Foreign Firm Ownership and Productivity Spillovers in the Southern African Development Community (SADC) Region

Paul J Dunne and Nicholas Masiyandima

ERSA working paper 596

April 2016

Economic Research Southern Africa (ERSA) is a research programme funded by the National Treasury of South Africa.

Foreign Firm Ownership and Productivity Spillovers in the Southern African Development Community (SADC) Region*

Paul J Dunne† and Nicholas Masiyandima‡

April 12, 2016

Abstract

The study uses firm level data from the World Bank Enterprise Surveys and employs alternative techniques to identify and estimate the within and intra-industry productivity impact of firm foreign ownership in SADC. Using firm labour productivity and employing sector fixed effects to identify the impact of foreign firm ownership on productivity, we find results that strongly suggest the existence of positive within firm and intra-industry FDI productivity spillovers for both small and large firms in the region. The productivity gains are, however, larger for small firms than for large firms suggesting greater productivity spillover advantages for the relatively technologically backward small firms. Similarly, there is heterogeneity with regard to productivity spillovers across individual countries, with the relatively technologically advanced countries such as South Africa and Mauritius experiencing larger intra-industry spillovers while less technologically endowed countries enjoy larger within firm gains

Keywords: Growth; development; firm; technology; spillovers; productivity; FDI; SADC

JEL classification: O33

1 Introduction

The issue of cross country income differences is topical in studies on growth with various propositions being made about the source of the differences. Studies by

*We acknowledge funding from the African Economic Research Consortium. We are grateful for valuable comments from participants at the AERC Bi-annual Conferences (June and December 2013), the Centre for the Study of African Economies (CSAE), 2014 Conference, the University of Cape Town, School of Economics Seminar Series and the anonymous referee for their fruitful comments on the paper. However, all remaining errors are ours.

†SALDRU, University of Cape Town, School of Economics. Tel: +27 793 521 770, Email: john.dunne@uct.ac.za

‡Corresponding Author. School of Economics, University of Cape Town. Tel: +27 793 521 770, Email: nicholas.masiyandima@uct.ac.za

Banerjee and Duflo (2005) and Hsieh and Klenow (2009), for example, suggest that part of the cross country differences in per capita incomes results from productivity differences at firm and industry levels, with Klenow and Rodriguez-Clare (2005) noting that differences in within-firm efficiency and productivity emanate from differences in rates of international technology diffusion across countries. Klenow and Rodriguez-Clare (2005), therefore, imply that increases in a country's aggregate growth emanate from improvements in firms' technical efficiencies. Similarly, Hsieh and Klenow (2009) arguing from the resource misallocation hypothesis, suggest that improving resource allocation efficiency among firms can raise a country's aggregate productivity and per capita income. It is clear that both models of within firm efficiency and those that are based on resource allocation efficiency across firms and industries suggest the importance of firm productivity in driving aggregate productivity.

Improvement in resource allocation can be achieved by the institution of market reforms that are inclined towards more competitive systems free of distortionary selective taxes and subsidies, for example, but a question that has been widely asked and researched on is how within firm technical efficiency can be improved (Romer, 1994). In one of their perspectives, endogenous growth theorists such as Romer (1994) and Mankiw, et al (1992) suggest that the driver of technology growth is productivity externalities emanating from R&D, innovation, human and physical capital investment. Thus countries with higher investment expenditures on research institutions, education, and infrastructure are expected to have accelerated growth, compared to those with low innovation. At firm level, the differences in country level productivity growth emanates from failure by firms to invest adequately in firm-specific capital and technical know-how, with firms that devote more resources and managerial time to accumulating more knowledge capital expected to experience higher growth that contribute to accelerated growth for the economy.

While R&D and human capital development are plausible ways of improving firm level technical efficiency, most developing countries often have limited resources and capacity to undertake meaningful R&D and innovation. Similarly, resource reallocation is likely to be difficult for the countries given that most of the countries tend have structural and institutional rigidities such as distortionary subsidies and taxes in their product, credit and labour markets that restrict their ability to raise firm productivity through meaningful resource re-allocations (Hsieh and Klenow 2009). Consequently, the countries have relied more on foreign sources of technology such as FDI and trade as the immediate feasible options to access modern advanced technology, with Keller (2004) suggesting that foreign sources of technology account for at least 90% of the developing countries' domestic productivity growth.

In a model of international technology, Barro and Sala-i-Martin (2004) suggest that technologically poor countries can access advanced technology from countries with advanced technology through a leader follower catch-up mode involving processes of new innovations in the advanced economies and imitation by the technology poor countries, implying that poor countries that are more open to trade and capital flows should accelerate and converge towards

higher income levels faster than otherwise. Similarly, Liu (2008) has a model suggesting that the presence of multinational corporations is positively related to the accumulation of firm-specific capital in the FDI host country by way of their positive effect on local innovation possibilities, while Blomstrom and Kokko (1998) suggest that firms in countries hosting more MNCs are forced to improve their productive efficiency due to stiffer competition they face from the MNCs. These models suggest that firms in the developing countries stand to benefit from the domestic presence of MNCs.

Given these propositions, the question which inspires this study is whether an increase in developing countries' exposure to foreign sources technology can effectively transmit higher technology and productivity externalities in SADC. In more specific terms, we consider how foreign firm ownership in the Southern African Development Community (SADC), which is mainly comprised of developing countries in Sub Saharan Africa, has impacted on firms' productivity in the region. We argue that technology growth is critical for the region and that FDI should be one important source of technology for the countries given their limited R&D and internal innovations. In addition to the direct transfer of technology associated with FDI, Blomstrom and Kokko (1998) add that local firms also benefit from better international markets exposure and access over time though associating with the MNCs. These FDI effects suggest that there can be potential benefits from the existence of MNCs in the region.

The perceived gains from FDI have led most developing countries to institute a number of diverse institutional reforms, FDI absorption capacities and fiscal incentives such as tax and tariff exemptions in order to attract and retain foreign investments. Coincidently, there has been a significant increase in the global stock of inward foreign direct investment over the years, with developing countries getting an increasing share of the flows (UNCTAD, 2014). Concurrently, the SADC region has had significant growth in inward FDI for over a decade, with the region hosting an average of about 36% of FDI flows to Africa between 2000 and 2009 and a cumulative of US$83 billion of FDI in greenfield projects in manufacturing and services between 2009 and 2013 (AfDB, 2011 and UNCTAD, 2014). The increase in FDI for developing countries is potentially a result of the incentives and support measures for FDI that these countries have been instituting. However, a question which remains debatable is whether there have been commensurate gains from the resource outlays and FDI inflows.

Skeptics of the role of FDI in development include the dependency neo-Marxist school, which sees FDI as benefiting the FDI source countries and the modern economy at the expense of the host and periphery (Wilhelms, 1998). In their criticism, MNCs are regarded as entities that suppress and distort the development process and unduly manipulate the political systems of the countries in which they invest (Findlay, 1978). Similarly, Rodrik (1999) has remarked that studies that suggest the existence of productivity spillovers from FDI to the host country are extravagant while Ajayi (2006) has hinted at the possibility of less developing countries "racing to the bottom" in excessive support measures for foreign direct investment. In addition, Aitken and Harrison (1999) puts forward a market stealing hypothesis suggesting that FDI crowds out do-

mestic investment and productivity in the FDI host countries while UNCTAD (2013) has reported a global decline in FDI's contribution to exports and value addition growth.

In the SADC region, however, there has been high growth during the high FDI growth period, with the region growing by up to an average of about 6.4% between 2004 and 2008 and remaining above 4% since 2009 (AfDB, 2011). Notwithstanding the high growth rate over the period, there have been heterogeneities in the pattern of growth across countries which do not seem to tally with FDI patterns, with some major FDI recipient countries in the region including South Africa, Angola and Zambia, growing by below the region average growth. These facts suggest a clear puzzle that requires further research for a more informed evidence based analysis of the relationship between FDI and productivity growth.

The divergent perspectives and evidence on the productivity and growth impact of FDI are a motivating puzzle which this study attempts to address for the SADC region. In more specific terms, the study investigates the benefits of foreign firm ownership to the host SADC countries in terms of its impact on within firm and intra-industry productivity in the region, with the FDI productivity gains estimated for the pooled SADC firms, for individual countries and for small and large firms in the region. To achieve these objectives, the harmonized World Bank Enterprise Surveys firm data is used. The data covers 12 out of the 15 countries in the region. To the best of our knowledge, no cross country study on the impact of FDI on firm productivity in the region has been undertaken and the study should be a novel contribution to the literature on the FDI productivity spillover hypothesis. The results that we obtain are informative with regard to both the debate on the subject and for suggesting possible policy handles for the region and developing countries at large.

The organization of the study is as follows: the next section discusses literature on the FDI technology spillover hypothesis; section 3 presents the theoretical framework of the study; section 4 presents data description; sections 5 and 6 deal with the estimation and discussion of the study results and section 7 concludes the study and provide some policy recommendations.

2 Literature Review

Productivity spillovers from foreign direct investment were formally recognized and modelled since the 1960s, with MacDougall (1960) explicitly including them among the possible general welfare effects of foreign direct investment. Other early contributions were provided by Corden (1967), who theoretically looked at the effects of FDI on optimum tariff policy, and Caves (1971), who examined the welfare effects of FDI as well as how FDI influences the industrial structure. The presence of MNCs was perceived as a competitive force, which reduces profits, while improving efficiency and productivity. Because the aim of the studies was on welfare effects of FDI, FDI productivity externalities were discussed together with other indirect effects that came into the welfare assessment function, such

as those arising from the impact of FDI on government revenue, tax policies, terms of trade, and the balance of payments. Since then, models that systematically consider the mechanisms and effects through which FDI productivity externalities are realized have been put forwarded.

Models of FDI productivity externalities envisage foreign direct investment productivity spillovers as occurring when the domestic presence of MNCs leads to productivity or efficiency benefits to local firms, and the MNCs' are not able to fully internalize the benefits. As suggested by Blomstrom and Kokko (2003), the gains include improvements in firms X-efficiency, allocative efficiency as well as international market access spillovers realized by local firms through their interactions with the MNCs. Various channels have been suggested for FDI productivity spillovers to local firms, which include the imitation of foreign technology by local firms; informal and formal interactions of workers between the MNCs and local firms through hiring and firing; backward and forward linkages between MNCs and local firms, and demonstrations effects.

Findlay (1978) proposed one of the early models of FDI productivity spillovers emphasizing the direct contacts between the MNCs and local firms and or their workers and technology diffusion was more seen as spontaneously taking place between MNCs and local firms that are situated in proximity. Thus, Findlay (1978) suggests that the spread of technology from advanced economies to the backward economies is facilitated by the presence of international corporations in the underdeveloped countries. In his model the rate of technology advancement in the backward economy receiving FDI positively depends on the technology gap between its own level of technology and that of the advanced country, implying that FDI does not only transfer technology to the FDI host country but also result in productivity and income convergence between the FDI source and host countries.

Wang (1990) has extended Findlay (1978)'s model by suggesting that FDI and the growth of domestic human capital are complimentary and endogenously depending on each other. In his model, an increase in FDI induces more investments in human capital, which enhances the catch-up potential of the recipient country. Higher levels of human capital on the other hand also attract more FDI inflows. In the whole, the relationship creates an opportunity for the FDI recipient country to expand its productivity The perceived complementarities between FDI and domestic investment emanate from the growth in income associated with the presence of the MNCs The limitation with models by Findlay (1978) and Wang (1990), however, is that they seem to suggest a passive role for individual firms in terms of building firm specific capacities to harness technology externalities from FDI, with Findlay (1978) likening the process of technology transmission to the spread of a contagion disease just requiring the interaction of foreign corporations and domestic firms to occur. This seem to suggest that the role of creating FDI absorptive capacities is delegated to governments.

The importance of the FDI absorptive capacities in the FDI host countries is explicitly modelled by Walz (1997) and Baldwin, et al (1999) who refer to the FDI absorptive capacities as the knowledge-capital sector. In Baldwin, et al (1999)'s model, the sector's productivity in terms of new innovations and

technology positively depends on the amount of foreign technology brought by foreign corporations which influences the probability of new innovation and technology discoveries. Of late, some MNCs have resorted to building up their own R&D as exemplified by cases of IBM in Kenya and Panar Seed in Southern Africa (UNCTAD, 2014), with similar productivity spillover implications as those of national R&D centers except that productivity spillovers from individual firms' R&D are likely to be narrower and more firm specific than public R&D centres that are more general in scope.

Other models that involve the building of firm specific capital by the MNCs include models by Fosfuri, et al (2002) and Blomstrom and Kokko (2003) which explicitly model productivity spillovers from FDI to local firms through deliberate worker training and human capital development by the MNCs. Fosfuri, et al (2002)'s model emphasizes the protective attitude of the MNCs which extend their firm-specific technical and managerial know-how to local affiliates and pay the trained workers premium remunerations in order to ensure that they do not cross over to local firms. Alternatively, Fosfuri, et al (2002) suggests that the foreign firm may resort to exporting rather than investing off shore to protect its knowledge capital. However, productivity spillovers from the MNCs to domestic firms eventually occur when local firms appropriate the MNCs' technology by hiring the trained managers or when the managers start their own businesses.

Blomstrom and Kokko (2003), propose a wider relationship between FDI and domestic capital, in which higher levels of human capital are an FDI absorptive factor, which attracts FDI while at the same time, the MNCs provide scholarship and training for locals through direct funding of tertiary institutions, direct training of their workers and through providing prestigious employment opportunities to locals who advance in schooling. Their model suggests that there is an interaction effect between domestic human capital and FDI which leads to domestic human capital development and growth in productivity while at the same time creating higher FDI absorptive capacities. Thus according to the model, the effect of FDI on domestic productivity should be self-perpetuating through the induced human capital development.

A much broader model of FDI productivity spillover allowing for different forms of building productivity enhancing capacities by Ehrlich et al (1994)'s firm specific model capital accumulation model. In its version as modelled and utilized by Ehrlich et al (1994), the model suggests that the amount of resources and time devoted to the accumulation of firm-specific capital by the firm is dependent on the relative returns on marginal investment on the firm-specific capital to production. The broadness of the model emanates from its flexibility to handle different forms through which firms can accumulate knowledge capital from the local presence of MNCs which include setting up R&D centers and human capital training. As such the model is favorable to this study.

Liu (2008) has suggested that the local presence of foreign technology provides local firms with greater chance of new discoveries hence improve returns from time invested in the accumulation of firm-specific capital at the margin. This implies that higher levels of FDI incentivize domestic firms to produce more firm specific capital and in the process to improving domestic firms' pro-

ductivity. An important feature of the model by Liu (2008) is its ability to separate the short term productivity impact of FDI in the host economy which is likely to be negative as firms divert resources to accumulate the firm specific capital and the positive long run productivity impact occurring as returns from the built firm specific capital start to accrue. Liu (2008), however, does not emphasize the potential differences in the productivity impacts of intra-industry, within firm and extra-industry FDI and we argue that the effect of FDI on the marginal profitability of firm-specific capital investment should depend on whether it's within the same firm or sector or not.

Models of technology spillover from FDI to local firms suggest that the transfer of technology is not without costs. Besides the implied cost of accumulating firm-specific capital, the tacit nature of technology means that there are costs associated with diffusion of technology from the MNCs to local firms that require domestic firms to spend resources to access the technology. By suggesting that MNCs have an incentive to prevent technology leakage to local competitors through the use of intellectual property rights, production and trade secrecy and paying higher wages to trained workers, Fosfuri, et al (2002) imply that local firms can not freely access technology from the MNCs without expending some resources. Similarly, Aitken and Harrison envisage a market stealing hypothesis in which the MNCs crowd out domestic firms in local markets while Blomstrom and Kokko (1998) note that the entry and presence of MNCs disturbs existing domestic market equilibrium and forces local firms to take costly action to protect their market shares. The existence of these costs imply that the process of international technology transfer is not spontaneous but needs deliberate efforts by host countries to learn and transfer the technology, hence the appropriateness of Liu (2008)'s firm specific capital accumulation model which combines the possibility of both costs and benefits in the process of technology transfers.

Having looked at the various models of international technology transfers, we now turn to the empirical findings on the subject, which mainly fall into three categories. First, there are case studies such as by Moran (2001), which are highly informative but lacking external validity outside the case study because they pertain to particular FDI projects or specific countries. Then, there are industry-level studies, which have mostly used cross-sectional data and most of which have confirmed the FDI productivity spillover hypothesis, with higher foreign firm ownership leading to higher average value added per worker in the sector. These have been criticised for their inability to establish cause and effect between FDI and productivity or value addition. Finally, there are studies based on firm level panel data, which have sought to identify causality between productivity and FDI. The studies largely confirm productivity spillovers in developed countries while suggesting weak or no spillovers for developing countries.

Most of the early studies on the productivity spillovers of FDI indirectly tested the spillover effects of FDI through estimating the impact of MNCs on firm profit margins under the prediction that the presence of MNCs should lower monopolistic tendencies and lower profit margins (Caves, 1974). Caves (1974) estimated productivity spillovers in manufacturing industries in Canada, Australia and the United States by way of associating the spillover gains with

inter-industry differences in the share of the market occupied by foreign firms in Canadian and Australian markets and finds results that confirm the gains. Similarly, Globerman (1979) estimated the differences in Canada's manufacturing industries labour productivity against various measures of foreign ownership and finds a positive relationship between productivity differences across plants and the amount of foreign ownership in an industry and suggest that the results confirm the FDI productive Spillovers.

Other relatively more recent studies have estimated FDI productivity spillovers by closely linking the FDI source and host countries in a pairwise manner to see if there is any productivity convergence between the source and host countries. These include Nadiri (1991) who confirms the spillover hypothesis for U.S. direct investment in plant and equipment in France, Germany, Japan, and the U.K's manufacturing sectors and Blomstrom and Wolff (1994) who find evidence of manufacturing sector productivity convergence between the U.S and Mexico as a result of U.S FDI in Mexico's manufacturing sector. Because these studies are at industry or individual country levels, they are informative. Their limitation, however, is that they are not easily generalizable given their confinement to a specific country or industry.

Broader FDI technology spillovers are estimated by Keller and Yeaple (2009) who investigated the presence of international productivity spillovers through imports and foreign direct investment (FDI) for the US manufacturing firms between 1987 and 1996 and confirm both spillovers on the firms. The study finds that FDI leads to substantial productivity gains for domestic firms of about 11% of total productivity growth in U.S. firms, while imports-related spillovers are also found to be significant but weaker than those from FDI, thus suggesting the superiority of FDI in transmitting internationally. In another relatively developed economy, Edwards (2002) in a case of South African firms concludes that large foreign firms in export sectors are more productive than domestic owned firms. He finds that foreign firms are more skill and capital intensive than domestic firms and concludes that technological transfers through foreign ownership and export competition increase the skill intensity of production and productivity. The wider confirmation of the FDI spillover hypothesis for developed countries, seem to be in line with the argument that FDI can only transmit productivity externalities in environments of good absorption capacities given the level of development of the capacities in the advanced economies.

The importance of FDI absorption capacities is confirmed by most of the estimations of FDI productivity spillovers in less developed or developing countries where FDI absorptive capacities are relatively low which fail to confirm the spillover hypothesis. The studies include Haddad and Harrison (1993), who fail to confirm productivity spillover effects from FDI for Moroccan firms while Aitken and Harrison (1999) in a study of Venezuelan firms find negative intra-industry productivity effect of FDI on domestic firms and put forward a "market-stealing" hypothesis in which domestic firms are squeezed out by the MNCs in domestic to explain the negative effect of FDI on firm productivity. Similarly, Chen (2007) estimates the relationship between FDI and regional innovation capability in China and fails to confirm FDI spillover effects towards

the innovation outputs of the R&D institutions. He instead finds that higher domestic R&D expenditure strengthens the FDI spillovers for domestic innovation, suggesting that developing countries should build domestic FDI absorption capacities, especially in R&D in order to enjoy productivity spillovers from FDI.

Liu (2008) and Javorcik (2004) have, however, suggested that evidence that discard the FDI productivity spillover hypothesis are a result of wrong model specifications. Using the firm specific capital accumulation model and separating the short and long run effects of FDI for the Chinese manufacturing firms, Liu (2008) finds evidence suggesting that an increase in firm foreign ownership lowers the firms' short-term productivity but significantly raises their long-term rate of productivity growth. In overall terms, he concludes that FDI has productivity spillovers which increase and become significant in the long-run. His results suggest that it is important to look at the impact of FDI on productivity from a long term perspective than from short term perspectives only since the process of accumulating firm specific capital takes time.

Similarly, Javorcik (2004) argues that studies which fail to confirm the FDI productivity spillover hypothesis are simply looking for the spillovers in the wrong place and suggest that studies should estimates the productivity spillovers in backward and forward linkages between domestic and foreign firms. In her study on Lithuanian manufacturing firms, Jarvocik (2004) finds evidence in support of positive productivity spillovers taking place through contacts between foreign affiliates and their local suppliers in upstream sectors and for joint ventures between foreign and domestic ownerships with not spillovers associated with wholly foreign owned firms. Jarvocik (2004) suggests that technology is more easily shared when the MNCs has direct control over the local affiliates and in mixed firm ownerships since such ownership types allow for a closer cross pollination of ideas. The study suggests that there is limited technology transfers when the MNCs are wholly foreign owned, implying a narrower channel of technology diffusion. Thus the estimated productivity spillovers are narrower than those suggested by the wider channels through which MNCs can transfer technology to local firms.

3 Modelling Technological Spillovers

In estimating the firm productivity impact of foreign firm ownership in SADC, this study is inspired by the firm-specific capital accumulation theoretical framework. The model gives an explicit pro-active role to the firm in the process harnessing the FDI productivity spillovers. It envisages firm-specific capital accumulation as an input in the firm production function. The accumulation of capital endogenously depends on optimum allocation of managerial time by the firm between production of technical know-how and firm output. The model is dynamic in nature and not directly applicable to cross section data. To suit our cross section data, we assume that when the firm is observed ex post, it has gone through its value maximizing choices of firm-specific capital investment. The firm is, therefore, observed as a high productivity or low productivity en-

tity depending on its past firm-specific capital accumulation. We extend the model by Liu (2008) to allow different impacts of firm and sector FDI on firm productivity as suggested by Aitken and Harrison (1999). Following Liu (2008), the firm's production function is specified as:

$$Y_{ijt} = A_{jt} B_{ijt} L_{ijt}^{\alpha} K_{ijt}^{\beta} [H_{ijt} M_{ijt}]^{\gamma} \tag{1}$$

Where Y_{ijt} is the log of output for firm i in industry j.A_t represents exogenous technology which is common to all firms; B_{it} is the state of technology that is embodied in FDI for the firm. This is at firm level. L_{it} and K_{it} are the logs of labour and capital employment by the firm; H_{it} is the stock of firm specific capital. H_{it} is unique to the firm and it depends on the effort, resources and time that the firm devotes to R&D, imitation and learning from observing techniques employed by the MNCs. It is positively related to the amount of technical information the firm has. M_{it} is the proportion of time the firm devotes to current output production out of its total available production time assumed to be unit. Through its optimizing decision, the firm determines proportion of production time (M_{it}) and that for production of the firm specific capital ($1 - M_{it}$). The allocation of firm time between M_{it} and $1 - M_{it}$ affects the firm's labour input through a positive or negative scaling factor depending on whether the firm chooses to devote less or more of its managerial time to the production of firm specific capital.

The production of H positively depends on three factors. These are the current stock of the firm specific capital the firm has; the amount of time the firm devotes to the accumulation of new stocks $(1 - M)$ and the amount of technical information the firm has (G) (Liu, 2008).

$$H_{ijt} = r H_{ijt-1} [1 - M_{ijt}]_{\delta} G_{ijt}^{\varphi} \tag{2}$$

The information input in the production function (G) is either internal to the firm or is in the public domain. An inflow of FDI releases new information on advanced methods of production through channels such as demonstrations and worker turn over. G, therefore, increases with FDI in the country. The parameter r is an efficiency parameter of the firm specific capital production. The parameter $0< \delta <1$ indicates whether there are diminishing, constant or increasing returns to the amount of time devoted to the production of firm specific capital. φrepresents the intensity of technology spillovers from FDI to local firms. The parameter is at least greater than zero. If $\varphi \geq 1$ there are increasing returns from FDI technology spillovers and if $\varphi = 0$, FDI does not confer any technology spillovers to the production of H_t.

Following Aitken and Harrison (1999), we hypothesizes that the magnitude of φ depends on the magnitudes of sector and firm level FDI. The parameter increases with FDI in the firm's sector and with respect to the firm's foreign ownership percentage. The differences in the impact of sector FDI on firm specific capital follows from the fact that sector FDI is more accessible and provides more relevant information to the firm than FDI in other sectors, while the differences in the impact of foreign firm ownership is due to the fact that

firms with more foreign ownership interact and interface more with other MNCs in terms of production linkages as well as worker turnovers than those with less foreign ownership. The log of firm's productivity from equation 1 is thus defined as:

$$TFP_{ijt} = \frac{Y_{ijt}}{L_{ijt}^{\alpha} K_{ijt}^{\beta}} = A_{jt} B_{ijt} [H_{ijt} M_{ijt}]^{\gamma} \tag{3}$$

Equation 2 links firm and sector FDI to the firm productivity equation through H. Substituting equation 2 into 3 gives a firm productivity equation, which is an implicit function of firm and sector foreign ownership, the past stock of firm specific capital, exogenous technology, and the level of technology embodied in foreign capital. The choice of M has two opposing effects on firm productivity. A reduction in the amount of time allocated to output production has a negative scale effect on current firm productivity. At the same time it increases the growth of the firm specific capital, which in the long term improves productivity. The net effect on productivity, depends on which effect dominates. Intuitively, the firm's optimum solution of M is at the point where the marginal profitability of time allocated to producing firm specific capital is equal to the marginal profitability of time allocated to output production.

From equation 3, it follows that an increase in FDI increases the marginal return of time allocated to production of firm specific capital through the potential increase in the firm's output productivity, with the effect depending on the level of foreign firm ownership, as well as on the total level of foreign ownership in the firm's sector. Firms in sectors with higher FDI or those with more foreign ownership have greater incentives to invest more in the firm specific capital and create higher scope for improved productivity. In a cross section of firms, firms with higher foreign ownership or in sectors with more FDI stocks are likely to have higher firm specific capital and so higher productivity.

On the basis of this analytical framework, we motivate the empirical model that we estimate to establish firm level productivity spillovers for firms in SADC. An estimable presentation of the firm-specific capital model in logarithm takes the form of equation 4, for which we have dropped the time subscript the on the basis that our data is cross sectional. Similar versions of the model have also been used by Aitken and Harrison (1999) and Liu (2008).

$$\begin{aligned} Q_{ij} = \pi_0 + \pi_1 FDI_{firmij} + \pi_2 FDI_{\sec j} + \pi_3 FDI_{firm*\sec ij} + \pi_4 X_{ij} \\ +\varepsilon_c + \varepsilon_I + \varepsilon_T + \varepsilon_i + \varepsilon_{ijc} \end{aligned} \tag{4}$$

With Q_{ij} proxing for the FDI productivity spillovers on firm i in sector j, which are the logarithm of labour productivity and total factor productivity in our case. FDI_{firmij} is the share of foreign equity participation at the firm level. If foreign ownership in a firm increases its productivity, the coefficient on FDI_{firmij} should be positive. The coefficient reflects the within firm productivity effect of changes in foreign firm ownership. $FDI_{\sec j}$ is a measure of the presence of foreign ownership in the industry, whose computation is detailed in the data section. On the basis of the productivity spillover hypothesis, the coefficient on industry FDI is expected to be positive. $FDI_{firm*\sec ij}$, is the

level of industry foreign ownership for firms with foreign ownership. It allows for inference on whether the effects of the MNCs' presence on other foreign firms differs from the effects on domestic firms.

The matrix X_{ij}captures other determinants of firm productivity that include firm size, firm age, infrastructure obstacles, corruption, credit constraints, human capital, industry regulations, access to land, institutions and political stability measures, which are all present in our data set. Shocks to firm productivity represented by $\varepsilon_c, \varepsilon_I, \varepsilon_T and \varepsilon_i$ are in respect of country, industry, year and firm fixed effects. They are controlled for by the inclusion of their respective dummies obtainable from the data, except for the firm specific effects. The year dummy takes account of the differences in the years the country surveys were done in light of the fact that technology evolves over time. The random shocks to firms' productivity are captured by ε_{ijc} and are assumed to be exogenous to the productivity covariates in the estimated model.

4 Data and Variables

In undertaking the study, we use data on manufacturing firms from the World Bank Enterprise Surveys[1] which were done between 2006 and 2011 for countries in SADC. All the surveys are consistent and harmonized by the use of standardized survey instruments and a uniform sampling methodology across countries (World Bank, 2007). This enables us to pool the survey data. Countries for which the survey data is available and included in the study are Angola, Botswana, DRC, Lesotho, Malawi, Madagascar, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Data problems were in respect of Malawi, Lesotho and Seychelles, with Malawi's survey done in 2005 before the global survey approach and not easily poolable with other countries while the survey for Lesotho lacks critical variables on worker education and firm capital stocks and Seychelles does not have the surveys. The three countries were, therefore, left, with the remaining 12 countries constituting about 3000 manufacturing firms. South Africa has the largest representation of 24%, while Swaziland and Botswana are least represented (2%) (See Annex A, table A1).

The survey data covers firms in all the major two-digit manufacturing industries classified according to the International Standard Industrial Classification (ISIC), revision 3.1. To obtain enough number of firms in each industry, some of the industries were combined on the basis of similarities in the type of their activities in table 1. The category "Other Manufacturing" is a residual category that includes all firms that are outside the five major industry groups. The re-grouping process yields six industry classification as presented in table 1.

The surveys data has information on firm birth year, firm location, firm foreign ownership, firm domestic ownership, firm size, management experience, assets, output, employment, input costs, product destination, raw materials and source of inputs, production constraints and other variables affecting firm

[1]Details on the WBES are in the attached Data Analysis background paper appendix.

productivity. Firm foreign ownership (FDI_{firmij}) is defined as the percentage of subscribed equity owned by foreign investors in a firm, while industry foreign ownership ($FDI_{\sec j}$) is average foreign equity participation for all firms in an industry[2], weighted by each firm's share in industry employment.

Firm foreign ownership ranges from 0% for no foreign ownership to 100% for firms that are wholly foreign owned, with an average of 15% for the region. Firms that have at least 10% of foreign ownership in the pooled surveys constitute 25% or 602 firms of the total number of firms. In relative terms, there are more foreign owned firms among the large firms than there are domestic owned firms, with 38.4% of the foreign owned firms being large while 15.5% of the domestic owned firms are large. This implies that three is greater firm representation among the small firms in both the foreign and domestic owned firm categories.

The average industry or sector FDI is about 16%. Following Liu (2008), this computed as:

$$FDI_{\sec ij} = \sum_{i} \frac{employ_i}{Employ_j} XFDI_{firmij} \tag{5}$$

With $\frac{employ_i}{Enploy_j}$ giving the relative weights applied to individual firms' foreign ownership levels. In terms of industry composition, domestic firms have greater representation across all the sectors while representation of foreign firm ownership is largest in basic metals (26%) and followed by the chemicals, plastics and rubber sectors (25%) and the food industry (22%).

Since foreign firms tend to be more capital intensive than domestic firms as suggested by Edwards (2002), the share of foreign firms would be significantly higher if industry FDI is calculated using weights based on physical capital, hence the use of employment based shares. In line with arguments by Aitken and Harrison (1999) that firm productivity spillovers can also be spatially influenced, the estimated spillover model also includes a measure of region FDI wherein regions are defined in terms of the geographical clusters used in the surveys. The measurement of region FDI follows the same method as used in computing sector FDI in (E5), except that firm weights are computed using regional instead of sector employment levels.

To measure productivity spillovers (Q), labour productivity is preferred due to its wide use and easy of computation given our survey data. However, total factor productivity (TFP) could have been a better measure of firm productivity but its computation is likely to suffer from biases associated with reverse causality in the cross section data that we use. The TFP is, however, still estimated and used for robustness checking against results from using labour productivity given that literature has suggested that the two measures are positively correlated due to production frictions (Bartelsman, et al 2013).

Labour productivity is computed as firm's real sales divided by the number of workers employed, where real sales are firms' nominal sales deflated by individual country GDP deflator to 2005 US dollar equivalence. An accurate

[2]The terms plant and firm; and sector and industry are used interchangeably in this study, even though for our case the terms firm and industry are more appropriate.

measure of labour could have been actual number of hours worked instead of number of workers (Bartelsman, et al 2009). However, the firm surveys data used does not have information on hours worked, hence the measure could not be corrected for the effective time factor. Foster, et al (2008) and Bartelsman (2013) have, however, suggested that the correlation between measures that control for effective time worked and using the number of workers is positive and high, implying that number of workers employed can be used in place for hours worked.

Total factor productivity is the log of firms' deflated sales minus the weighted log of labour plus capital, where the weights are estimated from the Cobb-Douglas production function:

$$Y_{ij} = A_i + \theta_i^l L_{ij} + \theta_i^k K_{ij} + \omega_i + \varepsilon_{ij} \tag{6}$$

With Y_{ij} measuring firm real output obtained as in the computation of labour productivity above. K_{ij} is the real value of physical capital employed by the firm, measured as firms' reported net book values of fixed assets that include equipment and machinery and motor vehicles. Following the same deflation procedure as used for sales, real capital figures are obtained by deflating the local currency units measured values of the assets to 2005 using each country's GDP deflator before they are converted to the US dollar equivalence at 2005 exchanges. L_{ij} is labour employment adjusted for human capital, with adjustment is done using the approach by Caselli (2005) defining human capital adjusted labour as: $L_i = W_i * e^{Q(S_i)}$, with W_i representing the number of full-time workers for firm i and $Q(s_i)$ the average human capital per employee, assumed to be piecewise linear in average worker education (s_i) of the firm[3]. ω_i is firm specific effects on productivity approximated by industry specific effects on assumption that the firm effects are proportional to the industry specific effects, i.e $\omega_i \propto \omega_j$.

While deflating output using individual countries' GDP deflator is closer to using inflation which is closely related to each firm's sales than deflating using the US deflator, the approach falls short of getting actual physical output, which can only be obtained by deflating nominal sales using the firm specific price deflator or at least the industry specific deflator in each country. However, information on the two alternative deflators is not available in the surveys, hence the use of economy wide price deflators. This means that, there are still elements of idiosyncratic demand shocks that are firm specific in the measures of productivity used. We, however, use the revenue productivity measures following Bartelsman et al (2013) who have justified and used revenue productivity measures on the basis that they are highly positively correlated with their respective physical productivity measures.

In estimating equation (E6), literature has warned against productivity transmission to the optimal choice of inputs, which biases the estimated factor shares (Griliches and Mairesse, 1998). Attempts to correct the bias have

[3]On the basis of the piecewise approach used by Caselli (2005), human capital is estimated as 0.134*education years if education years>=2years; 0.132+0.101*education years if education years is equal to 3 or 4 years & 0.396+0.068*education years if education years>4

often used IV approaches with firm fixed effects (Arellano and Bond, 1991 and Olley and Pakes, 1996). The nature of our data, which is cross sectional, forbids us from using the dynamic structural estimation methods. However, to minimize the productivity transmission bias in (E6) we have resorted to instrumenting labour and capital with their past levels and use industry dummies as proxies for firm fixed effects.

Labour employment is instrumented by the number of workers employed by the firm at business commencement on the justification that productivity is persistent (Foster, et al, 2008 and Bartelsman and Dhrymes, 1998) and that more productive firms employ more workers (Edwards, 2002). To check on this assumption, we have estimated and find a correlation coefficient between workers at business commencement and current employment 0.7, which together with the fact that there should be no theoretical link between employment levels when the firm commenced operation and current firm productivity shocks justifies the instrument. While restructurings of firms between when the firm started operation and the time of the survey, could have affected firm productivity, it is assumed that on average firms that were perceived to be more productive at commencement of business are likely to remain productive after the restructurings, hence the high positive correlation between current employment and employment and business commencement.

Unlike labour employment decisions that are more short-term in nature, capital and investment decisions are relatively sunk and mostly determined at the beginning of the production year (Olley and Pakes, 1996). The factor is, therefore, instrumented by the current net book values of fixed assets on assumption that they are dependent on the amount of capital the firm had at the beginning of the production year and that the factor is subject to more adjustment frictions than labour that limit the amount productivity transmission from optimal capital choices during the current production period. Our approach is supported by Gandhi, et al (2012) who argue that if the value of an input is determined by a decision made before the current period, its current value can be used to instrument itself.

To check on whether the instruments used have reduced the bias in the estimated capital and labour shares or not, we have estimated the factor shares using both OLS and the IV technique and find that the IV approach reduces labour and increases capital elasticity coefficients compared to OLS except for Tanzania and Angola as shown in Annex A, table A3. Hence the IV technique has reduced the productivity transmission bias in the estimated production function. A summary of the variables and their correlations are in tables 2 and 3, respectively.

The variations in the number of observations in table 2 across different variables is a result of missing figures for some of the variables in some countries. This implies that in terms of the estimated regression equation, the number of observations in each model will differ depending on which variables are included in the model.

5 Non-Parametric Results Estimation and Analysis

It is important to assess any heterogeneities in firm productivity across countries in the region in order to utilise appropriate pooling methods. We have, therefore, plotted labour and total factor productivity distributions for individual countries in figure 1. The figure suggests that average labour productivity is generally higher than total factor productivity in the countries. This confirms findings by Bartelsman, et al (2013) who suggest that the difference follows from the fact that when estimating labour productivity capital is fixed as opposed to varying both labour and capital when estimating TFP. In addition, there is evidence of productivity heterogeneities, with differences in average productivity likely to be a result of country and time fixed effects, both of which require the use of country and time dummies when estimating the productivity spillovers. The DRC and Angola also exhibit outlying polarizations which are likely to be a result of data problems.

The effect of firm foreign ownership on firm productivity is assessed using the relative productivity distribution approach suggested by Morris and Handcock (1999)[4]. To be able to apply the method, we group firms into foreign and domestic owned firms and treat foreign owned firms as the referred group, while domestic owned firms are the comparison group. Firms are regarded as foreign owned if they have at least 10% foreign shareholding; otherwise they are defined as domestically owned. The cut-off point follows the International Monetary Fund (IMF, 1993)'s definition of FDI which allows the foreign stakeholder a controlling share in the foreign owned firm. Even though the productivity distribution of foreign owned firms is treated as the reference distribution and that of the domestic owned firms as the comparison, similar results are obtained from switching the groups' roles.

The relative distribution analysis is used to compare the two groups' productivity on the basis of a common density function using relative productivity data between foreign owned and domestic owned firms. The relative productivity data (r) is the percentile rank that the productivity of domestic owned firms have in the productivity distribution of the foreign owned firms both ranked by the productivity cumulative density function of the foreign owned firms. The relative density function is defined by the ratio of the fraction of firms in the domestic owned firms' productivity distribution to the fraction of firms in the productivity distribution of the foreign owned firms; i.e.

$$RD = g(r) = \frac{f(Q_0(r))}{f_0(Q_0(r))} \quad r \in [0,1] \tag{7}$$

With$f$defining the productivity PDF of the domestic firms and$f_0$the productivity distribution of the foreign owned firms both evaluated at $Q_0(r)$ which is the rth quantile of the relative ranking of domestic owned firms' productivity

[4]The discussion of the relative distribution here is mainly based on Morris and Handcock (1999)

to foreign owned firms' productivity on the original measurement scale and determined from the CDF of the foreign owned firms' productivity distribution. In contrast to directly comparing the groups' productivity distributions when they are overlaid on each other and requiring the computation of the differences between the two curves at each point on the scale, the relative productivity density codes this comparison directly in terms of a ratio. In general, the relative distribution is invariant to the scale of the distributions, implying that comparing productivity directly gives similar results as comparing the log of productivity (Morris and Handcock 1999).

From equation 7, if the relative productivity density greater than 1, it indicates that the frequency of domestic owned firms at the given quantile of the productivity distribution of foreign owned firms is greater than that of foreign owned firms implying greater productivity or foreign owned firms. If it is less than 1, it indicates greater frequency in the foreign owned firms distribution at the given quantile and greater productivity for domestic owned firms. For example, if the relative density of domestic firms' productivity at the 20^{th} percentile of the foreign firms' productivity distribution is to 2, this means that domestic owned firms are about twice as likely as foreign owned firms to fall at this point of productivity, implying that domestic firms are less productive than foreign firms. Alternatively, this scenario means that the proportion of domestic owned firms with productivity level corresponding to the 20^{th} percentile of the foreign owned firms' productivity distribution is twice the proportion of foreign owned firms at that point. When the two groups' distributions are identical, the relative productivity density is equal to one and it is defined by the uniform PDF on [0,1].

Following the relative productivity distribution analysis, the productivity distributions of the foreign and domestic owned manufacturing firms in SADC are shown in figure 2. Graphs in the first column of the figure give the firms' productivity distribution densities, with broken line graphs representing foreign owned firms and solid line graphs representing domestic owned firms; while graphs in the second column give the relative productivity distributions. In the first row, we present labour productivity distributions and the second row presents the total factor productivity (TFP) distributions.

An attempt to deduce productivity differences from overlaid productivity distributions of the foreign and domestic owned firms in the first column of figure 2 suggests that both labour and TFP are higher for foreign owned firms than for domestic owned firms, although the difference is marginal in the case of the TFP. The direct comparison of the productivity distributions, however, is limited in that it only gives a qualitative picture of the impact of firm foreign ownership on productivity. To get a more detailed analysis with quantitative interpretations using the relative distributions, we can use the relative productivity distributions in the second column with the 95% confidence bands to allow for statistical inferences on whether the difference in firm productivity is significant or not[5].

[5]For example, the top right graph shows that domestic firms have approximately between 1.25 and 2 more chance of falling at the 10^{th} decile of the foreign owned firms' labour pro-

Considering labour productivity in the first row of figure 2 first, the relative productivity distribution suggests that a greater proportion of domestic owned firms' productivity lies below the median labour productivity of foreign owned firms, with domestic firms' labour productivity twice more likely to fall below the median of the foreign owned firms' productivity than the foreign owned firms themselves. Similarly, there is a lesser proportion of domestic firms above foreign owned firms' median labour productivity. On the basis of the 95% interval, domestic firms' labour productivity is up to 1.5 times more likely to fall within the second decile of foreign firms' productivity distribution, implying that foreign owned firms are more productive than domestic owned firms in the region.

A qualitatively similar picture is portrayed by analyzing total factor productivity in the second row of the diagram. The TFP distribution of domestic firms is up to 2.5 times likely to fall within the lower 3^{nd} decile of the productivity distribution of the foreign owned firms, while in the upper end of the distributions, which capture more productive firms both foreign and domestic owned firms are more or less equally productive. In overall terms, figure 2 suggests that domestic owned firms are on average less productive than foreign owned firms. The positive association between FDI and firm productivity is, however, either a result of FDI self-selecting into more productive firms or of FDI boosting firms' within-firm productivity, given that causality cannot be deduced from the relative distribution analysis.

One potential problem with results from figure 2 pertains to the dominance of South African firms in the survey data as well as its relatively high technology levels compared to the average country in the region. It can be speculated that the inclusion of South African firms in the analysis of productivity differences between foreign and domestic owned firms may have influenced the correlation results. In light of this observation, firms' productivity graphs are re-plotted with South Africa excluded in figure 3.

Figure 3 confirm our speculation and suggest that there is greater productivity difference between domestic and foreign owned firms for the region when South African firms are excluded from the firm pool data. Productivity differences become more distinct for both labour and total factor productivity measures, with the relative distributions suggesting that domestic owned firms are now up to twice and three times more likely than foreign owned firms to fall within the median and 3^{rd} deciles of foreign owned firms' labour and TFP distributions, respectively.

A possible explanation for the difference in FDI productivity impact for the region when South African firms are excluded lies in the fact that the region excluding South Africa is composed of countries with relatively lower technology levels, which are likely to enjoy relatively larger productivity gains from FDI than when South Africa whose technology is relatively more advanced is included. This is in line with the model of international technology spillovers by Findlay (1978) and Baro and Sala-i-Martin (2004), which suggest that gains

ductivity, hence less productive than foreign owned firms.

from technology spillovers from FDI are greater the lower the level of technology of the FDI recipient country.

Another limitation with the firm productivity comparison in figures 2 and 3 is suggested by literature which points that there are usually productivity heterogeneities on the basis of firm size (Edwards, 2002 and Bartelsman, et al, 2013). To the extent that this holds, it means that comparison of the impact of FDI on firm productivity without separating firms according to their size may conceal important information about how firms in different size categories are affected by firm foreign ownership differentials. An analysis of the impact of FDI on firm productivity by firm size also becomes compelling given that the size distribution of firms in the region is highly skewed with small firms constituting a disproportionately large percentage of the firms (World Bank Enterprise Surveys).

To facilitate the analysis of firm foreign ownership impact on firm productivity in the region according to firm size, firms are classified into small and large firms groups within the foreign and domestic owned firm categories. Small and medium enterprises employing less than 100 workers are collectively classified as small firms, while firm employing at least 100 workers are classified as large firms. The classification cut off point follows the classifications used by most countries in the region for purposes of selective intervention policies for the small and medium enterprises (Government of Zimbabwe, 1991). On the basis of this classification, figure 4 shows the productivity difference between small and large firms excluding South African firms, with the scenario including South Africa shown in Annex A, figure A3. Figure 4 has left out the impact of firm foreign ownership on the TFP for clarity purposes to avoid congestion of graphs.

Figure 4 suggests that there is a greater positive impact of foreign firm ownership on small firms' productivity than for large firms. The productivity distribution of small domestic owned firms is up to 2.5 more times likely to fall within the 4^{th} decile of the productivity of their foreign owned counterparts and less likely to fall beyond the 4^{th} decile. In the case of large firms, the impact of foreign firm ownership is less distinctive, with domestic large firms being more productive than foreign large firms in the lower tail end of the productivity distribution density, while foreign large firms become more productive as productivity increases improves. Following suggestions by Findlay (1978) that the productivity gain from FDI is negatively related to the FDI recipient's state of technology, the greater productivity gain for small firms than for large firms suggest that small firms in the region are technologically less endowed than large firms. In terms of policy, this suggests the need for directed FDI policies that favour MNCs joint ventures with small to medium enterprises than with large established firms.

Another interesting feature from figure 4 is that the relative productivity distribution of large firms suggests that inefficient (low productivity) large foreign firms are less productive than inefficient (low productivity) large domestic owned firms. This could be a result of at least two factors, which are that less efficient large foreign firms in the region are employing obsolete and inefficient technologies or that large inefficient domestic firms are enjoying some selective

assistance such as selective credit, subsidies and market access support from their governments. Either way, the growth consequences are detrimental, as the first possibility implies that any additional FDI injection that comes through the inefficient large foreign firms has little or no technology spillover gains for the region, while the second explanation suggests that if such selective assistance exists for the inefficient large domestic owned firms, the interventions may amount to growth stagnation and higher poverty in the long run through the perpetual loss in potential productivity growth.

However, when South African firms are included in annex A, figure A3, both large and small firms have more or less similar productivity gains from foreign ownership, suggesting that large foreign owned firms in South Africa are more productive than large foreign owned firms in the rest of the region. Possible reasons why large firms in South Africa are more productive than large firms in other countries in the region could be that large firms in the rest of the region upgrade their technology at slower pace than those in South Africa. Alternatively, it could be that most of the large foreign owned firms in the rest of the region outside South Africa are inefficient parastatals jointly owned by foreign investors and governments.

Another limitation with our analysis of the impact of firm foreign ownership emanates from the possibility of productivity heterogeneities within countries suggested by figure 1 above. Such heterogeneities imply that our pooled firm data analysis may fail to give us a picture of how foreign firm ownership could be impacting on firm productivity in each of the region's countries. As such the analysis of the impact of firm foreign ownership on firm productivity is extended to consider impact at country levels, with the country graphs shown in annex A, figure A6, which qualitatively confirm findings from the pooled firm data with foreign owned firms being more productive than domestic owned firms in all the countries except Angola, where data problem issues have already been raised. However, the positive correlation between firm productivity and firm foreign ownership is marginal for South Africa and Mauritius, suggesting that the two countries' technology levels are close to those in most of their FDI source countries as implied by Findlay (1978) and Barro and Sala-i-Martin (2004).

6 Econometric Results Estimation and Analysis

To further investigate the impact of firm foreign ownership on firm productivity in the region, the FDI productivity spillovers are estimated from productivity spillover model 4, which we restate below. The same model is estimated for all the pooled firms in the region, for firms in individual countries and for small and large firm categories:

$$Q_{ij} = \pi_0 + \pi_1 FDI_{firmij} + \pi_2 FDI_{\sec j} + \pi_3 FDI_{firm*\sec ij} + \pi_4 X_{ij} \quad (8)$$
$$+\varepsilon_c + \varepsilon_I + \varepsilon_T + \varepsilon_i + \varepsilon_{ijc}$$

With $Q_{ij}FDI_{firmij}$ and $FDI_{\sec j}$ defining measures of firm productivity, within firm foreign ownership and intra-industry foreign ownership, respectively. Pro-

ductivity is in log terms while measures of foreign ownership are in percentage. Estimated coefficients on the two measures of foreign firm ownership give within firm and intra-industry productivity spillovers, respectively

To estimate the productivity spillover model, we utilize the OLS technique. In light of productivity spillover identification problems associated with model 4 emanating from reverse causality between firm foreign ownership and firm productivity, we control for as many firm characteristics that may affect the firm's productivity as possible. This minimizes the prevalence of firm fixed effects in the error term. Second, under the assumption that firm-specific productivity is proportional to industry productivity, we use the industry-specific dummy in estimating model 4 to proxy for the firm fixed effects across all model specifications. We, however, take note of the fact that some of the firm characteristics controlled for identify with firm ownership types and to more clearly assess the productivity effects of the firm foreign ownership, we employ the stepwise regression technique moving from the most basic productivity model specifications to the most comprehensive model incorporating all possible firm characteristics likely to affect productivity.

Regression results from equation 4 for the pooled firm productivity are presented in table 4 below, with the baseline model presented in the first column[6]. The baseline model reports productivity spillover effects from within firm and intra-industry foreign ownership. In the second column, we introduce the interaction of firm and industry foreign ownership. The three FDI instruments are the hypothesized channels though which foreign firm ownership transfers productivity gains to local firms. In columns (3) we introduce the firm size dummy as another potentially critical factor likely to affect firm productivity. Columns (4) and (5), present the comprehensive models with all productivity determinants.

All the columns of table 4 only control for country and industry fixed effects, without control for time fixed effects. To the extent that technology naturally evolves over time, this is likely to impact on firm productivity in different countries even after holding other determinants of productivity constant. This could easily lead to misleading results about productivity heterogeneities across countries. Introducing a time dummy corresponding to the year of each country survey would, therefore, assist in purging off the time effect on firm productivity. Our preliminary estimations, however, suggest that country and time fixed effects in the data are highly collinear and as such cannot be jointly controlled for in the same model. The results suggest that models with country fixed effects have better fit than those time fixed effects. While table 4 presents stepwise regression model results using country fixed effects only, subsequent estimations present results of the comprehensive models of columns (4) and (5) with alternating country and time fixed effects in order to minimize the problem of omitted variables bias in the basic models.

Table 4 shows that the coefficients on both within firm and intra-industry

[6]Parallel model results using the TFP are reported in Annex A, tables A12 to A16. They suggest qualitatively similar results

foreign ownership are positive and significant across all models, while the impact of sector foreign firm ownership on the productivity of firms with foreign ownership is negative and significant. Variables with theoretically expected signs are firm age, average firm human capital and firm size with positive impacts on firm productivity and corruption, rule of law, competition and credit constraint which negatively impact on firm productivity. However, firm productivity is negatively related with managers' experience, which is not consistent with theoretical predictions that more experienced managers should be more productive. This, however, could suggest that the long serving managers are not updating their skills commensurately with new technology developments, hence become less productive than the more recent graduates. The large disparity between the numbers of firms reported in in table 4 and all the subsequent results tables and table 2, which summarized the study variables emanates from the fact that some variables used in the estimated models have missing data and also largely because in all the estimated pooled models, the DRC and Angola are excluded.

Turning to measures of firm foreign ownership, the regression results suggest that firms with 10 percentage points more foreign ownership have average labour productivity, which is about 0.12% higher than otherwise in both the baseline and comprehensive models. This represents the within plant impact of foreign firm ownership, which emanates from more advanced technology, managerial skills and training associated with FDI. It implies that foreign investment is both physical capital accumulation and an addition to FDI host countries' technology stocks. Similarly, the coefficient on sector foreign firm ownership is positive and significant, with a 10 percentage points increase in sector foreign ownership associated with between 0.1% and 0.15% higher productivity for firms in the same sector than those in other sectors. This differential captures the intra-industry FDI productivity spillover effect, which is realized by firms within the industry receiving more FDI and theoretically assumed to take place through channels such as labour turnover, imitations and demonstration effects. Given that the impacts of firm and industry FDI on productivity are estimated after controlling for other potential co-variates of firm productivity, including sector specific productivity effects that we have used to proxy for the firm-specific effects, the the positive productivity effects from firm foreign ownership should be attributed to the existence of more firm and sector foreign equity holdings in the region.

Contrary to the positive impacts of firm and sector FDI on firm productivity, sector FDI has a negative productivity effect on firms with foreign ownership. The negative and significant coefficient on the interaction term between firm and sector foreign firm ownership on domestic firms' productivity suggests that local joint ventures between domestic and foreign firms are negatively affected by an increase in sector foreign ownership. Given that the interaction term is jointly controlled for together with other firm productivity determinants, this implies that already existing foreign owned firms are disadvantaged by new foreign firm entrants. As suggested by Aitken and Harrison (1999), this could be explainable by the fact that new foreign owned firms could be more productive and competitive than the existing foreign owned firms. This occurs if there

is lack of continuous technology upgrading by local foreign owned firms such that their technology lags behind new technology coming with the increases in intra-industry foreign ownership. To the extent that this holds, it suggests that most local joint ventures are old and commanding old production methods. Another possible explanation lies in the 'market stealing' hypothesis, in which case new foreign firms could be concentrated in areas that already have more FDI concentration.

A potential problem with the estimated FDI productivity spillovers in table 4 emanates from failure to control for the use foreign inputs by firms. Literature on international technology transfers has suggested that the use of foreign inputs by domestic firms is a potential channel of transmitting foreign technology to local firms given that the inputs are usually embodied with the high technology (Keller and Yeaple, 2009 and Yasar and Paul, 2008). Thus to the extent that foreign owned firms are also likely to be users of more foreign inputs through backward and forward linkages, the observed productivity spillovers in column 1 could be emanating from the use of foreign inputs by firms instead of firm or sector FDI. In column 3, we therefore control for use of foreign inputs. The impacts of firm and sector FDI remain positive and significant. The productivity impact of foreign inputs is, however, also positive and significant, with a 10 percentage points differential in the use of foreign inputs causing a 0.05% differential in firm productivity. The results suggest that taking out the productivity impact of foreign inputs reduces the marginal productivity impact of industry FDI from 0.17% to 0.15% for a 10 percentage points increase in sector FDI, suggesting that part of FDI productivity spillovers estimated in column 1 is actually spillovers from use of foreign inputs even though it remains robust and significant.

Another question that could be asked is whether the estimated productivity spillovers are not a result of spatial productivity externalities if some regions are more productive than others and FDI favours more productive regions. In this case it means FDI would locate in spatially concentrated regions, resulting in spatial technology spillovers driving the observed productivity differentials instead of FDI productivity spillovers (Marshall, 1920). To control for the possibility of spatial productivity externalities, columns 4 and 5 isolate out the effects of regional FDI as well as average region productivity captured by average regional wage rate. However, the coefficients on firm and sector FDI remain positive and significant while that of regional FDI is insignificant. What obtains instead is a situation suggesting that productivity is also regional specific with the coefficient on regional wage rate being positive and significant. Thus the estimated productivity spillovers in model 4 are likely to be a result of technology externalities emanating from the presence on MNCs in the region. The findings confirm the FDI productivity spillover hypothesis for the SADC region and they suggest that the region stands to enjoy significant productivity gains from the presence of MNCs.

In light of the dominance role played by South Africa in terms of commanding relatively higher levels of technology and also constituting a greater proportion of firms in the region, both of which could put the generalization

of spillover results in the region to question, we estimate the spillover model 4 without the country and infer any differences in productivity. Results of the estimated spillover model without South Africa are presented in table 5 and they qualitatively do not suggest any difference in terms of the impact of FDI in the region with the productivity effects of both within firm and sector FDI remaining positive and significant. This suggests that the SADC region at large has productivity gains emanating from hosted MNCs even if the dominant country is excluded.

The improvement in the within firm impact of FDI and a decline in the intra-industry impact of FDI when South Africa is excluded in table 5 suggest that firms in the rest of the region excluding South Africa tend to enjoy greater within firm productivity gains from the presence of FDI than South African firms while South Africa has greater intra-industry productivity spillovers than the rest of the countries in the region. From suggestions by Findlay (1978) and Aghion and Howitt (2004) that the gain in productivity from FDI is larger the lower the level of technology in the FDI recipient country, this implies than firms outside South Africa have lower technology levels than South African firms. The larger intra-industry gains for South African firms, on the other hand, should be a result of better FDI absorptive capacities in South Africa and suggest that other countries should improve their capabilities (Durham, 2004).

Lastly, we also address potential problems of the likely differences in the impact of firm foreign ownership on the productivity spillovers of small and large firms and across countries in light of the earlier non-parametric estimations, which suggest the existence of productivity heterogeneities across firm sizes and countries in the region. Deducing the FDI productivity spillovers from the pooled firms' productivity could be misleading and less informative if firm foreign ownership has different effects on firm productivity within the different firm size categories or countries.

To investigate possible heterogeneities on the impact of firm foreign ownership on firm productivity between small and large firms in the region, we estimate the spilloaver model 4 for the two firm groups separately and present the estimated results in tables 6 and 7 below, respectively.

The regression results in tables 5 and 6 suggest that small firms have larger productivity gains from firm foreign ownership in the region. A 10 percentage points increase in within firm foreign ownership leads to within firm increase in productivity of 0.13% for small firms and 0.08% for large firms. The within firm increases are significant for both firm categories. On the intra-industry productivity spillovers, the productivity impact of industry FDI is positive and significant for small firms and insignificant for large firms. The differences in the impact of FDI on firm productivity suggest that the region, which hosts more small firms that large firms, stands to gain significantly from the presence of MNCs. The results suggest that countries in the region should promote foreign joint ventures with local firms in this category.

Lastly, to make inferences about possible heterogeneities with respect to the impact of FDI across the different SADC countries, the productivity spillover model is estimated separately for each individual country and the results are

presented in table A9 annex A. Results suggest that seven countries experience positive within firm productivity gains, while the impact is positive but insignificant in the other countries. There are larger gains for the relatively technologically backward countries in the region compared to South Africa's gains. Largest intra-industry productivity spillovers are found in Angola and South Africa, respectively. The heterogeneities with respect to individual countries' gains are an indication of differences in the countries' FDI absorption capacities and differences in country technology levels. Countries with better FDI absorption capacities or with low technology are expected to gain more from FDI productivity spillovers than otherwise. This means that countries should promote their FDI absorptive capacities in order to gain more from FDI.

In overall terms, results from the estimated FDI spillover model and our analysis clearly suggest the existence robust productivity spillovers from FDI in the region. The results, which have been confirmed for both non-parametric and parametric estimations are robust to isolating the possible productivity spillover from imported inputs and spatial proximity in production, to the excusion of South African firms in the sample and also for most countries in the region. This suggests that countries in SADC have potential significant gains from FDI presents.

6.1 Firm Productivity and FDI Causality Issues

According to the literature on FDI productivity spillovers, FDI tends to flow to higher productivity firms and sectors such that any observed positive correlation between firm productivity and measures of FDI may be a result of FDI self-selecting into higher productivity firms and not necessarily FDI raising productivity (Liu, 2008; Alfaro, et al, 2009 and Keller and Yeaple, 2009). This causes identification problems in the estimated FDI productivity spillovers, especially in cross section firm data where it is impossible to pin down the firm-specific productivity effects. To infer on the likely causal direction between FDI and firm productivity implied by model 4 in our estimated results, we re-estimate the FDI productivity spillover model exclusively for domestic owned firms as presented in equation 9.

$$Q_{ij}^{d} = \pi_0 + \pi_2 FDI_{\sec j} + \pi_4 X_{ij} + \varepsilon_c + \varepsilon_I + \varepsilon_T + \varepsilon_i + \varepsilon_{ijc} \tag{9}$$

With Q^d representing labour productivity for domestic owned firms. Since the reverse causality between FDI and productivity occurs when FDI self-selects into high productivity sectors, it can be assumed that firms without foreign ownership are low productivity firms compared to those with foreign ownership. If this is the case, then evidence of spillovers on the coefficient of sector FDI in 8 would suggest that causality runs from FDI to firm productivity as it suggests the existence of FDI productivity externalities to non-foreign owned firms. The estimated results from equation (E8) are presented in table 8 and show that sector foreign firm ownership has positive productivity spillover effects to local firms that are wholly domestically owned. Domestic firms in sectors with 10%

more foreign ownership are between 0.11% and 0.16% more productive than those in sectors with 10% less FDI.

The finding presented in table 8 is robust to controlling for the impact of foreign inputs use by the domestic firms. Hence, it can be concluded that the existence of firm foreign ownership in the region confers productivity spillovers to domestic firms regardless of whether they are perceived to be high or low productivity firms by the foreign investors. This suggests that the estimated productivity spillovers in model (E4) are likely to be a result of the impact of FDI than a reflection of FDI self-selecting into high productivity firms.

7 Conclusion

In this study, we have undertaken an empirical analysis of the productivity spillover effects of FDI on domestic firms in SADC. In specific terms, we have investigated whether there are any positive within firm and intra-industry productivity spillovers from FDI for SADC firms, for small and large firms in the region and for firms in individual countries in the region. The study is a valuable contribution to the literature on the FDI productivity spillover hypothesis, given that it has been undertaken for a group of mostly developing countries in where such studies are limited due to unavailability of harmonized firm level data.

Evidence from the study suggest the existence of within firm and intra-industry productivity spillover effects for the region, with productivity gains that are stronger and larger for small firms than for large firms. At the country level, there is evidence suggesting heterogeneities with respect to the productivity impact of FDI while almost all the 12 countries investigated experience some within firm productivity gains from foreign firm ownership, the intra-industry gains are significant for South Africa, Angola, Mozambique and Tanzania and insignificant for other countries. It has been argued that the differences and weaker results with respect to individual countries are a result of small size and data problems in some countries. Similarly, adverse country fixed effects have been emphasized as alternative contributing factors.

Overall, it appears that the region enjoys considerable productivity gains from the presence of MNCs in the region. First, the large within firm productivity gains for small firms and the relatively poor countries suggests significant productivity and growth gains for the region given that most of the counties in SADC still command relatively low technology levels and that a large proportion of the firms in SADC are still in the small to medium size category. The downside risks to productivity growth are, however, in respect of large firms in the region outside South Africa, which seem to be utilizing less productive technology.

Similarly, the finding that large low productivity foreign firms are less productive than their domestic owned counterparts has been interpreted as signifying the existence of adverse idiosyncratic measures that sustain large inefficient firms such as the support by governments of inefficient public enterprises in

the region. The prevalence of such selective interventions have been identified for China and India by Hsieh and Klenow (2009). To the extent that this is occurring, such policies are detrimental to growth in the long run due to lost potential growth in productivity. This suggests the need for market and policy reforms to remove or minimize any policies that tend to protect inefficiency of large corporations such as subsidies and concessionary credit.

On the policy front, the finding that firm foreign ownership results in productivity gain the region encourages countries to promote the establishment of MNCs to promote the productivity spillovers. Second, the large productivity gains for small firms than large firms, suggest that FDI policies in the region should be directed and inclined towards promoting foreign joint ventures with local small and medium enterprises in order to obtain maximum productivity spillovers. There is, however, need to ensure that large corporations in the poor countries of the region pro-actively upgrade their technology through, for example, removal of selective protectionist policies that seem to sustain their inefficiencies.

However, notwithstanding the study's potential contribution, its major weakness lies in the cross section data used and as such we suggest that further studies be done in future once full firm panels of the harmonized data are available.

8 References

References

[1] AfDB (2011), *Southern Africa Regional Integration Strategy Paper 2011-2015*,

[2] Aghion P and Howitt P (2004), *Growth with Quality-Improving Innovations: An Integrated Framework*; in Aghion P and Durlauf S (ed), Handbook of Economic Growth; ELSEVIER

[3] Aitken B. J and A.E Harrison (1999), *Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela*, American Economic Review, Vol.89, No.3

[4] Ajayi S I (2006), *FDI and Economic Development in Africa*, ADB/AERC International Conference on Accelerating Africa's Development Five years into the Twenty-First Century, Tunis, Tunisia November 22-24

[5] Arellano M and Bond S (1991), *Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations*, Review of Economic Studies, 58(E2),

[6] Baldwin R, et al (1999*), Multinationals, endogenous growth and technological spillovers: theory and evidence,* CEPR Discussion Paper, 2155.

[7] Banerjee, et al (2005), *Growth Theory Through the Lens of Development Economics*, in Handbook of Economic Growth, Vol 1A, P Aghion and S S Durlauf, eds.

[8] Bartelsman E J and P J Dhrymes (1998), *Productivity Dynamics: U.S. Manufacturing Plants 1972-1986*, Journal of Productivity Analysis: 9:1 pp. 5-34

[9] Bartelsman E, et al (2009), Measuring and Analyzing Cross-Country Differences in Firm Dynamics, in Producer Dynamics: New Evidence from Micro Data, by Dunne, T et al (eds), pp 15-76; University of Chicago

[10] Bartelsman E, et al (2013), *Cross-Country Differences in Productivity: The Role of Allocation and Selection*, AER, 103:1, pp 305-334

[11] Barro R J and X Sala i Martin (2004), *Diffusion of Technology* in Barro R J and X Sala-i-Martin, eds., *Economic Growth*. Massachusetts Institute of Technology

[12] Blomström M and E Wolff (1994), *Multinational corporations and productivity convergence in Mexico* in Baumol W, et al (eds.), *Convergence of Productivity: Cross-national Studies and Historical Evidence*. Oxford; Oxford University Press.

[13] Blomström M and A Kokko (1998), *Multinational Corporations and Spillovers*, Journal of Economic Surveys, 12, 247–77.

[14] Blomström M and A Kokko (2003), *The Economics of Foreign Direct Investment Incentives,* NBER Working Paper 9489.

[15] Chen Y. (2007), *Impact of Foreign Direct Investment on Regional Innovation Capability: A Case of China*; Journal of Data Science 5(2007), pp577-596

[16] Caves, R.E. (1974), *Multinational Firms, Competition and Productivity in Host-Country Markets*, Economica, Vol. 41, pp. 176-193

[17] Caselli F (2005), *Accounting for Cross-Country Income Differences* in Handbook of Economic Growth, Volume 1A, Phillipe Aghion and Steven N. Durlauf (eds.), Amsterdam: Elsevier, 679-741.

[18] CZI (2009), *Confederation of Zimbabwe Industries Manufacturing Sector Survey*, Harare

[19] Dang D A (2013), *How foreign direct investment promote institutional quality: Evidence from Vietnam*, Journal of Comparative Economics, Elsevier, vol. 41(E4), pages 1054-1072.

[20] Edwards L (2002), *A Firm Level Analysis of Trade, Technology and Employment in South Africa,* TIPS

[21] Ehrlich I, et al (1994), *Productivity Growth and Firm Ownership: An Analytical and Empirical Investigation*, Journal of Political Economy, Vol. 102, No. 5 (Oct., 1994), pp. 1006-1038

[22] World Bank Enterprise Surveys (http://www.enterprisesurveys.org), The World Bank.

[23] Findly R (1978), *Relative backwardness, direct foreign investment, and the transfer of technology: a simple dynamic model,* Quarterly Journal of Economics 92, 1–16.

[24] Fosfuri A, et al (2002), *Foreign Direct Investment and Spillovers Through Workers' Mobility,* Journal of International Economics 53, 205–222.

[25] Foster L, et al (2008), *Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability*? AER, 98:1 pp 394-425

[26] Gandhi A, et al (2012), *On the Identification of Production Functions: How Heterogeneous is Productivity?* Carlo Alberto NoteBooks, working Paper No. 288 December 2012

[27] Germidis D (1977), *Transfer of Technology by Multinational Corporations*, Development Center of the OECD, Paris.

[28] Gerschenkron A (1952), *Economic Backwardness in Historical Perspective*, in Hoselitz B. F (ed), *The Progress of Underdeveloped areas*, University of Chicago

[29] Globerman S (1979), *Foreign Direct Investment and 'Spillover' Efficiency Benefits in Canadian Manufacturing Industries*, Canadian Journal of Economics, February 1979, 12(E1), pp. 42–56.

[30] Government of Zimbabwe, *National Budget Statement*, March 2009

[31] Griliches Z and J Mairesse (1998), *Production Functions: The Search for Identi?cation*, in *Econometrics and Economic Theory in the Twentieth Century*: The Ragnar Frisch Centennial Symposium. New York: Cambridge University Press, 169–203

[32] Haddad, M and Harrison, A E (1993), *Are There Positive Spillovers from Direct Foreign Investment? Evidence from Panel Data for Morocco,* Journal of Development Economics, October 1993, 42(E1), pp. 51–74

[33] Handcock, M S and M Morris (1999), *Relative Distribution Methods in the Social Sciences*. New York: Springer.

[34] Hsieh C T and P J Klenov (2009) *Misallocation and Manufacturing TFP in China and India*, Quarterly Journal of Economics, CXXIV:4

[35] IMF (1993), *Balance of Payments Manual*. 5th Edition, Washington D.C.: IMF

[36] Javorcik B S (2004), Does Foreign Direct Investment Increase the Productivity of Domestic Firms? American Economic Review

[37] Keller W and S R Yeaple (2009), *Multinational Enterprises, International Trade and Productivity Growth: Firm Level Evidence from the United States*, The Review of Economics and Statistics 91 (E4):821–831

[38] Keller W (2004), *International Technology Diffusion,* Journal of Economic Literature, Vol XLII (September)

[39] Klenow P J and A Rodriguez-Clare (2005), *Externalities and Economic Growth*, in Aghion A P and S Durlauf (eds), *Handbook of Economic Growth*, Vol. 1. Amsterdam: Elsevier,

[40] Kokko A. (1994), *Technology, Market Characteristics, and Spillovers*, Journal of Development Economics, Vol.43, No.2, pp.279-93

[41] Liu Z (2008), *Foreign direct investment and technology spillovers: Theory and evidence*, Journal of Development Economics 85 (2008) 176–193

[42] Mankiw N G, et al (1992), *A Contribution to the Empirics of Economic Growth*, NBER Working Paper No.3541.

[43] Marshall A (1920), Principles of Economics, New York: Macmillan.

[44] Moran T (2001), *Parental Supervision: The New Paradigm for Foreign Direct Investment and Development*, Washington DC: Institute for International Economics

[45] Nadiri M I and S Kim (1996), *International R&D Spillovers, Trade and Productivity in Major OECD Countries*, NBER Working Paper No.5801.

[46] Olley S. and Pakes A (1996), *The Dynamics of Productivity in the Telecommunications Equipment Industry*, Econometrica 64: 1263-1297

[47] Ospina S and M Schiffbauer (2010), *Competition and Firm Productivity: Evidence from Firm-Level Data,* IMF Worling Paper, WP/10/67

[48] Restuccia, et al (2008), *Policy Distortions and Aggregate Productivity with Heterogeneous Plants*, Review of Economic Dynamics, 11, pp 707-720

[49] Rodrik D (1999), *The New Global Economy and Developing Countries: Making Openness Work,* Overseas Development Council (Baltimore, MD) Policy Essay No. 24, 1999

[50] Romer P M (1994), *The Origins of Endogenous Growth*, Journal of Economic Perspectives, Vol 8: 1, Winter

[51] UNCTD (2011), *Foreign Direct Investment, the Transfer and Diffusion of Technology, and Sustainable Development*, United Nations Conference on Trade and Development, Feb 2011, Geneva

[52] UNCTAD (2013), http://unctadstat.unctad.org

[53] UNCTAD (2014), http://unctadstat.unctad.org

[54] Walz U (1997), *Innovation, Foreign Direct Investment and Growth*, Economica 64: 63-79

[55] Wang J (1990), *Growth, Technology Transfer and the Long-Run Theory of International Capital Movements,* Journal of International Economics 29, 255–271

[56] Wilhelms S K S (1998), Foreign Direct Investment and Its Determinants in Emerging Economies, African Economic Policy Paper, Discussion Paper Number 9, July 1998

[57] Yasar M and Paul C J M (2008), *Foreign Technology Transfer and Productivity: Evidence from a Matched Sample*, American Statistical Association, JBE Statistics, Vol 26:1

Table 1: Industry Classifications

Category	ISIC	2-Digit Industry	No. of Firms
1	28, 29, 30	Industrial equipment and Fabricated Metals	398
2	27, 26	Basic Metals and non-Metals	106
3	24, 25, 19	Chemicals, Plastics and Rubber	276
4	15, 16	Food	812
5	17, 18	Textiles and Garments	511
6	20, 21, 22, 36, 37, 31, 32, 33, 34	Other	838

Source: World Bank Enterprise Surveys

Table 2: Summary Statistics for Selected Variables

Variable	Obs	Mean	Std.Dev.	Min	Max
Log Labour Productivity	2469	6.122	1.684	0.0437	18.4
TF Productivity	2705	15.21	33.61	0	100
FDI_{firm}	2705	26.30	15.06	0	83.5
FDI_{sec}	2693	15.74	10.72	0	75
Mgt Experience (Years)	2194	3.543	2.944	0	100
Formal Competition	2686	19.58	18.83	1	100
Firm age (Years)	2213	1.562	6.317	0	100
Corruption	2705	0.716	1.024	0	5
Telephone Obstacle	2705	1.874	1.588	0	5
Credit Obstacle	2705	0.430	0.495	0	1
Firm Size	2705	0.796	0.403	0	1

Data Source: WBES

Table 3: Correlation Coefficients Summary for Selected Variables

	LP	TFP	Firm FDI	Sector FDI	Mgt Experience	Compe-tion	Firm Age
LP	1						
TFP	0.566	1					
Firm FDI	0.087	0.109	1				
Sector FDI	0.092	0.124	0.146	1			
Mgt Exper.	0.014	-0.072	-0.020	-0.055	1		
Competition	-0.025	-0.124	-0.050	-0.043	0.046	1	
Firm Age	0.171	-0.085	0.014	-0.106	0.374	0.034	1
Corruption	-0.118	-0.010	-0.007	0.065	-0.002	-0.013	-0.043
Tel. Obstacle	-0.007	-0.053	0.023	-0.008	-0.041	0.047	-0.019
Credit Obstacle	-0.158	-0.260	-0.101	0.001	0.005	0.077	-0.020
Start Workers	0.148	0.029	0.239	0.109	0.031	0.021	0.225

	Corrup-tion	Telephone Obstacle	Credit Obstacle
Corruption	1		
Tel. Obstacle	0.027	1	
Credit Obstacle	0.005	0.270	1

Data Source: WBES

Table 4: FDI and Labour Productivity Spillover for SADC Pool

	OLS Estimation Firm Labour Productivity (Excluding Angola and DRC)				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.008***	0.012***	0.011***	0.012***	0.012***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Sector Foreign Ownership	0.002	0.005*	0.005*	0.016***	0.015***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Firm FDI x Sector FDI		-0.000***	-0.000***	-0.000***	-0.000***
		(0.000)	(0.000)	(0.000)	(0.000)
Firm Size(0=large; 1=small)			-0.472***	-0.278***	-0.283***
			(0.068)	(0.088)	(0.087)
Management Experience				-0.006**	-0.005*
				(0.003)	(0.003)
Formal Competition				-0.020*	-0.020*
				(0.011)	(0.011)
Informal Competition				-0.008	-0.007
				(0.023)	(0.022)
Firm Age				0.010***	0.010***
				(0.002)	(0.002)
Firm Avg Human Capital				0.138***	0.151***
				(0.053)	(0.038)
Corruption				-0.007*	-0.007**
				(0.003)	(0.003)
Communication Obstacle				0.027	0.022
				(0.034)	(0.034)
Credit Constraint				-0.117***	-0.112***
				(0.022)	(0.022)
Rule of Law (0=yes; 1=no)				-0.130***	-0.108***
				(0.036)	(0.036)
Foreign Inputs				0.005***	0.005***
				(0.001)	(0.001)
Regional Foreign Ownership					-0.002
					(0.002)
Regional Wage					1.388***
					(0.171)
Constant	10.620***	10.525***	10.893***	10.776***	-1.661
	(0.078)	(0.085)	(0.098)	(0.171)	(1.535)
No. of Observations	2,685	2,685	2,685	1,861	1,861
R-squared	0.323	0.325	0.338	0.411	0.429
F-Stat	122	113	114	58	60
Industry FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes

// *** p<0.01, ** p<0.05, * p<0.1

//Robust standard errors in parentheses

Table 5: FDI and Labour Productivity Spillovers Excluding South Africa

	OLS Estimation of Labour Productivity Excluding Angola, DRC & S.A				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.014***	0.015***	0.012***	0.012***	0.013***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Sector Foreign Ownership	0.013***	0.012***	0.011***	0.011***	0.009**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Foreign Inputs			0.005***	0.004***	0.004***
			(0.001)	(0.001)	(0.001)
Regional Foreign Ownership				0.003	0.001
				(0.003)	(0.003)
	----see Annex A, table A7 for other control variables--				
Constant	10.096***	10.257***	9.799***	-0.399	3.184***
	(0.944)	(0.216)	(0.896)	(1.666)	(0.750)
Observations	1,246	1,246	1,246	1,246	1,246
R_squared	0.304	0.265	0.316	0.340	0.327
F-Stat	28.3	26.6	28.2	30.3	32.3
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

//Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
//See table A7 in Annex A for full results with all variables

Table 6: Labour Productivity Spillover Effects on Small Firms

	OLS Estimation of Labour Productivity				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.013***	0.012***	0.011***	0.011***	0.012***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Sector Foreign Ownership	0.016***	0.019***	0.014***	0.013***	0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Foreign Inputs			0.006***	0.006***	0.006***
			(0.001)	(0.001)	(0.001)
Regional Foreign Ownership				0.002	0.003
				(0.002)	(0.002)
	----see Annex A, table A8 for other control variables----				
Constant	10.755***	10.111***	10.740***	-0.471	3.315***
	(0.151)	(0.200)	(0.150)	(1.650)	(0.354)
Obs	1,515	1,515	1,515	1,515	1,515
Rsqrd	0.386	0.194	0.402	0.419	0.411
F-Stat	45.8	28.8	47.0	48.5	56.8
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
//See table A8 for results with all variables

Table 7: Productivity Spillover Effects on Large Firms

	OLS Estimation of Labour Productivity				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.008**	0.009**	0.007**	0.008**	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Sector Foreign Ownership	0.013	0.011	0.013	0.011	0.010
	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)
Foreign Inputs			0.001	-0.000	0.000
			(0.002)	(0.002)	(0.002)
Regional Foreign Ownership				-0.015**	-0.021***
				(0.006)	(0.006)
	----see Annex A, A9 for other control variables----				
Constant	10.700***	10.011***	10.704***	-8.281*	5.089***
	(0.365)	(0.461)	(0.366)	(4.652)	(0.949)
Observations	354	354	354	354	354
R-squared	0.311	0.170	0.311	0.349	0.298
F-Stat	10.5	8.23	10.1	10.7	11.8
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

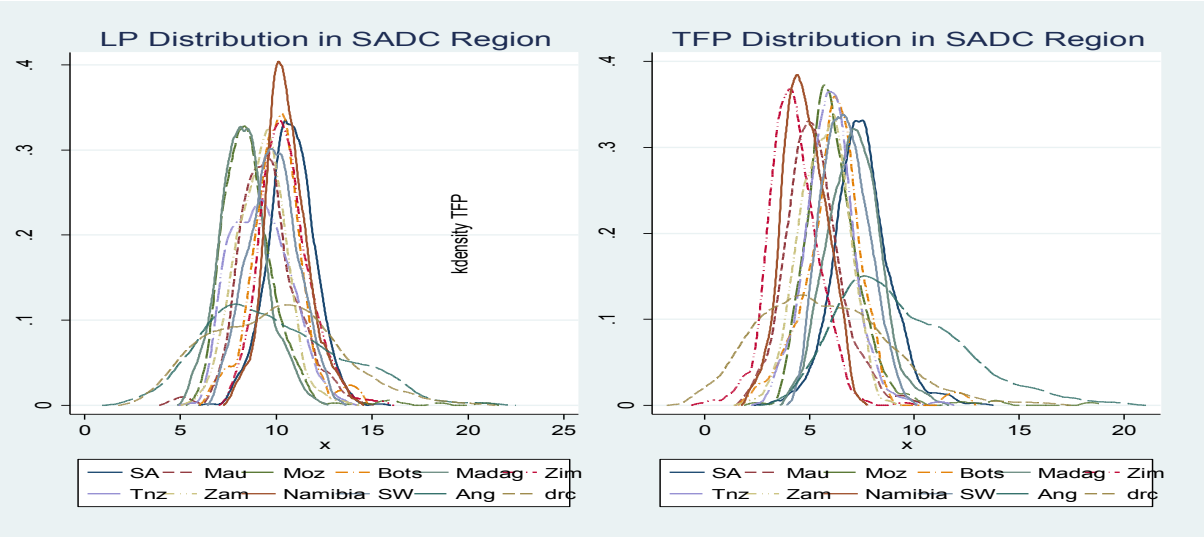
Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
//See Annex A table A9 for results with all variables

Table 8: FDI and Labour Productivity Spillover for Domestic Firms

	OLS Estimation of Labour Productivity Large Firms				
VARIABLES	LP_1	LP_2	LP_3	LP_4	LP_5
Sector Foreign Ownership	0.015***	0.016***	0.013***	0.012***	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Foreign Inputs			0.006***	0.005***	0.006***
			(0.001)	(0.001)	(0.001)
	----see Annex A, table A10 for other control variables----				
Constant	11.090***	10.568***	11.043***	-1.597	3.543***
	(0.170)	(0.228)	(0.170)	(1.656)	(0.366)
Obs	1,512	1,512	1,512	1,512	1,512
Rsqrd	0.409	0.211	0.424	0.444	0.432
F(23; 1491)	53.9	25.5	54.8	57.7	66.3
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

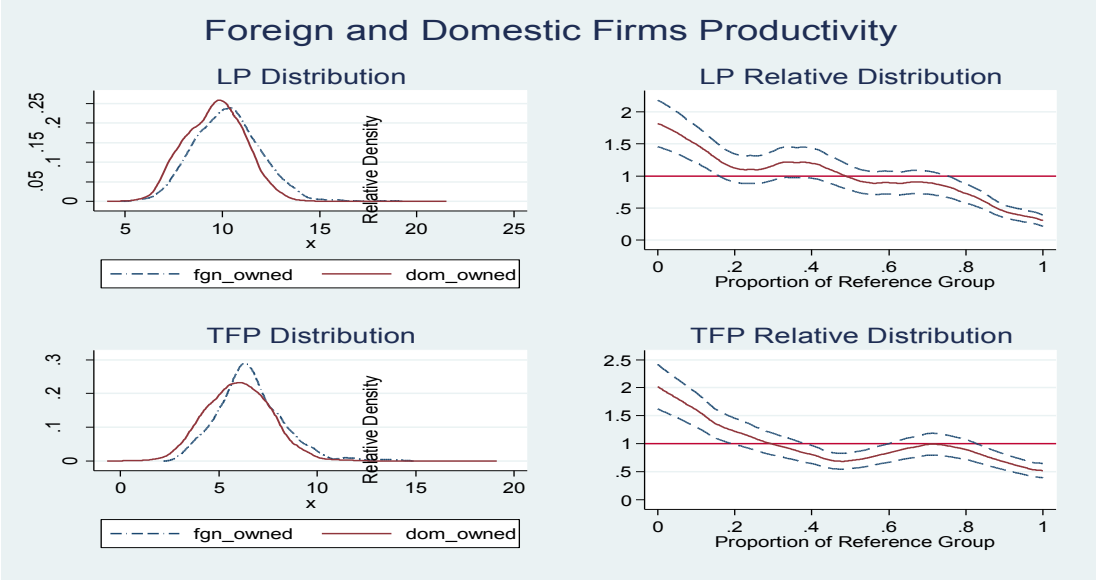
//Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
See Table A10 in Annex A for full variables tables.

Figure 1: Country Labour Productivity and TFP Distributions[1]



Source of Data: World Bank Enterprise Surveys

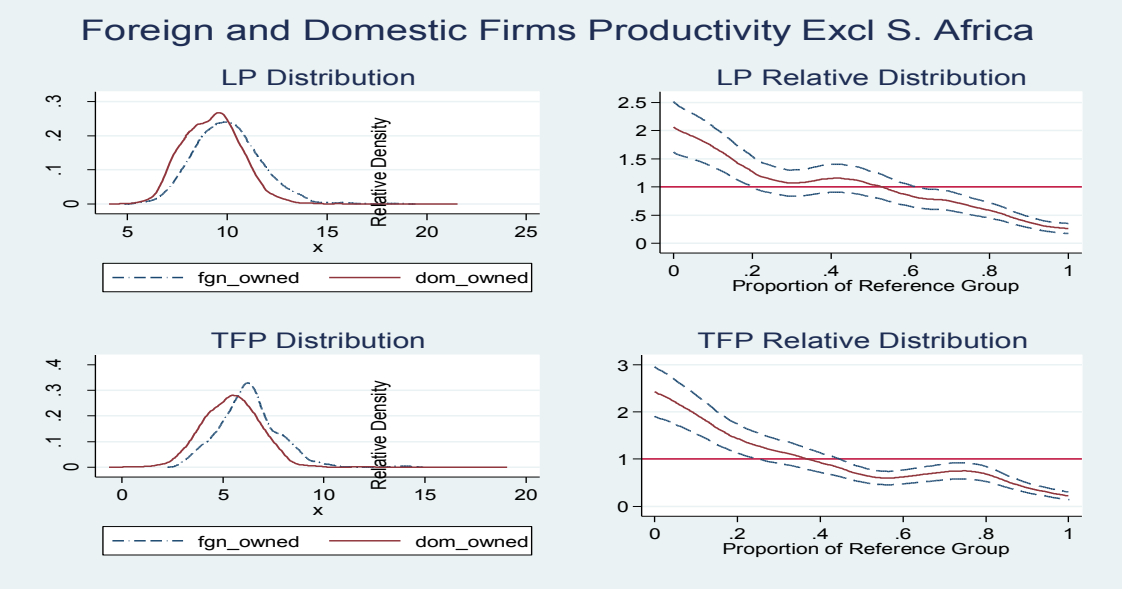
Figure 2: Firm Foreign Ownership and Firm Productivity



Source: World Bank Enterprise Surveys

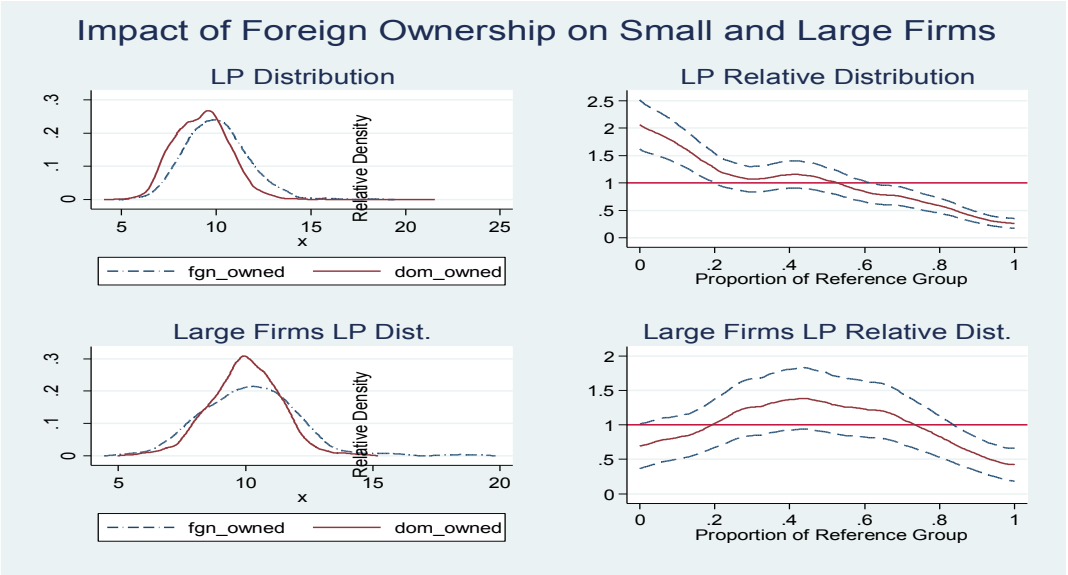
[1] SA=South Africa; Mau=Mauritius; Moz=Mozambique; Bots=Botswana; Madag=Madagascar; Zim=Zimbabwe; Tnz=Tanzania; Sw=Swaziland; Ang=Angola; drc=The DRC

Figure 3: Foreign Ownership and Productivity Excluding South Africa



Source: World Bank Enterprise Surveys

Figure 4: Firm Ownership and Firm Productivity by Firm Size (Excluding S.Africa)



Source: World Bank Enterprise Surveys

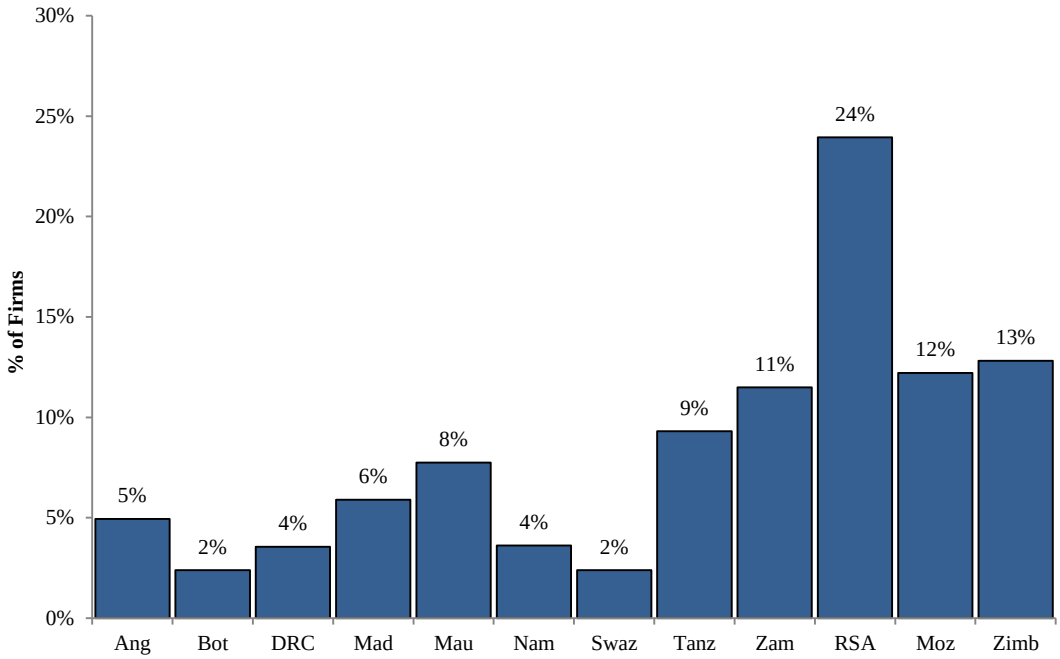
A**nnex A**

Table 25: List and Definition of Variables

Variable	Definition	Source
Chapter Two Variables		
Firm Foreign Ownership (FDI_{firm})	Percentage of firm equity holding owned by foreign investors.	WBES
Sector Foreign Ownership (FDI_{sector})	Weighted percentage of sector equity holding owned by foreign investors	"
Management Experience (Mgt Exper)	The number of years of magerail experience of the firm managing director	"
Formal Competition	Categorical variable indicating the threat of competition from other formal firms	"
Informal Competition	Categorical variable indicating the threat of competition from other the informal firms	"
Firm Age	The number of years the firm has been in existence since established	"
Corruption	Categorical variable indicating the threat of government corruption for the firm's operation	"
Firm Avg Human Capital	The average years of schooling education for the firm's workers	"
Communication Obstacle	Categorical variable indicating the threat of inefficient communication infrastructure to the firm's operation	"
Credit Constraint	Categorical variable indicating the threat of lack of credit on the firm's operation	"
Rule of Law	Dummy variable showing the existence or non-existence of the rule of law as rated by the firm	"
Firm Size	Dummy variable indicating whether the firm is small (D=1) or large (D=0)	"
Foreign Inputs	The percentage of foreign inputs in total inputs used by the firm	"
Regional Foreign Ownership	Weighted percentage of foreign firm ownership in specific regions	"
Regional Wage	Average wage rate in the region	

Insert 1: The World Bank Enterprise Surveys Data

Figure A1: Firm Representation by Country



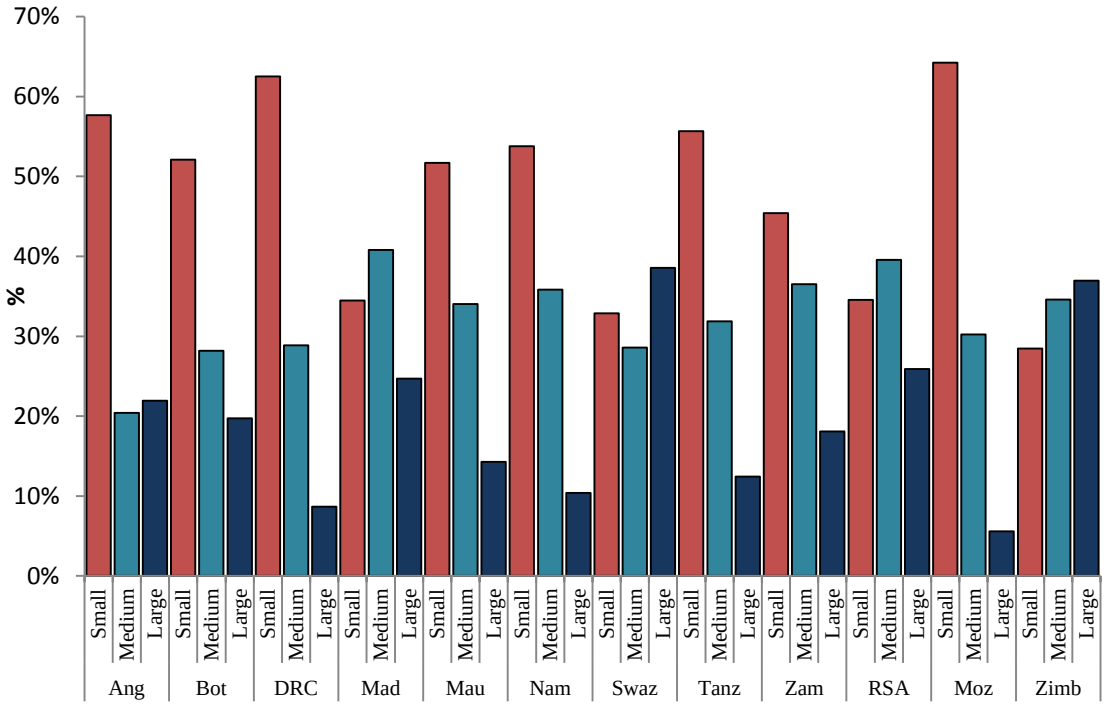
Source of Data: World Bank Enterprise Surveys (various)

Table A1: Firm Representation by Country and Industry (% of total No. in Each Industry)

	Ind-1	***Ind-2***	***Ind-3***	***Ind-4***	***Ind-5***	***Ind-6***
Angola	*3.0*	*6.6*	*2.9*	*9.1*	*1.8*	*4.2*
Botswana	*2.0*	*7.5*	*2.5*	*0.9*	*3.1*	*2.9*
DRC	*2.3*	*2.8*	*4.7*	*3.7*	*0.8*	*5.4*
Madagascar	*1.5*	*2.8*	*4.0*	*4.7*	*11.2*	*6.9*
Mauritius	*2.0*	*5.7*	*3.3*	*13.2*	*10.2*	*5.4*
Namibia	*5.0*	*9.4*	*4.0*	*2.3*	*1.0*	*4.9*
Swaziland	*1.8*	*4.7*	*2.5*	*2.0*	*1.0*	*3.6*
Tanzania	*5.5*	*12.3*	*9.1*	*8.6*	*0.6*	*16.7*
Zambia	*10.1*	*8.5*	*8.3*	*14.4*	*15.7*	*8.1*
S. Africa	*36.2*	*9.4*	*38.0*	*15.0*	*24.1*	*23.6*
Mozambique	*21.1*	*9.4*	*6.2*	*11.8*	*11.2*	*11.2*
Zimbabwe	*9.5*	*20.8*	*14.5*	*14.3*	*19.6*	*7.2*

Source: World Bank Enterprise Surveys

Figure A2: Within Country Firm Representation by Firm Size (% of Total Firms in each Country)



Data Source: World Bank Enterprise Surveys.

Table A2: Comparison of Within Country Sample and Population Proportions of Small Firms

Country	Proportion in Population	Proportion in Sample
South Africa	0.81	0.78
Angola	0.75	0.72
Botswana	0.83	0.79
DRC	0.91	0.90
Madagascar	0.83	0.76
Mauritius	0.85	0.89
Namibia	0.90	0.91
Swaziland	0.61	0.62
Tanzania	0.88	0.87
Mozambique	0.94	0.95
Zambia	0.87	0.82
Zimbabwe	0.75	0.62

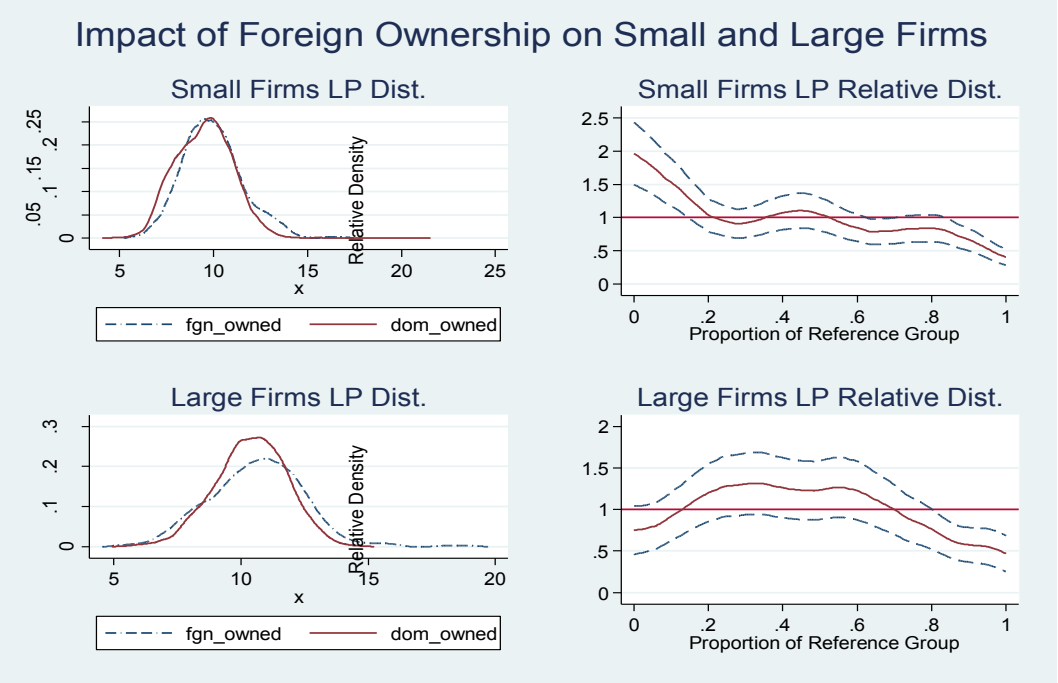
Source: Computed from World Bank Enterprise Surveys

Table A3*:* Factor Shares Using Three Estimation Specifications

	OLS		OLS With Sector Effects		IV With Sector Effects	
	Capital	Labour	Capital	Labour	Capital	Labour
Angola	-	-	-	-	0.43	0.63
Botswana	0.11	0.90	0.11	0.91	0.48	0.37
DR. Congo	0.40	0.69	0.39	0.61	0.59	0.38
Madagascar	0.09	0.92	0.10	0.90	0.25	0.50
Mauritius	0.33	0.90	0.30	0.90	0.54	0.32
Namibia	0.32	0.86	0.31	0.87	0.61	0.33
Swaziland	0.27	0.68	0.27	0.70	0.38	0.61
Tanzania	0.21	0.78	0.21	0.80	0.31	0.89
Zambia	0.25	0.75	0.24	0.76	0.40	0.59
R S A	0.20	0.80	0.19	0.81	0.43	0.63
Mozambique	0.16	0.84	0.17	0.84	0.27	0.81
Zimbabwe	0.37	0.72	0.37	0.72	0.62	0.31

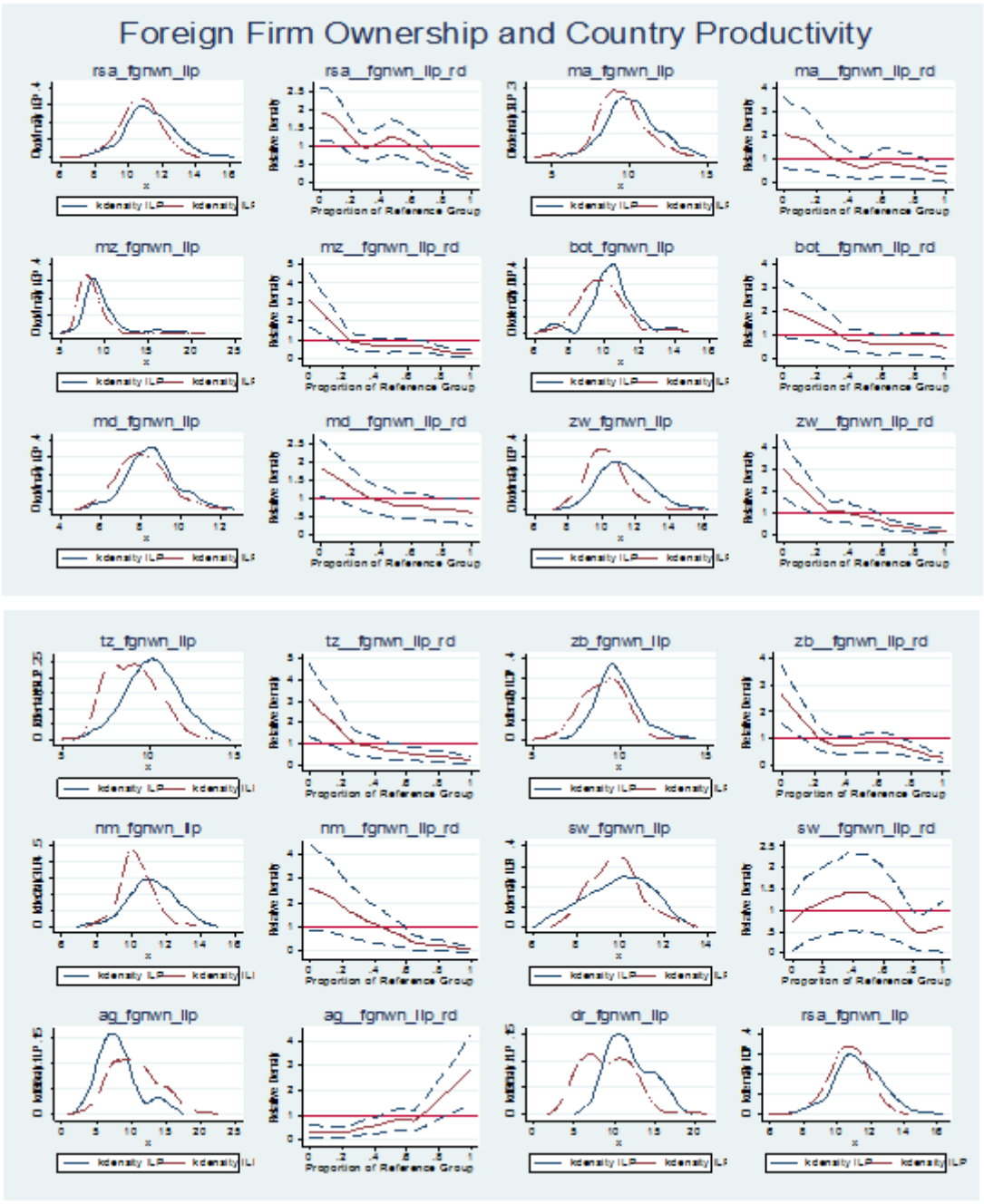
Estimated from the WBES

Figure A3: Foreign Ownership and Firm Productivity by Firm Size (All Countries)



Source: World Bank Enterprise Surveys

Figure A6: Impact of Foreign Firm Ownership At Country Level



///Solid line=foreign ownership; & broken line=domestic ownership

Table A7: FDI and Labour Productivity Spillovers Excluding South Africa

	OLS Estimation of Labour Productivity Excluding Angola, DRC & S.A				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.014***	0.015***	0.012***	0.012***	0.013***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Sector Foreign Ownership	0.013***	0.012***	0.011***	0.011***	0.009**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Firm FDI x Sector FDI	-0.000***	-0.000***	-0.000**	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Management Experience	-0.009**	-0.012***	-0.011***	-0.011***	-0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Formal Competition	-0.021**	-0.019*	-0.023**	-0.023**	-0.020*
	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)
Informal Competition	0.011	-0.020	0.013	0.011	-0.011
	(0.028)	(0.028)	(0.027)	(0.027)	(0.027)
Firm Age	0.010***	0.009***	0.009***	0.008***	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Firm Avg Human Capital	0.140**	0.121**	0.144**	0.159***	0.170***
	(0.062)	(0.060)	(0.061)	(0.042)	(0.057)
Corruption	-0.009**	-0.011***	-0.008**	-0.007**	-0.006*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Communication Obstacle	0.036	0.023	0.027	0.018	0.015
	(0.042)	(0.044)	(0.041)	(0.041)	(0.042)
Credit Constraint	-0.113***	-0.130***	-0.114***	-0.107***	-0.107***
	(0.026)	(0.027)	(0.026)	(0.025)	(0.025)
Rule of Law (0=no; 1=yes)	-0.117	0.067	-0.137*	-0.073	-0.016
	(0.083)	(0.086)	(0.083)	(0.083)	(0.084)
Firm Size(0=large; 1=small)	-0.241*	-0.292**	-0.179	-0.167	-0.172
	(0.129)	(0.125)	(0.128)	(0.129)	(0.128)
Foreign Inputs			0.005***	0.004***	0.004***
			(0.001)	(0.001)	(0.001)
Regional Foreign Ownership				0.003	0.001
				(0.003)	(0.003)
Regional Wage				1.321***	0.912***
				(0.179)	(0.092)
Constant	10.096***	10.257***	9.799***	-0.399	3.184***
	(0.944)	(0.216)	(0.896)	(1.666)	(0.750)
Obs	1,246	1,246	1,246	1,246	1,246
Rsqrd	0.304	0.265	0.316	0.340	0.327
F-Stat	28.3	26.6	28.2	30.3	32.3
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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

Table A8: Labour Productivity Spillover Effects on Small Firms

	OLS Estimation of Labour Productivity Excluding Angola and DRC				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.013***	0.012***	0.011***	0.011***	0.012***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Sector Foreign Ownership	0.016***	0.019***	0.014***	0.013***	0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Firm FDI x Sector FDI	-0.000***	-0.000**	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Management Experience	-0.003	-0.008**	-0.005	-0.004	-0.006*
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Formal Competition	-0.028***	-0.013	-0.030***	-0.030***	-0.028***
	(0.009)	(0.013)	(0.010)	(0.010)	(0.011)
Informal Competition	-0.002	-0.115***	0.003	0.004	-0.011
	(0.025)	(0.026)	(0.024)	(0.023)	(0.023)
Firm Age	0.009***	0.009***	0.008***	0.008***	0.008***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Firm Avg Human Capital	0.117**	0.089*	0.124**	0.138***	0.151***
	(0.054)	(0.054)	(0.054)	(0.037)	(0.049)
Corruption	-0.007**	-0.014***	-0.006*	-0.006*	-0.005*
	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)
Communication Obstacle	0.044	0.013	0.030	0.024	0.028
	(0.036)	(0.044)	(0.036)	(0.036)	(0.036)
Credit Constraint	-0.117***	-0.211***	-0.112***	-0.108***	-0.108***
	(0.023)	(0.026)	(0.023)	(0.023)	(0.023)
Rule of Law (0=no; 1=yes)	-0.179***	0.192**	-0.183***	-0.146**	-0.091
	(0.067)	(0.077)	(0.066)	(0.066)	(0.066)
Foreign Inputs			0.006***	0.006***	0.006***
			(0.001)	(0.001)	(0.001)
Regional Foreign Ownership				0.002	0.003
				(0.002)	(0.002)
Regional Wage				1.239***	0.839***
				(0.184)	(0.037)
Constant	10.755***	10.111***	10.740***	-0.471	3.315***
	(0.151)	(0.200)	(0.150)	(1.650)	(0.354)
Obs	1,515	1,515	1,515	1,515	1,515
Rsqrd	0.386	0.194	0.402	0.419	0.411
F-Stat	45.8	28.8	47.0	48.5	56.8
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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

Table A9: Productivity Spillover Effects on Large Firms

	OLS Estimation of Labour Productivity Excluding Angola and DRC				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.008**	0.009**	0.007**	0.008**	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Sector Foreign Ownership	0.013	0.011	0.013	0.011	0.010
	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)
Firm FDI x Sector FDI	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Management Experience	-0.012	-0.005	-0.012*	-0.011	-0.010
	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
Formal Competition	0.007	0.011	0.008	0.005	0.009
	(0.028)	(0.028)	(0.028)	(0.029)	(0.029)
Informal Competition	0.062	-0.017	0.062	0.049	0.037
	(0.065)	(0.073)	(0.065)	(0.062)	(0.068)
Firm Age	0.013***	0.016***	0.013***	0.012***	0.011***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Firm Avg Human Capital	0.805*	0.184	0.796*	0.848**	0.606
	(0.434)	(0.515)	(0.437)	(0.415)	(0.437)
Corruption	-0.012	-0.001	-0.011	-0.017	0.000
	(0.031)	(0.032)	(0.031)	(0.023)	(0.031)
Communication Obstacle	0.044	0.059	0.044	0.038	0.017
	(0.099)	(0.104)	(0.099)	(0.094)	(0.096)
Credit Constraint	-0.139**	-0.184**	-0.140**	-0.135**	-0.087
	(0.069)	(0.076)	(0.069)	(0.068)	(0.070)
Rule of Law (0=no; 1=yes)	-0.010	0.152	-0.012	-0.020	-0.120
	(0.166)	(0.196)	(0.166)	(0.168)	(0.179)
Foreign Inputs			0.001	-0.000	0.000
			(0.002)	(0.002)	(0.002)
Regional Foreign Ownership				-0.015**	-0.021***
				(0.006)	(0.006)
Regional Wage				2.159***	0.728***
				(0.521)	(0.110)
Constant	10.700***	10.011***	10.704***	-8.281*	5.089***
	(0.365)	(0.461)	(0.366)	(4.652)	(0.949)
Obs	354	354	354	354	354
Rsqrd	0.311	0.170	0.311	0.349	0.298
F(23; 1491)	10.5	8.23	10.1	10.7	11.8
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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

Table A10: FDI and Labour Productivity Spillover for Domestic Firms

	OLS Estimation of Labour Productivity for Domestic Firms				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Sector Foreign Ownership	0.015***	0.016***	0.013***	0.012***	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Management Experience	-0.006*	-0.009***	-0.008**	-0.007**	-0.008***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Formal Competition	-0.016*	-0.001	-0.016	-0.016	-0.013
	(0.010)	(0.013)	(0.011)	(0.011)	(0.012)
Informal Competition	0.017	-0.102***	0.023	0.021	0.008
	(0.024)	(0.027)	(0.024)	(0.023)	(0.023)
Firm Age	0.009***	0.010***	0.008***	0.007***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm Avg Human Capital	0.223*	0.228	0.228**	0.193**	0.263**
	(0.129)	(0.180)	(0.112)	(0.091)	(0.130)
Corruption	-0.010***	-0.016***	-0.008**	-0.008***	-0.008**
	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)
Communication Obstacle	0.020	-0.028	0.006	0.005	0.005
	(0.038)	(0.045)	(0.038)	(0.037)	(0.038)
Credit Constraint	-0.116***	-0.216***	-0.113***	-0.109***	-0.110***
	(0.024)	(0.026)	(0.023)	(0.023)	(0.023)
Rule of Law (0=no; 1=yes)	-0.164**	0.202***	-0.162**	-0.125*	-0.079
	(0.066)	(0.076)	(0.065)	(0.064)	(0.065)
Firm Size	-0.315***	-0.521***	-0.268***	-0.259***	-0.272***
	(0.091)	(0.101)	(0.090)	(0.089)	(0.090)
Foreign Inputs			0.006***	0.005***	0.006***
			(0.001)	(0.001)	(0.001)
Regional Foreign Ownership				-0.001	-0.000
				(0.002)	(0.002)
Regional Wage				1.408***	0.857***
				(0.184)	(0.037)
Constant	11.090***	10.568***	11.043***	-1.597	3.543***
	(0.170)	(0.228)	(0.170)	(1.656)	(0.366)
Obs	1,512	1,512	1,512	1,512	1,512
Rsqrd	0.409	0.211	0.424	0.444	0.432
F(23; 1491)	53.9	25.5	54.8	57.7	66.3
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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

Table A11: FDI SPILLOVER EFFECTS BY COUNTRY LEVEL- USING THE LPR

	LPR RSA	LPR Mauritius	LPR Mozambiq	LPR Botswana	LPR Madagascar	LPR Zimbabwe	LPR Tanzania	LPR Zambia	LPR Namibia	LPR Swaziland	LPR Angola	LPR DRC
FDI_firm	0.005***	0.001	0.006*	-0.001	0.007**	0.015***	0.009***	0.008***	0.004	0.004	0.002	0.021*
	(0.001)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)	(0.004)	(0.004)	(0.017)	(0.011)
FDI_sec	0.040***	-0.040***	0.033***	-0.033***	-0.011**	0.012	0.038***	-0.013	-0.005	-0.006	0.102**	-0.007
	(0.009)	(0.010)	(0.011)	(0.009)	(0.005)	(0.008)	(0.008)	(0.008)	(0.010)	(0.005)	(0.043)	(0.020)
Reg_wge	1.603***	0.412	1.807***	-0.203	0.615	-0.294	1.465***	0.751	-3.952**	1.572	1.58***	0.980**
	(0.494)	(0.370)	(0.274)	(1.785)	(1.176)	(0.586)	(0.361)	(0.464)	(1.828)	(1.175)	(0.562)	(0.463)
Fgn_inp	0.005***	0.004*	0.004	0.005	0.005*	-0.005**	0.012***	0.003**	0.000	-0.003	-0.006	0.010
	(0.002)	(0.003)	(0.003)	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.014)	(0.011)
Constant	-4.743	8.211***	-2.324	12.023	4.247	11.745**	-2.060	3.747	42.468***	-2.942	7.354**	7.952*
	(4.471)	(2.821)	(1.938)	(14.221)	(7.565)	(4.652)	(2.690)	(3.229)	(14.914)	(9.055)	(3.008)	(4.043)
Obs	623	124	321	46	106	340	251	330	76	61	61	72
R-sqd	0.219	0.270	0.271	0.379	0.245	0.166	0.424	0.188	0.473	0.293	0.502	0.365

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

//All regressions are done with same variables as in those in table 1, except in some instances were variable(s) were dropped either because there is not enough variation in the variable at country level, eg firm size; or the variable had too many missing observations. A case of the later was corruption, which is inadequately reported in some countries

Table A12: FDI and Total Factor Productivity Spillover for SADC Pool

	OLS Estimation Firm Total Factor Productivity (Excl Angola and DRC)				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.008***	0.004*	0.007***	0.007***	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Sector Foreign Ownership	0.011***	0.015***	0.009**	0.009**	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Firm FDI x Sector FDI	-0.000*	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Management Experience	-0.001	-0.001	-0.002	-0.002	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Formal Competition	-0.012	-0.008	-0.013	-0.013	-0.014
	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Informal Competition	-0.056**	-0.099***	-0.054**	-0.054**	-0.036
	(0.022)	(0.024)	(0.022)	(0.022)	(0.023)
Firm Age	0.008***	0.010***	0.007***	0.007***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm Avg Human Capital	0.062	0.061	0.069	0.075	0.104
	(0.059)	(0.080)	(0.061)	(0.058)	(0.080)
Corruption	-0.012***	-0.015***	-0.010***	-0.010***	-0.009**
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Communication Obstacle	-0.008	-0.005	-0.017	-0.019	0.003
	(0.032)	(0.036)	(0.032)	(0.032)	(0.033)
Credit Constraint	-0.087***	-0.151***	-0.085***	-0.083***	-0.082***
	(0.021)	(0.024)	(0.021)	(0.021)	(0.023)
Rule of Law (0=no; 1=yes)	-0.091	-0.011	-0.092	-0.076	-0.190***
	(0.064)	(0.071)	(0.063)	(0.064)	(0.068)
Firm Size(1=large; 2=small)	-0.330***	-0.456***	-0.296***	-0.295***	-0.310***
	(0.089)	(0.099)	(0.088)	(0.089)	(0.093)
Foreign Inputs			0.005***	0.004***	0.002
			(0.001)	(0.001)	(0.001)
Regional Foreign Ownership				0.001	0.004
				(0.003)	(0.003)
Regional Wage				0.560***	0.575***
				(0.169)	(0.037)
Constant	7.754***	6.583***	7.721***	2.668*	1.809***
	(0.164)	(0.213)	(0.166)	(1.512)	(0.373)
Obs	1,803	1,803	1,803	1,803	1,803
Rsqrd	0.453	0.312	0.461	0.464	0.391
F-stat	74.3	57.8	70.8	66	67.7
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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

Table A13: FDI and Total Factor Productivity Spillovers For SADC Excluding South Africa

	OLS Estimation of TFP Productivity Excluding S.A				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.009***	0.007***	0.008***	0.008***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Sector Foreign Ownership	0.008**	0.011***	0.007*	0.007*	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Firm FDI x Sector FDI	-0.000*	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Management Experience	-0.005	-0.004	-0.007**	-0.007**	-0.005
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Formal Competition	-0.014	-0.018**	-0.015	-0.016	-0.020**
	(0.009)	(0.009)	(0.010)	(0.010)	(0.009)
Informal Competition	-0.019	0.021	-0.018	-0.019	0.019
	(0.025)	(0.026)	(0.025)	(0.025)	(0.025)
Firm Age	0.004	0.004*	0.003	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm Avg Human Capital	0.081	0.107	0.085	0.092	0.083
	(0.060)	(0.074)	(0.061)	(0.056)	(0.065)
Corruption	-0.011***	-0.010**	-0.010***	-0.010***	-0.009**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Communication Obstacle	-0.007	0.013	-0.017	-0.020	0.006
	(0.035)	(0.035)	(0.034)	(0.034)	(0.035)
Credit Constraint	-0.080***	-0.068***	-0.080***	-0.078***	-0.079***
	(0.024)	(0.025)	(0.024)	(0.024)	(0.025)
Rule of Law (0=no; 1=yes)	-0.109	-0.320***	-0.127*	-0.094	-0.277***
	(0.077)	(0.079)	(0.077)	(0.078)	(0.081)
Firm Size(1=large; 2=small)	-0.110	-0.096	-0.056	-0.047	-0.015
	(0.105)	(0.105)	(0.106)	(0.108)	(0.111)
Foreign Inputs			0.004***	0.004***	0.004***
			(0.001)	(0.001)	(0.001)
Regional Foreign Ownership				0.003	0.010***
				(0.004)	(0.003)
Regional Wage				0.581***	-0.509***
				(0.179)	(0.096)
Constant	6.094***	6.253***	5.834***	1.333	9.615***
	(0.936)	(0.218)	(0.895)	(1.623)	(0.748)
Obs	1,225	1,225	1,225	1,225	1,225
Rsqrd	0.323	0.263	0.334	0.339	0.288
F-stat	32.8	30	31.1	29.1	27
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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

Table A14: Total Factor Productivity Spillover Effects on Small Firms

	OLS Estimation of TFP Productivity Small Firms				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.010***	0.006**	0.009***	0.009***	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Sector Foreign Ownership	0.010**	0.014***	0.009**	0.009**	0.012***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Firm FDI x Sector FDI	-0.000**	-0.000	-0.000*	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Management Experience	-0.001	-0.001	-0.003	-0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Formal Competition	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Informal Competition	-0.021**	-0.015	-0.022**	-0.023**	-0.024**
	(0.009)	(0.010)	(0.009)	(0.009)	(0.009)
Firm Age	-0.056**	-0.098***	-0.052**	-0.052**	-0.038
	(0.024)	(0.025)	(0.023)	(0.023)	(0.024)
Firm Avg Human Capital	0.005**	0.006**	0.004*	0.004*	0.006**
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Corruption	0.074	0.089	0.079	0.085	0.122
	(0.054)	(0.077)	(0.056)	(0.052)	(0.075)
Communication Obstacle	-0.012***	-0.015***	-0.010***	-0.010***	-0.009**
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Credit Constraint	0.020	0.010	0.008	0.007	0.030
	(0.037)	(0.042)	(0.037)	(0.037)	(0.039)
Rule of Law (0=no; 1=yes)	-0.085***	-0.143***	-0.081***	-0.078***	-0.081***
	(0.023)	(0.025)	(0.023)	(0.023)	(0.024)
Foreign Inputs	-0.086	-0.023	-0.087	-0.059	-0.173**
	(0.067)	(0.076)	(0.066)	(0.067)	(0.072)
Regional Foreign Ownership			0.005***	0.005***	0.001
			(0.001)	(0.001)	(0.001)
Regional Wage				0.004	0.008***
				(0.003)	(0.003)
Constant				0.525***	0.524***
				(0.187)	(0.039)
Obs	1,479	1,479	1,479	1,479	1,479
Rsqrd	0.405	0.253	0.416	0.420	0.333
F(23; 1491)	61.3	45.8	58.6	54.8	55.4
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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

Table A15: Total Factor Productivity Spillover Effects on Large Firms

	OLS Estimation of TFP Productivity Large Firms				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Firm Foreign Ownership	0.001	0.000	0.001	0.001	0.001
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Sector Foreign Ownership	0.008	0.021**	0.007	0.006	0.015*
	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Firm FDI x Sector FDI	-0.000	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Management Experience	0.004	0.005	0.003	0.002	0.001
	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)
Formal Competition	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Informal Competition	0.003	0.003	0.005	0.003	0.004
	(0.026)	(0.027)	(0.028)	(0.029)	(0.030)
Firm Age	-0.027	-0.066	-0.026	-0.032	0.007
	(0.061)	(0.068)	(0.061)	(0.060)	(0.064)
Firm Avg Human Capital	0.012***	0.017***	0.011***	0.010***	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Corruption	-0.142	-1.542**	-0.130	-0.143	-0.679
	(0.535)	(0.622)	(0.530)	(0.524)	(0.546)
Communication Obstacle	-0.012	-0.007	-0.005	-0.006	0.001
	(0.042)	(0.044)	(0.040)	(0.037)	(0.038)
Credit Constraint	-0.100	-0.016	-0.100	-0.106	-0.080
	(0.070)	(0.072)	(0.070)	(0.070)	(0.068)
Rule of Law (0=no; 1=yes)	-0.095	-0.177**	-0.104*	-0.099	-0.078
	(0.062)	(0.069)	(0.062)	(0.063)	(0.068)
Foreign Inputs	-0.218	-0.082	-0.224	-0.257	-0.378**
	(0.178)	(0.209)	(0.177)	(0.182)	(0.190)
Regional Foreign Ownership			0.004*	0.004	0.004*
			(0.002)	(0.002)	(0.002)
Regional Wage				-0.016**	-0.011
				(0.008)	(0.007)
Constant				1.101**	0.898***
				(0.458)	(0.118)
Obs	324	324	324	324	324
Rsqrd	0.620	0.501	0.625	0.634	0.591
F(25; 298)	28.3	24.9	29.1	26.8	26.9
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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

Table A16: FDI and TFP Spillover for Domestic Firms

	OLS Estimation of Total Factor Productivity				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Sector Foreign Ownership	0.009**	0.013***	0.007*	0.007*	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Management Experience	-0.002	-0.001	-0.003	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Formal Competition	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Informal Competition	-0.008	-0.002	-0.008	-0.008	-0.010
	(0.009)	(0.011)	(0.010)	(0.011)	(0.010)
Firm Age	-0.047*	-0.101***	-0.043*	-0.044*	-0.032
	(0.024)	(0.025)	(0.023)	(0.023)	(0.025)
Firm Avg Human Capital	0.006***	0.007***	0.005**	0.005**	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	0.215***	0.248***	0.222***	0.206***	0.263***
	(0.070)	(0.080)	(0.064)	(0.059)	(0.089)
Communication Obstacle	-0.014***	-0.018***	-0.013***	-0.013***	-0.012***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Credit Constraint	-0.001	-0.005	-0.011	-0.011	0.024
	(0.038)	(0.043)	(0.038)	(0.038)	(0.039)
Rule of Law (0=no; 1=yes)	-0.084***	-0.150***	-0.082***	-0.080***	-0.080***
	(0.023)	(0.026)	(0.023)	(0.023)	(0.025)
Firm Size	-0.071	0.009	-0.069	-0.047	-0.162**
	(0.067)	(0.075)	(0.067)	(0.067)	(0.071)
Foreign Inputs	-0.395***	-0.490***	-0.358***	-0.352***	-0.350***
	(0.096)	(0.113)	(0.096)	(0.096)	(0.102)
Regional Foreign Ownership			0.004***	0.004***	0.001
			(0.001)	(0.001)	(0.001)
Regional Wage				0.002	0.005*
				(0.003)	(0.003)
Constant				0.569***	0.579***
				(0.195)	(0.040)
Obs	1,465	1,465	1,465	1,465	1,465
Rsqrd	0.475	0.326	0.482	0.486	0.411
F(23; 1491)	78.3	59.7	74.8	69.1	71.1
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes
Country FE	Yes	No	Yes	Yes	No

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