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Outward Foreign Direct Investment, Exporting and Firm-Level Performance in Sub-Saharan Africa

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Abstract

This paper adds to the small but growing literature that considers a relationship between the way a firm serves foreign markets and its subsequent performance. The current paper is the first to consider this issue for a sample of sub-Saharan African countries and includes data on both manufacturing and services firms. Results from a number of parametric and non-parametric tests for manufacturing industries indicate that there is a clear productivity ordering with firms undertaking outward FDI performing best, followed by exporters with domestically oriented firms performing least well. The results for services firms are more nuanced and indicate that while exporters and firms undertaking outward FDI are more productive than domestically oriented firms, there is no significant difference in productivity between these two types of firms. Despite this, average productivity and point estimates from the regression analysis on services firms suggest that the productivity of exporting firms is larger than that for firms undertaking outward FDI.

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1. Introduction

Exporting and FDI are alternative means of supplying a foreign market and are often considered to be substitute channels.[1] The choice between exporting and FDI has often been discussed in the context of the proximity-concentration trade-off (see Brainard, 1993). This approach suggests that FDI becomes more favourable relative to exporting as the size of the foreign market increases (and the costs of exporting increase), and less favourable as the cost of setting up foreign production grows. In this context, Helpman et al. (2004) recently extended the seminal contribution of Melitz (2003) to consider the choice between serving the domestic market only, exporting and foreign production achieved through horizontal outward FDI. As with the Melitz model heterogeneity with respect to firm productivity is the main determinant of the decision to serve foreign consumers through exporting or outward FDI, implying that firms self-select into exporting and FDI. Due to fixed costs in serving foreign markets, only the most productive firms will export or undertake FDI. In the case of exporting these fixed costs are usually thought to include those related to gathering information on product compliance, distribution networks, advertising and so on (Greenaway and Kneller, 2007), as well as transport costs. The costs of FDI are considered to be those associated with replicating production facilities abroad (though transport costs are eliminated). In the model of Helpman et al. (2004) it is assumed that the costs of outward FDI are greater than those for exporting, which implies that only the most productive firms will undertake outward FDI, while those with intermediate productivity levels will export, and those with the lowest levels of productivity will serve the domestic market only.

Greenaway and Kneller (2007) note that when there are factor price and market size differences, firms may also undertake vertical rather than horizontal FDI. They further note that in this case the ordering of the productivity distribution can be reversed: if the foreign country is small and offers some cost advantage, the least productive firms locate abroad, while the more productive ones remain at home. In this case, low productivity firms have an incentive to pay the sunk costs of FDI since they use the factor whose price is low abroad more intensively.

A small literature has tested whether this productivity ordering holds empirically. This literature tends to concentrate on firms in developed countries, and tends to use either standard regression analysis or non-parametric tests that consider differences in the whole produc-

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[1] A separate literature – largely at the aggregate level – has addressed the issue of whether exports and FDI are substitutes or complements (see for example Head and Ries, 2004).

tivity distribution rather than the conditional mean only. Results for Germany (Arnold and Hussinger, 2005), Italy (Castellani and Zanfei, 2007), Ireland (Girma et al., 2004), the United Kingdom (Girma et al., 2005) and Japan (Kimura and Kiyota, 2004) provide some support for the ordering hypothesised by Helpman et al. (2004). This evidence tends to be stronger for the ordering of exporting firms and firms that undertake outward FDI, with differences between exporters and firms serving only the domestic market found to be less pronounced.

All of the empirical studies mentioned above consider data on manufacturing firms only and for developed countries only. Recently, Bhattacharya et al. (2010) have extended the above model and approach to consider services trade, which has expanded rapidly in recent years. The focus on services trade has one important consequence, namely that trade in services is not associated with significant transport costs. In the case where transport costs are zero, Bhattacharya et al. (2010) argue that there is little incentive to pay the fixed costs of outward FDI, since foreign consumers can be served by producing at home. If the only reason to undertake FDI is to avoid transport costs therefore, we would not expect to see services firms undertake outward FDI. Services have a number of intangible characteristics however, implying that there is substantial uncertainty over the true characteristics of the service being provided. Bhattacharya et al. (2010) argue that this uncertainty may encourage services firms to undertake outward FDI. With this insight in hand they develop a model in which transport costs are assumed to be zero, but where there is assumed to be a risk to the consumer due to uncertainty associated with consuming services produced far away. This risk encourages outward FDI since it is assumed that physical proximity reduces the risk perception of the consumer, implying that the probability of positive demand is larger for firms undertaking outward FDI compared with exporters. Bhattacharya et al. (2010) show that in this case it can be that the productivity ordering is reversed with exporting firms being more productive than those engaged in outward FDI. This would be the case if the risk perception of consumers is high, since exporting firms that endogenise the risk of facing zero demand have to be more productive that firms undertaking outward FDI. The authors go on to test this hypothesis using data on the software industry in India and find support for their hypothesis, with productivity levels in firms undertaking outward FDI found to be lower than those for exporters. Recently, Wagner (2011) considers the productivity ordering of firms in the services sector for German firms and finds results consistent with those of Bhattacharya et al. (2010).

In this paper we use data from UNIDO's recently completed African Investor Survey (AIS), which has data on over 6,000 domestically and foreign-owned manufacturing and services firms from 19 sub-Saharan African (SSA) firms, to examine the productivity ordering of domestically owned firms that serve only the domestic market, that serve foreign markets by exporting and that serve foreign markets through outward FDI. In particular, we use data on the sub-sample of domestically owned firms, distinguishing between the three

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categories of firms mentioned above (i.e. domestic market, exporters, outward FDI). We further split our sample of domestically-owned firms into manufacturing and services firms to examine whether the productivity ordering differs between manufacturing and services firms, as hypothesised by Bhattacharya et al. (2010). This is the first paper that we are aware of that examines this productivity ordering for SSA firms, with the paper of Bhattacharya et al. (2010) being the only other that we are aware of that does this for another developing country, and then for just two industries (chemicals and software). Our results for manufacturing industries are broadly consistent with the theory of Helpman et al. (2004) and indicate that there is a clear productivity ordering with firms undertaking outward FDI performing best, followed by exporters with domestically oriented firms bringing up the rear. The results for services firms are more nuanced and indicate that while exporters and firms undertaking outward FDI are more productive than domestically oriented firms there is no significant difference in productivity between these two types of firms. Despite this, average productivity and point estimates from the regression analysis for services firms suggest that the productivity of exporting firms is larger than that for firms undertaking outward FDI (albeit not significantly so), providing partial support for the hypothesis of Bhattacharya et al. (2010).

The remainder of this paper is set out as follows: In Section 2 we discuss the data employed in our analysis; Section 3 describes the various parametric and non-parametric methods used to examine the productivity ordering; Section 4 presents and discusses the results; and Section 5 concludes.

2. Data and Summary Statistics

The data are drawn from the most recent UNIDO African Investor Survey (AIS) which was conducted over the period 2010-2011 and which surveys over 6,000 manufacturing and services firms in 19 SSA countries (see UNIDO, 2012). In order to ensure that the interviewed firms accurately represent the countries' economies, the samples were drawn from sampling frames which contained all available information about business activities in the survey countries. Furthermore, the sample was drawn by stratifying the sampling frames along the dimensions of size (10-49, 50-99 or 100+ employees), ownership (domestic or foreign) and sector (ISIC Rev. 3.1 2-digit level), and selecting companies randomly within each stratum. The data were collected mainly via face-to-face interviews between the respondent and a UNIDO enumerator, along with drop and pick in some occasions. The respondents were usually senior managers of the firm or – in case of foreign ownership – the local subsidiary. After the interview, the data were checked in the country by supervisors and re-checked at UNIDO headquarters. The UNIDO dataset is unique in that it covers a relatively large number of African countries and a large number of firms. As far as we aware, the survey is the largest single survey for Africa in terms of both country and firm coverage, with a number of the countries in the UNIDO dataset being surveyed for the first

time. In addition, the survey is current with the survey having been conducted in 2010-2011. An obvious drawback of the dataset is that the data have a country and industry dimension only, with no time dimension available. This means that we are unable to say anything on the direction of causality. In terms of the hypotheses tested in this paper however, it is assumed in the models of Helpman et al. (2004) and Bhattacharya et al. (2010) that productivity differences arrive due to self-selection of more highly productive firms into exporting and FDI, meaning that the issue of causality is not of primary concern.

The AIS surveyed both domestically- and foreign-owned firms and firms in both services and manufacturing industries. In our analysis, we concentrate on the sub-sample of domestically-owned firms who were asked whether they had subsidiaries abroad, and if so the number of such establishments and the value of these investments. Using these data we begin by searching for differences in productivity between firms serving the home market only, exporting firms and firms that have establishments outside of their home country (i.e. outward FDI) using the full sample of data. We then split the sample into manufacturing and services firms to examine whether the productivity ordering we find for the full sample holds for the two sub-samples and whether the results for the two sub-samples are consistent with the models of Helpman et al. (2004) and Bhattacharya et al. (2010) discussed above.

While it is common to assume that services are dominant in developed economies and manufacturing and agriculture dominate the economies of developing countries this is often not the case. Although services do dominate the economies of developed countries, accounting for almost 75 per cent of GDP in OECD countries (see Francois and Hoekman, 2010), they also form a significant component of developing countries' GDP. Francois and Hoekman (2010) for example note that services accounted for 66 per cent of value-added in Latin America in 2007 and that there has been a marked shift in value added towards the service sectors in SSA, despite lagging growth rates. Massimiliano et al. (2008) note that services constitute over 50 per cent of GDP in low income countries, and that 47 per cent of GDP growth in SSA over the period 2000-2005 was accounted for by services, compared with 37% and 16% for industry and agriculture respectively. While our dataset cannot provide information on the relative importance of services in the total economy of our sample of SSA countries we are able to say something about the relative performance of services and manufacturing firms in the sample. Table 1 reports information on the mean and median values of various performance indicators for all firms, and for services and manufacturing firms. The data reveal that while manufacturing firms tend to be larger in terms of employment and the capital stock, services firms have higher output and output per worker at the mean and median and tend to pay higher wages on average.

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Table 1

Mean and Median Values of Performance Indicators by Firm Type

	All firms	Domestically-oriented only	Exporters only	Outward FDI only
All Firms				
Log Output per Worker	9.71 (9.76)	9.60 (9.66)	10.13 (10.08)	10.54 (10.56)
Log Output	13.25 (13.25)	13.0 (13.03)	14.36 (14.55)	14.51 (14.74)
Employment	93 (30)	78 (26)	162 (66)	138 (47)
Average Wages	5974.2 (2304.4)	5232.0 (2174.7)	9525.6 (2704.5)	8181.9 (4768.2)
Log Capital Stock	12.56 (12.67)	12.32 (12.40)	13.64 (13.73)	13.82 (13.86)
Manufacturing Firms				
Log Output per Worker	9.48 (9.53)	9.30 (9.38)	9.95 (9.95)	10.59 (10.55)
Log Output	13.12 (13.15)	12.72 (12.80)	14.29 (14.45)	14.82 (14.62)
Employment	98 (36)	68 (29)	178 (76)	193 (65)
Average Wages	5650.9 (1900.2)	4433.1 (1717.5)	9046.0 (2510.7)	9313.5 (4924.3)
Log Capital Stock	12.68 (12.83)	12.31 (12.47)	13.69 (13.85)	14.29 (14.28)
Services Firms				
Log Output per Worker	10.01 (10.08)	9.93 (10.01)	10.94 (11.06)	10.48 (10.59)
Log Output	13.40 (13.42)	13.30 (13.34)	14.66 (14.88)	14.17 (14.77)
Employment	89 (25)	89 (25)	93 (41)	78 (42)
Average Wages	6258.5 (2949.7)	6030.8 (3011.9)	11539.7 (3205.4)	7022.9 (3766.1)
Log Capital Stock	12.43 (12.42)	12.32 (12.33)	13.41 (13.17)	13.30 (13.66)

Note: The table reports the mean values of the performance indicators along with the median in brackets.

Tables A1 and A2 in the Appendix report a breakdown of the domestically owned firms surveyed by country and ISIC revision 3.1 sector. The tables indicate that there is a fairly broad coverage of industries covered and that all countries are relatively well covered. Of the total sample of 3,254 domestically-owned firms, 1,817 are manufacturing firms and 1,437 are services firms. The minimum number of observations in a country is 52 (Niger) and the maximum is 365 (Ethiopia). In terms of sectoral coverage only one sector (manufacture of food products and beverages) has a share in the total sample greater than 10 per cent, though a number of sectors including Research and Development and the manufacture of radio, television and communication equipment unsurprisingly have very low shares. These tables also report the number of firms exporting and undertaking outward FDI by country and sector. In terms of our indicators of exporting firms and of firms that undertake FDI we define a firm serving the domestic market as one that does not export at all and that has not undertaken outward FDI, an exporting firm is one that exports any part of its output; and a firm undertaking outward FDI is one that has subsidiaries abroad, irrespective of whether the firm also exports or not.[2] Tables A1 and A2 indicate that exporting and outward FDI are relatively rare, a result found elsewhere in the literature. For the full sample of countries we observe that 15.4 per cent of firms export, with 2.7 per cent undertaking outward FDI. These figures are somewhat different when we consider manufactur-

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[2] There are only 44 observations in the dataset that have a foreign subsidiary but that do not export (of which 31 are services firms). It is thus not possible to consider firms that undertake FDI but do not export as a separate category.

ing and services industries separately. In particular, we find that exporting is much more common in manufacturing industries (22.5 per cent) relative to services (6.5 per cent), while for outward FDI the figures are similar though slightly higher in services (2.5 versus 3.1 per cent respectively). In our sample, exporting appears to be relatively common in the manufacture of food products and beverages, of tobacco products, and of textiles, as well as the tanning and dressing of leather and the manufacture of other transport equipment. Outward FDI is generally a rare activity in the sample though relatively high shares of firms undertaking FDI are found in manufacturing of medical, precision and optical instruments, watches and clocks, in manufacturing of electrical machinery and apparatus and in insurance and pension funding. Considering the data by country we observe that exporting tends to be relatively important in Kenya and Madagascar and relatively unimportant in Mozambique and Cape Verde. Outward FDI is relatively common in Mali and to a lesser extent Uganda and Niger, with little or no outward FDI being undertaken by the sampled firms in Mozambique, Cape Verde and Ethiopia.

Following the literature this paper uses a measure of labour productivity – defined as the log of the ratio of output to the labour force – as our performance measure. The mean and median values of logged labour productivity are reported in Table 1. These values are reported for all firms in our sample, for manufacturing firms only and for services firms only, with the data further decomposed into domestically-oriented firms, exporting firms and firms undertaking outward FDI. In terms of the mean and median values of logged labour productivity we find initial support for the theories of Helpman et al. (2004) and Bhattarachrya et al. (2010). When considering all firms and the subset of manufacturing firms only we find that the average levels of productivity are larger for firms undertaking outward FDI, followed by exporters, with domestically oriented firms having the lowest average levels of productivity. Such results are consistent with the theory of Helpman et al. (2004). For services firms however we observe that average productivity is highest for exports, followed by firms undertaking outward FDI, and domestically oriented firms. Results for services therefore are consistent with the hypothesis of Bhattarachyra et al. (2010). We now address this further using more formal statistical techniques. Results on the other performance indicators reported in Table 1 are generally found to be consistent with those for labour productivity. For all firms we find that the mean and median values of employment and wages are higher for exporters, with the mean and median levels of output and the capital stock being higher in firms undertaking outward FDI. In the case of manufacturing firms only however, we find that firms undertaking FDI dominate along all performance criteria with the mean and median values of the variables being higher for firms undertaking FDI than for both exporters and domestically-oriented firms. For services firms however we find that the mean and median values of all performance criteria are higher for exporters than for the other two types of firms.

3. Methodology

In order to test for differences in performance between domestically oriented firms, exporting firms and firms undertaking outward FDI we employ a number of statistical methods. We begin by reporting results from a simple comparison of means test, in which we allow the two distributions being tested to have different variances.[3] Such a test concentrates on only one moment of the distribution however, the mean. As such, we also make use of the concept of first order stochastic dominance, which allows one to both compare and rank the entire distributions of – in our case – firm performance. Establishing stochastic dominance requires that the productivity distributions of the three types of firm differ across all moments of the distribution, which thus provides a stricter test of the model than simply comparing mean productivity levels. In particular, we follow the approaches of Deglado et al. (2002) and Girma et al. (2004) and make use of the non-parametric one- and two-sided Kolmogorov-Smirnov (KS tests), which is described below.

Let F and G be two cumulative distribution functions, for example, the productivity of exporters and firms undertaking outward FDI. Then first order stochastic dominance of F relative to G means that $F(z) – G(z)$ must be less or equal to zero for all values of z, with strict inequality for some z. This can be tested using the one-sided and two-sided Kolmogorov-Smirnov (KS) test. The two-sided KS statistic tests the hypothesis that both distributions are identical, and the null and alternative hypotheses can be expressed as:

$$H_0 : F(z) - G(z) = 0 \qquad \forall \, z \in \Re$$
$$H_1 : F(z) - G(z) \neq 0 \quad \text{for some } z \in \Re$$

While the one-sided test can be formulated as:

$$H_0 : F(z) - G(z) \leq 0 \qquad \forall \, z \in \Re$$
$$H_1 : F(z) - G(z) > 0 \quad \text{for some } z \in \Re$$

In order to conclude that F stochastically dominates G requires that one can reject the null hypothesis for the two-sided test, but not for the one-sided test. In our analysis below we report results from the one-sided test for both the hypothesis that F dominates G and that G dominates F.

The KS test statistic for the two- and one-sided tests are:

$$KS_2 = \sqrt{\frac{n.\,m}{N}} \max_{1 \leq i \leq N} \{F_n(z_i) - G_m(z_i)\}$$

$$KS_1 = \sqrt{\frac{n.\,m}{N}} \max_{1 \leq i \leq N} |F_n(z_i) - G_m(z_i)|$$

respectively, where n and m are the sample sizes from the empirical distributions of F and G respectively, and $N = n + m$.

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[3] We also test for differences in the median of our performance measures across these groups using the Stata package 'cendif'. The results are not reported for reasons of brevity, but are largely similar to those using the test of means.

We further report results using regression analysis, which enables us to estimate the so-called productivity premium for different types of firm. The productivity premium for exporting firms for example is defined as the difference in labour productivity between exporting firms and firms that do not trade internationally after controlling for other relevant characteristics of firms. The additional characteristics included in our regression model are dictated by existing empirical studies and include a measure of firm size (the log value of employment) and its squared term, which accounts for any non-linear relationship between firm performance and firm size, and a variable capturing the firm's age.[4] In addition to these variables we account for country- and sector-differences through the inclusion of either country and sector dummies separately or sector-country interaction dummies. The basic estimating equation therefore is of the following form:

$$\ln Y_{ijk} = \beta_1 \ln \text{EMP}_{ijk} + \beta_2 \left(\ln \text{EMP}_{ijk} \right)^2 + \beta_3 \text{AGE}_{ijk} + \beta_4 \text{EXP}_{ijk} + \beta_5 \text{FDI}_{ijk} + \theta_i + \varphi_j + \varepsilon_{ijk}$$

where Y is output per worker in firm k in industry i in country j, EMP is the number of employees, AGE is firm age in years, EXP is a dummy equal to one if the firm is an exporter (but doesn't have establishments abroad), FDI is a dummy variable taking the value one if the firm has establishments abroad (irrespective of whether it is an exporter or not), and θ_i and φ_j are country- and sector-specific effects respectively. In various specifications these latter effects are replaced by sector-country fixed effects, τ_{ij}.

The above regression equation is estimated using standard OLS techniques along with the standard within regression when including sector-country fixed effects. Such models seek to estimate the productivity premia at the conditional mean of the productivity distribution. There are reasons to believe however that the impact of exporting or of outward FDI is likely to differ across firms. In particular, the recent theoretical literature on trade and productivity (e.g. Melitz, 2003) suggests that firm heterogeneity is to be expected. To account for this possibility therefore we also estimate the above regression model using quantile regression methods, which estimate the parameters of the model at different points on the (conditional) productivity distribution.[5] The method thus allows one to estimate different parameters on the EXP and FDI dummies for under-achievers (i.e. those at the lower end of the conditional productivity distribution) and over-achievers (i.e. those at the upper end). In addition to allowing for non-linearities in the relationship between a firm's trading status and its performance, quantile regressions have a number of other advantages over OLS. A further benefit relates to the fact that median regression methods can be more efficient than mean regression estimators in the presence of heteroscedasticity. Quantile regressions are also robust with regard to outlying observations in the dependent variable. The quantile regression objective function is a weighted sum of absolute deviations, which gives a robust measure of location, so that the estimated coefficient vector is not sensitive

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[4]   In his analysis Wagner (2011) includes employment and employment squared (alongside fixed effects) while Castellani and Zanfei (2007) includes variables capturing a firm's age and size (alongside sector and region fixed effects).

[5]   For an introduction to quantile regression models see Buchinsky (1998) and Koenker and Hallock (2001).

to outlier observations on the dependent variable. Finally, when the error term is non-normal, quantile regression estimators may be more efficient than least squares estimators.

One problem with the use of quantile regression methods in a panel context arises when including a large number of fixed effects, as is the case when we include sector-dummy fixed effects.[6] In particular, the inclusion of a large number of fixed effects leads to an incidental parameters problem; with a large number of cross-sectional units and a small number of observations for each cross-sectional unit the estimates of the fixed effects are likely to be poor. The poor quality of the estimates of the fixed effects causes the estimates of the main parameters of interest to be badly behaved. Koenker (2004) discusses approaches to deal with such problems, including a class of penalised quantile regression estimators, while Powell (2010) develops an unconditional quantile regression estimator that allows for the inclusion of fixed effects. Both of these approaches are computationally intensive to implement however. Recently, Canay (2011) has introduced an alternative method of estimating quantile regression models with fixed effects that is easy to implement using standard software. The method is based upon the assumption that the fixed-effects in the model act like pure location shift effects, meaning that the fixed effects are constant across quantiles. Given this assumption, Canay proposes the following two-step estimator:

(i) Estimate the standard fixed effects regression at the conditional mean (i.e. the usual within transformation) and using the estimated parameters from this model construct estimates for the individual fixed effects as $\hat{\alpha}_i = \frac{\sum_{t=1}^{T}\left(Y_{it} - X_{it}'\widehat{\beta}_\mu\right)}{T}$, where $\hat{\alpha}_i$ are the estimated fixed effects, Y_{it} is the dependent variable, X_{it} are the explanatory variables, and $\hat{\beta}_\mu$ are the estimated parameters from the conditional mean regression.

(ii) Define $\hat{Y}_{it} \equiv Y_{it} - \hat{\alpha}_i$ and estimate the quantile regression(s) using this newly defined variable as the dependent variable.

Canay (2011) shows that this estimator is consistent for large T. Canay (2011) also proposes a bootstrap procedure for estimating the variance-covariance matrix for this estimator. The bootstrap method is implemented by drawing with replacement a sample of size NT and computing the two-step estimator as described above. Repeating this a total of B times the estimated bootstrapped variance-covariance matrix at quantile τ is constructed as:

$$\frac{1}{B}\sum_{j=1}^{B}\left(\hat{\beta}_j^*(\tau) - \bar{\beta}^*(\tau)\right)\left(\hat{\beta}_j^*(\tau) - \bar{\beta}^*(\tau)\right)'$$

where $\hat{\beta}_j^*(\tau)$ are the estimated parameters from the jth bootstrap and the τth quantile, and $\bar{\beta}^*(\tau) = \frac{1}{B}\sum_{j=1}^{B}\hat{\beta}_j^*(\tau)$.

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[6] In the case of the services sector we have data on 19 countries and 24 sectors, meaning that there are 456 fixed effects to include.

We adapt this approach to our dataset, which has a country, sector and firm dimension. In our analysis we account for sector-country fixed effects and so follow step 1 above to construct estimates for the sector-country fixed effects and then use these to define the transformed dependent variable for use in step 2. Analogous to the arguments of Canay (2011) the estimator in this case would be consistent as the number of firms increase.[7]

4. Results

We begin our comparison of firms that serve the domestic market only, that export, and that undertake outward FDI by conducting simple mean comparison tests for the full sample of firms and for the two sub-samples of manufacturing firms and services firms separately. To account for differences in our performance measure across sectors and countries we de-mean log productivity by constructing a variable equal to the logged value of productivity minus the mean of the logged value of productivity of all firms in the same country and sector. We also use this demeaning procedure when employing the non-parametric KS test below. Results from the comparison of means test are reported in Table 2, with DOM referring to domestically oriented firms and EXP and FDI as defined above. When considering the full sample of firms we observe that there are significant differences in the mean values of productivity between all three types of firms, with the results supporting the productivity ordering of Helpman et al. (2004). In particular, we find that mean productivity for exporters is larger than that for domestically oriented firms, but is significantly lower than the mean of productivity for firms undertaking outward FDI. This pattern is also observed when considering manufacturing firms only. When considering services firms however we observe that while exporting firms and firms undertaking outward FDI both perform better than domestically oriented firms there are no significant differences in productivity between exporting firms and firms undertaking outward FDI, though the mean value of productivity is somewhat larger for exporters.

While the results reported in Table 2 would seem to suggest that firms undertaking outward FDI and exporting perform better than domestically oriented firms, with firms undertaking outward FDI also performing better than exporters in the manufacturing sector the statistics only look at one moment of the distribution of the performance measures (i.e. the mean). To provide an initial insight into the entire performance distribution of firms by type we report in Figures 1-9 plots of the cumulative distribution functions for domestically oriented firms, exporting firms and firms undertaking outward FDI for the full sample of firms, and for manufacturing and services firms only. The figures for all firms (figures 1-3) indicate that the productivity distribution of exporters and firms undertaking outward FDI always lie to the right of

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[7] For brevity we choose not to report results when including country and sector fixed effects separately. Given the relatively small number of fixed effects to be included in this case however, it is possible to include them using standard quantile regression methods. These results are available upon request and are qualitatively consistent with those when including country-sector fixed effects.

that for domestically oriented firms, thus supporting the view that these two types of firms perform better than domestically oriented ones. Differences in the distributions for exporters and firms undertaking outward FDI are much smaller however. This pattern also holds for manufacturing firms (figures 4-6), though in this case there are more pronounced differences between exporters and firms undertaking outward FDI. Finally, the figures for services firms (figures 7-9) again show pronounced differences between exporters and domestically oriented firms. The difference is less pronounced between firms undertaking outward FDI and domestically owned firms, with the distributions for exporters and firms undertaking outward FDI found to be quite similar and found to cross at a number of points.

Table 2

Comparison of Means Test – Demeaned Log Labour Productivity

Group 1 v Group 2	Mean for Group 1	Mean for Group 2	Alternative Hypothesis (p-value)		
			Unequal Means	Difference favourable to Group 1	Difference favourable to Group 2
All Firms					
DOM v EXP	-0.079	0.316	0.0000***	1.0000	0.0000***
DOM v FDI	-0.079	0.595	0.0000***	1.0000	0.0000***
EXP v FDI	0.316	0.595	0.0523*	0.9739	0.0261**
Manufacturing Firms					
DOM v EXP	-0.112	0.285	0.0000***	1.0000	0.0000***
DOM v FDI	-0.112	0.799	0.0000***	1.0000	0.0000***
EXP v FDI	0.285	0.799	0.0085***	0.9957	0.0043***
Services Firms					
DOM v EXP	-0.045	0.451	0.0008***	0.9996	0.0004***
DOM v FDI	-0.045	0.387	0.0412**	0.9794	0.0206**
EXP v FDI	0.451	0.387	0.7847	0.3923	0.6077

Figure 1
Productivity Differences between EXP and DOM Firms – All Firms
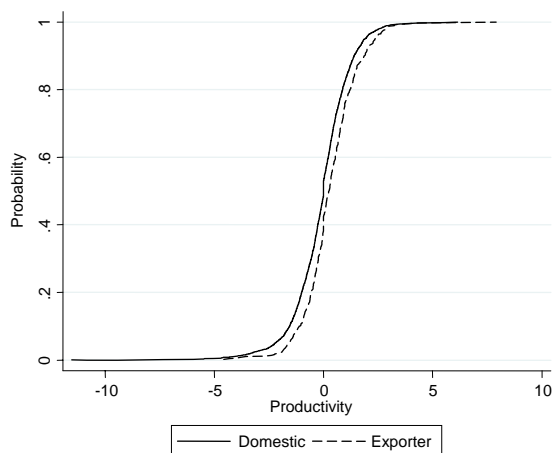
Figure 2
Productivity Differences between FDI and DOM Firms – All Firms
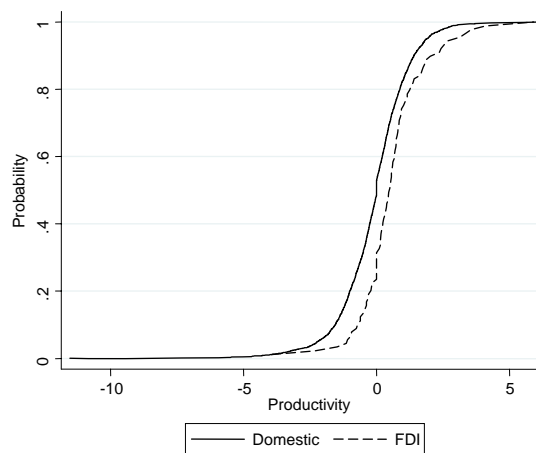
Figure 3

Productivity Differences between FDI and EXP Firms – All Firms
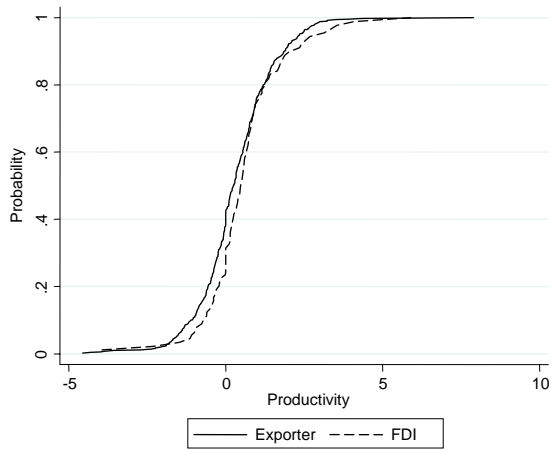
Figure 4

Productivity Differences between EXP and DOM Firms – Manufacturing Firms
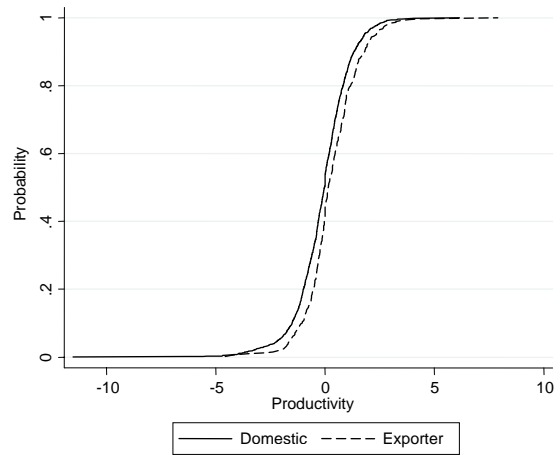
Figure 5

Productivity Differences between FDI and DOM Firms – Manufacturing Firms
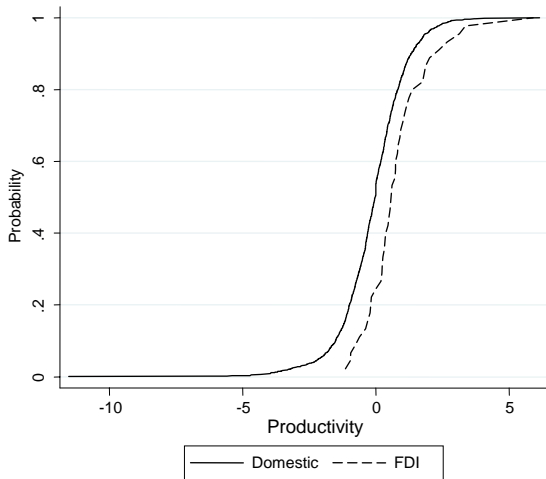
Figure 6

Productivity Differences between FDI and EXP Firms – Manufacturing Firms
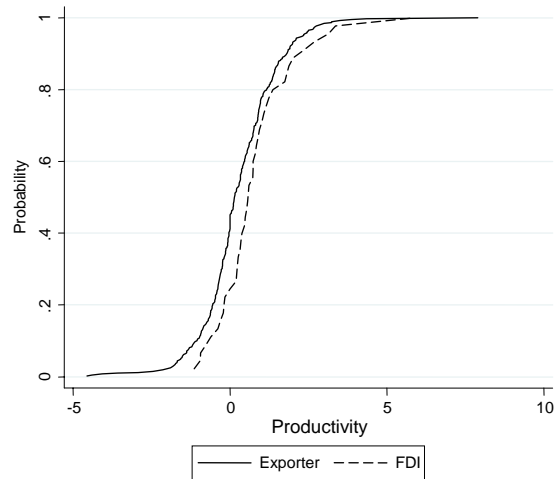
Figure 7

Productivity Differences between EXP and DOM Firms – Services Firms
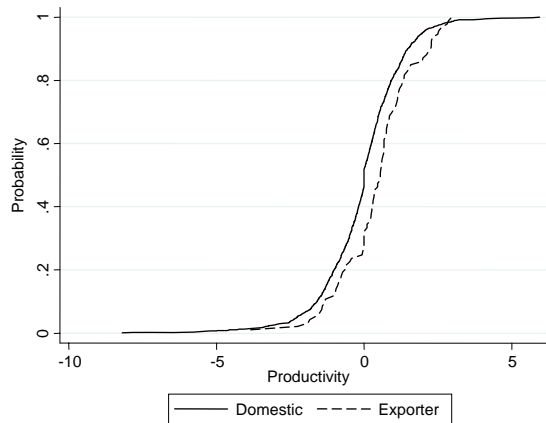
Figure 8

Productivity Differences between FDI and DOM Firms – Services Firms

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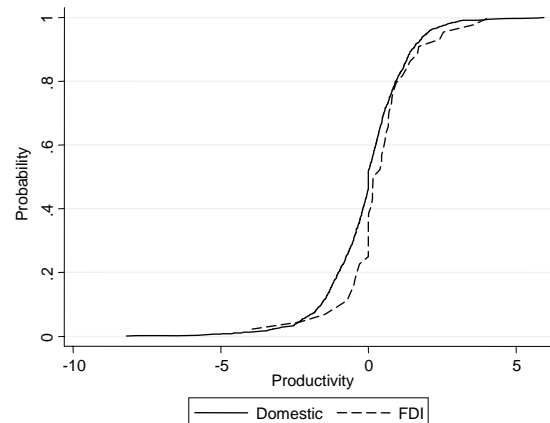
Figure 9

Productivity Differences between FDI and EXP Firms – Services Firms
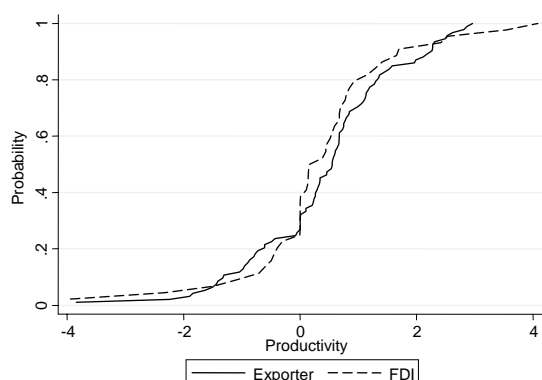
The non-parametric KS test formally tests for significant differences between two distributions and we now turn to these results, which are reported in Table 3. In terms of significance we find that the results from the KS test are identical to those from the comparison of means test. In particular, we observe that there are significant differences in the productivity distributions of domestically oriented firms, exporters and firms undertaking outward FDI for both all firms and for manufacturing firms only (as indicated by the significant coefficients on the equality of the distributions). The table also indicates that the productivity distribution of both exporters and of firms undertaking outward FDI dominate that of domestically oriented firms, while the distribution of firms undertaking outward FDI dominates that of exporters for both the full sample and for manufacturing firms only. When considering services firms only we again find that the distributions of both exporters and of firms undertaking outward FDI dominate that of domestically oriented firms but we find that there is no significant difference between the distributions of exporters and firms undertaking outward FDI.

Table 3

KS Test

Group 1 v Group 2	Observations		Equality of Distribution		Differences favourable to group 1		Differences favourable to group 2	
	Group 1	Group 2	Statistic	p-value	Statistic	p-value	Statistic	p-value
All Firms								
Domestic v Exporter	2663	501	0.1214	0.000***	0.1214	0.000***	-0.0003	1.000
Domestic v FDI	2663	89	0.2589	0.000***	0.2589	0.000***	-0.0008	1.000
Exporter v FDI	501	89	0.1545	0.054*	0.1545	0.027**	-0.0085	0.989
Manufacturers								
Domestic v Exporter	1364	408	0.1269	0.000***	0.1269	0.000***	0.000	1.000
Domestic v FDI	1364	45	0.3582	0.000***	0.3582	0.000***	0.000	1.000
Exporter v FDI	408	45	0.2703	0.005***	0.2703	0.003***	-0.0025	1.000
Services								
Domestic v Exporter	1299	93	0.2425	0.000***	0.2425	0.000***	-0.0131	0.971
Domestic v FDI	1299	44	0.2339	0.019**	0.2339	0.010**	-0.0096	0.992
Exporter v FDI	93	44	0.1559	0.462	0.1026	0.533	-0.1559	0.234

Finally, we report results from regression analysis, which allows us to control for additional covariates (other than sector-country fixed effects) that may help explain firm productivity. Table 4 reports OLS regression results for all firms, manufacturing firms only and services firms only. The table reports results when including a number of different fixed effects, with Column (1) including no country or sector fixed effects, Column (2) including country and sector fixed effects separately, and Column (3) including sector-country fixed effects. The results on employment and employment squared are largely consistent with the existing literature and indicate that labour productivity rises with firm size, but at a diminishing rate, while firm age is found to have a positive effect on productivity when significant. Turning to our main variables of interest – EXP and FDI – we observe coefficients that are large, positive and significant irrespective of the fixed effects included and irrespective of whether we look at all firms or whether we split the sample of manufacturing and services firms. Such results provide strong support for a productivity premium from exporting and from undertaking outward FDI (relative to only serving the domestic market). The coefficients on FDI are found to be larger than those on EXP when considering the full sample of countries and the sample of manufacturing firms only. The premium for firms undertaking outward FDI is estimated as being between 101 and 154 per cent for all firms (depending upon the fixed effects included), with that for exporters estimated as being between 62 and 86 per cent.[8] For manufacturing firms the premium is found to be between 158 and 205 per cent for firms undertaking FDI and between 65 and 72 per cent for exporting firms. While this difference is only found to be significant in one case for all firms (when no fixed effects are included), the difference is significant in two of the three cases when only manufacturing firms are considered. When we consider the sub-sample of services firms however we observe a somewhat different pattern. In particular, we observe that the coefficient is always larger for exporters than for firms undertaking outward FDI. The premium for exporters is estimated as being between 94 and 156 per cent, while that for firms undertaking outward FDI is estimated as being between 59 and 85 per cent. These differences are never found to be significant however.

Tables 5, 6 and 7 report quantile regression results for the 10th, 30th, 50th (i.e. median), 70th and 90th percentiles for all firms, for manufacturing firms only and for services firms only respectively. The quantile regression model is estimated using the approach of Canay (2011) to account for sector-country fixed effects. In all three tables the coefficients on employment, employment squared and firm age are display a similar pattern and are largely consistent with the OLS results reported in Table 4. We tend to observe a positive coefficient on employment, a negative one on employment squared and a positive one on firm age, though the coefficients tend to be insignificant at the highest quantiles. In terms of our main variables of interest we tend to observe similar results when considering all firms and manufacturing firms only (tables 5 and 6). The coefficients on EXP and FDI tend to be

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[8] The premium is calculated from the estimated coefficients on the FDI and exporter dummy as $100(e^{\beta} - 1)$, where β is the estimated coefficient.

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positive and significant at all quantiles, though often larger at the ends of the conditional productivity distribution compared with the median. The coefficients at the median also tend to be somewhat smaller than those at the conditional mean, as reported in Table 4, which is suggestive of an outlier problem with the OLS results. The coefficients on the FDI variable are in all cases larger than those for EXP, and in the case of manufacturing firms this difference tends to be large (i.e. the coefficient on FDI is more than twice as large as that on EXP). Moreover, at most quantiles (except for the lowest quantiles) the difference in the two coefficients is found to be significant. In the case of services (Table 7) we again find positive and significant coefficients on FDI and EXP. As with the OLS results the coefficients tend to be larger on EXP (the exception being the 30th percentile), though in no case are the coefficients significantly different.

Table 4

OLS results

VARIABLES	All Firms			Manufacturing Firms only			Services Firms only		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\ln EMP$	0.470***	0.405***	0.316***	0.531***	0.211	0.137	0.611***	0.734***	0.607***
	(0.106)	(0.106)	(0.120)	(0.126)	(0.133)	(0.145)	(0.168)	(0.157)	(0.189)
$\ln EMP^2$	-0.0580***	-0.0481***	-0.0396**	-0.0472***	-0.00878	-0.00265	-0.0958***	-0.106***	-0.0949***
	(0.0142)	(0.0137)	(0.0155)	(0.0165)	(0.0164)	(0.0174)	(0.0233)	(0.0211)	(0.0255)
AGE	0.00682***	0.00255	0.00146	0.00414*	0.000980	-9.27e-05	0.0133***	0.00245	0.00264
	(0.00199)	(0.00187)	(0.00210)	(0.00216)	(0.00193)	(0.00223)	(0.00363)	(0.00358)	(0.00398)
EXP	0.484***	0.662***	0.622***	0.505***	0.542***	0.524***	0.939***	0.682***	0.663***
	(0.0811)	(0.0800)	(0.0955)	(0.0908)	(0.0945)	(0.111)	(0.167)	(0.163)	(0.186)
FDI	0.894***	0.761***	0.934***	1.109***	0.949***	1.117***	0.591**	0.463*	0.613**
	(0.191)	(0.181)	(0.185)	(0.266)	(0.249)	(0.233)	(0.268)	(0.252)	(0.289)
$H_0: EXP = FDI$	4.17**	0.27	2.66	4.91**	2.69	6.49**	1.28	0.56	0.02
Sector and Country Fixed Effects	No	Yes	No	No	Yes	No	No	Yes	No
Sector-Country Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes
Observations	3,227	3,227	3,227	1,803	1,803	1,803	1,424	1,424	1,424
F-Statistic	21.76***	13.67***	3.05***	27.53***	11.30***	3.14***	15.96***	9.26***	2.70***
R-squared	0.033	0.227	0.374	0.071	0.221	0.346	0.053	0.236	0.391

Robust standard errors in parentheses

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

Table 5

Quantile Regression Results – Full Sample

VARIABLES	(1) 10th	(2) 30th	(3) 50th	(4) 70th	(5) 90th
$\ln EMP$	0.802***	0.734***	0.446***	0.292***	0.00951
	(0.171)	(0.104)	(0.0890)	(0.111)	(0.134)
$\ln EMP^2$	-0.109***	-0.0851***	-0.0478***	-0.0295**	0.00301
	(0.0231)	(0.0136)	(0.0115)	(0.0141)	(0.0172)
AGE	0.00890**	0.0102***	0.00653***	0.00573**	0.00682***
	(0.00396)	(0.00249)	(0.00204)	(0.00237)	(0.00250)
EXP	0.549***	0.361***	0.336***	0.454***	0.479***
	(0.157)	(0.0978)	(0.0829)	(0.101)	(0.120)
FDI	0.787**	0.832***	0.820***	0.745***	0.918***
	(0.320)	(0.206)	(0.179)	(0.217)	(0.246)
$H_0: EXP = FDI$	0.49	4.60**	6.48**	1.58	2.76*
Psuedo R^2	0.023	0.026	0.020	0.018	0.016
Observations	3,227	3,227	3,227	3,227	3,227

Standard errors in parentheses

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

Table 6

Quantile Regressions – Manufacturing Firms

VARIABLES	(1) 10th	(2) 30th	(3) 50th	(4) 70th	(5) 90th
$\ln EMP$	0.472**	0.742***	0.685***	0.463***	0.222
	(0.207)	(0.119)	(0.117)	(0.130)	(0.194)
$\ln EMP^2$	-0.0420	-0.0717***	-0.0629***	-0.0346**	-0.00393
	(0.0277)	(0.0154)	(0.0148)	(0.0162)	(0.0239)
AGE	0.00327	0.00627**	0.00561**	0.00350	-0.000826
	(0.00452)	(0.00252)	(0.00233)	(0.00242)	(0.00321)
EXP	0.458***	0.434***	0.380***	0.526***	0.524***
	(0.173)	(0.0954)	(0.0898)	(0.0971)	(0.141)
FDI	0.971**	0.902***	1.108***	1.020***	1.236***
	(0.432)	(0.242)	(0.229)	(0.245)	(0.343)
$H_0: EXP = FDI$	1.34	3.51*	9.53**	3.78*	3.99**
Psuedo R^2	0.024	0.044	0.046	0.043	0.051
Observations	1,803	1,803	1,803	1,803	1,803

Standard errors in parentheses

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

Table 7

Quantile Regression – Services Firms Only

VARIABLES	(1) 10th	(2) 30th	(3) 50th	(4) 70th	(5) 90th
$\ln EMP$	0.928***	0.764***	0.507***	0.286*	-0.0967
	(0.243)	(0.182)	(0.151)	(0.149)	(0.213)
$\ln EMP^2$	-0.149***	-0.116***	-0.0730***	-0.0409**	-0.00140
	(0.0318)	(0.0240)	(0.0199)	(0.0193)	(0.0287)
AGE	0.0197***	0.0167***	0.0155***	0.0134***	0.00495
	(0.00689)	(0.00492)	(0.00397)	(0.00341)	(0.00391)
EXP	1.154***	0.791***	0.849***	0.959***	0.875***
	(0.356)	(0.254)	(0.216)	(0.204)	(0.276)
FDI	1.028**	0.834**	0.345	0.787***	0.534
	(0.497)	(0.357)	(0.305)	(0.288)	(0.383)
$H_0: EXP = FDI$	0.05	0.01	1.91	0.25	0.55
Psuedo R^2	0.052	0.034	0.026	0.029	0.018
Observations	1,424	1,424	1,424	1,424	1,424

Standard errors in parentheses

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

5. Conclusions

In this paper we add to the small but growing literature that considers whether there is a relationship between the type of international activity undertaken and firm performance. The current paper is the first to consider this issue for a sample of SSA countries and is the first that we are aware of to comprehensively distinguish between manufacturing and services firms in a developing country context. Results from a number of parametric and non-parametric tests for manufacturing industries are broadly consistent with the theory of Helpman et al. (2004) and indicate that there is a clear productivity ordering with firms undertaking outward FDI performing best, followed by exporters with domestically oriented firms bringing up the rear. The results for services firms are more nuanced and indicate that while exporters and firms undertaking outward FDI are more productive than domestically oriented firms there is no significant difference in productivity between these two types of firms. Despite this, average productivity and point estimates from the regression analysis suggest that the productivity of exporting firms is larger than that for firms undertaking outward (albeit not significantly so), which provides partial support for the hypothesis of Bhattacharya et al. (2010). In future years as the UNIDO AIS develops it would be hoped that these issues will be examined in a panel setting for SSA, which will allow us to control for firm heterogeneity in a more appropriate manner and say something on the direction of causality between firm performance and the means of serving foreign markets. With this caveat in mind it is nevertheless worthwhile considering possible policy implications. While the theories tested in this paper rely upon the assumption of self-selection, the result that firms that are outwardly oriented perform better than domestically oriented points to the

policy conclusion that facilities and policies should be in place that help firms to enter foreign markets through either exporting or foreign investment (examples being the organisation of trade fairs and missions, and so on), in addition to productivity-enhancing policies.

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Appendix

Breakdown of Firms by Country

Country	No. of Firms (% of Total)	Manufacturing (Services) Firms	Manufacturing Firms		Services Firms	
			Exporters	FDI	Exporters	FDI
Burkina Faso	70 (2.15)	31 (39)	13	0	2	2
Burundi	100 (3.07)	28 (72)	8	0	4	2
Cameroon	100 (3.07)	44 (56)	11	4	3	2
Cape Verde	236 (7.25)	67 (169)	6	1	6	0
Ethiopia	365 (11.22)	285 (80)	48	0	7	1
Ghana	196 (6.02)	138 (58)	27	4	6	0
Kenya	275 (8.45)	133 (142)	68	11	20	11
Lesotho	79 (2.43)	30 (49)	10	1	1	1
Madagascar	95 (2.92)	49 (46)	27	1	5	0
Malawi	69 (2.12)	46 (23)	12	2	1	0
Mali	172 (5.29)	103 (69)	9	7	3	8
Mozambique	126 (3.87)	53 (73)	2	0	2	0
Niger	52 (1.6)	24 (28)	3	1	0	1
Nigeria	358 (11.0)	256 (102)	27	3	2	0
Rwanda	81 (2.49)	54 (27)	16	0	1	3
Senegal	136 (4.18)	57 (79)	24	1	7	4
Tanzania	239 (7.34)	163 (76)	40	2	3	1
Uganda	331 (10.17)	159 (172)	37	5	11	8
Zambia	174 (5.35)	97 (77)	20	2	9	0
Total	3,254 (100)	1,817 (1,437)	408	45	93	44

Table A2

Breakdown of Firms by Sector

Sector	No. of Firms (% of Total)	Exporting (FDI) Firms
Manufacture of food products and beverages	416 (12.78)	101 (9)
Manufacture of tobacco products	4 (0.12)	2 (0)
Manufacture of textiles	72 (2.21)	29 (1)
Manufacture of wearing apparel; dressing and dyeing of fur	99 (3.04)	29 (2)
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	58 (1.78)	38 (0)
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	90 (2.77)	22 (2)
Manufacture of paper and paper products	56 (1.72)	14 (2)
Publishing, printing and reproduction of recorded media	197 (6.05)	21 (3)
Manufacture of coke, refined petroleum products and nuclear fuel	3 (0.09)	0 (0)
Manufacture of chemicals and chemical products	140 (4.3)	33 (10)
Manufacture of rubber and plastics products	133 (4.09)	36 (3)
Manufacture of other non-metallic mineral products	98 (3.01)	5 (1)
Manufacture of basic metals	36 (1.11)	10 (0)
Manufacture of fabricated metal products, except machinery and equipment	193 (5.93)	22 (2)
Manufacture of machinery and equipment n.e.c.	52 (1.6)	12 (3)
Manufacture of electrical machinery and apparatus n.e.c.	21 (0.65)	4 (2)
Manufacture of radio, television and communication equipment and apparatus	1 (0.03)	0 (0)
Manufacture of medical, precision and optical instruments, watches and clocks	9 (0.28)	2 (1)
Manufacture of motor vehicles, trailers and semi-trailers	16 (0.49)	2 (2)
Manufacture of other transport equipment	7 (0.22)	3 (0)
Manufacture of furniture; manufacturing n.e.c.	112 (3.44)	21 (2)
Recycling	4 (0.12)	2 (0)
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	133 (4.09)	7 (3)
Wholesale trade and commission trade, except of motor vehicles and motorcycles	209 (6.42)	30 (10)
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	224 (6.88)	17 (4)
Hotels and restaurants	195 (5.99)	2 (3)
Land transport; transport via pipelines	98 (3.01)	7 (8)
Water transport	7 (0.22)	1 (0)
Air transport	8 (0.25)	3 (0)
Supporting and auxiliary transport activities; activities of travel agencies	61 (1.87)	6 (0)
Post and telecommunications	37 (1.14)	0 (3)
Financial intermediation, except insurance and pension funding	83 (2.55)	2 (1)
Insurance and pension funding, except compulsory social security	47 (1.44)	2 (4)
Activities auxiliary to financial intermediation	15 (0.46)	0 (1)
Real estate activities	40 (1.23)	0 (0)
Renting of machinery and equipment without operator and of personal and household goods	9 (0.28)	1 (0)
Computer and related activities	23 (0.71)	3 (0)
Research and development	1 (0.03)	0 (0)
Other business activities	174 (5.35)	9 (5)
Public administration and defence; compulsory social security	4 (0.12)	1 (0)
Education	13 (0.4)	0 (0)
Heath and social work	8 (0.25)	0 (0)
Sewage and refuse disposal, sanitation and similar activities	29 (0.89)	2 (0)
Recreational, cultural and sporting activities	12 (0.37)	0 (2)
Other service activities	6 (0.18)	0 (0)
Activities of private households as employers of domestic staff	1 (0.03)	0 (0)
Total	3.254 (100)	501 (89)

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