Imported inputs and exporting in the Africa's manufacturing sector

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Abstract

Purpose – The purpose of this paper is to estimate both direct and indirect channels through which imported inputs spur exporting in the African manufacturing sector.

Design/methodology/approach – The authors estimated models for all exporters, direct exporters and indirect exporters using a probit model. The authors circumvented the endogeneity of imported inputs and productivity in the export status models by using their lagged values. The authors employed the World Bank Enterprise Survey data for a set of 26 African countries.

Findings – From the direct channel, the authors find that importers of inputs in the previous period increase the probability of exporting in the current period pointing to the possibility of sunk cost complementarities. Indirectly, high lagged firm productivity spurs exporting in the current period. Being a direct importer of inputs in the previous period increases the probability of exporting directly but has no effect on indirect exporters. Both channels are complimentary because their interaction term is positive and significant.

Practical implications – The importation of inputs seems a precondition for exporting and that any policy obscuring imports may indirectly inhibit exportation. Government policy should make importation inputs easier in order to stimulate exporting activities.

Originality/value – The paper's contribution to empirical literature is that much of the empirical studies have overly concentrated on developed countries and hence leaving a huge knowledge gap for African countries. The only papers focusing on Africa are by Parra and Martínez-Zarzoso (2015), who focused on the Egyptian manufacturing sector, and Edwards *et al.* (2017), who used firm-level data from South Africa. The authors extend this literature by undertaking firm-level analysis in a cross-country setting among manufacturing firms in Africa.

Keywords Performance, International trade, Exporting, Direct and indirect channels

Paper type Research paper

1. Introduction and motivation

Exporting induces firms to adopt internationally best practices and frontier technological innovations which induce efficiency and product quality enhancement, resulting in export competitiveness. Such a behavior is referred to as learning-by-exporting since export markets normally demand high-quality products that suit international consumer standards (Bbaale, 2011; Verhoogen, 2008). The demand for high-quality exports, especially by advanced markets, implies that firm output must result from high-quality inputs which, for most developing countries, must be imported (Edward *et al.*, 2017; Bas and Strauss-Kahn, 2014). This is largely because research and development which results in frontier innovation is typically unaffordable by firms located in developing economies; therefore, technological imitation is the second best option. It is thus largely through importation that firms in developing economies can access frontier production inputs.

Importation of inputs enhances the export performance of firms through direct and indirect channels (Bas and Strauss-Kahn, 2014; Bas, 2012). The direct channel relates to importation enabling access to a variety of high-quality inputs at a lower price compared to domestic sources (Halpern *et al.*, 2015; Okafor *et al.*, 2016). Bas and Strauss-Kahn (2014) argued that the lower cost of imported inputs reduces the cost of production, thereby enhancing a firm's export price competitiveness. Additionally, high-quality imported inputs

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imply high-quality final goods that match international market consumer tastes and preferences (Kugler and Verhoogen, 2009).

The indirect channel, on the other hand, suggests that the importation of inputs enhances firm-level productivity which, in turn, increases a firm's likelihood to self-select itself to export. Indeed, there is consensus in empirical literature that the use of imported inputs enhances firm-level productivity (Gopinath and Neiman, 2014; Foster-McGregor *et al*., 2013; Okafor *et al*., 2016; Halpern *et al*., 2015; Amiti and Konings, 2007; Kasahara and Rodrigue, 2008; Augier *et al*., 2009; Topalovaand Khandelwal, 2011). This is based on the premise earlier noted that the importation of inputs is associated with knowledge and technological diffusion which lead to efficiency gains, thereby inducing a firm's export competitiveness. Another indirect channel through the importation of inputs enhances export performance by reducing export sunk cost. Indeed, Kasahara and Lapham (2013) and Jienwatcharamongkhol (2015) argued that import restrictions and barriers may indirectly constrain a country's capacity to export because of the sunk cost complementarities between imports and the exports sector. Import participation in the previous period makes it easier for export penetration in the current period, since some of the sunk costs of market entry might have been settled previously. Also, Muuls and Pisu (2009) showed the presence of fixed costs in both exporting and importing activities leading to a process of self-selection in both markets.

Besides the preceding empirical discussion about the direct and indirect effects of imported inputs on firm export performance, there is equally a plethora of empirical literature examining the relationship between imported inputs and export performance of firms without explicitly stating the directness or indirectness of relationship (Edward *et al*., 2017; Bas and Strauss-Kahn, 2014; Feng *et al*., 2016; Castellani and Fassio, 2016; Pierola *et al*., 2015; Parra and Martínez-Zarzoso, 2015; Jienwatcharamongkhol, 2015; Grazzi *et al*., 2017; Turco and Maggioni, 2013; Muuls and Pisu, 2009; Kasahara and Lapham, 2013). For example, using manufacturing firm-level data from China, Feng *et al*. (2016) showed that an increase in the importation of firm inputs is associated with an increase in exports and export product varieties with effects varying with the source of imports. Similarly, Edwards *et al*. (2017) using firm-level data from South Africa showed that exporting will be increasing in input importation more so if inputs are sourced from advanced economies. Also, in a study of manufacturing firms in India, Grazzi *et al*. (2017) showed that imported inputs play an important role in expanding export activities of firms. Furthermore, with the aid of firm-level data from Peru, Pierola *et al*. (2015) showed that the greater use of imported inputs of higher quality and variety is associated with higher exports, faster export growth, greater diversification of export markets and higher quality exports. Studies in developed economies find similar results, for example, Bas and Strauss-Kahn (2014) using firm-level data from France argued that access to new varieties of inputs enhances productivity and exporting through better complementarity of inputs and transfer of technology. Furthermore, Castellani and Fassio (2016) in a study of Swedish firms argued that it is not importing per se that matters in promoting exporting activities, rather the number of imported inputs and the geographical reach of imports that matter, especially for small and medium enterprises.

From the literature survey done, it is clear that while there is much of the literature connecting imported inputs and exporting concentrates on developed countries, there is still a huge knowledge gap for developing countries, especially those in SSA. The only papers focusing on Africa are by Parra and Martínez-Zarzoso (2015), who focused on the Egyptian manufacturing sector, and Edwards *et al*. (2017), who used firm-level data from South Africa. We extend this literature by undertaking firm-level analysis in a cross-country setting among manufacturing firms in Africa. We circumvented the endogeneity problem of imported inputs and productivity in the export status model by using their lagged values.

Additionally, empirical evidence for the case of developing countries has for long estimated the export function and hence examined the determinants of exports without particular attention to the relationship between imported inputs and export behavior of firms. Furthermore, while several authors document a relationship between firm-level productivity gains emerging from imported inputs (as noted earlier in this paper), quite a few studies have examined the relationship between imported inputs and firm export participation. The main aim of this paper is to analyze the role of imported inputs in explaining firms' export behavior for both direct and indirect exporters. We estimate both the direct and indirect channels through which imported inputs influence firm-level export activities. To the best of our knowledge, no paper has undertaken a similar study for the case of African countries and hence this paper represents a real value added.

2. Methodology

2.1 Model and empirical strategy

This paper seeks to empirically test the validity of both direct and indirect mechanisms through which imported inputs influence a firm's export decision. In order to estimate both direct and indirect effects of imported inputs on firm's export decision, we follow Bas and Strauss-Kahn (2014) and Edwards *et al.* (2017) and specify the following regression models:

$$\tau_{ijct}\_exp = \beta imports_{ijct-1} + \lambda prodty_{ijct-1} + \theta imports_{ijct-1} \times prodty_{ijct-1} + \gamma' Z_{ijct} + \zeta_t + \zeta_j + \zeta_c + \eta_{ijct}, \quad (1)$$

$$\tau_{ijct}\_direxp = \beta imports_{ijct-1} + \lambda prodty_{ijct-1} + \theta imports_{ijct-1} \times prodty_{ijct-1} + \gamma' Z_{ijct} + \zeta_t + \zeta_j + \zeta_c + \eta_{ijct}, \quad (2)$$

$$\tau_{ijct}\_indirexp = \beta imports_{ijct-1} + \lambda prodty_{ijct-1} + \theta imports_{ijct-1} \times prodty_{ijct-1} + \gamma' Z_{ijct} + \zeta_t + \zeta_j + \zeta_c + \eta_{ijct}, \quad (3)$$

where i, j, c, and t represent firm, industry, country and time, respectively. From Equation (1), τ_{ijct}_exp is the overall export status dummy variable which that equals "1" if the firm exports and "0" if the firm only sells domestically. Where if τ_{ijct}_exp is equal to "1", then it captures that export either directly or indirectly. A firm is direct exporter if its products are sold on the international market without first selling to domestic third parties. While a firm engages in indirect exports if its products are sold domestically to third party that eventually exports the products. In Equation (2), τ_{ijct}_direxp captures firms that export directly. τ_{ijct}_direxp is equal to "1" if a firm exports directly otherwise it is equal to "0". In Equation (3), $\tau_{ijct}\_indirexp$ captures firms that export indirectly. It is equal to "1" if a firm is an indirect exporter otherwise "0". The main independent variables are lagged imported inputs ($imports_{ijct-1}\_direxp$), lagged productivity (measured as output per worker) variable ($prodty_{ijct-1}$) and the interaction term between the two ($imports_{ijct-1} \times prodty_{ijct-1}$). If we observe a positive and significant coefficient on the interaction term between lagged imports and productivity in the contemporaneous export model, we conclude that firms with previous import experience that also experienced productivity shift are more likely to export compared to counterparts. In other words, firms with previous import experience are better positioned to penetrate into export markets once productivity increases. In order to circumvent the problem of endogeneity or reverse causation, imported inputs and the productivity measure are introduced into the export models when they are lagged one period. We include the productivity measure in our models

in order to capture the indirect pathway through which imports of inputs influence a firm's decision to export while imported inputs capture the direct pathway.

Z_{ijct} is a vector of observable control variables specific to the firm and these account for differences between firms. These variables include *firm ownership* where we construct a variable equal to "1" if a firm is foreign owned otherwise "1." *Age* is a continuous variable generated from the difference between the year of the survey and the year in which the firm commenced operations. We accordingly transform it into natural logarithms in order to reduce the size of the numbers and also ease the interpretations. *Quality certification* is a dummy variable equal to "1" if a firm has an internationally recognized quality certification otherwise "0". *Email use* is constructed as equal to "1" if a firm uses an e-mail to contact its customers otherwise "0". *Website use* equals "1" if a firm uses a website to contact customers otherwise "1". Size of the firm is divided into three categories according to the World Bank definition. *Small* size is equal to "1" if a firm employs less than 20 workers otherwise "0." *Medium* size is equal to "1" if a firm employees 20–99 workers otherwise "0." *Large* size is equal to "1" if a firm employees at least 100 workers otherwise "0". Source of financing is represented by two variables; *loan* and *overdraft* facilities. *Loan* equals "1" if a firm has access to a loan facility otherwise "0." *Overdraft* is equal "1" if a firm has access to an overdraft facility otherwise "0." The business environment is represented by *electricity outages* which is equal to "1" if a firm experienced electricity outages in the last fiscal year otherwise "0."

Finally, ζ_t, ζ_j and ζ_c are time, industry and country fixed effects, respectively, which are included in our model estimations. We include fixed effects in our regression models in order to control for the time-invariant firm heterogeneity that might jointly determine importing and exporting behavior. η_{ijct} is the zero-mean error which is identically and independently distributed across firms/white noise. We use a probit model during the analysis.

2.2 Data

This paper used the cross-sectional World Bank Enterprise Survey (WBES) data to investigate the role of imported inputs in stimulating exporting activities in the African manufacturing sector. The World Bank uses a harmonized questionnaire to collect formal firm-level data all over the world since 2006. For the case of most African countries, two waves of data exist with some countries like Niger having data as recent as 2017 (see Table I for a list of countries included in the analysis). The WBES provides a unique opportunity to undertake this study since it contains all the key variables needed for the successful implementation of the study. The variables include but not limited to access to finance, annual sales, sales three years ago, annual employment, employment three years ago, importation of inputs, export status, corruption/bribery, bureaucracy, infrastructure such as electricity, age of the firm, ownership, taxation, quality certification, email use, website use, firm size, informality, innovation and technology among others. The WBES asks firms of the percentage of sales that are national, percentage of sales that direct exports and the percentage of sales that are indirect exports. The survey also asks firms about the share of firm inputs that are imported and also if the imports are direct or indirect.

3. Findings

This section presents both descriptive and empirical findings. We first present results from the descriptive analysis emerging from some cross-tabulations in order to lay a foundation for the empirical findings.

3.1 Descriptive findings

Table II shows the descriptive statistics of the variables that we employed during the regression analysis. The findings show that there is a small share of exporters in our

Country	Wave 1	Wave 2	Frequency
Angola	2006	2010	291
Benin	2009	2016	142
Botswana	2006	2010	199
Burundi	2006	2014	162
Cameroon	2009	2016	208
Cote d'Ivoire	2009	2016	310
DRC	2010	2013	365
Ethiopia	2011	2015	706
Egypt	2013	2016	3,188
Ghana	2007	2013	669
Guinea	2006	2016	162
Kenya	2007	2013	810
Madagascar	2009	2013	467
Malawi	2009	2014	268
Mali	2007	2010	461
Mauritania	2006	2014	132
Namibia	2006	2014	287
Niger	2009	2017	103
Rwanda	2006	2011	140
Senegal	2007	2014	508
Swaziland	2006	2016	145
Tanzania	2006	2013	713
Togo	2009	2016	80
Uganda	2006	2013	685
Zambia	2007	2013	668
Zimbabwe	2011	2016	665

Table I.
List of countries in our sample

Variable	Entire sample	Exporters	Direct exporters	Indirect exporters
Exporting firms	0.229			
Indirect exporters	0.109			
Direct exporters	0.167			
Importers of inputs	0.561	0.798	0.824	0.771
Importers of inputs in the previous period	0.277	0.354	0.370	0.293
Direct importers of inputs	0.495	0.701	0.761	0.557
Current productivity	9.224	9.819	9.948	9.512
Lagged productivity	9.618	10.180	10.210	10.036
Foreign	0.128	0.254	0.277	0.214
Age	18.117	22.748	23.371	21.587
Quality certification	0.189	0.435	0.489	0.358
Email use	0.529	0.816	0.870	0.710
Website use	0.295	0.559	0.615	0.472
Medium size	0.316	0.330	0.307	0.368
Large size	0.189	0.455	0.530	0.309
Loan	0.207	0.347	0.372	0.302
Over draft	0.266	0.461	0.493	0.393
Power outage	0.801	0.793	0.776	0.814
N	13,556	3,091	2,265	1,478

Source: Authors' own computations based on WBES

Table II.
Descriptive statistics

sample accounting for only 23 percent. The WBES disaggregates direct and indirect exporters where direct exporters account for 17 percent of the sample, while indirect exporters 11 percent of the sample. It is clear from this exposition that there is an overlap; some exporters are both direct and indirect exporters. In terms of importation of inputs,

56 percent of the firms in our sample are importers of inputs. Considering exporters, 80 percent of exporters are importers of inputs and that this is more pronounced amongst direct exporters (82 percent) compared to indirect exporters (77 percent). In the same vein, 28 percent of firms in our sample are importers of inputs in the first wave of the survey and that 35 percent of importers are exporters, 37 percent are direct exporters while 29 percent are indirect exporters.

Almost a half of the firms importing inputs are direct importers meaning that they do not go through an intermediary. Considering exporters, 70 percent of exporters are direct importers of inputs. There are more direct exporters (76 percent) compared to indirect exporters (56 percent) who are direct importers of inputs. This might imply that there is complementarity or sharing of costs between exporting and importing activities. The current productivity value is slightly lower than the productivity value of the previous period meaning that either employment increased or output declined between the previous and current period. However, the average productivity value for exporters is higher than that of the entire sample (9.8 compared to 9.6 in logs). Direct exporters have the highest average productivity value (10 in logs) compared to indirect exporters (9.5 in logs). A similar picture is visible for the average productivity value of the previous period.

Considering the other control variables, we show that foreign-owned firms are a small proportion of our sample, accounting for only 13 percent, implying that the majority of firms in Africa are domestically owned. This further implies that there is limited penetration of foreign direct investment in the African manufacturing sector. This might also imply that foreign investors are operating in other sectors other than manufacturing. However, when we consider exporters, the picture is rather different. It is revealed that 25 percent of exporters are foreign owned and that direct exporter are more likely to be foreign owned (27 percent) compared to indirect exporters (21 percent). The average age of firms in the African manufacturing sector is 18 years implying that manufacturing firms have not yet matured; they are still in the youthful stage. However, exporters are, on average, older (23 years) and that direct exporters are, on average, slightly older (23 years) compared to the indirect exporters (22 years). Our descriptive statistics further show that only 19 percent of firms in our sample have an internationally recognized quality certification. However, more exporters (44 percent), on average, have an internationally recognized quality certification and that more direct exporters (49 percent) than indirect exporters (36 percent) have an internationally recognized quality certification.

In terms of ICT use, 53 and 29 percent of firms in our sample do use emails and websites, respectively, while communicating with their customers, respectively. However, on average, 82 and 56 percent of exporters use emails and websites, respectively. Also, on average, 87 and 63 percent of direct exporters use emails and websites, respectively. On the other hand, 71 and 47 percent of indirect exporters use emails and websites, respectively. Looking at firm size, it is very clear that African manufacturing sector is predominantly occupied by small firms employing less than 20 workers (49 percent) compared to medium firms employing 20–99 workers (32 percent) and large firms employing at least 100 workers (19 percent). However, exporters are, on average, larger than their counter parts; it is revealed that 46 percent of exporters are large firms and that more direct exporters (53 percent) than indirect exporters (31 percent) are large firms. Considering access to finance, it is revealed that only 21 percent of firms in our sample have access to loan facilities, while 27 use overdraft facilities to pay for their transactions. However, a higher average percentage of exporters (35 and 46 percent) have access to loan and overdraft facilities and that a higher percentage of direct exporters (37 and 49 percent) compared to indirect exporters (30 and 39 percent) have access to loan and overdraft facilities. These findings point to limited access to formal finance by the majority of African manufacturers.

In terms of the business environment, 80 percent of the firms in our sample reported power outages and the picture remains almost the same irrespective of the export status.

3.2 Empirical findings

Our empirical findings are generated from the estimation of three probit models specified in Equations (1)–(3) and presented in Tables III–V, respectively.

Our findings reveal the importance of import experience in stimulating the probability of exporting in the subsequent period. Overall being an importer of inputs in the previous period increases the probability of exporting in the current period by 10 percent and also increases the probability to export if the firm directly and indirectly exports by 6 and 5 percent, respectively. These findings point to the possibility of sunk cost sharing between importing and exporting activities as a result of participation in international market by an importer which makes the transition into the export market cheaper or easier. These cost complementarities emerge in areas such as ease of establishment of marketing channels, dealing with institutional and legal framework in a foreign land and learning the quality standards requirements in advanced markets which makes it easier to upgrade the domestic products in line with these requirements. Additionally, imported inputs ensure the production of high-quality varieties at a lower cost which boosts a firm's profits and makes the firm ready for the international market both in terms of the required quality and variety of the products. This has been documented and supported in the literature as the direct channel through which the importation of inputs enhances the probability of exporting (Bas and Strauss-Kahn, 2014; Feng *et al.*, 2016; Edward *et al.*, 2017; Grazzi *et al.*, 2017; Castellani and Fassio, 2016; Kasahara and Lapham, 2013; Parra and Martínez-Zarzoso, 2015). Edwards *et al.* (2017) and Feng *et al.* (2016) emphasized the fact that it is imported inputs sourced from advanced economies that spur exporting activities and not imported inputs, in general.

Variables	(1) Marginal effects	(2) Marginal effects	(3) Marginal effects	(4) Marginal effects
Lagged imported inputs	0.101*** (0.0141)	0.00213 (0.0386)		
Lagged productivity	0.00795*** (0.00240)	0.00556** (0.00255)	0.0115*** (0.00422)	0.00829 (0.00511)
Imported inputs × productivity		0.00898** (0.00356)		
Foreign	0.0817*** (0.0151)	0.0819*** (0.0152)	0.0976*** (0.0219)	0.0975*** (0.0219)
Age	0.00995 (0.00637)	0.00997 (0.00638)	0.00854 (0.0111)	0.00808 (0.0111)
Quality certification	0.150*** (0.0142)	0.150*** (0.0142)	0.155*** (0.0195)	0.156*** (0.0196)
Email use	0.0846*** (0.0112)	0.0849*** (0.0112)	0.0724*** (0.0198)	0.0721*** (0.0199)
Website use	0.0674*** (0.0121)	0.0673*** (0.0121)	0.0843*** (0.0189)	0.0849*** (0.0189)
Medium size	0.0817*** (0.0122)	0.0820*** (0.0122)	0.111*** (0.0210)	0.111*** (0.0210)
Large size	0.256*** (0.0193)	0.257*** (0.0193)	0.316*** (0.0259)	0.316*** (0.0259)
Loan	0.0236** (0.0110)	0.0241** (0.0110)	0.0236 (0.0182)	0.0236 (0.0182)
Over draft	0.0352*** (0.0109)	0.0346*** (0.0109)	0.00969 (0.0176)	0.00916 (0.0176)
Power outage	−0.0214* (0.0123)	−0.0199 (0.0123)	0.00343 (0.0208)	0.00294 (0.0208)
Direct imports			0.127*** (0.0171)	0.0652 (0.0620)
Direct imports × productivity				0.00622 (0.00593)
Observations	8,951	8,951	4,921	4,921
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

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

Table III. Export status and imported inputs

Variables	(1) Marginal effects	(2) Marginal effects	(3) Marginal effects	(4) Marginal effects
Lagged imported inputs	0.0565*** (0.0107)	0.0469 (0.0324)		
Lagged productivity	0.00524*** (0.00179)	0.00502** (0.00196)	0.00609* (0.00350)	0.00432 (0.00459)
Imported inputs × productivity		0.000792 (0.00257)		
Foreign	0.0588*** (0.0115)	0.0588*** (0.0115)	0.0826*** (0.0184)	0.0827*** (0.0184)
Age	0.00495 (0.00453)	0.00494 (0.00453)	0.00554 (0.00894)	0.00535 (0.00894)
Quality certification	0.0962*** (0.0109)	0.0962*** (0.0109)	0.103*** (0.0163)	0.103*** (0.0164)
Email use	0.0726*** (0.00857)	0.0726*** (0.00857)	0.0748*** (0.0165)	0.0748*** (0.0165)
Website use	0.0483*** (0.00897)	0.0483*** (0.00898)	0.0615*** (0.0154)	0.0617*** (0.0154)
Medium size	0.0625*** (0.00983)	0.0626*** (0.00983)	0.0851*** (0.0189)	0.0854*** (0.0189)
Large size	0.216*** (0.0180)	0.216*** (0.0180)	0.273*** (0.0253)	0.274*** (0.0254)
Loan	0.0162** (0.00786)	0.0163** (0.00786)	0.0265* (0.0148)	0.0265* (0.0148)
Over draft	0.0239*** (0.00800)	0.0238*** (0.00800)	0.00654 (0.0142)	0.00642 (0.0143)
Power outage	−0.0182** (0.00914)	−0.0181** (0.00914)	−0.0205 (0.0175)	−0.0207 (0.0176)
Direct imports			0.131*** (0.0144)	0.103** (0.0509)
Direct imports × productivity				0.00287 (0.00492)
Observations	8,935	8,935	4,909	4,909
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

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

Table IV.
Direct export status and imported inputs

Variables	(1) Marginal effects	(2) Marginal effects	(3) Marginal effects	(4) Marginal effects
Lagged imported inputs	0.0473*** (0.00969)	−0.0409** (0.0195)		
Lagged productivity	0.00226 (0.00144)	−0.000125 (0.00153)	0.00487* (0.00250)	0.00568* (0.00293)
Imported inputs × productivity		0.00867*** (0.00218)		
Foreign	0.00535 (0.00829)	0.00554 (0.00829)	−0.00325 (0.0124)	−0.00330 (0.0124)
Age	0.00660 (0.00412)	0.00671 (0.00412)	0.00584 (0.00700)	0.00604 (0.00701)
Quality certification	0.0585*** (0.00948)	0.0582*** (0.00947)	0.0694*** (0.0133)	0.0692*** (0.0133)
Email use	0.0183** (0.00742)	0.0188** (0.00742)	0.0128 (0.0129)	0.0128 (0.0129)
Website use	0.0231*** (0.00789)	0.0226*** (0.00786)	0.0380*** (0.0124)	0.0378*** (0.0123)
Medium size	0.0311*** (0.00799)	0.0313*** (0.00798)	0.0516*** (0.0141)	0.0514*** (0.0141)
Large size	0.0295*** (0.0110)	0.0296*** (0.0109)	0.0520*** (0.0179)	0.0519*** (0.0179)
Loan	−0.00112 (0.00673)	−0.000634 (0.00674)	−0.0100 (0.0110)	−0.0101 (0.0110)
Over draft	0.00530 (0.00676)	0.00476 (0.00672)	−0.00166 (0.0109)	−0.00150 (0.0109)
Power outage	−0.00836 (0.00806)	−0.00690 (0.00798)	0.00209 (0.0134)	0.00218 (0.0134)
Direct imports			−0.00947 (0.0110)	0.00687 (0.0374)
Direct imports × productivity				−0.00161 (0.00352)
Observations	8,948	8,948	4,921	4,921
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

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

Table V.
Indirect export status and imported inputs

Lagged firm productivity positively and significantly influences the probability of exporting in the current period (see Table III). A firm that experienced a productivity increase in the previous period increases the probability of exporting by 0.8 to 1 percent. Also, more productive firms are more likely to export directly and indirectly by

0.5 percent (see Table IV) and 0.6 percent (see Table V), respectively. Being highly productive makes the firm better able to meet the sunk costs of exporting, suggesting that highly productive firms self-select into exporting and do supply to the foreign market at competitive prices. Additionally, highly productive firms are more likely to import high-quality inputs that enables a firm provide final goods that are consumable on the international market. This finding is supported by previous authors who also underscored the importance of firm-level productivity in heightening the probability of exporting (Bas, 2012; Bas and Strauss-Kahn, 2014; Jienwatcharamongkhol, 2015).

As might be expected, the direct importation of inputs spurs the direct exportation of products. Being a direct importer of inputs and intermediates increases the probability of exporting by 13 percent (see Table III, Model 3). Also, the direct importation of inputs increases the probability of exporting directly by 10-13 percent (see Table IV, Models 3 and 4) but has no effect on indirect exporters (see Table V, Models 3 and 4). Since the direct importation and exportation of goods implies that firms do not go through an intermediary in order to import or export, being a direct importer means learning how to exist in the foreign market in terms of product quality, marketing and distribution channels and dealing with the legal system which, in turn, makes direct exporting easier/cheaper.

The interaction term between lagged imported inputs and lagged productivity was included to investigate whether firms that experienced productivity shifts and imported inputs in the previous period are more likely to export in the subsequent period compared to others. An increase in firm productivity combined with being an importer of inputs in the previous period increases the probability of exporting by 0.9 percent (see Table III, Model 2). This result implies that both the direct and indirect channels through which the importation of inputs enhances firm exporting re-inforce each other to the extent that they spur firm exporting business. Firms that are more efficient and also imported inputs previously seem better prepared to take an advantage of an opportunity to export. These findings are corroborated by Jienwatcharamongkhol (2015), who studied Swish manufacturing firms and confirmed that imported inputs enhance the productivity effect on the firm's probability to export.

A key message from our analysis is that importing experience enhances firm's exporting activities through the provision of cheap and high-quality inputs that facilitate the production of high-quality varieties of products that match the international market standards. Additionally, the importation of inputs initially pays for some of the sunk costs of international trade that would hinder exporting activities. This confirms the notion that there is cost complementarities between importing and exporting. Furthermore, the importation of inputs improves firm-level productivity through knowledge and technological diffusion embodied in the imported inputs. This, in turn, means that high productivity firms will self-select into export markets and are in a better position to meet the sunk costs thereof. In a nutshell, the importation of inputs and intermediates seems a precondition for exporting and that any policy obscuring imports will directly inhibit exportation, especially in the African manufacturing sector that is facing an acute shortage of high-quality industrial inputs. Government policy should make importation easier in order to stimulate exporting activities.

Other firm characteristics are also observed to be significant in influencing the probability of exporting. Being a foreign-owned firm increases the probability of exporting 6-10 percent compared to counterparts that are domestically owned (see Table III). However, foreign ownership is important for enhancing direct rather than indirect exporting implying that foreigners are more likely to be direct exporters. Having an internationally recognized quality certification increases the probability of exporting by 15–16 percent compare to firms without it. However, the effect of quality certification is more pronounced among direct exporters with a probability of 10 percent compared to indirect exporters whose probability is 6–7 percent. Having an

internationally recognized quality certification implies that global markets have approved the quality standards of the firm's products and this makes it easier for firms to penetrate several international markets.

The use of ICTs as an alternative marketing channel increase the probability of exporting. Firms using an e-mail or website to communicate with customers increase the probability of exporting by 7–9 percent compared to firms that do not use ICTs (see Table III). The importance of ICTs is more pronounced amongst direct exporters with a probability of 5–8 percent compared to indirect exporters whose probability is 2–4 percent (see Tables IV and V). Firm size is very imperative in influencing a firm's probability of exporting. Being a medium-sized firm increases the probability of exporting by 8–11 percent compared to small firms. Being a large firm increases the probability of exporting by 26–32 percent compared to small firms (see Table III). However, the effect of firm size is more imperative for direct exporters than for indirect exporters. For example, the probability that a large firm is more likely to export directly is 22–27 percent compared to 3–5 percent for indirect exporters (see Tables IV and V). Access to finance increases the probability of exporting by 2–4 percent compared to counters with no access to finance (see Table III). However, the effect of access to finance is significant for only direct exporters with a probability of 2–3 percent than for indirect exporters (see Tables IV and V). In terms of the business environment, power outage is observed to reduce the probability of exporting by 2 percent (see Tables III and IV). This is due to the fact that power outage inhibits production processes and also increases the cost of production in the event that firms use generators as a mechanism of ensuring continuous production.

4. Conclusion

The study sets out to investigate the effect of the importation of inputs and intermediates on the probability of exporting in the African manufacturing sector. Both direct and indirect channels were empirically estimated in three models (all exporters, direct exporters and indirect exporters) using a probit model. We circumvented the endogeneity of imported inputs and productivity in the export status models by using their lagged values during the estimations. We employed the WBES data for a set of 26 African countries with an objective of interrogating how firm-level import decisions can potentially result into observed exporting differences. The WBES questionnaire was harmonized for the entire world since 2006, hence providing an opportunity to implement cross-country enterprise studies.

Considering the direct channel, our findings show that being an importer of inputs in the previous period increases the probability of exporting in the current period pointing to the possibility of sunk cost complementarities between importing and exporting activities. From the indirect channel perspective, lagged firm productivity positively and significantly influences the probability of exporting in the current period. This emphasizes the possibility of knowledge and technological diffusion embodied in imported inputs that enhance firm productivity which, in turn, spurs exporting. Additionally, being a direct importer of inputs and intermediates increases the probability of exporting directly but has no effect on indirect exporters.

We find a positive and statistically significant interaction term between lagged productivity and lagged imported inputs, suggesting that both the direct and indirect channels through which importation of inputs enhances firm exporting reinforce each other. Firms that are more efficient and also imported inputs previously seem better prepared to take advantage of an opportunity to export.

A key message from our analysis is that there seems to be cost complementarities between importing and exporting activities to the extent that the importation of inputs in the previous period makes exporting easier or cheaper. The diffusion of knowledge and technology embodied in imported inputs heightens firm productivity which, in turn, spurs

exporting activities. Additionally, the importation gives access to high-quality and cheaper inputs and intermediates which facilitates the production of high-quality product varieties at a lower cost. Consequently, a firm's profits increase which further enables the firms to pay the sunk costs required to penetrate into export markets. In a nutshell, the importation of inputs and intermediates seems a precondition for exporting and that any policy obscuring imports can indirectly inhibit exportation, especially in the African manufacturing sector that is facing an acute shortage of high-quality industrial inputs. Government policy should make importation easier in order to stimulate exporting activities. We, however, wish to note that further research could benefit from exploiting panel dataset for Africa.

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