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How is Sectoral FDI Affecting Firms' Performance in Mozambique?

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Abstract: I study the effect of sectoral FDI on firms' performance in Mozambique from 2007 to 2010 through productivity and efficiency functions, using comprehensive firm level data. Although foreign ownership has a positive effect on firms' productivity, my results show that in general, sectoral FDI has a negative and statistically significant effect on Mozambican firms' productivity. The findings of this study are similar to previous studies that argued that positive foreign spillovers were not automatic. Using a stochastic frontier model, to measure efficiency, I find that in general foreign firms tend to be more efficient than domestic firms. However, using this model, it seems that domestic firms' efficiency is not affected by the presence of foreign firms.

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1. Introduction

Foreign Direct Investment (FDI) inflows in developing countries have increased significantly in the past years. FDI is assumed to have great potential for economic growth and development through transfers in both physical and human capital, and also better technology. Foreign firms can introduce new processes or products which can benefit local firms with new technology. These spillovers can have an important role in the host country and can promote economic growth (Alfaro, Chanda, Kalemli-Ozcan & Sayek, 2004). The positive externalities from FDI are in the form of knowledge spillovers and linkages from foreign firms to domestic firms (Alfaro & Rodriguez-Clare, 2004). Therefore, many developing countries changed regulations and laws to attract more FDI, and also, countries were competing for attracting FDI through fiscal and financial subsidies (Wang & Wong, 2008).

However, FDI can also impact negatively the host country. This can be the case with reduction of productivity for domestic firms, especially in the short run if the foreign firm leads the domestic firm to reduce the production (Aitken & Harrison, 1999). On the other hand, in the long run FDI can cause more competition, forcing inefficient firms to exit and the surviving firms will become more efficient (Hu & Jefferson, 2002). Another possible negative impact of FDI referred in the literature is the Dutch disease mainly relating the problem to the type of FDI. The literature relating the Dutch disease as one of the negative consequences of FDI, especially for countries with exploitation of natural resources, is vast (Sy & Tabarraei, 2009; Cali & Velde, 2007; Lartey, 2007). This theory argues that capital inflows can have a negative impact on economic growth by causing appreciation of the real exchange rate. This over-evaluation of the exchange rate will lead to export slow down, which will increase the non-tradable sector of the economy while reducing the tradable goods sector (Sy & Tabarraei, 2009). Exploitation of new natural resources can therefore prevent other economic sectors to develop. The main symptom is the real exchange rate appreciation (Cerutti & Mansilla, 2008).

Previous studies have analysed specific sectors or industries and concluded that in general FDI in Mozambique does not have positive spillover effects (Warren-Rodríguez, 2010). Therefore, this study aims to use Mozambican firm level panel data obtained by annual firm surveys to study firms' performance by analysing firms' efficiency and productivity as a result of

FDI. This study will also analyse the firm's efficiency levels using a stochastic frontier analysis. The rest of the paper is organized as follows: section 2 describes the literature review; section 3 presents the data; section 4 presents the productivity function and stochastic frontier model, empirical specifications and the empirical results and section 5 concludes.

2. Literature

Economic theory predicts that the presence of FDI should increase domestic firms' efficiency and/or productivity. However, empirical evidence both at the firm level and at the national level are still ambiguous about whether there are positive spillovers of FDI in host countries or not (Alfaro et al., 2004). Some authors showed that previous studies found positive spillovers because the results were mainly influenced by endogeneity. It could be the case that FDI was being directed to industries that were more efficient and productive (Aitken & Harrison, 1999). Most of the research that has been conducted regarding FDI and efficiency was based on industry level data or using cross country data and most of the studies didn't find positive spillovers in the host country. As a result, to reduce the endogeneity problem and "cherry picking" of FDI, the recent tendency of empirical work tries to use micro data to study technical efficiency of firms, both intra and inter industry (Hu & Jefferson, 2002; Liu & Wei, 2006; Bloch & Suyanto, 2009; Wang & Wong, 2012).

One of the mechanisms by which technological innovations can be transferred from more developed countries to developing countries is international trade and FDI. International diffusion of knowledge and innovations may be the main channels of total factor productivity (TFP) growth (Wang & Wong, 2012). How firms acquire and appropriate technology affects efficiency and has important implications for policy (Aw & Batra, 1998). Therefore, technology, productivity and efficiency of local firms may improve due to the presence of foreign companies with new technologies, training of workers and managers who can later work in local companies (Kokko, 1994). Local firms could learn from foreign companies by observing, doing business with them or through labour turnover (Kinda, 2012).

Some authors argue that FDI promotes capital growth only when a country reaches a certain level of financial depth and contributes to productivity growth. Also, when the host country has a certain level of human capital then FDI can contribute positively (Wang & Wong, 2008). This positive effect of FDI on economic growth requires a country to have a threshold level of human capital, which can be measured by average years of secondary schooling (Wang & Wong, 2008). Borensztein, Gregorio and Lee (1998) argued that for countries with very low levels of human capital the direct effect of FDI is negative. Additionally, some empirical studies demonstrated that domestic economies can achieve productivity growth only if the technology transfer is utilized efficiently (Wang & Wong, 2012).

Recent firm-level studies showed that local firms which supply foreign firms have vertical spillovers since they tend to be more productive or efficient (Kinda, 2012). In a broad sense, the concept of efficiency is used to characterize the utilization of resources. It is a process of utilizing inputs to transform into outputs. Therefore, its concept is relative and for that reason the performance of an economic unit needs to be compared to a specific standard (Hjalmarsson & Fersund, 1974). Efficiency of a firm usually means its success in producing as much as possible output using the existent inputs (Farrel, 1957). In this context, efficiency measures can be aggregated into three different levels, namely: macro level where the allocation of resources to different sectors is compared with the ideal allocation, industry level in which the relative performance of a firm in an industry is measured, and lastly, micro level where the efficiency is observed within the firm (Hjalmarsson & Fersund, 1974).

Some authors argue that the differentiation between intra and inter firm analyses is important in order to better capture the dynamics of the firms in a specific context. For example, Lansink (2001) differentiated these two concepts in his study. For him, intra-firm technical efficiency involves taking into account a particular firm's efficiency degree over time, therefore taking the firm specific production frontier as the reference frontier. On the other hand, inter-firm technical efficiency for a particular firm involves choosing the "best practice frontier" at each time period among the set of comparable firms, and then, evaluating the firm's technical efficiency relative to that frontier. Therefore, intra-firm efficiency reveals a specific firm's performance over time relative to its own technology, while inter-firm efficiency reveals that firm's performance over time relative to the best available technology in the industry (Lansink, 2001).

Bloch and Suyanto (2009) made an important contribution regarding a firm's efficiency and productivity by decomposing total factor productivity (TFP) growth into three parts, namely, technical progress (TP), technical efficiency change (TEC) and scale efficiency change (SEC). The scale efficiency change is the adjustments of the scale operations such as the level of input to achieve the technologically optimum scale of operations. Technical efficiency can be defined as the firm's ability to obtain maximum output from a given vector of inputs, and therefore technical efficiency improvement represents the movements towards the production function (Wang & Wong, 2012). The difference between technical progress and technical efficiency change comes from the fact that technical progress is an outward shift of the production function whereas a technical efficiency change is a movement towards the production function (Wang & Wong, 2013). This distinction is important and comes from empirical studies showing that, in some cases, when these two effects are decomposed different results can be found. This is the case for a manufacturing firms study in China, where the authors found that intra-industry FDI is negatively associated with a firm's technical efficiency. But there were positive FDI spillovers from foreign end users to domestic suppliers (Wang & Wong, 2013).

As pointed above, there are mixed evidences regarding the spillover effects in different countries and industries, suggesting that spillover effects depend largely on the host country policy environment and the technological capabilities of local firms (Liu & Wei, 2006). Additionally, Liu and Wei (2006) argued that these different results may also be due to the use of different measures of foreign presence and estimation methods applied. As Kokko (1994) discussed, there are two opposing arguments in the literature of FDI and technology transfer. On the one hand, there is one side arguing that Multinational Corporations (MNC) might be too advanced to generate spillover effects in domestic firms. On the other hand, it is recognized that the existence of a technological gap is a necessary condition to allow the local firms to benefit from the spillover effects.

Different approaches were conducted in order to link FDI to productivity gains or efficiency through variables that analysed technology transfers, education, capital accumulation and local conditions in terms of human capital or financial sector characteristics. For example, some empirical studies showed that domestic economies can achieve productivity growth if the technology transfer is utilized efficiently (Wang & Wong, 2012). In relation to growth, FDI can have beneficial effects through higher efficiency rather than simply from higher capital accumulation (Borensztein et al., 1998). Existent literature tends to use sector-level information to assess spillovers from foreign to local firms which can result in significant heterogeneity (Kinda, 2012). To address this caveat, Kinda used a stochastic frontier approach in order to reduce omitted variable bias (2012). On the subject of what is the best environment for FDI to generate positive spillovers, Kokko concluded that efforts to promote FDI should focus on industries which local firms already have relatively well-built technological capabilities or in markets which foreign firms cannot take over the whole market (1994).

Investigations on productivity spillovers at the firm level are relatively limited because research on spillovers is usually carried out at the macro level (Liu & Wei, 2006). Another limitation of the existing literature on FDI spillover effects is the fact that most studies used industrial level data rather than firm level data, which would be more appropriate (Görg & Greenway, 2001). For example, in countries with opportunities in the mining sector, another perspective presented by Perkins and Robbins (2012) stated that powerful mining companies can take advantage of their power and dominate the infrastructure of the country for its own production, therefore reducing the prospects for economic diversification in the host country. For that reason, countries should do cost benefit analyses between policies adopted to attract FDI and those that improve local conditions (Alfaro et al., 2004). Another dimension to this analysis is the possibility that domestically owned firms can face productivity reduction in the short run. This can be the case if the foreign firm faces lower marginal costs of production which will lead to an increase in production and this hurts the productivity of domestic firms (Aitken & Harrison, 1999). In this case we can see a more complex scenario in which there is an indirect spillover effect of FDI to domestic firms (Hu & Jefferson, 2002).

This cost benefit analysis is especially important for countries like Mozambique, which has FDI mainly concentrated in the exploitation of mineral resources and in the energy sector, which are not renewable resources with weak linkages to the real economy (Castel-Branco & Mandlate, 2012). Different studies conducted about Mozambique showed that the country has low levels of industrial development and not enough Research and Development (R&D). Therefore, technological development in Mozambique has to rely on international transfers of foreign technology (Warren-Rodríguez, 2010). However, according to Warren-Rodríguez (2010) FDI did not play a significant role in the formation and accumulation of technology capabilities and skills in the Mozambican metalworking and light chemicals sectors. On the other hand, another study argued that Mozambique, along with Malawi, Mali, and Papua New Guinea are non-OECD countries which have the highest potential for improving efficiency (between 6% and 7%) by increasing FDI transfer foreign R&D (Wang & Wong, 2012). Mozambique is one the sub-Saharan countries which had received in the recent years large amounts of FDI (figure 1) and can be expected to receive more in the coming years since more natural resources are being discovered (for example, coal, gas, petroleum).

To contribute to the existent literature, this study seeks to examine whether FDI enhances productivity and efficiency levels of firms in Mozambique, therefore contributing to economic growth. This study looks at all major sectors excluding the financial sector which is not included in the firm annual survey data available. To the best of my knowledge, there has been no study that uses Mozambican firm level data to investigate whether there is any spillover of FDI to domestic firms and firm's productivity and efficiency levels using a stochastic frontier model. Therefore, this is the first time a study is being conducted using a sample of the Mozambican firms and not only specific sectors or the main FDI recipient sectors which can have the results being driven by only big firms or mega projects.

This research aims to study the effect of sector FDI on a firm's performance. I will look at the effects of horizontal (upstream) FDI on efficiency and productivity levels in Mozambique using comprehensive firm level data. The analyses will closely relate to Aitken and Harrison (1999) and Hu and Jefferson (2002), using sample data that represents firms in Mozambique in 15 sectors[1] across the country's eleven provinces from 2007 to 2010 to study the spillover effects of FDI. In this case, the study will focus on the relationship between productivity and FDI. Additionally, to analyze the firm's efficiency levels using a stochastic frontier model, this paper will closely relate to Bloch and Suyanto (2009) and Wang and Wong (2012). The study by Wang and Wong (2012) uses different country level data; however, I am using firm level data to specifically study Mozambican firms.

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[1] Agriculture, Livestock, Forest and Fishing; Quarrying Industries; Manufacturing Industries; Electricity and Gas; Construction; Trade; Transport; Hotels and Restoration; Information and Communication; Consulting; Administrative; Education; Health and Social Action; Recreation and Other services.

3. Data Description

This paper uses disaggregated accounting firm data obtained from the Mozambican National Statistical Bureau (Instituto Nacional de Estatística-INE). Since the year 2006, INE conducts annual surveys of firms and publishes a report called *Estatísticas de Empresas*. The data set provided includes relevant accounting information of selected firms from 2006 to 2010 which is the main data base for the report mentioned above. The survey covers all firms with number of employees greater or equal to 30 and/or volume of business greater or equal to ten million Meticais (equivalent to USD 333.333)[2] and randomly selects firms with less than 30 employees. The survey does not include firms in the agriculture and fishing sector with less than ten employees. The survey also does not include financial sector and insurance firms because information on these sectors is collected by the Central Bank of Mozambique which regulates these sectors. In 2007 the survey was conducted in 1.347 firms, 2.234 firms for 2008, 2.214 firms for 2009 and 2.228 firms for 2010. As we can see, the data set is not a balanced panel since the total number of firms varies across each year of the sample.

The original data set gives a total of 8,023 firms over the period of 2007-2010. However, a number of observations were deleted because the number of employees was less than five people or there was no information on the composition of their capital or there was missing data in some of the variables of interest. The final data set has a sample size of 3.540 firms. I didn't use 2006 data because the accounting system in this year was different from the rest of the years.

Some limitations of the data set include lack of information on employees' education levels, on the origin of FDI, on export, and on levels of technology. Years of establishment didn't cover most of the firms; therefore, I could not use the age of the firm in my regressions as the literature suggests. Table 1 presents the summary statistics for the main variables.

[2] Exchange rate 1USD=30 Meticais

4. Conceptual Framework, Empirical Specification and Results

4.1 Productivity Function

Assuming that MNC possess non tangible assets, such as technological know-how, marketing and managing skills, then we would expect foreign ownership to increase a firm's productivity (Aitken & Harrison, 1999). Following Aitken and Harrison (1999) and Hu and Jefferson (2002), I analyze the impact of sectoral FDI on a firm's performance. I examine a firm's productivity by estimating an FDI-augmented production function (Hu & Jefferson, 2002). The model uses a log-linear production function at the firm level (Aitken & Harrison, 1999). Similarly to Aitken and Harrison (1999), the model aims to answer two questions, namely: (1) whether FDI is associated with an increase in the firm's productivity, and (2) whether there are positive or negative spillovers to domestic firms.

Most studies of FDI face the endogeneity critical identification problem. If FDI selects more productive industries, then the observed correlation between the presence of foreign firms and productivity of domestic firms will overstate the positive impact of FDI (Aitken & Harrison, 1999). However, observing each firm's behavior over time allows controlling for fixed differences in productivity levels across industries which might affect the level of FDI (Aitken & Harrison, 1999). The general specification of the model is:

$$(1) \quad Y = \beta_0 + \beta_1 \, lnK + \beta_2 \, lnL + \beta_3 \, FirmFDI + \beta_4 SectorFDI + \beta_5 \, FirmFDI * SectorFDI + \beta_6 X + \varepsilon \ ,$$

Output (Y) is measured by a firm's value-added, K represents physical capital and is measured by fixed assets of a firm, and L is labor measured by a firm's total number of employees. FirmFDI is the foreign ownership share relative to total capital in subscribed capital. The variable Sector FDI **(**SFDI) is calculated by the firm's market share multiplied by the FDI, which would be equivalent to the industry-level FDI. Variable X contains different controls.

4.1.1 Empirical Specification for the Productivity Function

According to Aitken and Harrison the coefficient on FDI can have an upward bias if foreign capital is selecting productive industries and/or productive firms (1999). If foreign investment is concentrated in more productive industries, then the correlation between the presence of foreign firms and the productivity of domestic firms will overstate the positive impact of FDI (Aitken &

Harrison, 1999; Hu & Jefferson, 2002). Therefore, this paper will focus mainly on the spillover effect of sectoral FDI (Aitken & Harrison, 1999; Hu & Jefferson, 2002). I assume that productivity in a specific firm will not influence the sectoral FDI. The general production function specification model is given by:

$$(2) \quad Y_{ijpt} = \beta_0 + \beta_1 \, FDI_{ijpt} + \beta_2 \, SFDI_{ijpt} + \beta_3 \, FSFDI_{ijpt} + \beta_4 \, (lnRD)_{ijpt} + \beta_5 \, (lnKL)_{ijpt} + \beta_6 X_{ijpt} + \beta_7 Trend + \alpha_j + \gamma_p + \varepsilon_{ij} \ ,$$

where *i, j,* and *p* are firm, industry and province subscripts, respectively, and *t* is year. Output (Y_{ijpt}) is measured by a firm's value-added, K represents physical capital and is measured by fixed assets of a firm, L is labor measured by a firm's total number of employees, and Trend is a time trend to take into account the possibility of non-neutral technological shocks. FDI is the foreign ownership share relative to total capital in subscribed capital (equity), which varies between 0 and 100 percent. The variable SFDI gives the sectoral FDI which is the main variable of interest and is calculated using the sales of the firm weighted by the total sales in its industry multiplied by the FDI, which would be equivalent to the industry-level FDI[3]. The interaction term FSFDI (firm FDI x sectoral FDI) permits to determine if the effect of foreign firms on other foreign firms is different from the effects on domestic firms (Aitken & Harrison, 1999). The variable RD corresponds to spending in research and development (R&D). Variable KL represents the capital per labour. Variable X contains different controls; I include fixed effects for industry classification (α_j) and location among the country's eleven provinces (γ_p). Industry and location fixed effect removes the fixed characteristics of domestic firms that belong to particular industries or provinces. I assume also that firms located in the capital city tend to be more productive.

If foreign ownership in a firm increases the firm's productivity, the coefficient on FDI should be positive. The sectoral FDI measures the presence of foreign ownership in the industry; therefore if there are spillover effects from foreign firms to domestic firms I also expect this coefficient to be positive. If firms with foreign investment benefit from the presence of other foreign firms this coefficient should be positive.

[3] $SFDI_{pjt}$ = ($Sales_{ipt}$ / Σ $Sales_{jpt}$) * FDI

4.1.2 Results

Table 2 reports the results for equation (2) from OLS estimations. All reported estimates are included with correction for heteroskedasticity. The results are consistent with previous literature in which the coefficient estimate for FDI was found to be positive and significant. The FDI coefficient is consistently positive and significant at the 5% level using the full sample of firms (columns 1-3). This result indicates that there are large productivity gains when there is greater degree of foreign equity (Aitken & Harrison, 1999; Hu & Jefferson, 2002).

However, as the literature points out, the estimate of the FDI impact on a firm's productivity might have an upward bias (Aitken & Harrison, 1999; Hu & Jefferson, 2002). Therefore, my variable of interest is the spillover impact of sectoral FDI (SFDI) on a firm's productivity. As we can see from table 2, the SFDI coefficient is consistently negative and statistically significant at the 1% level for all firms in the sample (columns 1-3). This result implies that the presence of FDI hurts the firms which are in the same sector as the firms that have FDI. As a result, the productivity of the firm decreases as the FDI share in that sector increases. In the short run, foreign investment decreases domestic firms' productivity because they might induce them to contract; they can lose market share and consequently their average costs increase (Aitken & Harrison, 1999). These negative spillover impacts of sectoral FDI on domestic firms are consistent with the findings of Aitken and Harrison (1999) and Hu and Jefferson (2002). Consistent also with previous literature, the results provide support for the claims that firms that receive FDI have strong direct benefits in productivity gains while the spillover effects from FDI to domestic firms tend to be negative (Aitken & Harrison, 1999; Hu & Jefferson, 2002).

Similarly to Hu and Jefferson (2002), I divide the sample into domestic firms and foreign firms. Domestic firms are firms without any FDI on its capital share. The main purpose for disaggregating the data into foreign and domestic firms is to study the impact of FDI on domestic firms only. This specification is also an attempt to reduce the endogeneity and reverse causality problem that can bias the results. The SFDI coefficient is also negative and significant at the 5% level when I consider only domestic firms (columns 4-6). Bergeijk and Mebratie's (2013) estimates, based on domestic firms only, presented less significant effects from FDI. This indicates that foreign firms are often more competent to learn new technologies and other intangible assets from other foreign firms compared to domestic firms, which are often at the infant stage of developing countries.

Following Hu and Jefferson (2002) I include state-owned firms in equation (2) to see if they are especially vulnerable to competition from FDI since it is common to assume that they tend to have weak management. I also include an interaction term between state-owned firms and sectoral FDI to examine if foreign firms affect state-owned firms that are in the same industry. However, differently from Hu and Jefferson (2002), I did not find any significant results. The coefficient for state-owned firms is negative which would imply that they are less productive but the coefficient is not statically significant.

One result that is interestingly different from what the literature predicts is the R&D variable. The results in table 2 suggest that R&D does not increase a firm's productivity, as one would expect, in all the model specifications. The coefficient is negative and statistically significant in all specifications, which means that having R&D decreases a firm's productivity. One possible explanation for this result could be that firms are not using their resources efficiently. Firms could instead use the funds allocated to R&D for more productive activities. Another reason can be the fact that investments made in R&D take time to translate into gains in productivity. A similar result was found in the research by Kleynhans and Zwedala (2012) studying manufacturing firms in South Africa. These authors found that while R&D in general had a positive spillover effect in the firm's productivity, the cost of training, which was one the measures of R&D (along with capacity utilization, foreign licensing and international quality certification), was detrimental to the firm. Kleynhans and Zwedala argued that the reason could be attributed to limited absorptive capacity from the manufacturing firms. However, the data set that I used does not specify which R&D is reported and therefore I could not further investigate this result. In contrast, a study by Bergeijk and Mebratie (2013) looked at the literature on FDI spillovers analysing econometric studies published from 1983 to 2010 and found that 71% of the studies in their sample presented insignificant effects of R&D for productivity growth due to FDI. However, they recognized that the sample size for this specific study was too small, only 7 studies.

The capital per labor variable (KL) has a positive and significant coefficient in all the specifications, using the full sample and domestic firms in table 2. This result implies that the capital per labor increases a firms' productivity.

In table 3, we can see that when I control for the size of the firm, the estimation shows a slightly different result. In this case the FDI coefficient is still positive for big firms (firms with more than 30 employees) but the coefficient is not statistically significant anymore (column 2). However, the FDI coefficient remains positive and significant at the 5% level for small firms. This result is consistent with Aitken and Harrison's (1999) finding that in the Venezuelan case, the firm FDI positive effect was only robust for small firms. The authors argued that it could be the case that foreign investors were only targeting more productive enterprises if the firm was big. However, for small firms, the result was similar to the one that I find (positive and significant). Another explanation for this result might be the fact that small firms can be easier for a foreign owner to manage. Similarly to Yudaeva, Kozlov, Melentieva and Ponomareva (2003)'s study of firms' productivity in Russia, it is likely that most of the small firms in Mozambique are start-up firms while large firms are privatized ones. Therefore, small firms can be more productive than larger ones (Yudaeva et al., 2003).

The other exception is when I control for firms located outside the capital city; in this case the FDI estimate becomes negative but also not significant (column 6). Additional controls for firm size, R&D spending, and capital city location give similar results on the sectoral FDI coefficient. The sectoral FDI (SFDI) coefficient is still consistently negative and significant at the 1% level in almost all the specifications. This result means that SFDI has still a negative impact on a firm's productivity. The only exception is for small firms, where the impact of SFDI is negative but not significant as in the other alternative specifications (column 1). It seems that the competition effect is stronger for big firms while small firms have a learning effect. This is the opposite effect from the one on the FDI variable, where the effect was not significant anymore for big firms. This result is also different from the study by Aitken and Harrison in which they found that the negative spillovers were concentrated on small firms (1999).

Another robustness check that I perform is aggregating the 15 industries into three main categories, namely, agriculture and mining activities, manufacturing, and services (table 4). I perform this aggregation because most of the literature analyze the effects of FDI on the manufacturing industry. I also disaggregate the full sample into just domestic firms. For domestic firms, I did not include the agriculture and mining results because the number of observations was too small. Therefore, I only included manufacturing and services sectors (columns 4-5). The FDI coefficient becomes negative but not statistically significant for agriculture and mining activities with the full sample (column 1). FDI coefficient remains positive and statistically significant at the 1% level for manufacturing firms, which implies that FDI has more positive effects for manufacturing firms and is also positive and significant at the 5% level for services. The positive results from FDI for manufacturing firms are consistent with previous literature (Aitken & Harrison, 1999). For this specification, the three categories show the same negative result for sectoral FDI impact, but it is only significant for services (column 3). This result implies that the sectoral FDI is harmful especially for the services sector with a 1% level of significance, using the full sample and 5% level of confidence for domestic firms. One possible explanation for this result can be the fact that it is much easier to start a business in the services sector. Therefore there is more competition between foreign firms and domestic firms. Since foreign firms tend to be more productive in general, this effect can be more noticeable in the services sector which tends to be a more dynamic sector. I would like to remark that this study did not include financial services, insurance companies and therefore the sample size is reduced to 647 domestic firms and 960 firms using the full sample.

Using FDI as a dummy variable, which wouldn't take into account the amount of the FDI but only the presence or absence of FDI, gives the same positive and statistically significant results for the FDI coefficient and negative and statistically significant results for sectoral FDI (see appendix, table 5). I also checked if the results were not being driven by the presence of outlier firms. However, even after excluding some firms which have variables with substantial different characteristics, in terms of fixed assets, or excluding firms with more than five thousand employees, and firms with other specific characteristics, the results were still consistent with previous specifications (see appendix, table 7).

Similar to Hu and Jefferson (2002), my data set has a short period (four years), not long enough to allow industry dynamics to unfold. These dynamics would include the effect of inefficient firms exiting the industry, caused by the competitive pressure of foreign firms (Hu & Jefferson, 2002). However, following Hu and Jefferson, I also estimated the long difference version of equation (2) which is the difference between 2007 and 2010 (table 5). I found the same negative and significant result in my variable of interest. The sectoral impact of FDI is still negative and significant at the 10% level using the long difference model. Hu and Jefferson (2002) found statistically and economically insignificant results with this specification. However, Aitken and Harrison (1999) also found significant negative impact of industry FDI using, various lengths of difference. The short time period of this study did not allow me to use lengths of difference. Therefore these results might be robust only in the short run. The time period, 2007 to 2010, coincides exactly with the financial crisis period and might have affected foreign and domestic firms differently. The crisis effects to the firms could have been caused by high variation on foreign exchange rates, inflation rates and interest rates. Therefore, additional years subsequent to the financial crisis period would be very helpful to study firms' productivity and evaluate the results in the long run.

4.2 Efficiency Function

The analysis of a firm's technical efficiency will be based on the approach of the stochastic frontier technique. This model estimates the maximum output level for a country/firm based on a set of production inputs. The difference between a firm's maximum output and actual output is defined as the technical inefficiency (Wang & Wong, 2012). The model will use a flexible translog production function, which does not impose constant elasticity of substitution. The stochastic frontier model allows for relaxing the assumption that individual firms or industries always exhibit full efficiency (Wang & Wong, 2013).

Additionally, according to Mastramarco and Ghosh, the stochastic frontier analysis has the advantage of decomposing the residual into technical change, inefficiency, and statistical noise (2009). Mastramarco and Ghosh, citing Blomstrom, Lipsey, and Zejan (1994), argued that the translog production function is more appropriate to analyze low income countries where structural rigidities might be more in evidence (2009). The general specification of a frontier model is:

$$\ln Y_{ijt} = \beta \, lnX_{ijt} + (v_{it} - u_{it}), \quad (3)$$

where i and j are firm and industry subscripts, respectively, and t is year. Variable X is a vector of production inputs. v_{it} is a random error, assumed to have independent and identical (iid) normal distribution, i.e., v_{it} ~ N (0, σ_u^2) and u_{it} represents the technical inefficiency and is defined by the truncation (at zero) of the normal distribution with mean z_{it} and variance σ_u^2 (Bloch & Suyanto, 2009).

In addition, the inefficiency is assumed to be independent for different firms and years. The mean of the distribution can be represented as a linear function of certain determinants, included in the vector Z and w_{it} is an unobservable random variable (Bloch & Suyanto, 2009):

$$(4) \qquad u_{it} = \delta_0 + \sum_{j}^{J} \delta_j Z_{ijt} + w_{it}$$

Technical efficiency (TE) is defined as the ratio of actual output to the maximum output level. TE scores vary from zero to one, where one is the highest efficiency level (Bloch & Suyanto, 2009).

$$(5) \qquad \text{TE} = E[\exp(-u_{it}) | \varepsilon_{it}]$$

4.2.1 Empirical Specification for the Efficiency Function

Based on the general framework of a stochastic frontier analysis, the translog production function is expressed below in a log-linear form (Bloch & Suyanto, 2009):

$$(6) \qquad \ln(Y_{ijpt}) = \beta_c + \beta_K \, lnK_{ijpt} + \beta_L \, lnL_{ijpt} + \tfrac{1}{2}\beta_{KK} \, (lnK_{ijpt})^2 + \tfrac{1}{2}\beta_{LL} \, (lnL_{ijpt})^2 + \beta_{KL} \, (lnK_{ijpt} \text{ x } lnL_{ijpt}) + \beta_{TK} \, (T \text{ x } lnK_{ijpt}) + \beta_{TL} \, (T \text{ x } lnL_{ijpt}) + \beta_T \, T + \tfrac{1}{2}\beta_{TT} \, T^2 + v_{ijpt} - u_{ijpt},$$

where *i, j,* and *p* are firm and industry province subscripts, respectively, and *t* is year. Output (Y_{ijpt}) is measured by a firm's value-added, K represents physical capital and is measured by fixed assets of a firm, L is labor measured by a firm's total number of employees, and T is a time trend. v_{ijpt} is a random error, and u_{ijpt} represents the technical inefficiency (Wang & Wong, 2012).

The baseline average inefficiency function is represented by the following equation:

(7) $$\mu_{ijpt} = \delta_0 + \delta_1 FDI_{ijpt} + \delta_2 SFDI_{ijpt} + \delta_3 FSFDI_{ijpt} + \delta_4 lnRD_{ijpt} + +\delta_5\, GOV_{ijpt},$$

Firm's location and industry are included as dummy variables. I think that is important to control for a firm's location, since I am assuming that firms located in the capital city tend to be more efficient. Coefficient δ_2 captures the effect of sectoral FDI spillovers on a firms technical inefficiency (Bloch & Suyanto, 2009).

4.2.2 Results

A negative coefficient in the inefficiency function means that a particular Z factor (FDI, SFDI, FSFDI, R&D, and GOV) reduces the technical inefficiency or increases the technical efficiency (Bloch & Suyanto, 2009). Table 6 shows that FDI coefficient is negative and significant at the 5% level when I included the full sample of firms. This means that foreign firms tend to be more efficient than domestic firms. From table 6, column 2, the negative coefficient .027 suggests that other things being held constant, foreign firms are 2.7% more efficient than domestic firms.

The difference between foreign firms and domestic firms' efficiency appears to be small and might be caused by the inefficiency factors included in the inefficiency function. Some authors include in the inefficiency function a human capital variable, measured by the employees schooling levels (Ghosh & Mastromarco, 2009) or the age of the firm (Bloch & Suyanto, 2009; Wang & Wong, 2013). However, the data set didn't have information on these variables or the information was not complete, therefore I could not include these variables in the inefficiency function. For example, Wang and Wong (2013) found that foreign manufacturing firms in China were 46% more efficient than domestic firms and also that this result was consistent with previous frontier analyses.

The inefficiency model presents the same result regarding R&D as the productivity analyses. R&D coefficient is positive and significant in all the specifications. This means that in general, R&D seems to increase firms' inefficiency (table 6). Bloch and Suyanto study argued that the effect of R&D becomes stronger when there is an increase in human capital accumulation, which would be the case for higher education levels (2009). The authors also pointed out that their results seemed to suggest that countries benefit from foreign technology when they have the ability to exploit it. Therefore, my results conforms with Bloch and Suyanto's suggesting that Mozambique might still not have the human capital threshold to allow the firms to obtain positive impacts from investing in R&D or spillovers from R&D from foreign firms.

We can see from table 6 that the mean efficiency level of all the firms in Mozambique is 0.47. Bloch and Suyanto (2009) found that there were substantial regional differences in terms of efficiency in their study of 57 developing countries. These authors argued that the increase in efficiency from 1981 to 2000 was about 39% for the Asian countries but for the African countries the increase was only 27%. They also argued that the median efficiency for the African countries was the lowest and showed a decreasing path (Bloch & Suyanto, 2009). Figure 2 shows the mean efficiency of 10 industries from the 15 industries used in this study. Five industries were not included because they didn't have enough observations (electricity and gas, health and social, consulting, recreation, and other services). As we can see, the transportation industry is the sector with the highest mean efficiency of 0.75 in Mozambique and the lowest is the information and communication sector with a mean efficiency of 0.20. Figure 3 shows that foreign firms are more efficient than domestic firms in both sectors, namely, manufacturing and transport.

Table 8 shows that the technical efficiency for the domestic manufacturing sector presents a negative coefficient, significant at the 10% level for the sectoral FDI variable. This result indicates that the presence of FDI in the sector helps reducing the inefficiency of the firms. It could be the case that in this sector, there is some sort of positive spillovers from foreign firms to domestic firms. However, one striking result that I found was that using the technical inefficiency function, the sector FDI did not change firms' efficiency. I did not find any significant results using the full sample or using a subsample of foreign firms. This result is similar to the production function estimation using OLS, where there is a negative but statistically insignificant result for the sectoral FDI spillovers in the manufacturing sector.

5. Conclusions

Using a comprehensive firm level data set of Mozambican firms, from 2007-2010, I find that in general FDI has a significant positive effects on a firms' productivity. The FDI coefficient is positive and statistically significant though I find that this positive effect of FDI is only significant for small firms and not for big firms. The focus of this study is to find the spillover effects from FDI to firms in Mozambique. The estimations for spillover effects show that the presence of FDI, i.e., the sector FDI, hurts the firms in the same industry. This result is consistent with previous studies that argued that the positive effects of FDI for the country could be offset by the negative impact at the sector level, especially for domestic firms (Aitken & Harrison, 1999). The short time period of this study did not allow me to use lengths of difference. Therefore these results might be robust only in the short run.

The stochastic frontier model I used to measure efficiency showed that the FDI coefficient was negative and significant. This means that, in general, foreign firms tend to be more efficient than domestic firms. The mean efficiency level of all the firms in Mozambique is 0.47. The transportation industry is the sector with the highest mean efficiency of 0.75 and the lowest is the information and communication sector with a mean efficiency of 0.20. However, using the technical inefficiency function, I found that the sector FDI did not change the efficiency results. This result is different from the production function using OLS to estimate the coefficients.

Although this study didn't include employees' education levels, most of the literature is consistent regarding the positive spillover effects that education can have in terms of FDI. Therefore, further research should try to quantify the effect of spillover of FDI taking into account the employees' education levels. More so, the country policy should focus on increasing the education levels in the Mozambique, since there is already enough empirical evidence showing that human capital is very important to generate positive spillovers and enhance the countries' absorptive capacity. Another caveat of this study relates to the short period covered (2007-2010) which could not be used as an effective control for endogeneity, for example, applying lags. This limitation make it both difficult to use effective instrumental variables and hard to find examples in the literature to control for endogeneity (cherry picking problem).

Bergeijk and Mebratie (2013) argued that it appeared that the firm size, labour quality and export actually had a more significant effect on the development of firms, compared to that of foreign ownership. This implies that future research on firms' productivity should include these factors among the explanatory variables.

The findings of this study collaborate with previous studies that argued that positive foreign spillovers were not automatic. FDI can cause domestic firms' productivity to decrease. Therefore, for some countries, as it seems to be the case of Mozambique, FDI can be detrimental if the negative effect on domestic firms is bigger than the positive effect of having FDI. This has to be considered even after taking into account all the direct benefits that usually comes from FDI (employment, technology, capital inflow and revenues). Especially, when foreign firms are more capital intensive and also when they compete with domestic firms. In most cases, domestic firms are not prepared to face competition with foreign firms. In order to stay in the business they need to improve their productivity and efficiency.

As for a set of broad policy recommendations, enhancing the absorptive capacity of domestic firms seems to be the most important one to implement, along with better infrastructure and raising the quality of institutions, knowledge and human capital. Since Mozambique is rich in natural resources (coal, gas, and mineral resources), similarly to other authors, I would also recommend policies to promote industry diversification, to prevent the occurrence of the Dutch disease and enhance the impact on economic growth. There is significant empirical support suggesting that countries with abundance of natural resources tend to have an economy based on extractive industries, which might not be sustainable in the long run. This type of industrial structure has less impact in terms of creating sustainable economic growth, if not accompanied by specific policies that avoid its negative effects on other sectors of the economy.

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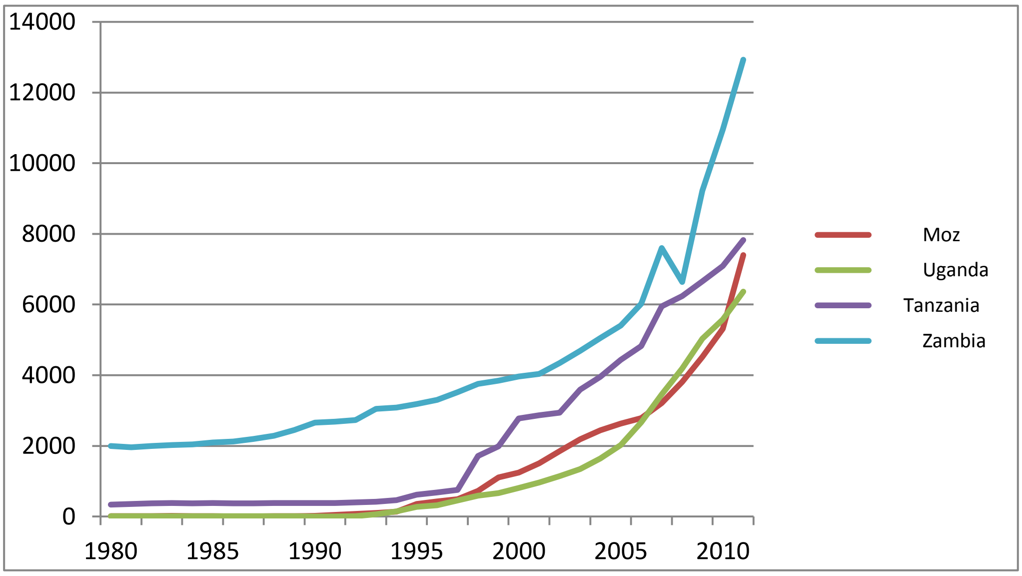
Figure 1: Stock of FDI in selected SSA countries (millions of USD)



Source: author's own compilation using data from UNCTAD

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Foreign ownership (FDI)	4,263	24.60	39.76	0	100.00
Sectoral FDI (SFDI)	15,743	32.25	27.23	0	87.80
Foreign ownership x Sectoral FDI (FSFDI)	4,263	1,239.42	2,243.07	0	8779.60
Private ownership	4,362	72.66	41.48	0	100.00
State enterprises	4,277	3.83	17.31	0	100.00
Employees	6,652	114.02	453.25	5	10,805.00
R&D	6,651	1,174,263	7,814,271	0	16.21
Fixed assets	5,619	14.91	2.56	5	24.68

Table 2: Full Sample and Domestic Firms (OLS)

	Full Sample			Domestic Firms		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
FDI	0.00400**	0.00413**	0.00410**			
	(0.00188)	(0.00187)	(0.00188)			
SFDI	-0.00756***	-0.00779***	-0.00791***	-0.00535**	-0.00533**	-0.00553**
	(0.00232)	(0.00231)	(0.00237)	(0.00266)	(0.00265)	(0.00271)
FSFDI	-2.73e-05	-3.09e-05	-3.02e-05			
	(3.59e-05)	(3.57e-05)	(3.59e-05)			
lnKL	0.375***	0.374***	0.374***	0.350***	0.351***	0.350***
	(0.0157)	(0.0158)	(0.0159)	(0.0195)	(0.0197)	(0.0197)
lnRD	-0.111***	-0.111***	-0.111***	-0.120***	-0.120***	-0.120***
	(0.00740)	(0.00743)	(0.00743)	(0.00944)	(0.00947)	(0.00948)
GOV		-0.00161	-0.00239		-0.00177	-0.00299
		(0.00155)	(0.00326)		(0.00168)	(0.00343)
GOVSFDI			1.94e-05			3.05e-05
			(6.49e-05)			(6.90e-05)
Ccity	0.364	0.372	0.372	0.638	0.644	0.644
	(0.385)	(0.386)	(0.386)	(0.495)	(0.495)	(0.496)
Trend	-0.151***	-0.149***	-0.150***	-0.190***	-0.191***	-0.192***
	(0.0361)	(0.0361)	(0.0361)	(0.0434)	(0.0435)	(0.0435)
Constant	8.379***	8.419***	8.426***	8.812***	8.815***	8.825***
	(0.486)	(0.487)	(0.488)	(0.624)	(0.625)	(0.626)
Industry dummies	Yes	Yes	Yes	yes	yes	yes
Province dummies	Yes	Yes	Yes	yes	yes	yes
Observations	3,540	3,526	3,526	2,379	2,377	2,377
R-squared	0.307	0.307	0.307	0.277	0.277	0.277

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3: Robustness Check for Firm's Size, R&D and Capital City Location (OLS)

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Small	Big	w/ R&D	w/o R&D	ccity	not ccity
FDI	0.00676**	0.00259	0.00891*	0.00351*	0.00614**	-0.00101
	(0.00340)	(0.00219)	(0.00456)	(0.00207)	(0.00269)	(0.00285)
SFDI	-0.00361	-0.0111***	-0.0117**	-0.00754***	-0.00947***	-0.0126***
	(0.00410)	(0.00282)	(0.00557)	(0.00257)	(0.00307)	(0.00375)
FSFDI	-7.40e-05	-5.17e-06	-8.93e-05	-2.32e-05	-3.44e-05	3.17e-05
	(6.95e-05)	(4.05e-05)	(9.06e-05)	(3.90e-05)	(5.71e-05)	(4.96e-05)
lnKL	0.378***	0.360***	0.565***	0.320***	0.266***	0.387***
	(0.0265)	(0.0198)	(0.0352)	(0.0168)	(0.0180)	(0.0242)
lnRD	-0.137***	0.0125			-0.108***	-0.112***
	(0.0106)	(0.0147)			(0.00927)	(0.0127)
Ccity	0.0855	0.324	1.292	-0.231		
	(0.684)	(0.356)	(0.804)	(0.262)		
Trend	0.101	-0.241***	-0.533***	-0.148***	-0.132***	-0.167***
	(0.0791)	(0.0404)	(0.142)	(0.0372)	(0.0475)	(0.0565)
Constant	9.777***	8.768***	5.727***	9.479***	9.464***	8.632***
	(0.911)	(0.651)	(1.029)	(0.398)	(0.514)	(0.578)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,434	2,106	752	2,789	1,993	1,547
R-squared	0.293	0.378	0.394	0.299	0.245	0.307

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4: Full Sample and Domestic Firms Aggregated in Three Sectors: Agriculture and Mining, Manufacturing and Services (OLS)

	(1)	(2)	(3)	(4)	(5)
		Full Sample		Domestic Firms	
Variables	Agric & Mining	Manufacturing	Services	Manufacturing	Services
FDI	-0.00137	0.00348***	0.00302**		
	(0.00313)	(0.000843)	(0.00144)		
SFDI	-0.0135	-0.00522	-0.00887***	-0.00370	-0.00705**
	(0.0113)	(0.00387)	(0.00278)	(0.00498)	(0.00328)
lnKL	0.547***	0.374***	0.313***	0.347***	0.315***
	(0.0676)	(0.0195)	(0.0267)	(0.0239)	(0.0337)
lnRD	-0.0478	-0.123***	-0.0771***	-0.130***	-0.0868***
	(0.0337)	(0.00898)	(0.0132)	(0.0114)	(0.0168)
Ccity	3.177*	-0.229	0.603**	-0.00556	1.146***

	(1.757)	(0.443)	(0.270)	(0.535)	(0.144)
Trend	-0.144	-0.223***	-0.0286	-0.242***	-0.0630
	(0.369)	(0.0430)	(0.0699)	(0.0526)	(0.0802)
Constant	3.687	9.743***	9.155***	9.725***	8.754***
	(2.277)	(0.560)	(0.422)	(0.683)	(0.388)
Obs.	209	2,371	960	1,637	647
R-squared	0.451	0.318	0.235	0.288	0.225

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5: Long difference for all firms (2007-2010) (OLS)

	(1)
Variables	Long Difference
SFDI	-0.00883*
	(0.00510)
lnKL	0.184***
	(0.0342)
lnRD	0.0166
	(0.0258)
Constant	0.419
	(0.863)
Observations	583
R-squared	0.133

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6: Technical Efficiency

Panel (a): Production function

	(1)	(2)	(3)
Variables		Full Sample	
ln(K)	-0.274***	-0.276***	-0.275***
	(0.0880)	(0.0880)	(0.0879)
ln(L)	0.954***	0.951***	0.949***
	(0.151)	(0.151)	(0.151)
ln(K) x ln(L)	0.00191	0.00228	0.00238
	(0.00932)	(0.00930)	(0.00930)
ln(K) ^2	0.0454***	0.0454***	0.0452***
	(0.00608)	(0.00608)	(0.00608)
ln(L) ^2	-0.124***	-0.124***	-0.123***
	(0.0265)	(0.0263)	(0.0263)
ln(K) x Trend	-0.0327**	-0.0329**	-0.0327**
	(0.0151)	(0.0151)	(0.0151)
ln(L) x Trend	0.00440	0.00448	0.00378

	(0.0325)	(0.0324)	(0.0324)
Trend	-4.004***	-3.948***	-3.943***
	(0.301)	(0.306)	(0.306)
Trend^2	2.099***	2.075***	2.071***
	(0.107)	(0.110)	(0.110)
Constant	17.65***	17.63***	17.63***
	(0.843)	(0.843)	(0.843)
Industry dummies	yes	yes	yes
Province dummies	yes	yes	yes

Panel (b): Technical inefficiency

FDI	-0.0258**	-0.0272**	-0.0409
	(0.0130)	(0.0139)	(0.0285)
SFDI		0.0129	0.00996
		(0.0159)	(0.0161)
FSFDI			0.000245
			(0.000371)
lnRD	0.422**	0.440**	0.450**
	(0.182)	(0.193)	(0.200)
GOV	-0.0176	-0.0190	-0.0196
	(0.0202)	(0.0218)	(0.0224)
Constant	-6.472	-7.618	-7.708
	(4.621)	(5.382)	(5.465)
Mean Efficiency	0.47	0.47	0.48
Gamma	0.86	0.87	0.87
Log likelihood	-6410.97	-6410.54	-6410.28
Wald Chi2	3696.54	3644.36	3641.24
Observations	3,526	3,526	3,526

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Figure 2: Mean Efficiency of 10 Selected Sectors in Mozambique

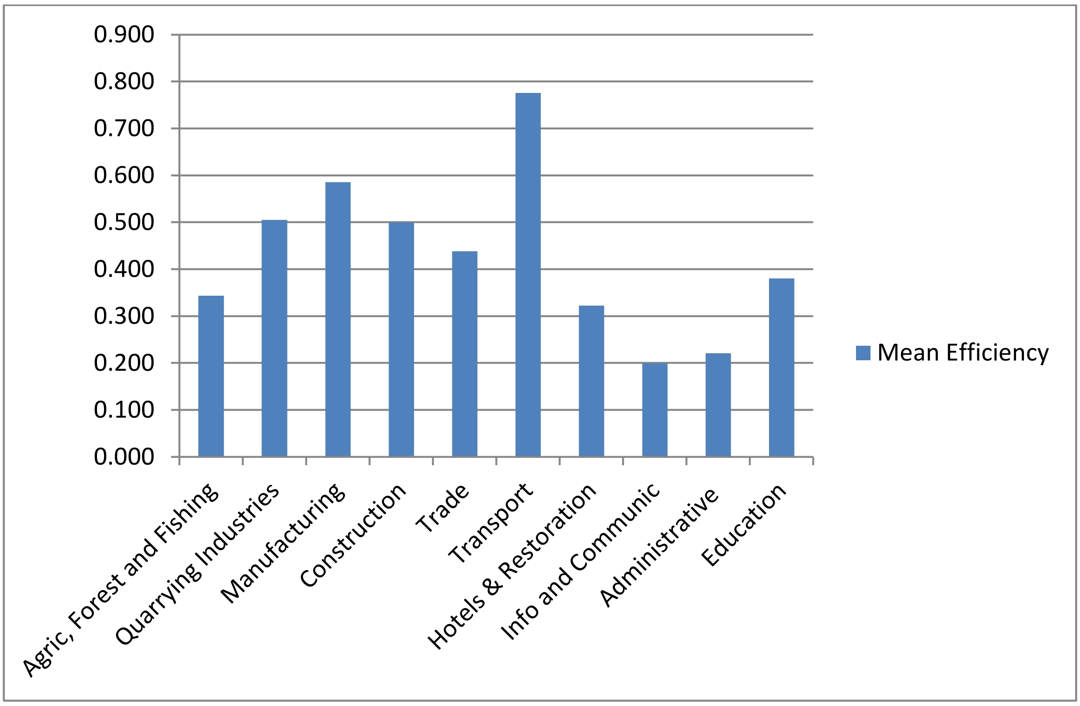


Figure 3: Mean Efficiency for Foreign and Domestic Firms in the Manufacturing and Transport Sectors

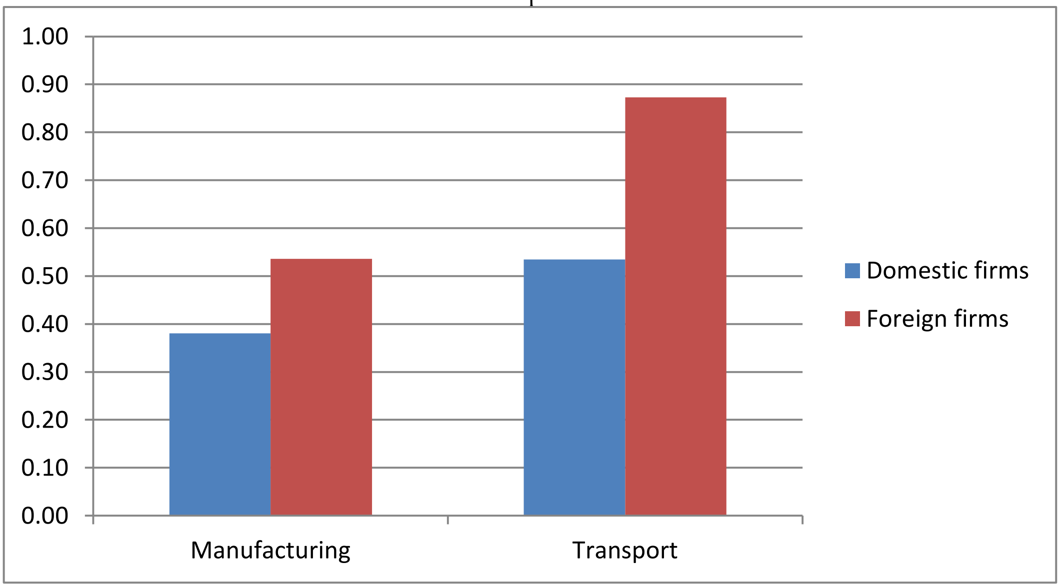


Table 7: Technical efficiency for domestic firms

Panel (a): Production function

	(1)	(2)
Variables		
ln(K)	-0.234**	-0.227**
	(0.109)	(0.109)
ln(L)	1.070***	1.081***
	(0.197)	(0.198)
ln(K) x ln(L)	-0.0189	-0.0205*
	(0.0120)	(0.0123)
ln(K) ^2	0.0469***	0.0472***
	(0.00766)	(0.00767)
ln(L) ^2	-0.0654*	-0.0630*
	(0.0360)	(0.0364)
ln(K) x Trend	-0.0262	-0.0265
	(0.0189)	(0.0190)
ln(L) x Trend	-0.0329	-0.0337
	(0.0409)	(0.0412)
Ttrend	-4.063***	-4.140***
	(0.370)	(0.388)
Trend^2	2.140***	2.179***
	(0.132)	(0.145)
Constant	17.08***	17.10***
	(1.014)	(1.018)
Industry dummies	Yes	Yes
Province dummies	Yes	Yes

Panel (b): Technical inefficiency

SFDI		-0.00570
		(0.00696)
lnRD	0.237***	0.214***
	(0.0665)	(0.0661)
GOV	-0.00923	-0.00732
	(0.00985)	(0.00853)
Constant	-1.434	-0.628
	(1.425)	(1.551)
Mean Efficiency	0.44	0.43
Gamma	0.68	0.64
Log likelihood	-4325.46	-4325.18
Wald Chi2	2065.01	1970.13
Observations	2,377	2,377

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 8: Technical Efficiency for Manufacturing Sector

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Full sample		Domestic firms		Foreign firms	
FDI	-0.0125***	-0.0121***			-2.122	-2.133
	(0.00390)	(0.00391)			(2.226)	(1.584)
SFDI		-0.00229		-0.0116*		2.173
		(0.00701)		(0.00646)		(2.410)
lnRD	0.196***	0.191***	0.169***	0.150***	20.81	21.54*
	(0.0389)	(0.0394)	(0.0342)	(0.0275)	(19.67)	(12.80)
GOV	0.000773	0.000922	0.00121	0.00257	-2.951	-2.756
	(0.00601)	(0.00575)	(0.00570)	(0.00424)	(4.836)	(4.343)
Constant	-0.199	0.0188	0.223	1.170*	-459.5	-572.4
	(0.742)	(0.950)	(0.606)	(0.609)	(435.2)	(352.1)
Mean Efficiency	0.41	0.41	0.39	0.38	0.53	0.54
Gamma	0.64	0.63	0.479712	0.391104	0.997863	0.997773
Log likelihood	-4264.19	-4264.14	-2980.53	-2979.22	-1226.4017	-1225.81
Wald Chi2	2401.20	2187.25	1338.29	1150.03	1171.15	1146.92
Observations	2,365	2,365	1,637	1,637	713	713

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix

Table 1: Literature on FDI Spillovers and Productivity

Author (s)	Country	Period	Data	Aggregation	Result
Blömstrom & Persson (1983)	Mexico	1970	cs	ind.	+
Blömstrom & Wolf (1994)	Mexico	1970/1975	cs	ind.	+
Kokko (1996)	Mexico	1970	cs	ind.	+
Haddad & Harrison (1993)	Morocco	1985-1989	panel	firm & ind.	Ambigous
Kokko et al. (1996)	Uruguay	1990	cs	firm	Ambigous
Blömstrom & Sjoholm (1999)	Indonesia	1991	cs	firm	+
Chuang & Lin (1999)	Taiwan	1991	cs	firm	+
Aitken & Harrison (1999)	Venezuela	1976-1989	panel	firm	Mixed
Kathuria (2000)	India	1976-1989	panel	firm	Ambigous
Kokko et al. (2001)	Uruguay	1988	cs	firm	Ambigous
Krugler (2001)	Colombia	1974-1998	panel	ind.	Ambigous
Hu & Jefferson (2002)	China	1995-1999	cs	firm	Mixed
Liu & Wei (2006)	China	1998-2001	panel	firm	+
Bloch & Suyanto (2009)	Indonesia	1988-2000	panel	firm	+
Wang & Wong (2013)	China	2002-2004	panel	firm	Mixed

Source: Adapted by the author based on Görg & Greenway (2001)

Table 2: Literature on FDI and Economic Growth

Author (s)	Country	Period	Methodology	Variables	Economic Growth
Borensztein et al. (1998)	69 LDC	1970-1989	cross-country regression and seemingly unrelated regression (SUR)	Human capital, technology diffusion and domestic investment	Dependent on the level on human capital and on the presence of absorptive capabilities of technologies in the host country. FDI contributes more to economic growth than domestic investment.
Alfaro et al. (2004)	OECD and non-OECD	1970-1995	cross-country regression	Local financial markets	Ambiguous role but significantly gains for countries with well-developed financial markets.
Wang & Wong (2008)	69 countries	1970-1989	Seemingly unrelated regression (SUR)	Human capital and financial development	Promotes productivity growth only when the host country reaches a threshold level of human capital and promotes capital growth only when a certain level of financial development is achieved.

Source: author's own compilation

Table 3: FDI Literature for African countries

Author (s)	Country	Period	Data	Variables	Results
Akinlo (2004)	Nigeria	1970-2001	ind.	Export, human capital, labor, government consumption, and financial depth.	Small impact on economic growth. Extractive FDI not growth enhancing as much as manufacturing FDI. Export and human capital have positive effects on growth. Financial development has negative effect.
Lumbila (2005)	47 countries	1980-2000	panel	GDP, human capital, trade, inflation, government consumption, infrastructure, GDI, population, M2, and aid.	FDI exerts a positive impact on growth in Africa. Corruption does not matter in the case of FDI.
Musonera (2007)	SSA	1990-2002	panel	Education (absorptive capacity), trade (openness), economic, and manufacturing value-added activities.	Spillover benefits depend heavily on FDI, absorptive capacity, and openness. These variables do not always exert a positive effect on economic and manufacturing growth activities. Spillover effects on 13 countries out of 27 tested.
Ng (2007)	14 SSA	1970-2000	panel, firms	GDP, labor, and capital.	Limited to higher total factor productivity growth. No evidence that FDI inflows led to higher technical change but some evidence of higher efficiency in 3 countries.
Warren-Rodriguez (2010)	Mozambique	2004	firms	Accumulation and formation of skills and technological capabilities	FDI is not reversing the negative trends in the metalworking and light chemicals sectors (manufacturing).
Fauzel (2012)	10 SSA	1990-2008	panel	Human capital, trade openness and institutional factors (legal system, corruption index, political risk), tariff, and exports.	Productivity gains in certain sectors. Spillover more prevalent in the primary sector. The services sector, the financial services, as well as the tourism sectors, registered a positive and significant productivity effect.

Kleynhans & Zwedala (2012)	South Africa	n.a.	firm	FDI, technology, and R&D.	FDI contributes little to secondary spillovers to other firms.

Source: author's own compilation

Table 4: Variable Definitions

Variable	Label	Definition
Y	Value added	Value added (in millions Meticais) which is the difference between core income and raw material expenses in core business
K	Assets	Fixed assets (in millions Meticais)
L	Employees	Total number of employees
FDI	% of FDI	Foreign ownership share relative to total capital in subscribed capital
SFDI	Sectoral FDI	Sales of the firm weighted by the total sales in its industry multiplied by the FDI.
FSFDI	Firm FDI and sector FDI interaction	Effect of foreign firms on other foreign firms
GOV	State-owned firms	Government ownership share relative to total capital in subscribed capital

Table 5: OLS Productivity Function with FDI as a Dummy Variable

Variables	(1)	(2)	(3)
FFIRM	0.283**	0.310***	0.308***
	(0.118)	(0.117)	(0.117)
SFDI	-0.00782***	-0.00799***	-0.00808***
	(0.00227)	(0.00226)	(0.00231)
FSFDI	-1.07e-05	-1.71e-05	-1.66e-05
	(2.63e-05)	(2.62e-05)	(2.63e-05)
lnKL	0.374***	0.374***	0.374***
	(0.0157)	(0.0159)	(0.0159)
lnRD	-0.110***	-0.111***	-0.111***
	(0.00739)	(0.00742)	(0.00743)
GOV		-0.00178	-0.00243
		(0.00154)	(0.00325)
GOVSFDI			1.63e-05
			(6.49e-05)
Ccity	0.348	0.354	0.354
	(0.386)	(0.387)	(0.387)
Trend	-0.151***	-0.149***	-0.149***
	(0.0360)	(0.0360)	(0.0361)
Industry dummies	yes	yes	yes
Province dummies	yes	yes	yes
Foreign Firm dummies	yes	yes	yes
Constant	8.399***	8.438***	8.444***
	(0.486)	(0.487)	(0.488)
Observations	3,540	3,526	3,526
R-squared	0.307	0.307	0.307

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6: OLS Productivity Function with FDI as a Dummy Variable and Without the Interaction term of FDI and Sectoral FDI (FSFDI)

Variables	(1)	(2)	(3)
FFIRM	0.268***	0.242***	0.242***
	(0.0552)	(0.0606)	(0.0606)
SFDI	-0.00951***	-0.00856***	-0.00861***
	(0.00115)	(0.00212)	(0.00216)
lnKL	0.323***	0.373***	0.373***
	(0.0126)	(0.0158)	(0.0158)
lnRD	-0.0836***	-0.110***	-0.110***
	(0.00603)	(0.00741)	(0.00741)
SFDI		-0.00200	-0.00239

		(0.00153)	(0.00323)
GOVSFDI			9.60e-06
			(6.37e-05)
Ccity	0.351	0.359	0.359
	(0.297)	(0.386)	(0.386)
Trend	-0.136***	-0.148***	-0.148***
	(0.0292)	(0.0358)	(0.0358)
Industry dummies	yes	yes	yes
Province dummies	yes	yes	yes
Foreign Firm dummies	yes	yes	yes
Constant	9.019***	8.453***	8.456***
	(0.376)	(0.485)	(0.486)
Observations	5,529	3,549	3,549
R-squared	0.276	0.307	0.307

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7: OLS Productivity Function Excluding Outliers

	Fixed assets<10billions (Mts)	Employ<5000	Excluding firms	All exclusions
Variables	(1)	(2)	(3)	(4)
FDI	0.00252***	0.00271***	0.00252***	0.00264***
	(0.000718)	(0.000721)	(0.000721)	(0.000723)
SFDI	-0.00892***	-0.00880***	-0.00867***	-0.00900***
	(0.00219)	(0.00218)	(0.00218)	(0.00220)
lnKL	0.372***	0.375***	0.372***	0.372***
	(0.0160)	(0.0159)	(0.0159)	(0.0160)
lnRD	-0.110***	-0.111***	-0.110***	-0.111***
	(0.00746)	(0.00742)	(0.00743)	(0.00746)
GOV	-0.00213	-0.00298	-0.00282	-0.00236
	(0.00356)	(0.00323)	(0.00323)	(0.00356)
GOVSFDI	1.38e-05	3.88e-05	3.09e-05	2.44e-05
	(6.95e-05)	(6.45e-05)	(6.43e-05)	(6.95e-05)
Ccity	0.377	0.377	0.375	0.374
	(0.387)	(0.385)	(0.387)	(0.386)
Trend	-0.147***	-0.148***	-0.148***	-0.146***
	(0.0361)	(0.0361)	(0.0361)	(0.0362)
Constant	8.494***	8.429***	8.479***	8.482***
	(0.489)	(0.487)	(0.488)	(0.489)
Observations	3,513	3,517	3,515	3,499
R-squared	0.303	0.308	0.305	0.303

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1