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IMPORTING AND FIRM EXPORT PERFORMANCE: NEW EVIDENCE FROM SOUTH AFRICA

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Abstract
This article uses firm-level data from company income tax and customs declarations from South Africa to analyse the complementary relationship between direct access to imported intermediate inputs and firm exports in the manufacturing industry. There are two main findings. The first is on firm heterogeneity, showing that firms that import and export consistently demonstrate premiums in terms of productivity, employment, wages and capital intensity in production compared to firms that do not trade, or only export or import. The second supports the hypothesis that importing raises exports, especially if inputs are sourced from advanced economies.
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1. INTRODUCTION

Exporting provides firms an opportunity to grow by exploiting international markets, spurring growth and dynamism in the domestic economy. However, exporting is difficult and rare. Bernard, Eaton, Jensen and Kortum (2003) show that exporting is rare among USA firms and that US exporters are more productive and larger than their domestic counterparts. The literature spawned by Melitz (2003) argues that only the most productive firms can cover the significant fixed costs of exporting, leading to a tight relationship between firm productivity and exporting. In addition, Verhoogen (2008) argues that exporting from developing countries often involves upgrading product quality to appeal to consumers in advanced countries. This in turn involves employing better quality and a greater variety of intermediate inputs in production.

In this paper, we argue that foreign intermediate inputs sourced via imports may be important for firm exports, particularly in developing countries. The variety and characteristics of imported goods are a measure of the knowledge that flows into a country from abroad, resulting in new learning opportunities related to the use of new products. Imports can provide firms in developing countries with access to cheaper, better quality and a wider

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variety of intermediate inputs, including the foreign technology embodied in them that may be more advanced than locally available technology. By facilitating the access to intermediate inputs and machinery, openness to trade represents the most traditional channel for knowledge and technological acquisition (Grossman and Helpman, 1991).

The use of imported inputs might increase the likelihood of exporting in three ways. First, imported inputs may be associated with increases in firm productivity (Schor, 2004; Broda and Weinstein, 2006; Amiti and Konings, 2007; Kasahara and Rodrigue, 2008; Topalova and Khandelwal, 2011; Halpern et al., 2015). Second, access to lower cost imported inputs may boost export revenue (Bas and Strauss-Kahn, 2014). These channels boosts firm profitability, which can increase existing exports and allow firms to bear the fixed costs of accessing new product markets. Third, imported inputs may allow firms to upgrade product quality, due to the introduction of more sophisticated inputs in the production process. Importing goods that are different from one's own exports is likely to generate a higher variety in external knowledge flows and induce incremental innovation, which in turn should allow developing countries to produce more sophisticated goods (Puga and Trefler, 2010). This might not only encourage the creation of new varieties for the domestic market (Goldberg et al., 2010), but could also allow firms to introduce higher quality goods for the export market (Kugler and Verhoogen, 2009).

Existing evidence on the role of importing on firm export performance seems to support previous claims. A study by Bas (2012) on Argentinean firms finds a positive effect of input trade liberalisation on the entry of firms into exporting. Some other recent evidence has shown that firms that import, and especially those importing more and higher quality varieties, end up exporting more at both the intensive and extensive margins (Bas and Strauss-Kahn, 2014; Feng et al., 2016). Other studies focus on the quality and varieties of imported inputs. Procuring more sophisticated inputs, especially those originating from advanced markets, positively affects both the propensity to export (Manova and Zhang, 2012) and the quality of exports (Fan et al., 2015).

In light of the above, with this paper we aim to analyze the association between imports and export performance of South African manufacturing firms. Boosting exports has been identified as a policy priority of the government in its National Development Plan 2030 (NDP, 2013). Over the past decade, South Africa's exports have underperformed (Purfield et al., 2014) and have lagged other emerging economies in the upgrading of export sophistication (Hausmann and Klinger, 2008). Key constraints identified include lack of productivity of domestic firms, infrastructure bottlenecks and continued barriers to regional trade (Purfield et al., 2014). Tariff and other barriers to imported inputs have also restricted export growth and diversification, although tariff reform from the early 1990s has alleviated much of this constraint (Edwards and Lawrence, 2008).

In this paper, we take advantage of detailed transaction-level data from South Africa on firm exports and imports matched with firm-level data from company tax records. The data covers the period 2009–2013. This data allow us to confirm the premium enjoyed by exporters and indeed, firms that both import and export, in a wide array of firm characteristics and outcomes. In addition, we examine the relationship between importing and exporting in the data in a more rigorous empirical analysis that controls for firm characteristics like size and technique of production (capital and skill-intensity). Our results corroborate existing evidence that importing has positive implications for exporting (Bas and Strauss-Kahn, 2014). We find that imports from advanced economies prove to be relatively more relevant determinants of exporting, both at the intensive and the extensive margins (the value of exports and the

variety of products exported), consistent with the idea that superior technology embedded in these imports may enable firms from developing countries to penetrate export markets.

The paper is structured as follows. Section 2 outlines the empirical specification. Section 3 describes the data used for the analysis, while Section 4 presents the results. Section 5 concludes, drawing some implications.

2. EMPIRICAL SPECIFICATION

Our idea is to assess the connection between imported inputs and firm export performance. We anticipate that imports impact exports through an indirect and direct channel (Bas, 2012; Bas and Strauss-Kahn, 2014). By raising firm productivity, imports *indirectly* raise firm profitability. This not only boosts existing exports, but also allows firms to bear the fixed costs of accessing new product markets. If we define variety as a product-destination combination, this means that we expect imports through the indirect productivity channel to raise the variety of goods exported by firms.

We posit that imports also *directly* boost exports and the variety of products exported in two ways. First, international markets allow firms to access cheaper and a wider variety of intermediate inputs. Lower cost of inputs directly reduces production costs, which raises firm profits and hence the value and variety of exports. Bas and Strauss-Kahn (2014), in their analysis of the determinants of export varieties in France, capture this direct cost effect through the inclusion of imported varieties from developing (non-OECD) countries. Second, firms are able to access higher quality inputs and new technology embedded in inputs (Feng et al., 2016). Access to high technology/quality inputs allows firms to offset some of the fixed costs (like investment) that would be associated with reconfiguring plants to produce goods that meet the required quality standards of foreign demand, increasing the likelihood of exporting. For example, Kugler and Verhoogen (2009) show that firms that import generally adopt a larger variety of inputs, and pay higher prices for imported inputs compared to domestic inputs of the same product line. Bas and Strauss-Kahn (2014) capture this direct technology/quality effect through the inclusion of imported varieties from developed (OECD) countries. This channel may be particularly relevant for emerging economies, such as South Africa, that wish to export their manufactured goods to advanced economies.

Our data provide support for both the indirect and direct channels. To assess the indirect productivity channel, Fig. 1 presents kernel density estimates of total factor productivity (TFP) and import status for manufacturing firms using data for the full 2009–2013 period.[1] The first kernel density estimate (a) shows that firms that directly engage in international trade are on average more productive than non-trading firms, but exporter-importers are relatively more productive compared to firms that only export and only import.

To more precisely indicate how access to imported intermediate inputs affects firm productivity, we re-categorise firms according to whether they directly import intermediate inputs. As shown in the kernel density estimate (b) the relationship persists – the kernel density of importers of intermediate inputs lies to the right of that for non-traders and is similar to that of exporters.

To capture the direct relationship between importing and exporting, we estimate the following regression equation:

[1] TFP data for manufacturing firms are obtained from Kreuser and Newman (2016) and are estimated using the methodology of Ackerberg et al. (2006).

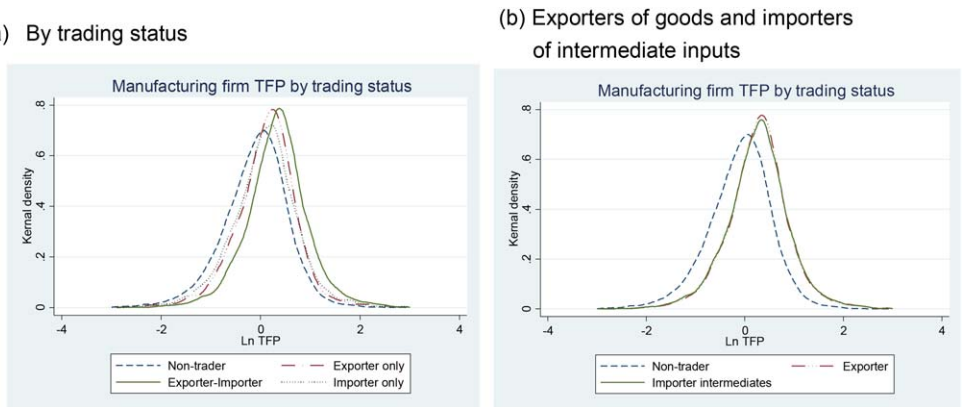

Figure 1. Kernel density estimates of TFP and trading status in South African manufacturing firms, 2009–2013
(a) By trading status, (b) Exporters of goods and importers of intermediate inputs [Colour figure can be viewed at wileyonlinelibrary.com]
Note: Intermediate inputs are defined according to the United Nations classification by Broad Economic Categories (Rev. 4). Firm-level TFP estimates are demeaned by industry/year combinations to rid estimates of sector by time-specific differences.
Source: Authors' elaboration on South African Revenue Services (SARS) Company Income Tax (CIT) and transaction trade data.

$$X_{it}=\alpha+\beta_1 M_{it-1}+\beta_2 DX_{it-1}+\beta_3 \ln\left(TFP\right)_{it-1}+\beta_m C_{it}^{m}+\lambda_i+\lambda_t+\varepsilon_{it} \quad (1)$$

where X_{it} is an indicator of export performance (propensity, value, variety) of firm i at period t. Variety is defined as a product-destination/origin combination, while propensity is a dummy variable that equals one if a firm has a positive export value in that year. We include firm total factor productivity, captured by TFP, to control for the indirect effect of imports on exports via the productivity channel. M_{it} is an indicator of firm import behaviour (import participation, value, variety). Since we condition on TFP, the coefficients we observe on import behaviour capture the direct effect of imports on exporting.

A key concern is that unobserved factors specific to firms might jointly determine importing and exporting behaviour. For instance, firms might experience technology shocks or shocks to managerial composition that might affect their costs of importing and exporting simultaneously. This would lead to inconsistent estimates on our variables of interest related to import behaviour. Hence, we include firm fixed effects (λ_i) to account for such shocks to the extent that they are time-invariant. In addition, TFP and import behaviour are lagged one period to help minimise biases stemming from reverse causation. Finally, we include time-varying controls (C_{it}^{m}) such as the number of employees, skill share (share of workers earning more than R20 000 per month), and capital–labour ratio to control for time-varying firm shocks that might be correlated with importing. In some estimates, a variable for lagged export propensity (DX_{it-1}) is also included. All estimates include year fixed effects (λ_t) to account for annual shocks common to all firms in the sample.

An important caveat to our study is that we do not capture the effect of imports on exporting performance for firms that do not directly import. Non-importing firms that

export may nevertheless gain from access to imported intermediates through third-party transactions or purchases from wholesalers. In addition, even firms that only purchase domestic inputs may benefit from increased openness, if import competition drives these domestic suppliers to reduce their prices, or improve the quality of their products. The effect of imported intermediates on firm export performance may therefore be more extensive than what we find in this paper.

3. DATA AND PRELIMINARY ANALYSIS

3.1 Data Description

To undertake our analysis we integrate three sources of firm-level data obtained from the South African Revenue Services (SARS). The primary data source is the Company Income Tax (CIT) data that provides full company accounts of firms operating in manufacturing and other sectors of the economy. This data covers the calendar years 2008–2013.[2] We restrict the data to cover the population of manufacturing firms.[3]

Using an anonymised concordance file, we then merge two additional databases into the CIT database. First, we merge in the transaction trade data provided by the Customs and Excise department of SARS. The transaction database includes very detailed information on firm-level export and import transactions, including value, quantity and destination/origin at the 8-digit level of the Harmonized System (HS) over the period 2009–2014 (in calendar years). To ensure consistency in product classification over time, the HS8-digit data are converted to the 6-digit level of revision 2007 of the HS classification. The customs transaction database is used to identify manufacturing firms that trade, as well as the value and range of products these firms export and/or import.[4]

[2] The data cover the financial years 2009–2014, but in most cases the tax year of each firm ends in February of the year. Consequently, in our analysis we refer to the calendar year rather than the financial year.

[3] A systematic process was followed to identify manufacturing firms. Different industry classifications are used in the various databases. One problem is that some firms do not consistently locate themselves in a given industry within or across the different databases, even at the 1-digit level of the ISIC of All Economic Activities (ISIC, Rev. 4). Our approach was to base the industry classification on the ISIC code provided in the employee income tax database. We adopted the following "cleaning" strategy. When firms changed 3-digit level industry classifications in a single period and then reverted to the original classification (single-period reversals) we replaced that period industry code with the original industry code. When the change in industry classification was longer than one period, we assumed that this reflected an actual change in industry classification. Missing industry codes were imputed using the prior- and post-period industry codes provided.

[4] We use the company reference number to match the trade transaction data into the CIT data. There are two main limitations with this approach. First, we do not capture firms that export indirectly through, for example, South African retailers that have opened up stores throughout Africa. We also do not capture firms that use imported inputs purchases from wholesalers and retailers. This information is not available in the currently available data. This constraint is faced by most similar studies. Second, international trade may be conducted by a separate entity that is linked to the firm either as a subsidiary, or as the holding company. This leads to an under-estimate of participation in international trade by the firms. This appears particularly problematic for the motor vehicle industry, which, according to the data, makes up less than 3% of the total value of direct exports and imports over the period 2009–2013.

Table 1. Summary statistics of data

	2009	2010	2011	2012	2013	Average 2009–2013
Firms (number)	20,726	23,314	26,191	26,904	22,997	24,026
Direct exporters (%)	22.4	24.9	24.3	25.0	23.1	24.0
Direct importers (%)	25.4	26.2	25.3	25.6	23.6	25.2

Note: This sample of firms is restricted to firms for which TFP estimates are available. Direct importers in this table include all firms that directly import goods, irrespective of whether they are intermediate goods or not.
Source: Authors' elaboration on SARS CIT and transaction trade data.

We then merge data from the IRP5 employee income tax certificates into the CIT data. Firms are required to issue an annual IRP5 certificate to each employee for which remuneration is paid and employee's tax is deducted. This form discloses remuneration earned, taxes deducted and time worked for the year of assessment for each employee. The individual IRP5 data are then mapped to each firm using a concordance file that maps the firm-level Pay-As-You-Earn (PAYE) reference numbers available on the IRP5 forms to the CIT reference numbers.[5]

Finally, we eliminate firms for which key production and employment data required for the estimation of TFP are missing. This reduces the overall sample from the initial population of manufacturing firms. TFP estimates can only be calculated for 60% of the 40,000 manufacturing firms with positive turnover in the CIT database in each year between 2009 and 2013. These firms, however, account for on average 77.6% of total annual turnover, 94.5% of direct export value and 84.1% of direct import value of manufacturing firms in the CIT database (Table A1 in the Appendix). The remaining firms, therefore, capture the bulk of economic activity conducted within the manufacturing sector.

Our final sample covers over 24,000 firm observations in each year between 2009 and 2013. The number of manufacturing firms in the sample rose by about 30% between 2009 and 2012 (Table 1). The slight decline to just under 23,000 in 2013 reflects the late submission by some firms of their income tax statements to SARS. Firms that directly export on average make up 24% of manufacturing firms, with little change in this share over time. Twenty-five percent of the firms directly import goods (intermediate, final, or capital goods) and there is also little change in this share over the period. Participation in international trading by manufacturing firms is relatively stagnant, contrary to what has been found in some other emerging economies (de Loecker, 2007).

Looking at the data, we identify a number of stylised facts regarding manufacturing firms and their direct engagement with the global economy. We find widespread simultaneous exporting and importing behaviour among manufacturing firms. As shown in Table 2, roughly a third of manufacturing firms directly engage in international trade. Of the firms that trade, half engage in both exporting and importing. Among direct exporters, 71% also directly import, while among importers 67% also export. Importing is therefore closely associated with export participation, a relationship that corresponds with findings in the international empirical literature (Bernard et al., 2016) and is consistent with the idea that importing can improve the ability of and opportunity for firms to export.

Firms directly engage in international trade across all manufacturing industries (Table 3), reflecting the heterogeneity within industrial categories. Once again, the findings for

[5] See Kreuser and Newman (2016) for further details.

Table 2. Manufacturing firm engagement in international trade (share firms; %)

	2009	2010	2011	2012	2013	Average
Exporter only	6.2	7.2	7.1	7.1	7.2	7.0
Exporter and importer	16.3	17.7	17.2	17.9	15.9	17.0
Importer only	9.2	8.4	8.2	7.7	7.7	8.2
Non-trader	68.4	66.6	67.5	67.2	69.2	67.8
Total	100.0	100.0	100.0	100.0	100.0	100.0

Note: Sample only includes those firms for which TFP estimates are available. Importers in this table include all firms that import intermediate and/or final goods.
Source: Authors' elaboration on SARS CIT and transaction trade data.

South Africa correspond closely with those from other countries, both advanced (Bernard et al. (2016) for the USA and Castellani et al. (2010) for Italy) and emerging (Kasahara and Lapham (2013) for Chile and Feng et al. (2016) for China).

Nevertheless, firm participation in international trade differs across industries, which is in line with the predictions of the model of heterogeneous firms and comparative advantage presented by Bernard et al. (2007), and with evidence from other developing countries (Schor (2004) on Brazil and Bigsten et al. (2016) on Ethiopia). Participation is particularly high in Other Manufacturing (49.5%), Leather (49.4%), Textiles (48.3%), Pharmaceuticals (47.9%), and Computer and electronics (46.2%). In all of these cases firms that import and export make up the bulk of the firms that trade. Interestingly, in all these cases the number of firms that only import exceeds the number that only export. This in part reflects South Africa's comparative advantage in exporting minerals and not manufacturing, but it also illustrates the relative importance of imported goods used by

Table 3. Trading status by 2-digit manufacturing industry (share total firms in industry), full sample 2009–2013

	Share total firms in industry (%)				Firm observations
	Exporter only	Exporter and importer	Importer only	Non-trader	Total
Food products	4.7	8.3	4.1	83.0	11,380
Beverages	10.3	15.4	3.7	70.6	1,586
Textiles	6.3	26.4	15.6	51.7	3,720
Wearing apparel	3.7	14.8	19.3	62.1	3,014
Leather	6.5	28.7	14.2	50.6	1,511
Wood products	10.5	8.9	6.5	74.1	2,626
Paper products	8.6	23.5	11.2	56.7	2,139
Printing and publish	7.8	10.2	5.4	76.6	5,737
Coke and refined petrol	2.5	5.3	1.6	90.5	2,954
Chemicals	9.5	24.1	9.5	56.9	5,542
Pharmaceuticals	6.1	30.1	11.7	52.1	489
Rubber and plastics	9.8	23.9	10.5	55.8	3,360
Other non-metallic minerals	5.6	8.7	7.5	78.2	4,250
Basic metals	9.8	15.9	7.2	67.0	5,033
Fabricated metals	9.1	17.3	8.2	65.4	11,824
Computer, electronic	3.1	29.7	13.3	53.8	1,813
Electrical equipment	6.6	19.0	7.4	67.0	2,462
Machinery and equipment	5.2	26.6	11.3	56.9	12,200
Motor vehicles	4.7	8.7	4.4	82.3	16,997
Other transport	6.5	20.6	9.0	63.9	1,966
Furniture	11.1	9.8	6.6	72.5	3,732
Other manufacturing	9.8	28.8	10.9	50.5	13,080
Repair	4.2	6.8	7.8	81.2	2,717
Total	7.0	17.0	8.2	67.8	120,132

Note: Sample only includes those firms for which TFP estimates are available. Importers in this table include all firms that import intermediate and/or final goods.
Source: Authors' elaboration on SARS CIT and transaction trade data.

Table 4. Share of top 5% of exporters and importers in value of trade, 2009–2013 (%)

	Imports	Exports
Food products	63.7	60.6
Beverages	57.9	65.8
Textiles	46.0	67.9
Wearing apparel	48.4	52.4
Leather	45.5	52.6
Wood products	46.8	64.9
Paper products	46.7	63.1
Printing and publish	55.7	58.2
Coke and refined petrol	95.4	84.2
Chemicals	59.0	65.3
Pharmaceuticals	58.6	68.4
Rubber and plastics	66.6	67.6
Other non-metallic minerals	61.9	75.2
Basic metals	79.4	85.7
Fabricated metals	57.0	71.9
Computer, electronic	49.1	65.2
Electrical equipment	47.7	48.7
Machinery and equipment	64.2	72.1
Motor vehicles	73.8	86.7
Other transport	66.7	69.5
Furniture	46.1	40.1
Other manufacturing	71.4	71.6
Repair	58.8	60.6
Total	59.4	66.0

Note: Sample only includes those firms for which TFP estimates are available. Importers in this table include all firms that import intermediate and/or final goods. The average of the annual shares from 2009 to 2013 is presented.
Source: Authors' elaboration on SARS CIT and transaction trade data.

manufacturing firms in production. Participation in international trade is low in Coke and refined petroleum (9.5%), Food products (17).

International trade among manufacturing firms is concentrated (Table 4). The top 5% of manufacturing exporters and importers, on average, account for 66% and 59% of the value of exports and imports, respectively, within each 2-digit ISIC (International Standard Industrial Classification Rev. 4) sector. Concentration in importing is high in Coke and refined petroleum (95% share accounted for by top 5% of firms) and Basic metals (79%). For exports, concentration is high (above 75%) in these sectors, as well as in Motor vehicles and Non-ferrous metals.[6]

Looking at the exporter and importer dynamics presented in Table 5, we find a high degree of persistence in trading status among manufacturing firms. The average survival rate of exporters and importers in each year is 91%. Entry and exit rates are 11% and 9%, respectively, for importers, and 15% and 9%, respectively, for exporters. Firms with below median turnover have substantially higher exit and entry rates into and out of importing or exporting. Larger firms are therefore more likely to persist in trading than smaller firms.[7]

[6] Fernandes et al. (2016) find that the share of exports accounted for by the top 5% of trading entities in the full transaction-level database for South Africa is substantially higher at 95%. This points to the presence of large trading entities that are either not mapped to the income tax data or are in non-manufacturing sectors.

[7] One explanation for the high persistence is that we eliminate firms for which key production data are missing. A lot of the churning could be lost by dropping these firms, particularly if they do not submit complete tax and employment records to SARS.

Table 5. Exit, entry and survival rates of importers and exporters, average of the annual rates from 2010 to 2013

	Entry rate (%)	Exit rate (%)	Survival rate (%)
Importers			
All firms	11	9	91
Above median turnover firms	11	8	94
Below median turnover firms	14	14	80
Exporters			
All firms	15	9	91
Above median turnover firms	13	8	93
Below median turnover firms	23	16	78

Note: Sample for importers and exporters is the balanced panel that includes manufacturing firms for which TFP estimates are available in each year from 2009 to 2013. Importers in this table include all firms that import intermediate and/or final goods. Entry, exit and survival rates are only calculated from 2010 as lagged period status is required to calculate the change in status. Entry rate is calculated as the number of new firms divided by the total number of firms in each year. Exit (survival) rate is calculated as the number of firms that exit (survive) in a year divided by the total number of firms in the prior year.
Source: Authors' elaboration on SARS CIT and transaction trade data.

Further details on exporter and importer dynamics are revealed in the transition matrix of manufacturing firms by trading status presented in Table 6. Only 3% of non-trading firms enter into exporting, importing, or both in the subsequent year. This reflects a low level of dynamism of non-trading firms into exporting or importing. In comparison, Abreha (2015) calculates that 19.54% of non-trading manufacturing firms in Denmark commence trading in the subsequent period.

Looking at the transitions of firms that trade, two-way traders (importer-exporters) are far more likely to continue exporting or importing than firms that only export or only import. For example, on average 2% of two-way traders discontinue trading in the subsequent period, whereas 21% of firms that only export and 16% of firms that only import transition into non-trading status the following year. This result also highlights the marginally higher persistence of importers in international trade activities than exporters.

3.2 Heterogeneous Traders

We find significant heterogeneity in firm characteristics by trading status, as illustrated in simple ordinary least squares (OLS) (linear) regressions of firm characteristics against

Table 6. Transition matrix of manufacturing firms across trading status

		Status (t + 1)				
		Non-trader (%)	Exporter only (%)	Importer only (%)	Importer and exporter (%)	Total (%)
Status (t)	Non-trader	97	1	2	0	100
	Exporter only	21	64	2	13	100
	Importer only	16	2	68	14	100
	Importer and exporter	2	7	9	82	100

Note: Transition matrix of trading status in t and t + 1. Firms are included only if present in both periods. The sample only includes firms for which TFP estimates are available. Importers in this table include all firms that import intermediate and/or final goods.
Source: Authors' elaboration on SARS CIT and transaction trade data.

Table 7. Import and export premiums, 2009–2013

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	**Value added**	**Labour**	**Value added per worker**	**Wage per worker**	**Capital–labour ratio**	**TFP**
Importer-exporter	1.525**	1.014**	0.510**	0.461**	0.697**	0.488**
	(0.011)	(0.011)	(0.007)	(0.0077)	(0.014)	(0.006)
Exporter only	0.697**	0.503**	0.192**	0.181**	0.283**	0.239**
	(0.015)	(0.014)	(0.010)	(0.011)	(0.019)	(0.008)
Importer only	0.491**	0.150**	0.339**	0.276**	0.512**	0.210**
	(0.014)	(0.014)	(0.010)	(0.010)	(0.020)	(0.008)
Constant	14.81**	2.460**	12.36**	11.14**	10.72**	12.63**
	(0.009)	(0.009)	(0.006)	(0.007)	(0.012)	(0.005)
Observations	120,122	119,900	119,900	118,359	119,900	120,122
Adj. R-squared	0.185	0.115	0.0977	0.0885	0.0561	0.201

Note: Based on simple OLS estimate of dependent variable (in logs) on dummy variables for international trade status and fixed effects for year and 3-digit industry. The sample only includes those firms for which TFP estimates are available. Value added is calculated as sales minus cost of sales, labour is calculated as the number of IRP5 employee tax certificates submitted by firms, wages are calculated as the wage bill divided by number of employees, capital is calculated as the book value of property, plant and equipment. TFP is estimated for each 2-digit sector following Ackerberg et al. (2006). $^{**}p < 0.01$, $^{*}p < 0.05$, $+p < 0.1$.
Source: Authors' elaboration on SARS CIT and transaction trade data.

dummy variables for trading status. Table 7 presents the coefficient estimates from the regression:

$$\ln (DV)_{ikt} = \alpha + \beta_1 DXM_{ikt} + \beta_2 DX_{ikt} + \beta_3 DM_{ikt} + \lambda_k + \lambda_t + \varepsilon_{ikt} \quad (2)$$

where DV_{ikt} refers to the characteristic of firm i at period t operating in industry k, DX_{ikt} is an exporter-only dummy equal to one if the firm exports, but does not import, DM_{ikt} is an importer only dummy equal to 1 if the firm imports (either intermediate or final goods), but does not export and DXM_{ikt} is an importer-exporter dummy equal to 1 if the firm imports and exports. The regression also includes time fixed effects (λ_t) and 3-digit industry (λ_k) fixed effects. The coefficients of interest are the β's that indicate whether the characteristics of trading firms are different from non-trading firms (the omitted dummy variable).

The results presented in Table 7 are consistent with international evidence. There is strong evidence that trading firms differ markedly from non-trading firms and that firms that exports and import differ from those that only export or import. Firms that directly engage in international trade are larger measured in terms of value added and employment (15% to over 100%), are more capital intensive (35%–80%), pay higher wages (17%–41%), and have a higher value added per worker (20%–51%) than non-traders. Firms that trade are also more productive (21%–49%), as shown in column (6), providing further support for the potential indirect productivity effect of imports on firm export performance. In all cases the premium is highest for firms that both export and import. Overall, these results are in line with more recent evidence on heterogeneous firms, showing consistently higher premiums for two-way traders (Bernard et al., 2016; Wagner, 2012). Further, the results suggest that some of the attributes, such as productivity premiums, commonly associated with export status in the literature could actually be attributed to those firms import status.

Next, we focus on the relationship between importing and exporting. Table 8 shows that manufacturing firms that export and import differ enormously from firms that only

Table 8. Mean (median) scope, scale, variety and value of South African manufacturing firm exports by trading status (2009–2013)

	Exports	
	Export-importer	**Exporter only**
Scope: products per destination	9.4 (4)	7.6 (3)
Scale: destinations per product	2.0 (1.2)	1.4 (1)
No. variety: product-destination/origin combinations	30.1 (10)	11.8 (5)
Mean value firm trade (R million)	14.7 (0.66)	2.2 (0.24)

Note: Values for the median firm are shown in parenthesis. Calculated as the annual average of each indicator over the period 2009–2013. Trade data are aggregated to the 6-digit level of the HS (Rev. 2007). Values reflect the simple average across firms in each category. Mean value firm trade is the average value of total trade by firms. The sample only includes those firms for which TFP estimates are available. Importers include all firms that import intermediate and/or final goods.
Source: Authors' elaboration on SARS CIT and transaction trade data.

export. Compared to firms that only export, firms that import and export have higher average export values (R14.4 million vs. R2.2 million), export more products per destination (9.4 vs. 7.6), and to more destinations per product (2 vs. 1.4), giving rise to a wider range of product-destination varieties (30.1 vs. 11.8).[8]

Figure 2 presents a kernel density estimate of the value of exports by trading status (a) and a scatter plot (b) between the value of exports and the value of intermediate inputs for South African manufacturing firms. All trade values are demeaned by 3-digit industry and year fixed effects to rid the data of industry and time specific characteristics. A clear positive relationship between export value and import status is shown in the kernel density estimate. Exporters that import final or intermediate goods (exporter-importer) and exporters that only import intermediate inputs (importer inputs) tend to export higher values than firms that only export. The "exporter-importer" and "importer inputs" categories overlap very closely as most firms that import final goods also import intermediate goods. The scatter plot of firm export value against the value of imported intermediate inputs corroborates this the positive relationship between importing and exporting relationship. Firms that import higher values of intermediate inputs have higher values of exports.

4. RESULTS

The above results establish a broad unconditional relationship between firm characteristics, exporting and import status. In this section of the paper, we present regression results for equation (2.1). We focus on the relationship between imports of intermediate inputs and three exporter outcomes: export propensity, export value and export variety. In all regressions the firm export variable is regressed (using OLS) on lagged indicators of firms imports of inputs and other lagged control variables. Firm fixed effects are included, so the relationships are estimated using the within-firm variation of the variables over time.

[8] See Mathee et al. (2016) for similar analysis focusing only on exporters.

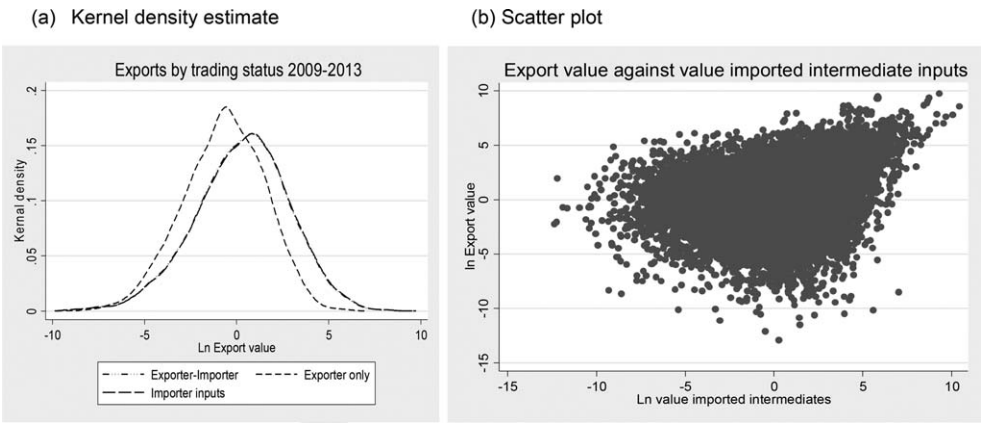

Figure 2. The relationships between import status, the value of direct imports of inputs, and export value in South African manufacturing, 2009–2013
(a) Kernel density estimate, (b) Scatter plot
Note: Figures based on sample of manufacturing firms for which TFP estimates are feasible. Intermediate inputs are defined according to the classification by Broad Economic Categories. Value variables are in logarithmic form. All values are demeaned by 3-digit industry and year. The category "Exporter-Importer" includes firms that import final consumer and capital goods. The category "Importer inputs" only includes firms that import intermediate inputs.
Source: Authors' elaboration on SARS CIT and transaction trade data.

Looking first at export propensity presented in Table 9, the results of column (1) reveal that becoming an importer of intermediate inputs in the prior period raises the propensity to become an exporter by 2.5% points. The coefficient is robust to the inclusion of TFP (column 2), the coefficient of which is insignificantly different from zero. Further

Table 9. Export propensity and importing status

	(1)	(2)	(3)
Dummy importer (t − 1)	0.025**	0.025**	0.024**
	(0.008)	(0.008)	(0.008)
ln TFP (t − 1)		0.002	0.001
		(0.003)	(0.004)
ln(employment)(t)			0.016**
			(0.004)
Skill share(t)			0.033*
			(0.016)
ln(capital/labour)(t)			0.004**
			(0.001)
Constant	0.275**	0.254**	0.168**
	(0.003)	(0.042)	(0.054)
Observations	76,865	76,865	76,771
R-squared	0.821	0.821	0.822

Note: The dependent variable is a dummy variable equal to one if the firm has a positive export value in that year. An importer is defined as a firm that directly import intermediate inputs. Skill share is defined as the share of workers that earn above R20 000 per month. All estimates include firm and year fixed effects. Robust standard errors in parentheses, $^{**}p < 0.01$, $^{*}p < 0.05$, $+p < 0.1$.
Source: Authors' elaboration on SARS CIT and transaction trade data.

Table 10. Export performance (value and variety) and imports of intermediate inputs, two-way traders only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ln(Export value)				Ln(Export variety)			
ln(value imports) (t − 1)	0.046**	0.039*			0.021**	0.018**		
	(0.015)	(0.015)			(0.007)	(0.007)		
ln(variety imports) (t − 1)			0.0638*	0.047			0.058**	0.050**
			(0.0310)	(0.031)			(0.016)	(0.016)
ln TFP (t − 1)	0.100*	0.100*	0.105*	0.105*	0.037+	0.038+	0.039+	0.039+
	(0.042)	(0.042)	(0.0421)	(0.042)	(0.020)	(0.020)	(0.020)	(0.020)
Dummy exporter (t − 1)		0.425**		0.427**		0.238**		0.236**
		(0.086)		(0.086)		(0.038)		(0.038)
ln(employment)(t)		0.286**		0.288**		0.142**		0.140**
		(0.061)		(0.062)		(0.031)		(0.031)
Skill share(t)		0.552*		0.551*		0.168		0.168
		(0.222)		(0.222)		(0.111)		(0.111)
ln(capital/labour)(t)		0.089**		0.090**		0.029*		0.028+
		(0.030)		(0.030)		(0.015)		(0.015)
Constant	11.71**	9.245**	12.13**	9.598**	1.715**	0.664+	1.863**	0.810*
	(0.579)	(0.743)	(0.556)	(0.733)	(0.273)	(0.355)	(0.261)	(0.349)
Observations	13,302	13,297	13,302	13,297	13,302	13,297	13,302	13,297
R-squared	0.911	0.912	0.910	0.912	0.928	0.929	0.929	0.929

Note: Trade values are valued in nominal Rands. Aggregate price effects are controlled for through the inclusion of year fixed effects. Import value and variety are for intermediate inputs only. Variety is calculated as the number of product-destination (for exports) and product-origin (for imports) for each firm in each year. All estimates include firm and year fixed effects. Robust standard errors in parentheses, $^{**}p < 0.01$, $^{*}p < 0.05$, $+p < 0.1$.
Source: Authors' elaboration on SARS CIT and transaction trade data.

controls are added in column (3). Consistent with what found by Rankin et al. (2006) for African manufacturing firms (including South Africa), export propensity is higher for larger, more skill-intensive firms and more capital intensive firms, but the inclusion of these variables has no influence on the coefficients for TFP and prior importer status.

The results suggest that the direct channel is the dominant mechanism through which importing status affects export propensity, with little effect via the indirect productivity channel. However, the importance of the indirect TFP channel in inducing firms to enter into exporting is likely to be understated. The insignificance of the TFP coefficient is primarily driven by the fact that with the inclusion of firm fixed effects, the relationship is identified by firms that switch in and out of trading. As shown earlier in Table 6, firms that trade, particularly two-way traders, do not regularly change their export status. These firms are also the most productive (Table 7). The influence of the indirect TFP channel in determining the selection of these firms into exporting is not captured in our results.

Table 10 unpacks some of the heterogeneity in the export–import relationship by looking at firms that both export and import. More specifically, columns (1–4) analyse the relationship between importing behaviour and the value of exports, while the second set of columns (5–8) focus on importing and the variety of firm exports. The results confirm a strong relationship between the value of imports and exporting. The higher the value of intermediate inputs imported by a firm, the higher the value of exports (column 1) and the variety of goods exported (column 5). This relationship holds even after controlling for the indirect effects of imports on export performance via TFP, which is positively associated with the value and variety of exports. Also in this case, results remain robust to the inclusion of other firm controls such as prior export status, skill-intensity, size and capital-intensity (columns 2 and 6).

Table 11. Export performance (value and variety) and origin of imports, two-way traders only

	(1)	(2)	(3)	(4)
	Ln(Export value)		**Ln(Export variety)**	
ln(variety imports HI) (t − 1)	0.086**	0.067*	0.060**	0.049**
	(0.030)	(0.029)	(0.015)	(0.015)
ln(variety imports non-HI) (t − 1)	0.013	0.009	0.027+	0.026+
	(0.028)	(0.028)	(0.014)	(0.014)
ln TFP (t − 1)	0.117**	0.109**	0.049**	0.044**
	(0.034)	(0.034)	(0.017)	(0.017)
Dummy exporter (t − 1)		0.317**		0.237**
		(0.052)		(0.025)
ln(employment)(t)		0.224**		0.112**
		(0.048)		(0.024)
Skill share(t)		0.297+		0.160+
		(0.163)		(0.088)
ln(capital/labour)(t)		0.077**		0.021+
		(0.021)		(0.011)
Constant	11.63**	9.782**	1.501**	0.716**
	(0.449)	(0.552)	(0.221)	(0.277)
Observations	20,525	20,516	20,525	20,516
R-squared	0.899	0.900	0.912	0.914

Note: Trade values are valued in nominal Rands. Aggregate price effects are controlled for through the inclusion of year fixed effects. Import value and variety are for intermediate inputs only. Variety is calculated as the number of product-destination (for exports) and product-origin (for imports) for each firm in each year. Quality is calculated as the average product level price of intermediate imports for each firm where the price is calculated using demeaned unit values at the HS 6-digit level. All estimates include firm and year fixed effects. Robust standard errors in parentheses, $^{**}p < 0.01$, $^{*}p < 0.05$, $+p < 0.1$.
Source: Authors' elaboration on SARS CIT and transaction trade data.

Halpern et al. (2015) show that firms raise their productivity by importing a wider variety of complementary intermediate inputs. In columns (3–4) and (7–8) of Table 10 we look more closely at this channel. TFP is positively and statistically significantly related to both export value and export variety (though only at 10% level of significance for varieties). Therefore, it is possible to argue that, indirectly via TFP, imported varieties enhance the value and variety of exports.[9]

The coefficient on the lagged import variety variable indicates the direct association with export value and variety after accounting for the indirect TFP channel. In the case of export value, the coefficient is significant when only including TFP (column 3), but loses significance once other controls are included (column 4). In contrast, the coefficient on imported varieties is positive and statistically significant in explaining export varieties even after the inclusion of firm controls (column 8). This is in line with most of the existing evidence on the topic, showing that accessing new inputs allows firm to introduce new products, both for the domestic and export markets (Kugler and Verhoogen, 2009; Goldberg et al., 2010). In addition, the coefficient in the export variety estimate is very similar in size to the within-firm estimates for France by Bas and Strauss-Kahn (2014).

[9] Including TFP reduces the coefficient on the import variable, which is consistent with the argument that imports raise exports indirectly via TFP.

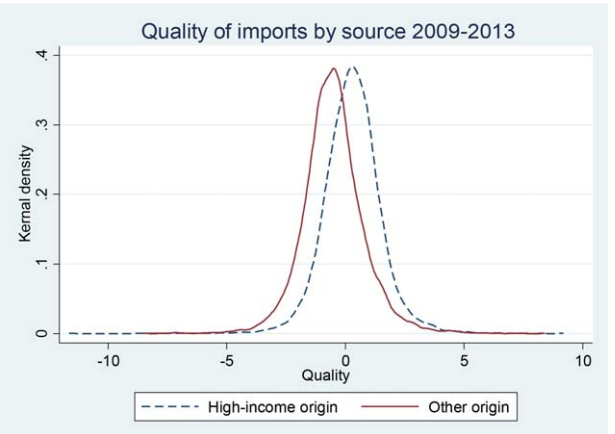

Figure 3. Kernel density estimate of log unit value (quality) and source of intermediate imports, 2009–2013 [Colour figure can be viewed at wileyonlinelibrary.com]
Note: Intermediate inputs are defined according to the United Nations classification by Broad Economic Categories. Quality is measured as the log import unit value demeaned by product/year combinations to rid estimates of product by time-specific differences.
Source: Authors' elaboration on South African Revenue Services (SARS) Company Income Tax (CIT) and transaction trade data.

Finally, Table 11 analyses the relationship between the origin and quality of the imported varieties and export performance.[10] We distinguish between inputs sourced from advanced countries vs. emerging countries on the ground that the former embeds higher levels of technology and quality compared to the latter.[11] Figure 3 supports such an assumption, showing that imports from high-income countries embody higher quality levels, measured through their unit values.

Column (1) to (4) reveal that imports of varieties from advanced countries have a significant positive association with the value and variety of exports even after controlling for TFP and other firm characteristics. The coefficient on varieties imported from emerging economies is insignificant in the case of export values, but is marginally significant (at 10% level) in explaining export varieties, with a much smaller coefficient than for imports from advanced economies. A 10% increase in the number of varieties imported from advanced economies is associated with a 6.7% increase in export value and a 4.9% increase in the variety of exports. This result suggests that the imported technology channel is an important determinant of export performance in South African manufacturing, and seems consistent with what has been previously found for China by Feng et al. (2016) and France by Bas and Strauss-Kahn (2014).

[10] Due to the lack of detailed information on prices, and acknowledging the flaws related to the use of unit values as proxies for quality, we follow other studies associating the origin of imports as a proxy for the level of knowledge and technology embedded in acquired inputs (Feng et al., 2016). We note, however, that results, not included here and available upon request, point to a significant correlation between the unit value of imports and the variety of exports on the one hand and a positive, though not significant correlation with the variety of exports on the other.
[11] Advanced economies are defined as those countries classified as high-income by the World Bank, with all other countries classified as emerging.

5. CONCLUSION

Using a novel database that combines company tax information with detailed transaction-level data, we provide support for the idea that importing a wide range of intermediate inputs, especially from advanced countries, is associated with a higher likelihood of exporting and greater scope, scale and value of exports. Among the main mechanisms explored are the complementarities with domestic inputs on the one side, and the opportunity to exploit the knowledge and technologies embedded in new imports on the other. Our results are consistent with a range of existing evidence for both advanced and emerging countries and confirm the potential spillovers from international trade.

Broadly, our results are consistent with the idea that imports can play a key role in encouraging firms to produce for the international market. This has important implications for developing countries in which unemployment remains an important concern and access to knowledge and technologies is a main objective to enhance private sector development. The literature has established that exporters tend to be larger, more productive and pay higher wages than domestic firms. Boosting the integration of manufacturing firms into foreign markets can therefore provide an opportunity for raising employment and aggregate productivity. Our study argues that ensuring access for domestic firms to a variety of intermediate inputs from abroad can be crucial to achieving this end and can contribute to economic development.

On this respect, it is important to remark, also in view of future research on this topic, that the results of our work are somewhat conservative. Our study focuses only on firms that import and export directly. It ignores the influence that imports may have on exports via other channels such as the purchase of imports through third-party transactions and the use of import-competing domestic substitutes. Our study therefore captures a narrow dimension of the full potential effect of imported intermediates on firm export performance.

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APPENDIX

Table A1. Annual average number of firms, value of sales and value of trade, 2009–2013

	Number	Share	Value (R billion)	Share
Sales				
Manufacturing firms in CIT	40,011	100	1,722.0	100
Firms with TFP estimates	24,026	60.0	1,336.0	77.6
Exports				
Manufacturing firms in CIT	7,296	100	67.8	100
Firms with TFP estimates	5,775	79.1	64.0	94.5
Imports				
Manufacturing firms in CIT	7,993	100	145.2	100
Firms with TFP estimates	6,068	75.9	122.2	84.1

Note: We only consider manufacturing firms with positive turnover in the CIT database to rid the sample of dormant or non-producing firms. Importers in this table include all firms that import intermediate and/or final goods.
Source: Authors' elaboration on SARS CIT and transaction trade data.