LEARNING-BY-EXPORTING AND DESTINATION EFFECTS: EVIDENCE FROM AFRICAN SMEs

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Abstract

Exports, in this study, are more productive than non-exports, but why? Using a micro-panel dataset from five African countries we show that more productive small and medium enterprises (SMEs) self-select into exporting. Ultimately we are interested in impact of exporting on productivity. Results demonstrate that African SMEs experience productivity gains because of export participation. Firms learn-by-exporting, however, improvements are moderated by export destinations. Firms that export outside Africa become more capital intensive and improve productivity while hiring more workers. In contrast, firms that export to African neighbouring countries downsize on capital and decrease productivity while hiring more unskilled workers at higher wages.

Keywords: trade destinations, learning-by-exporting, exports, firm-level analysis, propensity score matching, economic development

JEL Classifications: D21; F10; F14; O12; O55

1. Introduction

Over the past decade a burgeoning literature based on firm-level analysis has indicated that exporting firms are more productive than firms that are only active in the domestic market. For this reason many governments have aimed to push domestic firms to generate sales abroad using export-promotion programs. However, the quest to internationalize is still contentious in the African context due to a serious knowledge gap (Van Biesebroeck, 2005; Greenaway & Kneller, 2007; Wagner, 2007, 2011; ISGEP, 2008). African policy makers in favour of export-promotion rely on the several assumptions. First, although there is widespread evidence that exporters are more productive than non-exporters, hardly any firm-level studies have been undertaken in Africa (Wagner, 2011.). This study aims to broaden this perspective by analyzing micro-panel data from five African countries, specifically manufacturing firms from Ghana, Kenya, Nigeria, Tanzania and South Africa.ⁱ Second, the reasons for the presupposed productivity difference between exporting firms and domestically orientated counterparts are still unclear. Many scholars argue that more productive firms self-select into exporting activities (Damijan, Kostevc & Polanec, 2010). Therefore, according to this so-called self-selection hypothesis, if exporting firms are already more productive *before* entry abroad then in certain respects pushing firms towards internationalization becomes less meaningful. To this end we are interested in the impact of

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exporting itself on the performance of the firm. By exploiting the time-series dimension of our dataset and applying a difference-in-difference approach we test if firms improve productivity *because of* export participation. According to this purported learning-by-exporting hypothesis, exporting firms acquire knowledge from international experience, improve their organization and obtain foreign technologies which boost productivity.ⁱⁱ Third, on area that has received little attention in the recent literature is how the export destination itself affects firm learning from export activities (Fabling & Sanderson, 2010; Wagner, 2011). This question of whether export destinations matter is becoming more important given both increasing regional integration within Africa and the support for export promotion policies within a number of African economies. Some African exporters only trade with neighbouring countries whereas others have operations directed to more developed regions outside the continent. Not accounting for such destination heterogeneity may give policy makers who want to promote exports a biased view, unless exports destinations do not matter for learning effects. Theoretically, the learning effects may be most significant if firms trade with partners who have more advanced technologies. To this end this study contributes to this debate by differentiating the learning effect by destinations within the African region and exploring the effects of intercontinental trade.

Two final points of interest concern the prominent position of small scale manufacturing in stirring the development process in Sub-Saharan Africa (Collier & Gunning, 1999). First, as the United Nations Commission on Trade and Development concludes African governments should focus more on manufacturing (UNCTAD, 2011).ⁱⁱⁱ The share of the manufacturing sector in terms of GDP declined from 13 percent in 2000 to 10 percent in 2009. Also, the share of manufacturing in Africa's total exports fell from 43 percent in 2000 to 38 percent in 2009. It is often argued that the combination of manufacturing and exports spurs economic growth in Africa, however, a limiting factor is the relative small scale of production (e.g. Söderbom & Teal, 2003). So, secondly, most African firms are relatively small. So far most studies on the effects of internationalisation are based on large firms (Blalock & Gertler, 2004). Because expansion of the manufacturing sector is earmarked as "vital" for economic growth, it is even more pressing to increase the understanding of the link between internationalisation and growth of small African manufacturers. This paper takes up these challenges and focuses on small and medium enterprises (SMEs) from manufacturing sector. We test the self-selection hypothesis which argues that more productive firms start exporting. We also test the learning-by-exporting hypothesis which holds that exporting firms have become more productive because of exporting. A key contribution of the study is that we account for export destinations. In particular we estimate how large the learning effects are for exporting activities within and outside the continent. We utilize a micro-panel dataset from 1991 to 2003 to study the heterogeneity among exporters and non-exporters in five African countries: Ghana, Kenya, Nigeria, Tanzania and South Africa (see Rankin, Söderbom & Teal, 2006). We derive a firm productivity measure and test if and why African exporters are more productive. First, we explore the determinants of export participation and demonstrate that firm size, foreign ownership and human capital positively affect the decision to export. Next, to study the impact of exporting and subsequent effects of export destinations on firm productivity we apply propensity score matching techniques and a Dif-in-Dif methodology (Arnold & Hussinger, 2005; Girma, Greenaway & Kneller, 2004; De Loecker, 2007).

Our results confirm the selection hypothesis and support the learning-by-exporting hypothesis. African SMEs in the manufacturing sector are more competitive *before* they

internationalise and increase productivity *because of* internationalisation. However, there is large heterogeneity with respect to export destination. Exporting outside Africa leads to more capital intensive production while exporting within Africa leads to a relative downsize of capital intensive production. Such firm-level adjustments of exporters within the African regions create *negative* productivity effects as exporters hire more (low-skilled) workers and pay higher wages. The paper commences as follows. In Section 2 prior literature on learning-by-exporting is discussed. Section 3 elaborates on the data and measurements applied in this study. Section 4 provides details on the methodology and gives the main results. Section 5 discusses the results and Section 6 concludes.

2. Empirical Literature on Exporting and Productivity

Exporting firms are exceptional in two ways. First, only few firms engage in exporting. Second, empirical economic literature indicates that exporting firms are more productive, bigger, more capital intensive, pay higher wages, and survive longer than non-exporting firms (Bernard & Jensen, 1995, 1999, 2004). However, although Bernard and Jensen's results suggest that exporting firms are more productive, they find no indication that exporting results in productivity improvements for firms in the United States. Most scholars confirm the superior productivity of internationally active firms as well as the finding that firms do not further improve productivity after entry in foreign markets (Aw & Hwang, 1995; Castellani, 2002; Delgado et al. 2002; Wagner, 2002; Hansson & Lundin, 2004). Because these first studies rely on data from developed countries we may conclude that in these markets, more productive firms self-select into export but do not learn from exporting experience.^{iv} Subsequent studies in emerging markets have challenged the pure self-selection; even though the evidence remains mixed. Several studies based on Latin-American firms are predominantly supportive of the self-selection hypothesis. Clerides, Lach and Tybout (1998) argue that this self-selection effect only partially explains the difference between exporters and non-exporters based on data from Colombia and Mexico.^v Likewise, Isgut (2001) finds support for the self-selection hypothesis when comparing the productivity gains of new export participants with non-exporters using data from Colombia, although there also appear some learning effects with respect to labour productivity. Alvarez and Lopez (2005) apply matching techniques and provide no support for the learning-by-exporting hypothesis in Chile. Other scholars provide evidence that export participation of emerging market firms improves productivity. According to the learning-by-exporting hypothesis firms acquire knowledge from their experience abroad which boosts their productivity. The lack of evidence for this channel in developed economies is attributed to the fact that the most advanced technologies are already available in the home market. In contrast, in emerging markets and developing countries exporters often trade with relatively more technological advanced countries where they can benefit from customer's technical assistance, new managerial practices, market information, information systems and supply chain networks. Moreover, exposure to international market is posed to create competitive pressures which induce skill upgrading. Finally, tapping international markets allows firms to exploit economies of scale. Within this spirit, Kraay (1999) shows Chinese exporters become more competitive after entry in foreign markets, mainly in terms of labour productivity. Similarly, using various techniques Blalock and Gertler (2004) find that Indonesian exporters increase their total factor productivity subsequent to export participation and strongly support the learning-by-exporting hypothesis. Based on data from Slovenia, De Loecker (2007) applies matching techniques and finds large improvements in productivity when comparing exporter and non-exporter performance. Hagemejer and

Kolasa (2011) conclude that Polish firms that start international activities improve productivity. In an emerging market context the self-selection and learning views are neither mutually exclusive nor contradictory: the most productive firms self-select into export markets and (some) subsequently increase firm productivity as a result of learning experiences from internationalisation. Recently, scholars have actively collected data on African firms (Bigsten & Söderbom, 2006). Although the continent's business environment is characterized by many obstacles, especially in trade, empirical findings offer promising prospects for exporting firms in Africa. Fafchamps, El Hamine and Zeufack (2008) use survey data from Moroccan manufacturers over the period 1997 to 2000 to analyse the selection into export markets. They show that future exporters are more familiar with (foreign) market conditions and not necessarily are more efficient in the production process *ex ante*. Bigsten and others (2004) analyze data from four African countries over the period 1992 to 1995 and find indications that African firms learn from exporting. Interestingly, they do not find support for self-selection, implying that any firm can enter export market regardless of productivity. In contrast, Mengistae and Pattillo (2004) use data from three African economies over a period from 1992 to 1995 and present support for the self-selection hypothesis. They also show higher productivity growth for exporting firms. Granér and Isaksson (2009) use data on Kenyan firms from 1992 to 1994 and give tentative support for learning effects. Although these studies broadly support the learning-by-exporting hypothesis, the limited time-span does not allow for any strong causal interpretation related to the learning hypothesis. In an extensive study Van Biesebroeck (2005) employs GMM estimations and finds that exporting firms in Sub-Sahara Africa not only self-select, but furthermore benefit from internationalisation. He finds that exporters have higher labour productivity and growth than non-exporters. Van Biesebroeck (2005) shows that exporters enhance their productivity advantage after entry into export markets, mostly because they benefit from economies of scale. Using a simple probit specification Rankin, Söderbom and Teal (2006) show that firm size, foreign ownership and human capital positively affect the decision to export. Their results do not find strong self-selection effects since productivity is not a key determinant for starting to export. Moreover, they find no sector composition effects for export propensity nor do they suggest that more capital intensive firms are more inclined to export. We aim to augment on these findings by employing more detailed data from more countries and over a longer time-span to test the extent of learning-by-exporting in African economies. One recent closely related work by Bigsten and Gebreeyesus (2009) uses data from Ethiopian manufacturing firms over the period 1996 to 2005. Their results based on propensity score matching suggest that firms learn-by-exporting and grow faster, but do not show significant productivity gains. A recent meta-analysis of over 30 papers on learning-by-exporting by Martins and Yang (2009) concludes that the impact of exporting on productivity is higher for developing than developed countries. Implicitly the learning-by-exporting hypothesis is based on the notion that exporting firms trade with technologically more advanced countries and subsequently climb the technology ladder (which explains why in developed countries there seems little evidence of productivity gains from exporting). Basically, the hypothesis is that if the export destination is a more developed country, then the firm can learn subsequently from trade. Hence, export destination heterogeneity matters and needs to be accounted for when testing the learning-by-exporting hypothesis. Surprisingly, only a few studies have included export destinations to explain the extent of learning from exporting. De Loecker (2007) finds that Slovenian firms improve productivity given that they export to a more advanced country. Using a

similar dataset Damijan and colleagues (2004) confirm the importance of export destinations for learning to occur. Granér and Isaksson (2009) provide evidence that Kenyan firms also learn from regional export participation. More specifically, they find no selection effect in regional exporting, implying that ex ante exporters are only different from non-exporters if they start trading outside the continent. Granér and Isaksson (2009) show that exporters are heterogeneous with respect to the destinations they serve, where exporters outside the region are more capital intensive and hold higher human capital levels than exporters within the region. They suggest that African exporters can improve most from regional trade as penetration in these markets requires ex ante lower productivity levels. As firms learn-by-exporting within the region, they self-select into export destinations with technologically more advanced markets. Mengistae and Pattillo (2004:344) find some learning effects of Kenyan exporting firms inside Africa, although they indicate the learning effects of trade outside Africa are much larger. More recently, Eaton and others (2008) study Colombian firms and provide a detailed analysis of the impact of export destinations. Their findings suggest firms strongly learn from exporting within the region. Exporting to neighbouring countries can be a stepping-stone to tap into other destinations to enhance growth further by experimentation. Finally, recent work by Fabling and Sanderson (2010) analyzes foreign market entry and the expansion of new export markets of firms from New Zealand. Using matching techniques to account for self-selection effects they show that exporting leads to more rapid firm growth and capital deepening which increase productivity, especially for newly exporting firms compared to firms who expand to new foreign markets.

3. Data and Measures

We use a firm-level (unbalanced) panel dataset which covers (formal) manufacturing firms from Ghana, Kenya, Nigeria, Tanzania and South Africa over the period 1991 to 2003.^{vi} The sample consists of 10,359 observations based on more than 1000 manufacturing firms. Most firms are small businesses: 80 percent of the firms has fewer than 100 employees. Table 1 shows the distribution of the firms by year and country. The firm surveys were conducted by the World Bank Regional Program on Enterprise Development (RPED) using stratified sampling strategies across location within each country, sector, and according to firm size (see Van Biesebroeck, 2005; Bigsten & Söderbom, 2006; Rankin, Söderbom & Teal, 2006). The survey data provide information on some key variables including core firm characteristics like productivity measures and measures related to internationalisation such as export status and export destination. About 20 percent of the manufacturing firms are exporting a share of their production at some point in time. Half of the exporters trade within the African continent, while 75 percent of exporters trades outside Africa. On average internationally active firms export 33 percent of their output to foreign markets (of which one third is traded within Africa).^{vii}

Table 1: Overview of manufacturing data per country

	Period	No. of years	No. of firms	No. of observations
Ghana	1991-2003	13	274	3390
Kenya	1992-1999	8	405	3240
Nigeria	1998-2003	6	156	700
Tanzania	1992-2000	7	375	2625
South Africa	1997-1998	2	212	404

Table 2 confirms the well-establish distinction between exporters and non-exporters for manufacturers in Sub-Sahara Africa. Unconditionally, exporting firms are bigger, older and

more capital intensive. Exporting firms also pay higher wages and employ relatively higher skilled workers in terms of education (number of years of schooling), age and tenure (years of work experience). As we are interested in export destination effects, in Table 3 we divide exporters by the type of foreign market they serve. Broadly, exporting firms can be active within or outside the African continent. Exporters with destinations outside Africa tend to be bigger, more capital intensive and pay higher wages than exporters that only trade within Africa.

Table 2: Descriptive statistics of non-exporting and exporting firms (mean)

	<i>firm characteristics</i>			<i>employee characteristics</i>			
	size	age	capital intensity	wages (\$)	education	age	tenure
non-exporting firms	52	18	7.40%	123	8.50	31	6.60
exporting firms	240	22	9.20%	297	9.60	36	8.10

Table 3: Firm characteristics and exporting destinations

	<i>firm characteristics</i>			<i>employee characteristics</i>			
	size	age	capital intensity	wages (\$)	education	age	tenure
within Africa	188	22	8.70%	157	10.00	37	7.50
outside Africa	239	22	9.30%	391	9.80	35	8.30

In order to derive a measure of productivity we start by setting-up a standard production function:

$$Y = f(L, K, M, O, X, C)$$

All variables are in logs and for convenience we leave out firm and time subscripts. Y denotes output, L number of workers, K capital stock, M material inputs, O other inputs (indirect costs), X and C capture time-varying and fixed control variables.^{viii} Taking first-differences removes the firm-specific effects and alleviates many potential endogeneity problems. So, we obtain the following “growth equation”:

$$(1) \quad \Delta \ln Y_{it} = \beta_1 \Delta \ln L_{it} + \beta_2 \Delta \ln K_{it} + \beta_3 \Delta \ln M_{it} + \beta_4 \Delta \ln O_{it} + \beta_5 \Delta \ln X_{it} + v_{it}$$

Although inference of the production function with micro-level data is often problematic, the obtained estimated productivity growth rates and their determinants as presented in Table 4 are straightforward. Moreover, estimates are consistent among various specification methods.^{ix}

Table 4: Determinants productivity growth rates (Δ output per worker)

	<i>Pooled FGLS</i>				<i>Fixed effects</i>	
$\Delta \ln L$	-0.36***		-0.15***	-0.06	-0.15**	0.01
$\Delta \ln O/L$	0.24***	0.26***	0.11***	0.13***	0.09***	0.10***
$\Delta \ln K/L$		0.21***	0.03*	0.11***	0.03	0.14*
$\Delta \ln M/L$			0.58***	0.55***	0.60***	0.58***
$\Delta \ln EDUC$				0.10***		0.11**
$\Delta \ln TENUR$				0.03		0.03
$\Delta \ln AGE W$				-0.10		-0.10
n	2713	2609	2560	1704	2560	1704

Note: Throughout the paper *, **, *** indicate significance at the 10%, 5%, 1% respectively.

We find that when not controlling for worker characteristics the labour growth rate negatively impacts the productivity growth rate. This could indicate diminishing returns to size in terms of employment (when the workers are of relatively low skill, given their age,

education and tenure). Higher capital intensity is associated with increases in productivity growth rates. This may suggest that African manufacturers are below their optimal capital-labour ratio and that there is underinvestment in capital stocks. We also obtain evidence that more material and other (indirect) inputs boost productivity growth rates, which again might indicate that firms are employing relatively too much labour. As expected, hiring more high skilled workers significantly contributes to higher productivity growth.^x Overall, productivity growth rates determinants are highly robust and intuitive: African manufacturing firms are likely to increase productivity growth rates with more capital, material, and indirect inputs, including more highly skilled workers.

Table 5: Productivity growth rates for export status and destination (in percentages)

	<i>fixed effects</i>	<i>random effects</i>	<i>pooled</i>
Non-exporting	1.3	1.8	1.0
Exporting	3.3	3.6	0.4
Within Africa	-1.3	0.3	-2.1
Outside Africa	3.7	3.7	1.2

Following equation 1 we estimate firm productivity growth using fixed effect, random effects and pooled regression techniques, where we normalize this proxy (mean zero, standard deviation one). Throughout the paper we use the predicted productivity growth based on the fixed effects estimates. Table 5 summarizes our main productivity growth rates comparing non-exporters and exporters, and export destinations (for countries and sectors, see appendix A.1.). On average, exporters experience higher productivity growth rates. Interestingly, these positive growth rates are only achieved by firms that export outside Africa. Most worrying is that exporters with destinations within Africa on average experienced productivity decreases.

4. Methodology and Results

There are several commonly used methods to assess if exporting firms are different which move beyond the simple unconditional comparison as in Table 5 (e.g. Blalock & Gertler, 2004; Wagner, 2007). We already showed that exporting firms tend to grow faster in terms of productivity, and we found large heterogeneity with respect to export destinations and productivity growth rates.

Following Bernard and Jensen (1995, 1999) we estimate an *export-premium* from a simple regression with various dependent variables (Y) on export status (EXP) given control variables (X) as follows:

$$(2) \quad Y_{it} = \alpha + \beta_1 EXP_{it} + \beta_2 X_{it} + e_{it}$$

This regression is similar to Table 2 which unconditionally compares exporters and non-exporters if we drop the conditional set X . Following equation (2) we obtain simple export-premia for various firm characteristics while accounting for country, sector and year effects. Results in Table 6 delineate exporters are 35% bigger in terms of employment, pay 28% higher wages, and on average employ (older) employees with higher education and tenure.^{xi}

Table 6: Simple export-premia

	<i>firm characteristics</i>			<i>employee characteristics</i>			
	size	age	capital intensity	wages (\$)	education	age	tenure
export premium	35%***	2%	0%	28%***	78%***	6%***	8%**

Self-selection hypothesis: Key question is if the differences between exporters and non-exporters are the result of exporting (learning-effect) or that internationally active firms are already different before they enter foreign markets (self-selection). Bernard and Jensen (1999:11) compare *ex ante* firm characteristics and growth rates for exporters and non-exporters by selecting a subsample of non-exporting firms at a given moment ($t=0$) and contrast their initial levels and growth rates of the dependent variables with future (T) exporting firms.

$$(3) \quad Y_{it} = \alpha + \beta_1 \text{EXP}_{it} + \beta_2 X_{it} + e_{it}$$

Using the described methods one gains insights how ex-ante exporters differ from non-exporters. Following equation (3) we first select all non-exporting firms at a particular point in time to compare the performance of firms that start exporting at the end of the period against the persistent domestically active firms, controlling for country, sector and time effects. We exclude firms that exported before and just re-entered the export market in period $t=T$. We use three-year subsamples with several time-windows to contrast ex ante firm characteristics and growth rates of (newly) exporters and non-exporters.

In Table 7, Panel A and Panel B suggest that future exporters are different from non-exporters. We find that future exporters are bigger, more capital intensive, earn more and pay higher wages beforehand. There are no significant differences in profits to capital ratio, although future exporters tend to have lower profits to capital levels. Table 7, Panel B, shows that there are no significant growth effects, except for 1998-2000. The outcomes for capital intensity are mixed. For the periods 1991-1993, 1994-1996 and 2000-2002 future exporters have relatively more capital prior to their internationalisation. However, in 1998-2000 future exporters are relatively less capital intensive and these firms significantly downsize on capital intensity. Future exporting firms are not more capital intensive nor do they alter their capital stock in a different manner from non-exporters. Future exporters pay higher wages. However, relative to firms which stay domestically oriented, future exporting firms seem to negatively adjust average workers' wages prior to exporting. These latter findings might suggest that newly exporting firms consciously prepare for exporting by hiring more workers and pay them more competitively wages.

Table 7, Panel A: Ex ante advantage for future exporters (levels)

period	size	cap. intens	wage	ln profits to K/L	ln earnings
1991-1993	79%***	30%**	27%**	-37%	45%***
	(n = 999)	(n = 959)	(n = 861)	(n = 861)	(n = 695)
1994-1996	59%***	22%*	78***	-37%	18%*
	(n = 542)	(n = 519)	(n = 484)	(n = 485)	(n = 422)
1995-1997	57%***	3%	40%***	-25%	28%***
	(n = 851)	(n = 817)	(n = 734)	(n = 738)	(n = 547)
1998-2000	55%***	-20%*	21%*	-39%*	22%**
	(n = 1407)	(n = 1322)	(n = 1238)	(n = 1214)	(n = 866)
1999-2001	31%**	15%	28%	-17%	34%**
	(n = 1073)	(n = 1027)	(n = 947)	(n = 962)	(n = 637)
2000-2002	61%***	50%**	54%***	-12%	58%***
	(n = 782)	(n = 765)	(n = 684)	(n = 738)	(n = 410)
Weighted mean	56.2	12.9	36.3	-28.2	33.2

Note: Throughout this paper in brackets we denote the number of observations (n). We apply a random effects GLS model on the natural logarithm of number of employees (size) and real wage per month in \$ (wage) and took the percentage of capital to labour inputs, while controlling for country, sector and time fixed effects. We removed all non-transformed wages below unity. Only a limited number of firms are designated as 'future exporters' at the end of the subsample period such that we have relatively few observations.

Table 7, Panel B: Ex ante advantage for future exporters (levels and growth rates)

period	Δ size	Δ cap. intens	Δ wage	Δ ln profits to K/L	Δ ln earnings
1991-1993	13%	0%	-45%*	-51%	
	(n = 402)	(n = 383)	(n = 317)	(n = 329)	
1994-1996	17%	-16%		64%	
	(n = 131)	(n = 123)		(n = 117)	
1995-1997	5%	-6%	4%	-20%	12%
	(n = 263)	(n = 250)	(n = 231)	(n = 243)	(n = 215)
1998-2000	28%**	-43%**	-43%*	3%	-17%
	(n = 669)	(n = 613)	(n = 557)	(n = 545)	(n = 408)
1999-2001	-7%	7%	-19%	17%	
	(n = 471)	(n = 453)	(n = 391)	(n = 412)	
2000-2002	-3%		-2%	-13%	-17%
	(n = 333)		(n = 274)	(n = 307)	(n = 163)
Weighted mean	10.2	-14.6	-25.6	-4.9	-9.1

Table 7, Panel B shows that future exporters do not have higher profits per capital ratio. To the contrary, results indicate that when accounting for capital intensity newly exporting firms make lower profits, with a (significant) difference up to 39% (for the period 1998-2000). If one looks at the earnings an sich the opposite holds. Future exporters have significantly higher earnings ex ante, with noteworthy difference between 22% and 58%. In terms of changes we find no significant variation which may refute conscious self-selection. There is some evidence of self-selection meaning that future exporting firms are ex ante on average 56 percent bigger, pay 36 percent higher wages, and earn 33 percent more, yet in terms of capital intensity profits to capital ratio, and, in terms of growth of each of these variables we find no significant differences to firms that stay domestically active.^{xii}

To summarize, the self-selection hypothesis holds that exporters are different from non-exporters already before they start exporting. With the use of prior established methods, we find evidence that African manufacturing firms seem to self-select into exporting primarily based on size, which confirms the findings by Rankin, Söderbom and Teal (2006) who also argue that the size effect is independent of productivity, capital intensity, country, sector or other firm-specific effects. Moreover, pre-entry exporting firms pay higher wages. Relative to firms which stay domestically oriented, future exporting firms seem to negatively adjust average workers' wages while hiring more workers prior to exporting. Meanwhile, future exporters become less capital intensive (although beforehand they do not have larger capital stocks), but most significantly they do not differ in terms of growth rates for any other variables prior to the exporting experience itself. Combined, our findings provide a more nuanced view of the self-selection of African exporters (see also Granér & Isaksson, 2009).

Matching techniques: African firms self-select into export markets. Note that if we observe substantial higher productivity growth in exporting firms this does not prove that the causality runs from exporting to productivity gains. If better firms self-select into export participation and given that newly exporting firms are beforehand more productive than non-exporters it is not surprising to see some persistence in this behaviour such that on average exporters would perform better in the future even if they would not start to export today (selection bias).^{xiii} The problem is that we do not observe whether exporters would do so as a consequence of exporting since we have no counterfactuals. Likewise, we cannot identify what could have happened to the firm if it had decided not to export due to

identification problems. A way out is to construct a control group in such a way that every exporter is precisely matched to a non-exporter that is similar to the newly exporting firm before internationalization. The calculated differences between the two matched groups based on observable criteria like firm size after the change in export status can then arguably be attributed to the “treatment” (see Heckman et al. 1999). Several scholars have applied matching techniques in the context of exporting (Wagner, 2002; De Loecker, 2007; Girma et al., 2004; Arnold & Hussinger, 2005; Fabling & Sanderson, 2010). Martins and Yang (2009) review more than 30 studies on learning-by-exporting and include 11 papers that apply propensity score matching techniques. Note that their analysis shows that these papers that rely on matching on average present lower estimated coefficients for the impact of exporting on productivity. Given our goal to unravel a *causal impact of exporting* on firm performance we can test if the outcomes from exporting (treatment) is different from matched non-exporters based on the *changes* in indicators like productivity, employment, human capital etc. We use the notation of Girma, Greenaway and Kneller (2004:859) and denote an indicator function $EXP_{it} \in \{0,1\}$ for whether the firm *entered* the export market. Let ΔY_{it+s}^1 capture the change in our performance measure at some time s after entry and ΔY_{it+s}^0 the outcome of the firm “had it not started exporting”. Hence, the hypothetical causal impact of exporting is $\Delta Y_{it+s}^1 - \Delta Y_{it+s}^0$ since ΔY_{it+s}^0 is unobservable: in expectations terms we have the “average treatment effect on the treated” (ATT):

$$(4) \quad E[\Delta Y_{it+s}^1 - \Delta Y_{it+s}^0 \mid EXP_{it} = 1]$$

Using some expectations operators we can show that if we rely on a counterfactual which shows the (expected) average outcome of the newly exporting firm had it not participated in exporting, such that ATT is:

$$(5) \quad E[\Delta Y_{it+s}^1 \mid EXP_{it} = 1] - E[\Delta Y_{it+s}^0 \mid EXP_{it} = 1]$$

Equation (5) uses the law of iterated expectations where the first term expresses the outcome after entry, given that there indeed is entry. The second expectation operator gives the outcome “had it not started exporting” although that we observe entry as given. We will produce a counterfactual by estimating a corresponding average value of firms that have remained non-exporters as follows:

$$(6) \quad E[\Delta Y_{it+s}^0 \mid EXP_{it} = 0]$$

We must specify a control group based on the selection of observables and the pre-entry level of the outcome variable Y_{it-1} . Given our results we know which observable determinants affect productivity growth. Likewise, we can identify a probability function for exporting using a simple probit model. We already categorized a group of variables for which exporters and future exporters differ from non-exporters. Now we follow Rosenbaum and Rubin (1983) and adopt “propensity score matching” techniques:

$$(7) \quad P(EXP_{it} = 1) = F(X_{it-1}, C_i)$$

Equation (7) defines the probability that a firm starts exporting based on the arguments of F which represents the normal cumulative distribution function. We will use several propensity score “matches” because it is well-known that the results are highly dependent on the quality of the match or the creation of the counterfactual. As before, in the vector X (here: *in lags*) we use combinations of subsets based on explanatory variables such as productivity, employment, capital intensity, firms age, and average worker’s wages.

Moreover, in set C we match on dummies for foreign ownership, sector and country categories (see e.g. Girma et al., 2004; Rankin et al., 2006). Note that it is not our intention to use all these variables because there is a trade-off. Using more observables is likely to increase the quality of the match yet will also require much richer data and as such including more variables can deteriorate the connection between the selected variables of the control and treatment groups. As Rubin (1973) explains, a key assumption of this technique is that conditioning on observable covariates like lagged productivity, assignment between treatment and control is random. This means that unobservables or the explanatory variables not included in the set of covariates should have no impact on the allocation between treatment and control. Obviously such randomization is difficult, for example because firms may be established with the aim of exporting later (Fafchamps, El Hamine & Zeufack, 2008). In this research we try to get a random assignment by using lagged covariates, looking at the outcome variables in growth rates and by employing three different matching models (each with “first-stage” F-values above 10). Based on our propensity score matching from equation (7) we obtain P_{it} which denotes the estimated probability of exporting for which the firm is actually (eventually) exporting. Using this score we can select a non-exporting firm which is “closest” in terms of $P(EXP_{it})$ in terms of observables. We use the selected non-exporter based on various matching techniques, including (a) (traditional) one-to-one, (b) nearest-neighbour, (c) capiler and the Epanechnikov kernel function (see Leuven & Sianesi, 2003).^{xiv}

Learning-by-exporting: Albeit stronger and more competitive firms are the ones able to participate in foreign markets, we are interested in the question if there are additional learning-effects compared to “had the firm not been exporting”. After construction of this control group based on the prior described matching techniques we apply a ‘Dif-in-Dif’ estimator to isolate the *causal effect* of internationalization on the performance dynamics. We calculate the difference in the average growth rates before and after entry given X_{it} and C_i . Roughly speaking, this captures the change in performance measures after export participation. Still, as Girma and colleagues (2004:861) stipulate, this impact cannot exclusively be attributed to the export decision since the changes after entry may stem from “factors that are contemporaneous with entry” or a “common shock”. Therefore in a second stage we again obtain difference in performance but now compared to the before and after difference from our counterfactuals, the control group of matched non-exporters. Results in Table 8 show that the impact of export participation on total factor productivity growth is not robust across specifications. Using several one-to-one matches does not yield any significant effects of export participation on changes in productivity, therefore we give no support for the learning-by-exporting hypothesis. To the contrary, when we match firms on the lagged productivity level, lagged firm size and the lagged average wage rates plus the standard set of controls (e.g. country and sector) and then compare matched firms (those who export with non-exporters) using nearest-neighbour or Epanechnikov matching kernels (Columns III(b) and III(c)) we find a negative adjustment of productivity. These results therefore give no support to the learning-by-exporting hypothesis. However, the outcomes of the difference in difference estimator in Column II(b) provides support for the learning-by-exporting hypothesis where firms are matched based on the capital intensity of production, firm age and average wage levels (all in lags). Overall, we conclude there is no evidence that export participation in general yields improvements in firm productivity. The analysis of the changes in total factor productivity is important at the heart of the learning hypothesis, but other outcome variables are of interest too. It is suggested that export

participation may not affect productivity directly (in a given year) but can impact other measures. In Table 8 we show that exporting firms have significantly higher employment growth, growth in workers' education levels, earnings growth and changes in profit to capital intensity relative to their matched non-exporting counterparts. Given several matched counterfactuals scenarios we find consistently faster growth rates in employment for exporting firms with differences up to 15%. Also, two measurements show that average worker's education of exporters increases more than the matched counterfactual at a ten percent significance level, while the impact is insignificant in others (more on this later). Exporters obtain up to 10% faster earnings growth rates than their counterfactuals, while the effect is insignificant in four out of nine specifications. Two outcomes show profits to capital intensity grow significantly faster with differences up to 7% at a ten percent significance level. One specification indicates that exporters experiences relatively slower output per worker growth than their non-exporting counterparts. Two specifications indicate the profits to capital improve upon exporting. With respect the change in capital intensity and output we present mixed results. We do not see any effect of exporting on wage changes. Overall, the findings in Table 8 give a more nuanced view of the impact of exporting on various performance measures of the firm. We cannot give unambiguous support to the learning-by-exporting hypothesis, but suggest that exporting lets firms grow in size, enhances their earnings and profits to capital. These findings fit with the learning-by-exporting hypothesis, however, we find mixed results with respect to the impact of exporting on productivity growth, output growth, changes in capital intensity, changes in education and wage levels. While controlling for selection biases, we find some support for the learning-by-exporting hypothesis in general although in some cases the outcomes are not robust between specifications, which is why next we further differentiate learning-by-exporting effects by destinations of exports.

Table 8: Exporters vs. non-exporters (ATT) using Dif-in-Dif with matching techniques

	I (a)	I (b)	II (a)	II (b)	III (a)	III (b)	III (c)
ΔTFP	0.08*	-0.12	0.02	0.18**	-0.07	-0.18*	-0.16*
$\Delta output$	-0.03	-0.03	-0.04	0.01	-0.02	-0.03	-0.07*
$\Delta size$	0.04*	0.05**	-0.01	0.04*	0.06**	0.12***	0.15***
$\Delta capital$	0.00	-0.06	0.05*	0.08**	-0.04*	-0.09***	-0.11**
$\Delta education$	-0.01	-0.02	-0.02	-0.04	-0.01	0.03*	0.05*
$\Delta wage$	-0.02	-0.03	0.00	0.05	-0.04	-0.03	-0.09
$\Delta earnings$	0.06**	0.05	-0.10	0.05	0.07**	0.09*	0.10**
$\Delta profit\ to\ K/L$	0.02	0.07*	0.05*	-0.15	0.10	0.03	0.05

Note: The propensity score matching techniques are (a) one-to-one, (b) nearest-neighbour and (c) Epanechnikov. We use bootstrapped resampling methods to obtain estimated standard errors and corresponding p-values, although such methods may not be valid for nearest-neighbour estimators (see Leuven & Sianesi, 2003; Abadie & Imbens, 2008). Models I(a) and (b) are based on Xit-1(SIZE) and Ci, II(a) and II(b) use Xit-1(K/L, AGE, WAGE) and Ci. Models III(a-c) use Xit-1(TFP, SIZE, WAGE) and Ci. For Model I and II epan results are dropped because they are highly similar to nearest-neighbour. We also applied several random sorting patterns of the data and rerun the analysis to check robustness since ordering can affect results due to similar propensity scores (signs and significance did not change).

Destination effects: African manufacturers self-select into exporting markets and experience significant productivity gains because of internationalization. However, as presented in Table 9 there is heterogeneity with respect to the learning effects given export destinations. Most matching specifications clearly indicate that firms that export outside Africa become significantly more capital intensive. We interpret this finding as an indication that goods exported outside the continent require more capital intensive production techniques. To our

knowledge we are the first to show evidence that firms that target these advanced markets indeed alter their production process towards more capital intensive production relative to other firms. We suggest that export products outside Africa require high product standards to be competitive that can only be met with capital investments.^{xv} In a way this contrasts with standard trade theory because it would predict a comparative advantage in labour intensive industries (Baldwin & Robert-Nicoud, 2010).

Table 9: Dif-in-Dif exporting outside Africa (ATT) using matching techniques

	OUTSIDE AFRICA					WITHIN AFRICA				
	I(a)	I(c)	II(a)	II(b)	III(c)	I(a)	I(c)	II(a)	II(b)	III(c)
ΔTFP	0.18**	0.03	0.02	0.07*	0.06*	-0.16*	-0.28**	-0.02	-0.11	-0.12*
$\Delta output$	-0.06*	-0.01	0.01	-0.02	0.01	-0.05	-0.07*	-0.01	-0.04	-0.04
$\Delta size$	0.06***	0.03*	-0.02	-0.01	-0.02	0.07***	0.05*	0.03	0.00	0.02
$\Delta capital$	-0.04	-0.05	0.06*	0.08**	0.07*	-0.07***	-0.07*	0.06	0.04	-0.05*
$\Delta education$	0.01	-0.01	-0.02	-0.04*	0.00	-0.01	-0.03	-0.02	0.03	-0.11***
$\Delta wage$	0.00	0.06*	0.04*	0.02	0.02	0.00	0.06	0.04	0.01	0.00
$\Delta earnings$	0.04	0.05*	0.07*	0.06	0.02	0.04	0.12***	-0.01	0.02	0.04
$\Delta profit$ to K/L	0.08	0.10	0.03	0.06	-0.05	0.03	0.04	-0.05	0.00	-0.08

Discussion: The results on the impact of exporting differentiate between exporter and non-exporter performance (Table 8) and, in addition, show the heterogeneity among trade destinations (Table 9). Several results stand out. First, exporting firms contribute to employment. We find a consistent pattern that regardless of the export destination, exporters create more employment and growth up to 17 percent quicker than matched non-exporters. We also substantiate that exporting firms are able to increase earnings up to 12 percent faster than matched counterparts, irrespectively of the export destination. Second, there is no robust impact of exporting on productivity growth, although it seems that exporters within the African region have lower productivity growth while exporters outside Africa have higher productivity growth than matched non-exporters. There are two possible explanations for this outcome. First, in contrast to firms that export outside the Africa region, firms that export within the African region are downsizing on capital compared to matched non-exporters. Second, in order to export with neighbouring African countries, firms hire more workers while there is a bias towards employing relatively lower skilled workers. The fact that exporters within the African region become more labour intensive and hire more lower skilled workers could explain the relatively lower productivity growth. Given such firm-level adjustments, exporters within the African region indeed experience higher earnings growth rates while output per worker drops. Exporters that trade outside the Africa continent also expand in size and have higher earnings growth than matched counterparts. However, these intercontinental exporters become more capital intensive although they hire more workers. This indicates that these firms heavily invest in order to serve advanced foreign markets. We find no robust evidence that firms with intercontinental exports have higher productivity growth, although the findings point to a positive impact of intercontinental exporting on productivity growth compared to matched non-exporters. A possible reason is that intercontinental exporters increase workers wages more than other firms (although in the majority of the specifications these results are insignificant). Hence, export destinations matter, especially in terms of changes capital and labour inputs (including wage rates). To our knowledge this study is the first to uncover this pattern using firm-level data from Africa. Firms that export to more technologically advanced regions outside Africa experience an increase in their capital to labour ratio, which may be the result of technology transfers, fierce competition or forced product standards. In contrast, promotion of exports within the region may accommodate labour-intensive industries as export participation

within the region does not contribute to capital intensive production. The findings with respect to export destination heterogeneity are highly relevant for policy makers as they suggest that intercontinental trade of SMEs leads to investment in capital, increased employment, higher average wages and possibly higher firm productivity growth rates. In contrast to the widely held view that exporters have a relatively higher demand for high skilled workers (Bernard & Jensen, 1997), African SMEs that export outside the continent show no skill-bias towards more educated workers. The latter may contradict the skill-bias literature but fits into the standard Heckscher-Ohlin (HO) framework as we find preliminary evidence that exporters demand more workers. It is encouraging that export participation does not cause negative wage corrections as we find no negative effects of exporting on the change in average workers wages. A wide range of studies indicates that multinational firms pay higher wages and we corroborate on these findings as intercontinental exporters seems to adjust wages upward. Feenstra and Gordon (2003) suggest that international trade has increased the “wage gap” because it has boosted outsourcing strategies. At first sight it seems that our study collaborates that exporters hire more educated workers, which can increase inequality. On the other hand, given that production sharing techniques are less prevalent in the Africa, a more detailed analysis reveals no such skill-bias. Exporting firms, especially those firms that export within the region, hire more workers and, with relatively lower skills. Another motivation could be that there is shortage of highly educated workers so that exporting firms which are expanding are constrained and cannot upgrade human capital. The bottom line is that export promotion seems a promising path for growth of Africa’s private sector. Export promotion could increase employment and alleviate poverty since exporters expand rapidly and upwardly adjust wages creating higher income growth without skill-bias.^{xvi} Policies that help small firms experiment with exporting towards more advanced markets accommodate both capital enhancement and employment against higher wages. A burdensome prerequisite seems that exporters self-select, such that newly exporting firms are already exceptionally productive and larger in size. This may call for policies that nourish and stimulate national superstars to expand activities abroad. It is likely that fixed cost for exporting outside the African continent is are higher than exporting to a neighboring country inside Africa, which could further explain the presented self-selection effects and strengthen the need for specialized agencies to facilitate intercontinental trade to reduce the market selection costs.

5. Conclusion

In this paper we employ a micro-panel dataset with more than 10.000 observations of small businesses from five African countries to investigate the determinants and effects of exporting. Exporters are more productive than non-exporters, but why?

First, this paper confirms the consensus view that more productive firms self-select into export participation (see Bernard & Jensen, 2004). Key determinants of exporting include productivity, firm size, capital intensity, other indirect production inputs (e.g. human capital) as well as foreign ownership. This study shows that ex ante, future exporting firms in Africa are larger in terms of earnings and the number of employees and also pay higher wages. In contrast to other studies, beforehand, future exporters earn lower profits and experience negative profit changes. Furthermore, future exporters expand their small business by hiring more workers and pay them more competitive (lower wages). These findings suggest that newly exporting firms consciously prepare for future exporting activities by adjusting their production process which becomes less capital intensive in line

Boermans, M.A. *Learning-By-Exporting and Destination Effects: Evidence from African SMEs* with the regions comparative advantage (e.g. Söderbom & Teal, 2003; Fafchamps et al., 2008).

Second, ultimately we are interested in the impact of exporting on productivity. Given the subsequent selection bias that “to be” exporters are different from “not to be” exporters this research applies propensity score matching and difference-in-difference estimations to test the learning-by-exporting hypothesis (Martins & Yang, 2009). The results present a more nuanced view on the general impact of exporting on productivity in African economies if the firms’ export destinations are not accounted for (see Fabling & Sanderson, 2010). There is not much evidence that SMEs that export experience greater gains in productivity compared to matched counterpart that are only active domestically. Although exporters show faster productivity growth, these changes seem less promising once these firms are precisely matched with comparable non-exporters. However, export participation leads to better firm performance in terms of growth in employment, earnings, profits given capital intensity and workers educational attainments, giving some support to the learning-by-exporting hypothesis.

Third, the empirical analysis demonstrates that productivity gains from exporting are moderated by export destinations. Firms that export outside Africa may improve productivity levels in line with the learning-by-exporting hypothesis (see De Loecker, 2007; Granér & Isaksson, 2009). Intercontinental trade allows firms to climb up the technological ladder through knowledge spillovers. These firms require a certain degree of flexibility and absorptive capacity to adjust their production process (Fafchamps et al. 2008) which can be complemented by foreign ownership. One possible reason why intercontinental exporters improve productivity (learning-by-exporting) may arise from investments in more capital intensive production on top of advantages from economies of scale. In contrast, trade within Africa does not produce such benefits. The results show that firms that exporters who trade with African neighbouring countries in fact decrease productivity levels. These firms are downsizing on capital and are hiring more relatively low-skilled workers, which may explain the decline in productivity while these exporters expand in size. Hence, the empirical analysis uncovers important difference across export destination which are relevant to policy makers (Eaton et al., 2008). If firms trade outside Africa then productivity growth rates increase, stipulating that destination effects are relevant and should be managed. To conclude, SMEs in the manufacturing sector that export are different *before and because of* export participation. Moreover, this study finds significant heterogeneity in firm performance and learning effects across export destinations.

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Notes

ⁱ Combined, these countries represent about 70 percent of total GDP (in PPP) and 40 percent of the total population of Sub-Saharan Africa. None of the countries is land-locked, and each country has large harbours and airports. Overall, the countries are relatively rich and stable for the Sub-Saharan African economy and are by no means representative for the region.

ⁱⁱ The two views, self-selection and learning-by-exporting are non-contradictory and not mutual exclusive. More productive firms may self-select into export participation, while these more productive firms subsequently learning by exporting and thereby further improving productivity.

ⁱⁱⁱ UNCTAD: "Africa now accounts for about 1 percent of global manufacturing, and cannot realistically hope to reduce widespread poverty if its governments don't take effective measures to expand this vital economic sector. (...) But such support should not be open-ended... it should be terminated if improved performance - such as the production of competitive export goods - is not achieved within a specified period of time."

^{iv} Based on more elaborate techniques some recent studies in developed countries show promising effects of exporting, supporting the learning-by-exporting hypothesis. For example, Girma and colleagues (2004) use matching techniques and show that UK manufacturing firms self-select and further increases firm productivity upon exporting (see also Bernard et al. 2003; Baldwin & Gu, 2003; Bernard & Jensen, 2004). Likewise, Damijan and Kostevc (2010) match Spanish manufacturing firms and find that both importing and exporting bring about innovations that ultimately improve productivity. In contrast, Arnold and Hussinger (2005) use data from German manufacturing firms and also apply matching techniques and confirm self-selection but reject learning effects from exporting.

^v Clerides and others (1998) find some weak support for the learning-by-exporting hypothesis in Morocco.

^{vi} Rankin, Söderbom and Teal (2006) use a similar dataset which cover the same countries, but a shorter period.

^{vii} There are also firms that export both within and outside Africa. 35 percent of the exporters has any foreign ownership, whereas of the non-exporters 13.3 percent has any foreign ownership. Differences in foreign ownership between exporters given export destination or intensity are negligible.

^{viii} The vector X includes real profits in \$ to capital ratio, earnings in \$, average workers wage in \$, education, tenure and age (to incorporate human capital, in years). The set C covers country and sector fixed effects. Note we use profits and earnings as unconditional proxies of productivity in a later stage.

^{ix} Following Disney, Haskel and Heden (2003) we assume that one of the time-varying control variables that might be correlated with output growth is in equilibrium, we use an analogous specification to Söderbom, Teal and Harding (2006) and obtain comparable results. The major difference is that our dataset is larger such that we obtain more significant coefficients. In the presented estimations we do not include time dummy, firm age and foreign ownership (here, fixed) because in none of the specifications they were significant and are therefore removed. Moreover, basic TFP proxies remain the same when excluding these X and C subsets. Finally, although first-differencing removes most of the collinearity issues we have employed a wide range of alternative specifications (not shown here, at request) by pair-wise excluding sets of variables; results are robust.

^x Using changes in earning and profits per capital ratio as explanatory variables shows that these measures are positively associated with our productivity growth estimate, which strengthens its validity.

^{xi} If we apply pooled panel data methods (see Table A.2) to assess the export premia then on average exporting firms are 29% bigger, pay 12% higher wages and, in contrast to Table 6, are more capital intensive if one controls for lagged dependent variable effects. The reason for including a lagged dependent variable (AR1) is to ensure that the relationship between our set of performance measures and exports is not mistakenly interpreted as causality running “from exports” when in fact causality may run in the other direction (self-selection). However, it is well known that in micro-panels allowing for a lagged dependent variable can create complications because of correlation between the lagged dependent variable and the (firm-specific) error term which leads to biased estimates. Two other findings in Table 6 stand out: in contrast to what is commonly assumed, exporters are not older nor use more capital when including a set of controls. Although we see that exporters are 22% older and are 24% more capital intensive, these difference stem from concentration of exports in specific countries, sectors and time.

^{xii} It is possible that in equations (2) and (3) we are missing time-invariant firm characteristics that are correlated with the explanatory variables. In order to account for this likely bias we expand the set of explanatory variables (X) given the production function in equation (1) and also control for unobserved firm heterogeneity using firm-level fixed effects. The main results (not shown here) do not change, although this inclusion of other variables is likely hamper estimations due to high correlations among variables. Apart from using fixed-effects we can account for the reverse causality from export participation to productivity by a random effects FGLS estimator which includes an autoregressive term for the dependent variable and allows for heteroskedasticity across panels. (Van Biesebroeck, 2005). We also use the “force” option in STATA here because of the irregular year structure for Tanzanian firms (or due to missing values) such that in some cases we skip a year (over our three years time window) and look at the difference in year 0 to year 2 as if it were one year. Results confirm (not presented here) that exporters are ex ante larger, often older, pay higher wages, frequently increase the number of workers, have mostly relatively lower profits per capital ratio and in some cases these also tend to change negatively. In the various specifications for some periods we found that future exporters hold significantly more capital per worker whereas for other periods the opposite was found, so again, results regarding capital intensity remain mixed, more on this later.

^{xiii} Appendix A.3 shows that firms that start exporting expand by hiring more workers yet relatively downsize on capital intensity and see negative changes in both total factor productivity and profits given capital intensity.

^{xiv} In this section the propensity score matching techniques are (a) one-to-one, (b) nearest-neighbour and (c) Epanechnikov. Nearest neighbour matches the treated to the non-treated where $|p_i - p_j| = \min\{|p_i - p_k|\}$ where k is taken from non-

exporters. Capiler estimation is based on the same method and pre-specifies a value δ which the match cannot succeed (it must be “within” that bound) otherwise the exporter cannot be matched ‘properly’ and if left unmatched. The kernel distribution match is based on a smoothed weighted average of the non-exporters in proportion to their closeness within a fixed caliper, using the Epanechnikov kernel function.

^{xv} In contrast, in specification I(c) we find the exporters outside Africa become more labor intensive.

^{xvi} Another heavily debate topic related to this research concerns the relationship between trade and poverty Winters, McCulloch and McKay (2004) have raised concerns about whether exporting firms provide benefits to the poor. One limitation of our firm-level study is that we can only give a partial account of the impact of exporting activities on poverty and cannot provide conclusive answers as to whether exporting firms can help people out of poverty. We could think of both positive and negative arguments. There are economies of scale and competition effects. Exporters tend to be formally active and contribute to the government income. Others have argued that openness may decrease government corruption and that exporting firms are at the gateway of technology transfers. One the negative side we like to pay attention to the selection effect as pointed out by Melitz (2003). As exporting firms will increase market competition, it is likely that small subsistence farmers and other self-employed poor people will tend to lose their respective markets to the ‘big’ firms, as the former are unable to comply with reduced prices and high productivity. These reallocations can be so strong that exporting activity can raise poverty levels while benefiting only a group of selective, inclusive few. On the other hand, if these price effects are indeed negative (or, if product quality is raised) locals can actually directly benefit from this: they find employment elsewhere at higher wages and can increase income and consumption. A standard Heckscher-Ohlin (HO) model predicts that as African economies open up to trade, the reform boosts demand for labour-intensive production, such that employment of unskilled-workers increase, and eventually wage rates too. However, as Winters, McCulloch and McKay (2004:75) emphasize, the dichotomy between unskilled and skilled workers does not hold. When semi-skilled labour demand increases as a results of more exporting activities, poverty is “possibly worsened”. African countries hold many agricultural resources and mineral endowments such that HO model suggests a stimulation for these sectors rather than the labour-intensive ones. Moreover, if unskilled workers are mostly active in the non-tradable sector and exporting firms demand semi-skilled employees, trade liberalization could fuel a depreciation of the real exchange rate, which may hurt the poor.

APPENDIX**A.1. Productivity growth rates per country and sector**

	<i>fixed effects</i>	<i>random effects</i>	<i>pooled</i>
Ghana	0.6%	0.7%	0.1%
Tanzania	4.1%	5.3%	6.2%
Kenya	8.3%	8.6%	2.8%
Wood	2.8%	1.2%	1.3%
Food	3.4%	2.4%	-4.3%
Metal/Chemical	3.1%	3.2%	3.8%
Garment	-1.5%	1.4%	2.7%
Textile	6.6%	2.9%	7.5%
Furniture	2.4%	3.5%	-1.2%

A.2. Export premia from pooled sample specifications

period	size	Δ size	cap. intens	Δ cap. intens	wage	Δ wage
<i>Pooled FGLS</i>	50%*** (n = 4530)	3%* (n = 2920)	-11%*** (n = 4340)	1% (n = 2764)	21%*** (n = 3991)	3% (n = 2419)
<i>Pooled with AR(1)</i>	29%*** (n = 1960)	2% (n = 1124)	20%*** (n = 1832)	0% (n = 1023)	12%** (n = 1178)	2% (n = 986)

Note: Results are based on population-average panel effects using a pooled FGLS estimator.

A.3. Differences between starters and non-starters of exporting (unconditional)

	Δ output	Δ size	Δ capital	Δ education	Δ wage	Δ earnings	Δ profit to K/L	Δ TFP
starters	0.05	0.12* *	- 0.07**	-0.01	0.00	-0.01	-0.13*	- 0.14**
non-starters	0.05	0.00	0.04	0.01	0.05	0.06	-0.05	0.00