to reduce their marginal and average costs and take demand away from local firms. MNCs may also take demand away from their local competitors by introducing differentiated products and adopting new process innovation system (as one could see with the introduction of the Just in Time production system in the 20th century), which may lead to a fall in the price of products in the host country (Buckley et al., 2006). It is further stressed that the presence of MNCs forces local firms to increase their average and overall cost of production which force them to cut their production. Thus, through this effect, MNCs reduce the growth opportunities of local firms and obtain their economies of scale which cause, less efficient local firms to drive out of the market (Aitken and Harrison, 1999; Konings, 2001; De Backer and Sleuwaegen, 2003; Belderbos and Van Roy, 2010:5-6). Finally, apart from outcompeting local firms, MNCs are also reported to create monopolies that assist them in repatriating profits and avoiding taxes in the host country through transfer pricing practice (Blomström and Kokko, 1998).

The geographical proximity or regional dimension channel highlights that the dissemination of technology from MNCs to local firms requires intense contact between MNCs and local firms. Hence, local firms that locate closer to MNCs benefit more from the technology spillovers

(Arrow, 1971; Ponomareva, 2000), because it is cheaper for them to imitate the technologies of MNCs, visit and communicate with MNCs workers and organise special training for local workers in collaboration with MNCs affiliates (Liang, 2008:11-12). The geographical proximity channel is reported to be an important prerequisite for the demonstration effect, especially imitation, to be effective (Saggi, 2002).

It has also been discussed that the extent to which local firms may benefit from FDI spillovers effects depend on the minimum absorptive capacity of local firms (Lall, 1996; Crespo and Fontoura, 2007). For instance, the necessary human capital, physical infrastructure, research and development activities (R&D) and distribution networks to sustain inward FDI (Glass and Saggi, 1998). Thus, this argument suggests that the lack of minimum absorptive capacity, through higher technology gap, implies lower quality of technology or knowledge to be diffused to local firms (Görg and Greenway, 2004)

2.2.2.2 Vertical or inter-industry spillovers

In contrast to horizontal spillovers, vertical spillovers are argued to occur through linkages. We distinguish two types of linkages: backward and forward linkages. Backward linkages occur when there is a contact between domestic suppliers of intermediate inputs and their MNCs customers in downstream sectors in the recipient country, forward linkages when there is a contact between MNCs suppliers of intermediate inputs and their clients in upstream sectors in the host country while (UNCTAD, 2001).

Backward linkage

Backward linkages occur when MNEs establish direct relationship with local suppliers of intermediates inputs (UNCTAD, 2001). Earlier models called “love of variety” and “positive development effect theorem” by Rodriquez-Clare (1996) and Markusen and Venables (1999) respectively help to critically understand backward linkage. In his model, Rodriquez-Clare discusses that MNCs produce sophisticated products and thus, they require complex and diverse inputs. As a result, through the establishment of local suppliers, the demand for these sophisticated inputs will provide opportunities for local production of inputs and employment of local workers, hence leading to an increase in the demand for factor inputs in the host country (Giroud, 2003). Markusen and Venables (1999) further support that backward linkage will induce managers of local firms to work efficiently and make rational decisions on investments. It is also discussed that through backward linkage, MNCs may transfer knowledge to local suppliers which will help them improve their management as well as technology capacities and

thus, become more efficient (Gerschewski, 2013). This transfer may occur by (1) providing them with management training and technical assistance throughout the entire production process, (2) helping them buy raw materials and monitoring quality control and (3) By imposing higher requirement for product quality and on time delivery of inputs. Finally, Katz, (1969:154) and Javorcik (2004) argue that the presence of MNCs may force local firms to modernise their production techniques which may lead to economies of scale. This may occur for example by upgrading their production management and quality standards, or by introducing on time delivery

As an example of backward linkage in the US automotive sector , Chung (2003) mentions Japanese transplants in the USA that encourage their local suppliers of automotive components inputs to adopt and implement new operating practices similar to those used in Japan.

Another example is provided by Javorcik (2004:608). He explains that it is accustomed that every time a Czech automotive supplier of aluminium alloy castings signs its first agreement with its MNCs client, the MNCs workers would visit the Czech firm's site for two days each month over a long period of time. They (both MNCs and local firms' employees) work on improving the quality control system. After the training, the Czech firm applies these improvements to its other production lines.

Furthermore, it is also discussed that strong backward spillovers are most likely to come from local firms that have mixed ownership (UNCTC, 2001; Javorcik, 2004). In this regard, UNCTC (2001) reports that strong spillover linkages effects are most likely to occur from local firms with some form of partial ownership, i.e. when MNCs enter the host country through joint venture or mergers and acquisitions (M&A), rather than from those with full foreign ownership such as Greenfield projects. The argument is that with the former, MNCs are most likely to source locally right at the beginning of their operations, i.e. they may take over the existing supplier of the acquired firm, whereas with the latter, they must put more effort into developing new local linkages (Javorcik, 2004). However, this view is not shared by Blomström and Sjöholm (1999) who points out that it is very difficult to talk about full foreign ownership in the host country because host governments do not often accept full foreign ownership firms in their countries. For instance, they may only allow M&A as a form of MNCs entry (Gerschewski, 2013:71).

Forward linkage

Blomström (1991) supports the idea of forward linkage and thus of the increasing role of MNCs-customer contacts in host countries. He explains that compared to local firms, MNCs are the only ones who have the necessary fund to invest in research and development (R&D) that enable them to develop and produce complex inputs and products of higher quality. Hence, this may suggest that MNCs should be suppliers of intermediate inputs. The use of sophisticated applications in production such as computer based automation, information technologies in the production of output, would require the expertise from the manufacturers. Thus, the relationship between MNCs suppliers and local clients is very important. In the same breath, Liang (2008:6) argues that through forward linkage, foreign suppliers provide their local customers with the necessary technology support and training when they buy these intermediate inputs. As a result, local firms may increase their productivities by using high quality inputs from foreign suppliers.

Similarly, Javorcik (2004) discusses that by buying new, superior and less costly intermediate inputs manufactured by MNCs, local firms may increase their productivities because the sales of intermediate inputs by MNCs is often accompanied with the provision of supplementary services that may not be available through the import of these inputs.

2.3 Empirical review

2.3.1 Empirical evidence for intra-industry spillovers

A number of empirical studies on FDI and productivity of local firms in horizontal industry have been carried out in developing and emerging countries. These studies sought to investigate the existence of horizontal spillovers in these countries, but their findings have been mixed and inconclusive.

These studies used different methodologies. For instance some of them used the cross sectional method (Haddad and Harrison, 1993; Kokko, 1994; Blomström and Wolff, 1994; Kokko et al., 1996; Blomström and Sjöholm, 1999; Chuang and Lin, 1999; Dimelis and Louris, 2004) while others used the panel data estimation method (Aitken and Harrison, 1999; Konings, 2000; Djankov and Hoekman, 2000; Flores et al., 2000; Kathuria, 2000; Kinoshita, 2000). Furthermore, they also differed in using either industry data or firm level data. Table 1 reports these studies based on their methodologies. This is followed by a brief discussion of their findings.

Table 1: Summary of some intra-industry spillovers studies

Authors	Countries	Period	Method	Aggregation level	Result
Haddad and Harrison (1993)	Morocco	1985-1989	Cross sectional	Firm and industry	-[1]
Blomström and Wolff, (1994)	Mexico	1970-1975	Cross sectional	Industry	+[2]
Chuang and Lin (1999)	Taiwan	1991	Cross sectional	Firm	+
Chuang and Hsu (2004)	China	1995	Cross sectional	Firm	+?[3]
Aitken and Harrison (1999)	Venezuela	1976-1989	Panel	Firm	-
Konings (2000)	Romania, Bulgaria and Poland	1993-1997	Panel	Firm	-
Kathuria (2000)	India	1976-1989	Panel	Firm	-
Djankov and Hoekman (2000)	Czech Republic	1992-1996	Panel	Firm	+
Ponomareva (2000)	Russia	1993-1996	Panel	Firm	+
Lutz and Tavalera (2003)	Ukraine	1998-1999	Panel	Firm	+
Chudnovsky et al. (2008)	Argentina	1992-2001	Panel	Firm	+?

Source: Diwambuena, Klingelhöfer and Kaggwa (2014:12)

[1] Negative spillovers.
[2] Positive spillovers.
[3] Positive, but conditional on technology gap, ownership structure, absorptive capacity.

As it can be seen, earlier studies used cross sectional methods and found mixed results. For example, in their seminal work, Haddad and Harrison (1993) examined the effects of FDI on the Moroccan manufacturing industry. They found that FDI had an adverse effect on the productivity of local firms, hence, evidence of negative FDI spillovers on local firms. However, starting from one year later, Blomström and Wolff (1994) examined the effects of the presence of MNCs on the productivity of local firms in Mexico, Chuang and Lin (1999) on the productivity of local firms in the Taiwanese manufacturing industry and Chuang and Hsu (2004) on the relationship between FDI, trade and spillover efficiency in the Chinese manufacturing industry. They discovered positive, the latter additionally even and significant FDI spillovers to local firms which have a low technology gap from MNCs affiliates.

Other studies used the panel data method, but also found inconclusive results. For example, Aitken and Harrison (1999) investigated whether local firms in Venezuela benefited from the presence of MNCs, Konings (2000) on the effects of FDI on the productivity of local firms in three emerging European countries (Romania, Bulgaria and Poland), and Kathuria (2000) on the effects of FDI on the productivity of local firms in India. They all found in general that the success in attracting a higher level of FDI had negative spillover effects on local firms in these countries. The only exception is Poland where Konings found no evidence of such spillovers.

In contrast, Djankov and Hoekman (2000), Ponomareva (2000), Lutz and Tavalera (2003), and Chudnovsky et al. (2008) studied the effects of foreign investment on the productivity of local firms in Czech Republic; in the Russian manufacturing industry, in Ukraine and the Argentinean manufacturing industry respectively. They all discovered that this effect was positive and that there were positive spillovers effects from MNCs to these local firms. The only exception is Argentina where Chudnovsky et al. (2008) found that positive effects were dependent on local firms' absorptive capacities.

2.3.2 Empirical evidence on Inter -Industry spillovers

The majority of productivity spillovers studies have sought to examine the existence of horizontal spillovers. As a result, few studies have been carried out to investigate the existence of vertical spillovers through forward and backward linkages. Of those few, recent studies have found evidence of backward and forward linkages. For instance, Javorcik (2004) studied the effects of FDI on the productivity of local firms in upstream sectors in Lithuania, Tomohara and Yokoto (2006) the effects of FDI on the productivity of local firms in Thailand; Buckley; Clegg and Wang (2007) on the relationship between inward FDI and host country productivity in the Chinese electronic industry, and Javorick and Spateneanu (2008) on FDI and

productivity of local Romanian firms. They all found the existence of positive vertical spillovers effects through *backward* linkage, but only for projects with partial foreign ownership. Only Negara and Latif (2012) discovered positive *forward* spillovers effects from FDI to local firms (in Indonesia).

3. Research Methodology

This paper uses cross sectional firm level data collected from the World Bank enterprise survey (WBES). The survey is conducted by the World Bank to obtain data on growth obstacles, productivity constraints and the effects of business environment to a country's business and international competitiveness (World Bank Enterprise Survey, 2009). It was done in South Africa in 2007 and covered 1056 firms. These data have been collected using the stratified random sampling methodology[4] and they are grouped according to the International Standard Industrial Classification (ISIC, revision 3.1). In the next sub section, some descriptive statistics of our data are shown.

3.1 Descriptive statistics

Table 2: Productivity means (MNCs versus Local firms)

Nature of Firm	Mean	Standard Deviation	Frequency
Local Firms	1.5855	0.6664	920
MNCs	1.6985	0.6468	136
Grand Mean Productivity	1.600	0.6647	1056

Source: Author's own analysis from WBES data (2007)

From our Productivity analysis as summarized in table 2, it appears that firms with FDI inflows tend to have higher average of productivity rate (1.6985) than local firms (1.5855). The average productivity of MNCs is even higher than the average one of all manufacturing firms included in the survey. In addition, the values of the standard deviations, which are statistically the same for MNCs and local firms, suggest that indeed the productivity means are significantly different from each other.

Table 3: Distribution of firms according to size

[4] Further details on this methodology can be found at http://www.enterprisesurveys.com. Information on data collection can be checked using the WBES sampling note and the implementation note for South Africa.

Size of firms	Nature of Firm	Frequency	Percent	Cumulative Percent
Medium and Large Firms	Local Firms	471	83.96	83.96
	MNCs	90	16.04	100
Small Firms	Local Firms	449	90.71	90.71
	MNCs	46	9.29	100
Total		**1056**		

Source: Authors' own analysis from WBES data (2007)

In the WBES, firms are grouped into small firms (1-19 employees), medium (20-99 employees) and large firms (100 employees and above). From table 3, it appears that MNCs prefer to invest their capital in medium and large firms. There are ninety (90) FDI firms under medium to large scale firms as compared to only fourty-six (46) FDI firms under the small firms' category. A possible interpretation could be that MNCs would like to enjoy economies of scale.

Table 4: Regional distribution of firms

Region	Nature of Firm	Frequency	Percent	Cumulative Percent
Johannesburg	Local Firms	611	85.10	85.10
	MNCs	107	14.90	100
Cape Town, Port Elizabeth and Durban	Local Firms	309	91.42	90.71
	MNCs	29	8.58	100
Total		**1056**		

Source: Authors' own analysis from WBES (2007)

Table 4 shows that out of a sample of 718 firms, about 107 or 15% of them are MNCs and are located in Johannesburg. In contrast, the table exhibits that out of a sample of 338 firms; only about 29 of these firms or 9% of them are MNCs and are based in the other three regions (Cape Town, Port Elizabeth and Durban). The interpretation could be that the city of Johannesburg tends to attract a higher number of MNCs in South Africa compared to other cities. Johannesburg is the city where the majority of business activities in South Africa are located and as such, it may present better opportunities for foreign investors than any other region. However, our interpretation should not be regarded as if the other regions (Cape Town, Port Elizabeth and Durban) are unattractive to foreign investors.

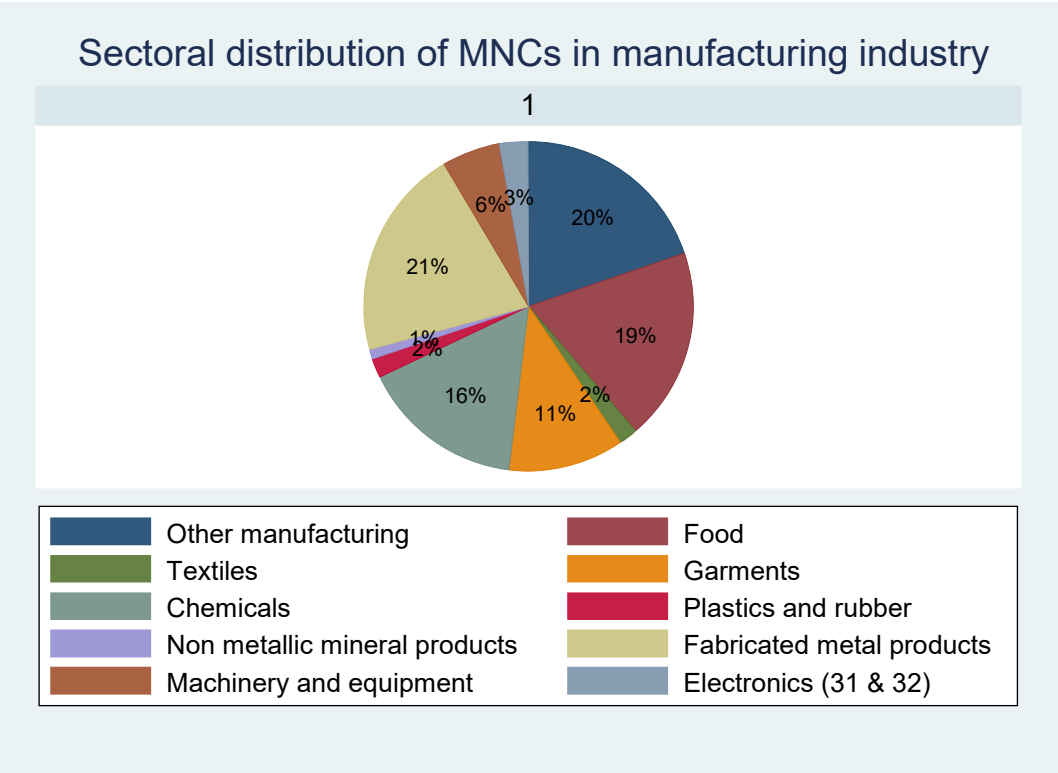

Figure 1: Sectoral distribution of MNCs in SA Manufacturing industry
Source: WBES (2007)

The above figure shows that the majority of MNCs are mainly concentrated in the following manufacturing sectors: the fabricated metals products sector (21%), the other manufacturing sector (20%), the food sector (19%), the chemical sector (16%), and the garment sector (11%). However, the presence of MNCs in the remaining sectors (machinery and equipment, non-metallic mineral products, electronics, and plastics and rubber) is only about 14%.

3.2 Variables Measurement and Econometric model

In this sub section, we start by explaining how our variables of interest are measured. This is followed by the discussion of the econometric model used.

3.2.1 Variables Measurement

In this sub section, the measurement of productivity is discussed. In addition, all important explanatory variables identified in the empirical literature are also discussed. In this study, productivity[5] (our dependent variable) is measured by the ratio of firms' sales to firms' labour input.. Capital is measured by the replacement value of fixed assets (Hale and Long 2007;

[5] In empirical literature, Productivity has been measured either by Total Factor Productivity (TFP: total sales adjusted by changes in inventroy) or labour productivity. Of these two measures, TFP is regarded as the best measure and the most common method of capturing productivity. However, due to difficulties in obtaining accurate measure of capital stock(especially because of depreciation), labour productivity is mostly preferred.

Cuyvers et al., 2008; Nhamo, 2011); Labour is proxied to firms' labour costs; material is measured by firms' total cost of raw materials and intermediate goods used in production (Cuyvers e al., 2008). FDI (or foreign ownership) is dummy variable where 1 shows the presence of foreign ownership and 0 means absence of foreign ownership; size is a dummy variable where 1 means medium and large firms and 0 means small firms. Absorptive capacity is measured by the ratio of skilled production workers to total number of employees. Age is measured as the difference between the year the firm started operations and the year the survey was done (Hale and Long, 2006). Region stands for regional dummies where Reg1, Reg2, Reg3 take on the value of 1 if firms are respectively based in Johannesburg, Cape Town, Port Elizabeth and 0 if otherwise. The omitted region is the benchmark region (Durban).Horizontal spillover effect is proxied to the ratio of foreign firms' output to the total output (Blomström and Sjöholm,1999). Backward spillover effect is measured by the share of intermediate goods that each industrial subsector supplied to MNCs affiliates in downstream industries (Javorcik, 2004; Belderbos, 2010). Forward spillover effect is measured by the proportion of intermediate goods purchased by each industrial subsector from MNEs affiliates in upstream industries (Javorcik, 2004; Belderbos, 2010)

3.2.1 Econometric Model

The choice of our model has been guided by the empirical review. According to the empirical literature, the parametric approach, which uses the Cobb Douglas production function, is appropriate for estimating productivity. However, it is argued that the Cobb Douglas production function omits important explanatory variables and as a result, it results in misspecifications errors. Thus, to overcome the misspecification problem, many studies used an augmented Cobb Douglas production function (a Cobb Douglas function which is augmented by all important explanatory variables identified in the empirical literature) because it provides efficient estimates (Wang & Schmidt, 2002; Harris & Trainor, 2005). Hence, this paper used the approach followed for instance by Cuyvers et al., (2008); Nhamo (2011) and Negara and Latif (2012). The econometric model has been constructed from the typical Cobb Douglas production function below:

$$Y_i = A^{\alpha} K_i^{\beta} L_i^{\lambda} M_i^{\phi} e^{\sum_{i=1}^{n} \varpi_i X_i + \varpi_0 + \varepsilon_i} \quad i = 1, 2, \ldots n \tag{1}$$

where Y_i is the output of firm i, K_i is the fixed capital stock of firm i, L_i is the number of workers or labour of firm i, M_i is the amount of material inputs used by firm i, β, λ, ϕ are the output elasticities with respect to capital, labour and material inputs respectively, ϖ_0 is the constant, X_i is a vector of observed explanatory variables identified in the literature. These include such as FDI, age, region, size, absorptive capacity, horizontal spillover, backward spillover and forward spillover and ε_i is the error term representing all the unobserved explanatory variables that may affect output of each firm.

In order to obtain labour productivity (LP), we divide both sides of equation (1) by L and get equation (2) below

$$\frac{Y_i}{L_i} = \frac{A^{\alpha} K_i^{\beta} L_i^{\lambda} M_i^{\phi} e^{\sum_{i=1}^{n} \varpi_i X_i + \varpi_0 + \varepsilon_i}}{L_i} \qquad 2)$$

After mechanics of mathematics that include taking logs of both sides and linearization, we end up with a simplified model below (see appendix 1)

$$\ln\left(\frac{Y_i}{L_i}\right) = \gamma_0 + \beta \ln\left(\frac{K_i}{L_i}\right) + \phi \ln\left(\frac{M_i}{L_i}\right) + (\beta + \phi + \lambda - 1) ln L_i + \sum_{i=1}^{n} \varpi_i X_i + \varepsilon_i \quad (3)$$

where:

$\left(\frac{Y_i}{L_i}\right)$ is labour productivity (the ratio of total sales to total labour cost)

$\left(\frac{K_i}{L_i}\right)$ is capital intensity (the ratio of the replacement cost of fixed assets to total labour cost)

$\left(\frac{M_i}{L_i}\right)$ is material intensity (the ratio of total cost of raw materials and intermediate goods used in production to total labour cost)

L_i is the labour inputs (the total labour cost)

γ_0 is the constant

β , ϕ , $(\beta+\phi+\lambda-1)$ are labour productivity elasticities with respect to capital intensity, material intensity and labour input respectively.

X_i is a vector of observed explanatory variables identified in the empirical review. These include such as FDI, age, region, size, absorptive capacity, horizontal spillover, backward spillover and forward spillover with their effects equal to ϖ_1

Rewriting model 3 with all observed explanatory variables affecting productivity results in equation 4

$$lnprod = \beta_0 + \beta_1 lnCapint + \beta_2 lnMatint + \beta_3 lnL + \beta_4 FDI + \beta_5 Size + \beta_6 Abscap + \beta_7 Age + \beta_8 Region + \beta_9 Horspil + \beta_{10} Forward + \beta_{11} Backward + \varepsilon \quad (4)$$

Where: lnprod: log of labour productivity (the ratio of sales to labour), lnCapint: log of capital intensity (ratio of replacement value of fixed assets to labour), lnMatint: log of material intensity (ratio of total cost of raw material and intermediate goods used in production is divided by labour), lnL: log of total labour cost; FDI: dummy of foreign ownership where 1 means presence of foreign ownership and 0 if otherwise; Size is a dummy variable where 1 means medium and large firms and 0 means small firms; Abscap: stands for absorptive capacity(the ratio of skilled production workers to total number of employees); age is the age of firms (the difference between the year the firm started its operations and the year of the survey);

Horspil: intra-industry FDI spillover effect defined as follow:

$$Horspil_j = FDI * Y_i \ / \sum Y_j$$

Where:

$FDI * Y_i$: Foreign firms' output

$\sum Y_j$: Total output

Backward: Backward spillover effect defined as below:

$$Backward = \sum_k \alpha_{jk} Horspil_k$$

Where:

α_{jk} : is the proportion of sector j's output supplied to sector k (with FDI presence). This excludes any intermediate inputs supplied within the same sector as these are captured in the horizontal spillover effect. Thus, the proportion is the product of the technical coefficient and the horizontal spillover. The technical coefficient is constructed from the 2005 Input Output (I-O) table of South Africa extracted from OECD[6], following the approach by Lenaerts and Merlevede (2011:6-8).The proportion is a matrix where each cell of the I-O table is divided by its row total.(see appendix 2)

Forward : Forward spillover effect given by

$$Forward = \sum_{k} \beta_{jk} Horspil_{k}$$

Where:

β_{jk} : is the proportion of intermediate inputs purchased by sector j from sector k (with FDI presence) out of total input sourced by sector j. Similarly, this excludes intermediate inputs supplied within the same sector (Javorcik, 2004). This is the product of the technical coefficient and the horizontal spillover. Following Lenaerts and Merlevede (2011:6-8) approach, it is a matrix where each cell of the I-O table is divided by its column.(see appendix 2)

[6] http://stats.oecd.org/Index.aspx?DataSetCode=STAN_IO_TOT_DOM_IMP

4. Econometric Analysis

4.1 Introduction

This section is dedicated to analysing our cross sectional data. Given that the presence of multicollinearity and heteroscedasticity are often suspected when cross sectional data are used, we decided to carry out the multicollinearity test (via the Variance Inflation Factor analysis) and the heteroscedasticity test(via the Breusch-Pagan[7] test) to avoid inefficient estimates, hence obtaining misleading econometric results (Cuyvers et al., 2008:28; Nhamo, 2011:88-89). These tests are reported as part of our post-regression diagnostics.

However, we discuss some of the findings here. With regard to the multicollinearity test, we found the horizontal and backward spillover variables to be highly correlated. This should be expected from the variable construction point of view (see equation4). In addition, given that the backward and forward spillover variables were also constructed in the same way (see equation 4), we also concluded that they were highly correlated. Thus, to address this issue, Gujarati & Porter (2009:343) recommend dropping one of the collinear variables. Thus, we decided to drop the forward spillover effect variable in our linear regression.

4.2 Econometric Estimation Results

Before carrying out our regression, we show the linear correlations that exist among some of our variables through the use of the bivariate correlation matrix. The results are reported in Table 5.

Table 5: The correlation matrix

	lnprod	lncapint	lnlabour	lnmatint	FDI	Size	Abscap	Age
lnprod	1							
lncapint	0.0621	1						
lnlabour	-0.0780	0.0677	1					
lnmatint	0.5679	0.1558	0.1348	1				
FDI	0.0570	0.0141	0.2035	0.0707	1			
Size	-0.0511	0.0701	0.7106	0.1239	0.1006	1		
abscap	-0.2083	0.2489	0.2699	0.0934	0.0304	0.1421	1	
Age	0.0903	0.0046	0.0736	0.1030	0.0335	0.0820	-0.0041	1

Source: Authors' calculation from WBES (2007)

[7] The alternative test is the White's test for heteroscedasticity. However, it is discussed to be less powerful than the Breusch-Pagan test (Gujarati & Porter (2009:389)

The results of Table 5 show that most of the variables have expected signs in their correlation coefficients with productivity except for the case of absorptive capacity and size. In addition, these variables are found to be weakly correlated with one another.

After showing the linear relationship among some of our variables, we run our regression model. The findings are reported in Table 6.

Table 6: Linear Regression Results

lnprod	coefficient	Standar error	t value	P value	Beta
lncapint	0.0189	0.0080	2.37*	0.018	0.0367
lnlabour	-0.0235	0.0108	-2.17*	0.030	-0.0806
lnmatint	0.5223	0.0246	21.26*	0.000	0.5852
FDI	0.0554	0.0493	1.12	0.261	0.0279
size	-0.0514	0.4970	-1.03	0.301	-0.0386
abscap	-0.5084	0.0499	-10.17*	0.000	-0.2424
age	0.0003	0.0001	3.50*	0.000	0.0347
Reg1	0.1088	0.0488	2.23*	0.026	0.0764
Reg2	0.0974	0.0552	1.76	0.078	0.0505
Reg 3	0.0891	0.0556	1.60	0.109	0.0325
horizman	-0.5706	18.3346	-0.03	0.975	-0.0024
backward	117.6245	183.6436	0.64	0.522	0.0463
cons	1.7779	0.1353	13.14	0.000	

Source: Authors' own analysis from WBES (2007)

$R^2 = 0.4095$, $F(12, 1043) = 87.99$

Prob > F = 0.0000

Thus, the estimated model (5) is written below:

Lnprod = 1.779 + 0.0189 lncapint - 0.0235lnlabour + 0.52231lnmatint +0.0554FDI - 0.0514size - 0.5084abscap +.00003age + 0.1088reg1 + 0.0974reg2 + 0.0891reg3 + 117.62 45 Backward - 0.57061Horizman

Discussion of findings

The regression results confirm the expected sign findings of the bivariate correlation matrix reported in Table 5. The regression results show positive effects that capital intensity (lncapint),

material intensity (lnmatint) and backward spillover effect have on productivity of local firms in South Africa. The same is true for the age of firms and the regional dummies for Johannesburg, Cape Town and Port Elizabeth. All these variables are found significant in explaining productivity of local firms. However, for the regional dummies, Johannesburg shows to have a much higher positive and significant effects on productivity of local firms in South Africa than Cape Town and Port Elizabeth. This may imply that local firms that are based in Johannesburg may have intense contact with MNCs and, as such, be more exposed to new technologies and production processes than local firms in other regions. As a result, they have higher productivity.

The coefficients of lncapint and lnmatint are positive and significant. Thus, this means that an increase in capital and material intensity raises productivity of local firms in South Africa. The coefficient of age is positive and significant. Hence, it may imply that experienced firms (firms with many years in operations) tend to have higher productivity due to knowledge accumulation over time than new firms. The positive coefficient of FDI could express that MNCs are more productive than local firms. However, it is found insignificant in explaining productivity of local firms. This may suggest that local firms do not benefit much from FDI spillovers in South Africa.

The positive but insignificant backward spillover effect (backward) on productivity of local firms in South Africa has implications. On one hand, this may indicate

- that MNCs have established local suppliers of intermediate inputs (downstream sectors) only in some of the manufacturing sectors in South Africa, and
- that those local suppliers have been able to produce and supply high quality intermediate inputs for MNCs.

However, its insignificance could be interpreted that:

- MNCs have not been successful in establishing local suppliers in all sectors within the manufacturing industry.
- There is a very limited number of local suppliers in the manufacturing industry and these suppliers have not been able to supply intermediate inputs to MNCs within the entire manufacturing

As explained above, due to high multicollinearity between backward and forward spillover, the forward spillover variable was removed from our regression analysis. Hence, by association, it

can also be concluded that local firms in upstream industries also experience higher productivity. This may suggest that local firms (customers) have been able to increase productivity by buying intermediate inputs from MNCs.

On the other hand, the findings show negative effects of labour (lnlabour), firm's size (size), horizontal spillover effect and absorptive capacity of local firms (abscap) on the productivity of local firms in South Africa. The coefficient of size suggests that medium and large firms do not contribute much to productivity of local firms as compared to small firms. However, its coefficient is found insignificant. The coefficient of labour is significant. In addition, it has the expected sign as it is expected that an increase in labour cost will, ceteris paribus, lead to fall in productivity of local firms.

The negative coefficient of absorptive capacity (-0.5084) is significant. This could be interpreted that South African local manufacturing firms did not have the minimum prerequisites (e.g. the necessary human capital, physical infrastructure, research and development activities (R&D) and distribution networks to sustain inward FDI) that allow them to take advantage of FDI spillovers. This supports the problem of skilled labour in South Africa.

Finally, as explained above, we found that the coefficient of FDI to be positive. This could express that MNCs are more productive than South African local manufacturing firms. However, the negative and insignificant coefficient of horizontal spillover effect suggests that there are negative intra-industry spillover effects from FDI to local firms in South Africa but MNCs do not affect much the productivity of local firms. This is expected in the theoretical literature since MNCs are expected to be reluctant to share technology with local firms given that these latter are seen as local competitors

5. Post regression diagnostics

As explained in the preceding section, the multicollinearity and the heteroscedasticity tests were carried out to ensure that our findings are credible. This section summarizes the findings of these two tests.

4.2.1 Variance Inflation Factor (VIF) test

As a rule of thumb, Gujarati & Porter (2009:340) suggest that if the VIF of a variable is above 10, then the variable should be said to be highly collinear. They further suggest that the tolerance index (the reciprocal of the VIF) can be used as an alternative. In this case, the closer

the tolerance index to zero (0), the bigger the degree of collinearity of the variable with other explanatory variables we may not suspect any multicollinearity.. From the results of Table 7, backward and horizontal Spillover variables have VIF of above 10. Thus they are highly correlated. This should be expected from the variable construction point of view. As explained above, because the backward and forward spillover variables were also constructed in the same way (see equation 4), we also concluded that they were highly correlated. Thus, to address this issue, we followed the approach by Gujarati & Porter (2009:343) who recommend dropping one of the collinear variables. Thus, the forward variable was dropped. However, the other variables have VIFs below 10. Hence, they are not correlated. Most importantly, the overall VFI mean (4.25) is also below 10. Thus, we can confirm that there is no multicollinearity among our the variables. Therefore, our regression results can be relied upon. Table 7 summarizes the results of the multicollinearity test through the Variance Inflation Factor analysis (VIF).

Table 7: Variance Inflation Factor (VIF) findings

Variables	VIF	Tolerance index(1/VIF)
Horizman	17.97	0.0556
Backward	17.41	0.0574
Lnlabour	2.34	0.4276
Reg1	2.22	0.4501
Size	2.09	0.4776
Reg 2	1.88	0.5324
Reg 3	1.48	0.6754
Abscap	1.28	0.7807
FDI	1.15	0.8677
Lncapint	1.10	0.9119
Lnmatint	1.08	0.9297
Age	1.02	0.9818
Mean VIF	**4.25**	

Source: WBES (2007): Authors' own analysis

4.2.2 Heteroscedasticity

As mentioned above, cross-sectional data are usually associated with the problem of heteroscedasticity. Since the presence of heteroscedasticity is assumed in our data, it was important to do a first round regression without robust residuals in order to test for heteroscedasticity. The Breusch-Pagan-Godfrey test returned a verdict of heteroscedasticity presence in the error terms. This means that the residuals were found to have unequal variances.

As a result, we run a second regression with robust residuals as a means to correct for the heteroscedasticity problem.

6. Conclusions, Recommendations and Policy implications

The purpose of this paper was to examine whether there are productivity differences between MNCs affiliates and local manufacturing firms in South Africa. In addition, the paper purports to investigate the existence of intra-industry or inter-industry spillover effects from FDI to local firms. In the introduction of this paper, we have hypothesized that because of more advanced technology, MNCs would be more productive than local firms. However, on the one hand, we expected positive spillover effects from FDI to local firms in downstream and upstream industries (backward and forward linkages). On the other hand, negative intra-industry spillover effects were expected from FDI to local firms.

Regarding these expectations, using a sample of 1057 firm level cross sectional data, our empirical findings show that in fact MNCs are more productive than local manufacturing firms in South Africa. Nevertheless, this productivity difference is found insignificant to explain productivity of local manufacturing firms. Furthermore, although insignificant, our results support on the one hand that there are positive inter-industry spillover effects (backward variable) from FDI to local firms while on the other hand, there are negative intra-industry spillover effect (Horizman variable) from FDI to local firms in South Africa (most likely from the competition effect channel). Hence, based on this, we can conclude that our empirical findings support our earlier hypothesis that MNCs would be more productive than local firms. In addition, it also supports our other hypothesis that on the one hand, there would be negative intra-industry spillovers from FDI to local firms while on the other hand, there would be positive inter-industry spillovers from FDI to local firm .

In this study, we have also discovered that the coefficient of absorptive capacity is negative – and significant. This indicates that South African local firms do not have the minimum prerequisites (e.g. the necessary human capital, physical infrastructure, research and development activities (R&D) and distribution networks to sustain inward FDI) that allow them to take advantage of FDI spillovers. In addition, we have found that firms who are based in Johannesburg tend to enjoy higher productivity than firms in other regions. Obviously, this supports the geographical proximity spillover channel: local firms who are closer to MNCs tend to enjoy much higher productivity.

The findings of this study do have some policy implications. Because MNCs are found to be more productive than local firms, we recommend to policymakers to continue attracting more FDI inflows in South Africa in general and the manufacturing industry in particular. We believe by encouraging more FDI inflows in South Africa and given that a lot of MNCs have the more updated technologies, local firms will somehow take advantage of these technologies from MNCs presence in the country. However, given that on the one hand, there is some evidence of negative intra-industry spillover effects and on the other hand, there is evidence of positive inter-industry spillovers, national efforts to attract more FDI inflows in South Africa should be encouraged in inter rather than intra industries (i.e. policymakers should encourage more backward linkages projects rather than Greenfield investment projects in South Africa). This can be done for instance by encouraging M&A or joint venture between MNCs and local suppliers. Since backward spillover effects are found insignificant in this paper, it could be translated that MNCs affiliates have not been able to establish strong linkages with local firms in downstream industries. Therefore, it is recommended to policymakers to adopt investment policies that encourage synergies between MNCs and local businesses (i.e. M&A or joint venture between MNCs and local firms) in all the manufacturing sectors of South Africa.

However, it is important to mention that the findings of this study are only applicable to the South African manufacturing firm level cross sectional data. Thus, future studies are encouraged to use firm level panel data for South Africa to investigate the existence of intra and inter industry spillover effects from FDI to local firms in the country. Furthermore, given that these findings are only applicable to the manufacturing industry, future studies may also aim to examine the interaction between FDI and local firms in other industries. For instance, the relationship between FDI and productivity of local firms in the service industry may be studied. In addition, to gain deeper insight and derive strong recommendations, future studies may also assess the inter-relationship between FDI, absorptive capacity and productivity of local firms.

References

Agosin, M., & Machado, R. 2005. "Foreign Direct Investment in Developing countries: Does it crowd in Domestic Investment." *Oxford Development studies* 33(2):149-162.

Aitken, B. J. & Harrison, A. 1999. "Do Domestic Firms Benefit from Direct Foreign Investment?Evidence from Venezuela'." *American Economic Review,* 89: 605–618.

Alfaro, L., & Rodríguez, A. 2004. "Multinationals and Linkages: Evidence from Latin America." *Economia* 4: 113–170.

Alfaro, L., Chanda, A, Kalemli-Ozcan,S, & Sayek, S .2004. "FDI and Economic Growth: The Role of Local Financial Markets." *Journal of International Economics* **64**: 113–134.

Alfaro, L. Kalemli-Ozcan, S., & Sayek, S. 2009. "FDI, Productivity and Financial Development." *The World Economy,* 32:111-115.

Arrow, K. 1971. Essays in the theory of risk-bearing. Amsterdam, North Holland.

Arvanitis, A. (2006): "Foreign Direct Investment in South Africa:Why has it been so Low". Available from: http://www.mf.org/external/pubs/nfi/2006/soafrica/eng/pasoafr/sach5.pdf. [Accessed: 11 April 2014].

Barrios, S. 2000. Are there positive spillovers from foreign direct investment? Evidence from the Spanish experience (1990–1994). Mimeo, University of Manchester.

Barrios, S.,& Strobl, E. 2002. "Foreign Direct Investment and Productivity Spillovers: Evidence from The Spanish Experience." *Weltwirtschaftliches Archiv* 138: 459-481.

Blankestijn, S. 2012. "FDI, ownership shares and domestic productivity A Meta-analysis." Erasmus school of economics.

Belderbos, R. & VanRoy, V. 2010. "Productivity Spillovers from Foreign Affiliates and Domestic Firm Internationalization: Firm-Level Evidence for Belgium." Katholieke Universiteit Leuven.

Blalock, G. & Gertler, P. 2008. "Welfare Gains from Foreign Direct Investment through Technology Transfer to Local Suppliers." *Journal of International Economics LA*: 402-421.

Blomstrom, M. 1989. "Foreign investment and Spillovers: A study of technology transfer to Mexico", London: Routledge.

Blomström, M. 1991,"Host Country Benefits of Foreign Investment" in D.G.McFetridge (ed). Foreign Investment Technology and Economic Growth, University of Calgary Press, Calgary.

Blomström, M. & Wolff, E. 1994. "Multinational Corporations and Productivity Convergence in Mexico." in W. Baumol, R. Nelson and E. Wolff, eds., Convergence of Productivity: Cross-National Studies and Historical Evidence, 343 New York, Oxford University Press.

Blomström, M.& Kokko, A.1998.. "Multinational Corporations and Spillovers." *Journal of Economic Surveys,* 12: 247–277.

Blomström, M., & Sjöholm, F. 1999. "Technology Transfer and Spillovers: does Local Participation with Multinatinals matter?" *European Economic Review* ***43***: 915-923.

Blomström, M., Globerman, S. & Kokko, A. 1999. "The Determinants of host Country Spillovers from Foreign Direct Investment: Review and Synthesis of the Literature."SSE?EFI Working Paper in Economics and Finance, No.239. Stockholm: The European Institute of Japanese Studies.

Blomström, M., Kokko, A., & Zejan , M. 2000. "Foreign Direct Investment: Firm and Host Country Strategies." London*: Macmillan.*

Buckley, P. J. & Casson, M. 1976. "The Future of the Multinational Enterprise." London: Macmillan.

Buckley, PJ, Clegg, J, Wang, C. 2006. Inward FDI and host country productivity: evidence from China's electronics industry. *Transnational Corporations,* 15(1):13-34.

Caves, R. E. 1971. "International corporations: the industrial economics of foreign Investment." *Economica*, 38(149): 1-27.

Carkovic, M. & Levine, R. 2002. "Does FDI Accelerate Economic Growth?" *Institute for International Economics*. Washington DC.

Chuang, Y.& Lin, C. 1999. "Foreign direct investment in R&D and spillover efficiency: evidence from Taiwan's manufacturing firms." *Journal of Development Studies* 35: 117–137.

Chuang, Y. C.& Hsu, P.F 2004. "FDI, trade, and spillover efficiency: evidence from China's manufacturing sector." *Journal of Applied Economics* 36: 1103–1115.

Chudnovsky, D., Lopez, A, & Rossi, G. 2008. "Foreign Direct Investment Spillovers and the Absorptive Capabilities of Domestic Firms in the Argentine Manufacturing Sector (1992–2001)." *Journal of Development Studies* 44(5): 645–677.

Chung, W., Mitchell, W, & Yeung, B. 2003. "Foreign direct investment and host country productivity: the American automotive component industry in the 1980s." *Journal of International Business Studies* **34**: 199–218.

Cohen, W. & Levinthal, D. 1989. "Innovation and Learning: The Two Faces of R&D." *Economic Journal* 99: 569–596.

Crespo, N. & Fontoura, M. P. 2007. Determinant factors of FDI spillovers – What Do We Really Know? *World Development,* 35(3): 410-425.

Cuyvers, L., Soeng, R., Plasmans, J. & VandenBulcke, D. 2008. "Productivity Spillovers from Foreign Direct Investment in the Cambodian Manufacturing Sector: Evidence from Establishment-Level Data." Working Paper 2008004, University of Antwerp, Faculty of Applied Economics.

Das, S. 1987. "Externalities and Technology Transfer through Multinational Corporations: A Theoretical Analysis." *Journal of International Economics,* 22(1-2): 171- 182.

DeBacker, K., Sleuwaegen, L. 2003. "Does foreign direct investment crowed out domestic entrepreneurship?" *Journal of Industrial Organization,* 22(1): 67-84.

Dimelis, S, & Louri, H. 2004. "Foreign Direct Investment and Technology Spillovers: Which Firms Really Benefit?" *Review of World Economics, 140(2),* 230-253.

Diwambuena, M.J, Klingelhöfer, H.E., & Kaggwa, M. 2014. Can South African local firms benefit from foreign direct investment? An Analysis of spillovers effects: proceedings of the 8th International Business Conference, held in Namibia on 18-21 August, 2014. Swakopmund

Djankov, S. & Hoekman, B. 2000. "Foreign investment and productivity growth in Czech enterprises." *World Bank Economic Review* 14(1): 49–64.

Dunning, J. H. 1980. "Toward an Eclectic Theory of International Production: Some Empirical Tests." *Journal of International Business Studies* 11(1): 9-31.

Dunning, J. H. 1981. "International Production and the Multinational Enterprise." London: George Allen and Unwin.

Findlay, R. 1978. "Relative Backwardness, Direct Foreign Investment and Transfer of Technology." *Quarterly Journal of Economics* 92(1): 1-16.

Flores, G. R., Fontoura, M.P. & Santos, R.G (2000). "Foreign Direct Investment Spillovers: What can we learn from Portuguese data?" *Mimeo, ISEG, Universidade Tecnica de Lisboa, Lisbon.*

Gerschenkron, A. 1962. Economic Backwardness in Historical Perspective. Massachusetts: Belknap Press of Harvard.

Gerschenberg, I. 1987. "The Training and Spread of Managerial Know-How. A Comparative Analysis of Multinational and Other Firms in Kenya." *World Development,* 15(7): 931-939.

Gerschewski, S. 2013. "Do Local Firms Benefit from Foreign Direct Investment? An Analysis of Spillover Effects in Developing Countries." *Asian Social Science*, 9(4): 67-73.

Girma, S., Greenaway, D. & Wakelin, K. (2001): "Who benefits from Foreign Direct Investment in the UK? Paper presented at the RES conference in St-Andrew, July.

Giroud, A. 2013. "Transnational corporations, technology, and economic development: Backward linkages and knowledge transfer in South East Asia." Cheltenham: Edward Elgar.

Glass, A.& Saggi, K (1998). "International Technology Transfer and the Technology Gap." *Journal of Development Economics*, 55(2): 369–398.

Globerman, S. 1975. Technological Diffusion in the Canadian Tool and Die Industry. *The Review of Economics and Statistics, 57(4),* 428-434.

Görg, H. and Strobl, E. 2001. "Multinational companies and productivity spillovers: A meta-analysis". *Economic Journal*, Vol. 111, 723-39.37

Görg, H.& Strobl, E. 2004. "Fdi and local economic development:beyond productivity spillovers." University of Nottingham.

Görg, H., & Greenaway, D. 2004. "Much Ado about nothing? Do domestic firms really benefit from foreign direct investment?" *The World Bank Research Observer* 19: 171-197.

Gruben, W.C, Mcleod, D (1998). "Capital Flows, Savings, and Growth in the 1990s." *Quaterly Review of Economics and Finance* 38 No. 3: 287-315.

Gujarati, D.N., and Porter, D.C. (2009): "*Basic Econometrics*". New York: McGraw-Hill, 5th Edition.

Haddad, M. & Harrison, A. 1993. "Are There Positive Spillovers from Direct Foreign Investment?" *Journal of Development Economics* 42: 51–74.

Hale, G.& Long, C. 2006. "What Determines Techonological Spillovers from Foreign Direct Investment?Evidence from China." *Yale Economic Growth Center Discussion Paper, 934*. New Haven, CT.

Haskel, J. E., Pereira, S.C.& Laughter, M.J. 2002. "Does Inward Foreign Direct Investment Boost the Productivity of Domestic Firms? National Bureau of Economic Research (Cambridge, MA), Working Paper No. 8724.

IMF (1993). Balance of Payments Manual 5th Edition. Washington DC.

Javorcik, B. S. 2004. "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages." *American Economic Review,* 94: 605–627.

Javorcik, B. & Spatareanu, M. 2008. "To Share or not to Share: Does Local Participation Matter for Spillover from Foreign Direct Investment? ." *Journal of Development Economics* 85(1-2): 194-217.

Kathuria, V. 2000. "Productivity spillovers from technology transfer to Indian manufacturing firms." *Journal of International Development,* 12: 343–369.

Katz, J. M. 1969. Production Functions, Foreign Investment and Growth. Amsterdam; North Holland.

Keller, W. 2004. "International Technology Diffusion." *Journal of Economic Literature* 42(3): 752-782.

Keller, W.& Yeaple, S (2008). "Multinational Enterprises, International Trade, and Productivity Growth: Firm- Level Evidence from the United States." University of Colorado.

Kinoshita, Y. 2000. "*R&D and Technology Spillover via FDI: Innovation and Absorptive Capacity*". CERGE-EI Working Papers wp163. The Centre for Economic Research and Graduate Education- Economic Institute, Prague.

Kokko, A., Tansini, R.,& Zejan, M (1996). "Local Technological Capability and Productivity Spillovers from FDI in the Uruguayan Manufacturing Sector." *Journal of Development Studies* 32(4): 602-611.

Konings, J. 2000. "The Effects of Direct Foreign Investment on Domestic Firms: Evidence from Firm Level Panel Data in Emerging Economies." *CEPR Discussion papers*.

Lall, S. 1980. "Vertical Interfirm Linkages in LDCs: An Empirical Study." *Oxford Bulletin of Economics and Statistics* 42: 203-226.

Lenaerts, K & Merlevede, B. 2011. " Horizontal or Backward? FDI Spillovers and Industry Aggregation. Department of Economics, "University of Ghent"

Liang, F. H. 2008. "Does Foreign Direct Investment Improve the Productivity of Domestic Firms? Technology Spillovers, Industry Linkages, and Firm Capabilities." University of California, Berkeley.

Lutz, S.H. & Talavera, O. 2003. "Do Ukrainian Firms Benefit from FDI?" . ZEW Discussion Papers 03-05, ZEW- Zentrum für Europäische Wirtschaftsforschung GmbH/ Centre for European Economic Research.

Markusen, J. R. & Maskus, K.E. 2002. "Discriminating among Alternative Theories of the Multinational Enterprise." *Journal of International Economics* 10(4): 694-707.

Meyer, K. E. 2004. "Perspectives on multinational enterprises in emerging economies." *Journal of International Business Studies* 35(4): 259-276.

Nhamo, S. 2011. MNC-Borne FDI, Absorptive capacity and Economic growth: An empirical investigation. PhD Thesis, University of the Witwatersrand.

Negara, S. D. & Latif, A. 2012. "Foreign Direct Investment andFirms' Productivity Level Lesson Learned from Indonesia." *ASEAN Economic Bulletin* 29 No. 2 (2012): 116-127.

OECD (1996). Benchmark Definition of Foreign Direct Investment, 3rd Edition. Paris.

Oman, C. 2000. "Policy competition for foreign direct investment: A study of competition among governments to attract FDI." *OECD Development Centre, Paris*.

Ponomareva, N. 2000. "*Foreign Direct Investment in Russia:Effects on Productivity. Materials of international conference" Crossborder Capital Flows in Transition Economies*, Kiev, Ukraine, April12-13.

Rodriquez-Clare, A. (1996). "Multinationals, Linkages and Economic Development." *American Economic Review*, 86(4): 852-874.

Ruane, F.& Ugur, A. 2002. "Foreign Direct Investment and Productivity Spillovers in Irish Manufacturing Industry: Evidence from Firm Level Panel Data." *Trinity Economic Papers 02/06 Trinity College*, Dublin.

Saggi, K. 2002. "Trade, Foreign Direct Investment, and International Technology Transfer: A Survey." World Bank Research Observer 17(2): 191–235.

Sandrey, R. 2013. "Foreign Direct Investment in South Africa: the BRIC perspective." Stellenbosch: *Trade Law centre (Tralac).*

Strydom, P. 2007. Saving Behaviour by South African Households. Available from: http://www. fnb.co.za/economics/econh!ml/docs/SavingHouseholds.pdf//. [Accessed: 28 March 2014].

Suyanto, R. & Bloch, H .2009. "Does Foreign Direct Investment Lead to Productivity Spillovers? Firm Level Evidence from Indonesia." *World Development 37*(12): 1861-1876.

Teece, D. J. 1985. "The multinational enterprise: market failure and market power considerations." *Sloan Management Review,* 22(3): 3-17.

Tomohara, A. & Yokoto, K. 2006. "Does Foreign Direct Investment Benefit Domestic Companies via Increased Productivity: Horizontal, Backward, and Forward linkages." The *International Centre for the Study of Queens College and CUNY Graduate Center*.

UNCTAD. 2001. World investment report 2001: Promoting linkages. New York and Geneva, United Nations.

UNCTC. 2001. World Investment Report. Promoting Linkages.

Oman, C. 2000. "Policy competition for foreign direct investment: A study of competition among governments to attract FDI." *OECD Development Centre, Paris*.

Wang, J. Y. & Blomstrom, M. 1992. "Foreign Investment and Technology Transfer: A Simple Model." *European Economic Review*, 36(1): 133-155.

Appendix

1. Derivation of the model

The econometric model has been constructed from the typical Cobb Douglas production function below:

$$Y_i = A^{\alpha} K_i^{\beta} L_i^{\lambda} M_i^{\phi} e^{\sum_{i=1}^{n} \varpi_i X_i + \varpi_0 + \varepsilon_i} \quad i = 1, 2, \ldots n \tag{1}$$

where Y_i is the output of firm i, K_i is the fixed capital stock of firm i, L_i is the number of workers or labour of firm i, M_i is the amount of material inputs used by firm i, β, λ, ϕ are the output elasticities with respect to capital, labour and material inputs respectively, ϖ_0 is the constant, X_i is a vector of observed explanatory variables identified in the literature. These include such as FDI, age, region, size, absorptive capacity, horizontal spillover, backward spillover and forward spillover and ε_i is the error term representing all the unobserved explanatory variables that may affect output of each firm.

In order to obtain labour productivity (prod), we divide both sides of equation (1) by L and get equation (2) below

$$\frac{Y_i}{L_i} = \frac{A^{\alpha} K_i^{\beta} L_i^{\lambda} M_i^{\phi} e^{\sum_{i=1}^{n} \varpi_i X_i + \varpi_0 + \varepsilon_i}}{L_i} \tag{2}$$

Multiplying the numerator by $L^{-\beta} L^{\beta}, L^{-\phi} L^{\phi}$ results in the equation below

$$\frac{Y_i}{L_i} = A^{\alpha} K_i^{\beta} L^{-\beta} L^{\beta} L_i^{\lambda - 1} M_i^{\phi} L^{-\phi} L^{\phi} e^{\sum_{i=1}^{n} \varpi_i X_i + \varpi_0 + \varepsilon_i} \tag{3}$$

Rearranging equation (3) results in equation (4)

$$\frac{Y_i}{L} = A^{\alpha}\left(\frac{K_i}{L_i}\right)^{\beta}\left(\frac{M_i}{L_i}\right)^{\phi} L^{\beta} L_i^{\lambda-1} L^{\phi} e^{\sum_{i=1}^{n} \varpi_i X_i + \varpi_0 + \varepsilon_i} \tag{4}$$

A further rearrangement of equation (4) results in equation (5)

$$\frac{Y_i}{L} = A^{\alpha}\left(\frac{K_i}{L_i}\right)^{\beta}\left(\frac{M_i}{L_i}\right)^{\phi} L_i^{\beta+\phi+\lambda-1} e^{\sum_{i=1}^{n} \varpi_i X_i + \varpi_0 + \varepsilon_i} \tag{5}$$

Taking logs on both sides of equation (4) gives rise to a linear equation shown below

$$\begin{aligned} \ln\left(\frac{Y_i}{L_i}\right) &= \alpha \ln A + \beta \ln\left(\frac{K_i}{L_i}\right) + \phi \ln\left(\frac{M_i}{L_i}\right) + \left(\beta + \phi + \lambda - 1\right) \ln L_i \\ &= + \sum_{i=1}^{n} \varpi_i X_i + \varpi_0 + \varepsilon_i \end{aligned} \tag{6}$$

A further Rearrangement of equation 6 results in equation (7)

$$\begin{aligned} \ln\left(\frac{Y_i}{L_i}\right) &= \gamma_0 + \beta \ln\left(\frac{K_i}{L_i}\right) + \phi \ln\left(\frac{M_i}{L_i}\right) + \left(\beta + \phi + \lambda - 1\right) \ln L_i \\ &= + \sum_{i=1}^{n} \varpi_i X_i + \varepsilon_i \end{aligned} \tag{7}$$

where:

$\left(\frac{Y_i}{L_i}\right)$ is labour productivity (the ratio of total sales to total labour cost)

$\left(\frac{K_i}{L_i}\right)$ is capital intensity (the ratio of the replacement cost of fixed assets to total labour cost)

$\left(\frac{M_i}{L_i}\right)$ is material intensity (the ratio of total cost of raw materials and intermediate goods used in production to total labour cost)

L_i is the labour inputs (the total labour cost)

γ_0 is the constant

β , ϕ , $(\beta+\phi+\lambda-1)$ are labour productivity elasticities with respect to capital intensity, material intensity and labour input respectively.

X_i is a vector of observed explanatory variables identified in the empirical review. These include such as FDI, age, region, size, absorptive capacity, horizontal spillover, backward spillover and forward spillover with their effects equal to ϖ_1

Rewriting model 7 with all observed explanatory variables affecting productivity results in equation 8

$$\begin{aligned}\text{lnprod} &= \beta_0 + \beta_1 \text{lnCapint} + \beta_2 \text{lnMatint} + \beta_3 \text{lnL} \\ &+ \beta_4 FDI + \beta_5 Size + \beta_6 Abscap + \beta_7 Age + \beta_8 Region \\ &+ \beta_9 Horspil + \beta_{10} + Forward + \beta_{11} Backward\end{aligned} \tag{8}$$

2. Table 8: Backward and Forward linkage coefficient

Industry code	Sector	Backward coefficient	Forward coefficient
2	Other manufacturing	0.035	0.1
15	Food	0.1	0.1
17&19	Textile and garment	0.1	0.1
24	Chemicals	0.1	0.1
25	Plastics and Rubber	0.1	0.1
26	Non mettalic mineral products	0.1	0.1
27	Basic metals	0.1	0.1
28	Fabricated metals products	0.1	0.1
29	Machinery and equipment	0.1	0.1
31&32	Electronics	0.035	0.1

Source: I-O Table 2005 from OECD. Authors' calculations