WIDER Working Paper 2016/39

Importing and firm performance

New evidence from South Africa

Lawrence Edwards,[1] Marco Sanfilippo,[2] and Asha Sundaram[3]

April 2016

United Nations University World Institute for Development Economics Research

wider.unu.edu

Abstract: This paper uses firm-level data from company tax declarations to analyse the complementary relationship between direct access to imported intermediate inputs and manufacturing firm performance in South Africa. There are three main findings. The first is on firm heterogeneity, showing that importers consistently demonstrate premiums in terms of productivity, employment, wages, and capital intensity in production compared to firms that do not trade. The second supports the hypothesis of firm learning by importing. Finally, we show that importing also has implications for exporting, especially if inputs are sourced from advanced economies.

Keywords: firms, imports of intermediate goods, South Africa
JEL classification: F14, F61

Acknowledgements: We would like to thank participants at the Economic Society of South Africa conference, 2–4 September 2015, and the South African National Treasury/UNU-WIDER/South African Revenue Services Policy seminar on 'Firm-level analysis', 21 January 2016. Support from UNU-WIDER is gratefully acknowledged. The South African National Research Foundation (NRF) (Unique Grant No.: 93648) provided additional support to cover subsistence and travel.

[1] Policy Research in International Services and Manufacturing (PRISM), University of Cape Town, corresponding author: Lawrence.edwards@uct.ac.za;[2] University of Bari, Italy, and University of Antwerp, Belgium, mario.sanfilippo@uantwerp.be; [3] Policy Research in International Services and Manufacturing (PRISM), University of Cape Town, assundar.wk@gmail.com.

This study has been prepared within the UNU-WIDER project on 'Firm- and Industry-level Analysis in South Africa', which is part of a larger research project on 'Regional Growth and Development in Southern Africa'.

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9256-082-9

Typescript prepared by Sophie Richmond.

UNU-WIDER acknowledges specific programme contribution from the National Treasury of South Africa to its project 'Regional Growth and Development in Southern Africa' and core financial support to its work programme from the governments of Denmark, Finland, Sweden, and the United Kingdom

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

International trade is among the main channels through which firms access new and more advanced knowledge and technologies (Grossman and Helpman 1991). This is true especially for developing countries, whose opportunities for economic growth are significantly influenced by the ability to access foreign technology. Recent evidence shows that higher openness to imports, especially of capital and intermediate goods, results in a more efficient allocation of resources and a rise in productivity and output within firms (Amiti and Konings 2007; Goldberg et al. 2010; Kasahara and Rodrigue 2008; Topalova and Khandelwal 2011).

In this paper, we bring new evidence based on detailed firm-level data from company tax declarations that have recently been made available from the South African Revenue Services (SARS) to analyse the complementary relationship between direct access to imported intermediate inputs and manufacturing firm performance in South Africa.

There are some important reasons why it is worthwhile to focus on South Africa. The lack of dynamism of the manufacturing sector has been seen as a key factor explaining slow growth and high unemployment levels in South Africa since the end of apartheid (Fedderke 2006; Rodrik 2008). A prevalent concern is that a key contributor to this weak performance is the competitive pressure from imports resulting from the multilateral trade reform in the early 1990s (Edwards 2005) and, more recently, from the rapid growth in imports from China following its entry into the World Trade Organization (WTO) in 2001 (Edwards and Jenkins 2015a). These concerns are reflected in the empirical literature (Dunne and Edwards 2007; Edwards 2001; Edwards and Jenkins 2015a, 2015b; Jenkins 2008; Rodrik 2008) as well as in various policy responses, including the raising of import tariffs and the imposition of quotas on imports.[1]

Existing research on the implications of trade liberalization for South Africa suffers from two main limitations. First, the complementary impact of better access to imported intermediate inputs on firm outcomes has not yet been fully explored. Recognizing the role of potential complementarities from trade can be crucial in view of the growing evidence on the role that imported inputs play in shaping key firm-level outcomes such as product range (see Goldberg et al. 2010, on India), productivity (see Amiti and Konings 2007, on Indonesia; Kasahara and Rodrigue 2008, on Chile), and exports (Bas and Strauss-Kahn 2015; Feng et al. 2012, both on China). Second, given the lack of comprehensive firm-level data in South Africa until now, much of the empirical analysis has been conducted at the industry level. This poses a severe challenge to our understanding of how firms respond to trade liberalization, since industry-level analyses cannot ascertain whether aggregate changes reflect changes within firms or between firms within each industrial sector. Understanding firm-level heterogeneous responses to foreign trade is critical to policy makers who seek to target policy interventions that can unlock firm-specific constraints to economic and employment growth in South Africa.

Our study closely follows the existing literature on the topic, emphasizing some of the main channels through which imports of intermediate inputs affect various dimensions of domestic firm performance.

A majority of existing studies exploit specific episodes of trade liberalization, where a sudden drop in input tariffs allows firms better access to foreign intermediate inputs that they can now

[1] In 2007 and 2008 the South African government imposed quotas on imports of Chinese clothing.

import at a lower price (Amiti and Konings 2007; Bas 2012; Goldberg et al. 2010; Topalova and Khandelwal 2011). Unlike these studies, our focus is on the composition of intermediate inputs imported by firms and its impact on firm outcomes. We explicitly ask if importing a wider variety of inputs from a broader range of source countries (advanced and developing) is associated with better firm outcomes (as in Bas and Strauss-Kahn 2015, and Feng et al. 2012). We can do this thanks to the availability of detailed transaction-level data on firm exports and imports that we are able to match with our company tax data. Our study therefore relates mainly to the works of Kasahara and Rodrigue (2008), Bas and Strauss-Kahn (2014), and Halpern et al. (2015). These studies show consistent evidence on the nexus between importing (and the variety and quality of imports) and firm productivity and export performance in a diverse mix of countries such as Chile, France, and Hungary.

Our results corroborate existing evidence from other developing countries, and show remarkable positive spillovers arising from imports by South African manufacturers. More specifically, we provide three distinct sets of findings. The first is on heterogeneity across firms that trade and those that do not. Here we confirm existing evidence on heterogeneous firms to show that importers consistently demonstrate premiums in terms of productivity, employment, wages, and capital intensity in production compared to firms that do not trade. The second set of findings supports the hypothesis of firm learning by importing. We show, in particular, that this works through enhancing the complementarity between domestic and foreign inputs, and by increasing the variety of imported ones. Finally, we show that importing also has implications for exporting. In this latter case, we find that imports from advanced economies prove to be 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 South African firms to penetrate export markets.

The paper is structured as follows. Section 2 reviews the existing literature and related evidence on the nexus between importing and firm performance. Section 3 describes the original data used for the analysis, while Section 4 presents the results. Section 5 concludes, drawing some policy implications.

2 Literature review

Research in international trade has consistently emphasized high levels of heterogeneity across firms in both developed and developing countries (Melitz 2003). Among the main stylized facts stemming from the related evidence is that firms that export are usually larger, more productive, and pay higher wages than non-exporters. Importers have initially been disregarded by this literature, which is surprising considering the strong interconnections between imports and exports, and despite the increasing relevance of imports of intermediate inputs in a global economy largely characterized by fragmentation of production and global value chains. Thanks also to the rising availability of transaction-level data (see Wagner 2016), there is now increasing evidence emphasizing the heterogeneity of importers, and the role of imports as key drivers of firm performance.[2]

[2] Such emphasis on the role of importing is not new. Endogenous growth models emphasize the static and dynamic gains from importing new varieties of inputs, showing that these contribute to a country's growth via gains in productivity and by fostering the development of new varieties of domestic products (Broda and Weinstein 2006; Goldberg et al. 2010).

Such evidence is unambiguous when showing that importers and exporters show similar characteristics, and that importers demonstrate a productivity premium (Bernard et al. 2007), which is often larger than the one for exporters (Bernard et al. 2015; Wagner 2012). Yet evidence on the direction of causality is mixed. So far, only a few studies have examined the self-selection hypothesis, building on the view that only inherently more productive firms can bear the higher fixed costs related to, for instance, establishing relations with foreign suppliers or tackling customs procedures (Antràs and Helpman 2004; Castellani et al. 2010; Kasahara and Lapham 2013; Kasahara and Rodrigue 2008). The learning-by-importing hypothesis, on the other hand, has received greater attention, particularly in view of the strong arguments supporting the importing–productivity nexus (Eaton and Kurtum 2001; Grossman and Helpman 1991).

In the remainder of this section, we will describe the main mechanisms through which higher imports of intermediate inputs translate into improved firm performance.

A first strand of empirical research has mainly investigated the implications of importing intermediate inputs on productivity due to a fall in the price of intermediate inputs resulting from trade liberalization. Looking at specific trade liberalization episodes, the novelty of these studies has been that of considering the effects of input and output tariff reductions. Accounting for input tariff reductions, in particular, allows these studies to measure the impact of accessing cheaper and newer inputs, and to isolate this cost-saving channel from the traditional 'competition effect' that is due to the lowering of output tariffs. Examples of works in this area include Schor (2004), Amiti and Konings (2007), and Topalova and Khandelwal (2011) that provide consistent evidence of increases in productivity in response to reductions in input tariffs on samples of Brazilian, Indonesian, and Indian firms, respectively.

More recent work has emphasized learning from access to new inputs embodying foreign technologies. Such learning spillovers can arise due to the introduction of new varieties that complement existing inputs, or due to higher quality of foreign inputs.

As far as developing countries are concerned, the variety mechanism proves extremely important, since it allows domestic firms to expand—and complement—the set of inputs available in the economy and can give rise to stronger learning spillovers. Broda and Weinstein (2006) were among the first to show the importance of new imported varieties as determinants of gains from trade. It is, however, the work by Goldberg et al. (2010) on Indian firms after trade liberalization that has become a benchmark in this field of research. They are able to distinguish the price effect due to lowering input tariffs from a variety effect due to the extensive margin of imported inputs, and show robustly that it is the latter channel that predominantly affects domestic firm performance.[3]

The work by Halpern et al. (2015) takes a slightly different perspective to get to similar findings. They combine firm-level information on Hungarian manufacturing with transaction data from customs. Unlike in most studies in the earlier literature, they do not examine specific trade liberalization episodes, but focus on the direct effect of importing intermediate inputs on firm productivity, as we do in this paper.[4] In addition, they are able to distinguish the variety and the quality channels, and show that it is mainly through the former, by combining domestic and

[3] Firms' performance is measured in their study as the number of varieties of products produced domestically.

[4] Kasahara and Rodrigue (2008) on Chilean firms, and Bas and Strauss-Kahn (2014) on French firms adopt a similar approach.

foreign inputs, that firms increase their productivity. An interesting complement to these findings comes from the work by Damijan et al. (2014). They look at Slovenian firms and show that it is the reallocation of imported inputs (churning), rather than their absolute numbers, that matters most for the performance of domestic firms, since this allows firms to better exploit complementarity of new and existing inputs.

Measuring the quality of imported inputs has proven a more difficult task, mostly because of data constraints, since prices of imported inputs are often not observed and hence have to be approximated by unit values.[5] Kugler and Verhoogen (2009), using plant-level information from Colombia, are nonetheless able to establish some robust evidence. They show that importers pay higher prices for inputs, and that the prices of imported inputs are consistently higher compared to the prices of domestically sourced inputs of the same variety, concluding that more productive plants employ higher quality inputs. These findings are supported by recent evidence on Chinese firms, showing that those firms paying higher prices (a proxy for high quality) for their inputs charge higher export prices and export more at both the intensive and extensive margins (Fan et al. 2015; Manova and Zhang 2012).

Other studies take different approaches and posit that the implicit quality, or the level of embodied technology, can differ according to the geographic origin of inputs. Based on a sample of French firms, Bas and Strauss-Kahn (2014) find that there is a slight productivity advantage for firms importing their inputs from developed, rather than developing countries. The same authors (Bas and Strauss-Kahn 2015), as well as Feng et al. (2012), this time looking at the export performance of Chinese firms after WTO entry, show that importing intermediate inputs from advanced (Organisation for Economic Co-operation and Development [OECD]) countries raises the quality of their exports.

3 Data and preliminary analysis

3.1 Data description

To undertake our analysis we integrate three sources of firm-level data obtained from 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 years 2008 to 2013.[6] We restrict the data to cover the population of manufacturing firms.[7]

---

[5] Khandelwal (2010) proposes a more sophisticated measure of quality accounting for prices and market shares at the product level. Both Colantone and Crinò (2014), and Bas and Strauss-Kahn (2015) adopt this measure to account for the 'quality' mechanism in their analyses.

[6] The data cover the financial years 2009 to 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.

[7] A systematic process was followed in identifying 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 across the different databases. Further, there is a lot of 'noise' in the industry classification by firms within each database, with evidence of major shifts in classification across years, even at the 1-digit level of the International Standard Industrial Classification of All Economic Activities (ISIC, Rev. 4). Our approach was to base the industry classification on the ISIC code provided in the PAYE employment database. We adopted the following 'cleaning' strategy. When firms changed 2-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

Using an anonymized concordance file, we then merge in 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 to 2014. To ensure consistency in product classification over time, the HS8-digit data were 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.[8]

We then merge data from the Employment Tax Certificate (IRP5/IT3(a)) into the CIT data. Firms are required to submit an annual Employee Tax Certificate for each employee that worked in the company to SARS. This form discloses remuneration earned, taxes deducted, and time worked for the year of assessment for each employee.

Finally, we eliminate firms for which key production and employment data required for the estimation of Total Factor Productivity (TFP) are missing. This reduces the overall sample from the initial population of manufacturing firms. TFP estimates can only be calculated for 60 per cent 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 per cent of total annual turnover, 94.5 per cent of direct export value and 84.1 per cent 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 per cent 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 per cent manufacturing firms, with little change in this share over time. Twenty-five per cent 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).

---

industry classification. Missing industry codes were imputed using the prior- and post-period industry codes provided.

[8] Most firms conduct their international trading activities through an independent trading company. The customs declaration form requires information on the trading firm as well as the company that is exporting or importing the goods. We use the company identity to match the transaction data into the CIT data. There are two main limitations with this approach. First, we do not capture indirect exports or indirect imports. Many manufacturing firms purchase imported intermediate goods indirectly from wholesalers and retailers. Similarly, firms may export indirectly through, for example, the South African retailers that have opened up stores throughout Africa. This information is not available in the currently available data. In fact, many studies in this area of research grapple with this data issue. 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 per cent of the total value of direct exports and imports over the period 2009–13.

Table 1: Summary statistics of data

	2009	2010	2011	2012	2013	Average 2009–13
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.

3.2 Heterogeneous traders

Looking at the data, we identify a number of stylized 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 per cent also directly import, while among importers 67 per cent also export. Importing is therefore closely associated with export participation, a relationship that corresponds with findings in the international empirical literature (Bernard et al. 2015) and is consistent with the idea that importing can improve the ability of and opportunity for firms to export.

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.

Source: Authors' elaboration on SARS CIT and transaction trade data.

Firms directly engage in international trade across all manufacturing industries (Table 3), reflecting the heterogeneity within industrial categories. Once again, the findings for South Africa correspond closely with those from other countries, both advanced (Bernard et al. 2015, for the US; Castellani et al. 2010, on Italy) and emerging (Kasahara and Lapham 2013, for Chile; Feng et al. 2012, 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 (e.g. Schor 2004, on Brazil; Bigsten et al. 2015, on Ethiopia). Participation is particularly high in Other manufacturing (49.5 per cent), Leather (49.4 per cent), Textiles (48.3 per cent), Pharmaceuticals (47.9 per cent), and Computer and electronics (46.2 per cent). 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 manufacturing firms in production. Participation

in international trade is low in Coke and refined petroleum (9.5 per cent), Food products (17 per cent), and Motor vehicles (17.7 per cent).[9]

Table 3: Trading status by manufacturing industry (share total firms in industry), full sample 2009–13

	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.

Source: Authors' elaboration on SARS CIT and transaction trade data.

International trade among manufacturing firms is concentrated, but not as concentrated as overall trade when including all trading firms. The top 5 per cent of manufacturing exporters and importers, on average, account for 66 per cent and 59 per cent 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 per cent share accounted for by top 5 per cent of firms) and Basic metals (79 per cent). For exports, concentration is high (above 75 per cent) in these sectors, as well as in Motor vehicles and Non-ferrous metals. Nevertheless, these shares of the top 5 per cent of firms in manufacturing are low when compared to the 95 per cent share for exports calculated by Fernandes et al. (2016) using the full transaction-level database for South Africa.

Looking at exporter and importer dynamics, 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 per cent. Entry and exit rates are 11 per cent and 8 per cent, respectively, for importers, and 15 per cent and 9 per cent, respectively, for exporters. The persistence in trading within manufacturing is higher than for firms in other sectors of the economy. Entry and exit

[9] The low participation by the motor vehicle industry is unanticipated. One explanation is that international trade in motor vehicles is conducted through subdivisions within the motor industry conglomerates as opposed to directly by the plant.

rates calculated using all firms in the transaction database are much higher (between 21 and 22 per cent).

Further details on exporter and importer dynamics are revealed in the transition matrix of manufacturing firms by trading status presented in Table 4. Only 3 per cent 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 (2014) calculates that 19.54 per cent 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 only 2 per cent of two-way traders discontinue trading in the subsequent period, whereas 21 per cent of firms that only export and 16 per cent 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.

Table 4: 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.

Source: Authors' elaboration on SARS CIT and transaction trade data.

Manufacturing firms that export and import differ enormously from firms that only export or only import. Compared to firms that only export, trading 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) (see first two columns of values in Table 5). Similar relationships hold when looking at imports, except that the mean value of direct imports by firms is substantially higher than the mean value of exports.

Table 5: Mean scope, scale, variety, and value of South African manufacturing firm exports and imports by trading status (2009–13)

	Exports		Imports	
	Export-importer	Exporter only	Export-importer	Importer only
Scope: products per destination	9.4	7.6	10.2	6.1
Scale: destinations per product	2.0	1.4	1.7	1.3
No. variety: product-destination/origin combinations	30.1	11.8	38.0	12.3
Mean value firm trade (R million)	14.4	2.2	23.7	6.8

Notes: Calculated as the annual average of each indicator over the period 2009–13. 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.

Source: Authors' elaboration on SARS CIT and transaction trade data.

This heterogeneity in firm characteristics by trading status is also illustrated in simple ordinary least squares (OLS) (linear) regressions of firm characteristics against dummy variables for trading status. Table 6 presents the coefficient estimates from the regression:

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

Where *DV* refers to the characteristic of firm *i* at period *t* operating in industry *k*, *DX* is an exporter-only dummy equal to one if the firm exports, but does not import, *DM* is an importer only dummy equal to 1 if the firm imports, but does not export and *DXM* 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 that indicates whether the characteristics of the firm are different for trading firms relative to non-trading firms (the omitted dummy variable). The results are presented in Table 6.

There is strong evidence that trading firms differ markedly from non-trading firms. Firms that directly engage in international trade are larger measured in terms of value added and employment (15 per cent to over 100 per cent), are more capital intensive (35–80 per cent), pay higher wages (17–41 per cent), and have a higher value added per worker (20–51 per cent) than non-traders. Overall, these results are in line with more recent evidence on heterogeneous firms, showing consistently higher premiums for two-way traders, as well as a slight advantage for importing firms over exporters (Bernard et al. 2015; Wagner 2012).

Table 6: Import and export premiums, 2009–13

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Value added	Labour	Value added per worker	Wage per worker	Capital–labour ratio
Importer-exporter	1.525**	1.014**	0.510**	0.461**	0.697**
	(0.0113)	(0.0110)	(0.00733)	(0.00767)	(0.0135)
Exporter only	0.697**	0.503**	0.192**	0.181**	0.283**
	(0.0145)	(0.0144)	(0.00993)	(0.0107)	(0.0194)
Importer only	0.491**	0.150**	0.339**	0.276**	0.512**
	(0.0141)	(0.0143)	(0.00974)	(0.0101)	(0.0195)
Constant	14.81**	2.460**	12.36**	11.14**	10.72**
	(0.00887)	(0.00896)	(0.00640)	(0.00657)	(0.0123)
Observations	120,122	119,900	119,900	118,359	119,900
Adj. R-squared	0.185	0.115	0.0977	0.0885	0.0561

Notes: 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. *, **, *** denote significance at the 1 per cent, 5 per cent, and 10 per cent level.

Source: Authors' elaboration on SARS CIT and transaction trade data.

4 Firm imports of intermediate inputs and productivity

We next focus on the relationship between firm imports of intermediate inputs and TFP. We follow a two-step approach. In the first stage, we estimate TFP at the firm level for each 2-digit manufacturing industry following the Ackerberg et al. (2007) methodology using the Wooldridge (2009) one-step generalized method of moments (GMM) estimator.[10] In the second stage, we regress these TFP estimates on various indicators of firm-level importation of intermediate inputs.

4.1 Background data

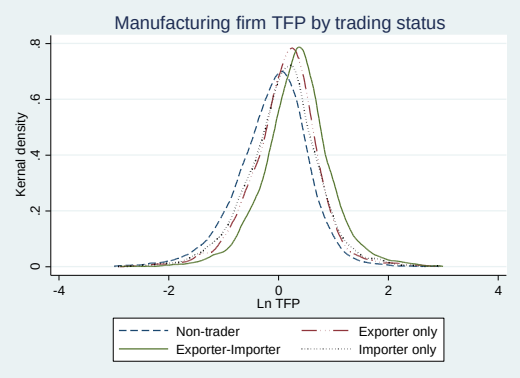
Figure 1 presents kernel density estimates of TFP using data for the full 2009–13 period. The first kernel density estimate (a) corroborates the preliminary analysis conducted earlier—firms that directly engage in international trade are on average more productive than non-trading firms, but exporter-importers 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-categorize firms according to whether they directly import intermediate inputs. Intermediate inputs are defined following the Broad Economic Categories definition of imported 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.

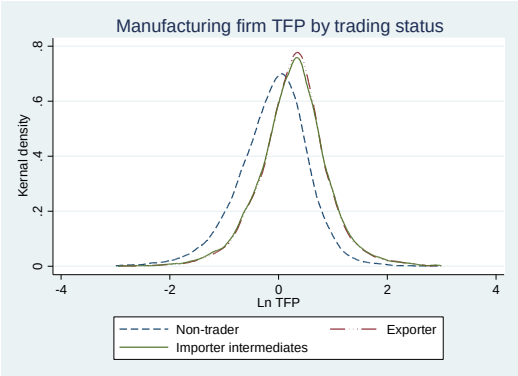
[10] The estimates do not take into account firm exit as it is not possible to determine whether missing firm observations in the income tax database denote firm exit or failure to submit a tax return. See Kreuser and Newman (2016) for details on the estimates of the TFP.

Figure 1: Kernel density estimates of TFP and import status in manufacturing, 2009–13

(a) By trading status



(b) Exporters and importers of intermediate inputs



Note: Intermediate inputs are defined according to the United Nations classification by Broad Economic Categories. Firm-level TFP estimates are demeaned by industry/year combinations to rid estimates of sector by time-specific differences.

Source: Authors' elaboration on SARS CIT and transaction trade data.

To evaluate the conditional relationship between importing and firm productivity, we estimate the equation:

$$\ln(TFP)_{ikt} = \alpha + \beta_1 M_{ikt} + \beta_2 DX_{ikt} + \sum_i \lambda_i F_i + \sum_t \lambda_t year_t + \sum_m \delta_m C_{ikt} + \varepsilon_{ikt}$$

where TFP_{ikt} is TFP of firm i at period t operating in industry k, DX is an exporter-only dummy equal to 1 if the firm exports, M is a variable for the importation of intermediate inputs and C_{ikt} a set of additional firm controls. F_i and $year_t$ denote firm and year dummy variables to control for unobserved firm-specific effects that can influence productivity and time-specific trends common to all firms in the sample.

4.2 Results: TFP and importing status

The first results isolate the productivity premium associated with importer status conditional on various firm characteristics. Table 7 presents the results from the OLS estimates of TFP on a dummy variable equal to 1 if firms are direct importers of intermediate inputs. To make our results comparable with existing literature, and for consistency, we start with a general specification including industry fixed effects, and then to our preferred specification including firm fixed effects.

Thus, the first column of results controls for year and industry fixed effects, and reveals that importers are on average 46 per cent (= exp(0.38)-1) more productive than firms that do not import. Some of this productivity premium could be associated with exporter status, however. The second column of results therefore includes a dummy variable for firm export participation. As a consequence of this inclusion, the importer premium falls to 0.23 (26 per cent more productive), but remains highly significant, while the coefficient of 0.26 on the exporter dummy variable is also significantly different from zero.

As emphasized in the heterogeneous firm literature, in the presence of fixed costs of entry into exporting or importing, it is only the relatively productive firms that engage in international trade (Bernard et al. 2015). To control for this, column (3) includes a variable accounting for firm size (the log of total employment) that is commonly shown to be positively associated with

productivity. The share of skilled labour employed and the capital–labour ratio are included as additional controls. Finally, province fixed effects are included to control for region-specific costs associated with accessing the international market.

As shown in column (3), productivity rises with the size (in terms of employment) and skill intensity and capital intensity of production of the firm. Including these controls in the regression reduces the productivity premium from importing to 0.1 (10.5 per cent), but the coefficient remains highly significant.

A further concern is that industry-specific trends, including reduction in tariffs and changes in global competition (e.g. China), may disproportionately affect the productivity of direct traders. Amiti and Konings (2007), for example, find that tariff liberalization in Indonesia disproportionately raised productivity of firms that import their inputs. Column (4) includes industry by time fixed effects to control for these influences. The importer premium hardly changes, suggesting that the potential biases from omitting variables that vary by industry and time are small.

These results provide strong evidence that within industries importers of intermediate inputs are more productive than other firms after controlling for time-varying firm characteristics. This productivity premium may nevertheless be biased upward by time-invariant firm-specific characteristics. For instance, a firm might have a management that is well trained and highly skilled. This may be associated with higher productivity because the management is savvy about industry best practice and may also be associated with trade status because the managers have wide buyer and supplier networks abroad. The final two columns (5) and (6) control for such factors to the extent that is possible by including firm fixed effects. The estimated relationship between importing status and productivity is now driven by within-firm changes in import status and productivity. The coefficient reflects the concurrent change in TFP associated with a firm's entry into importing. One implication of including firm fixed effects is that those firms that do not change trading status play no role in the estimation of the importer coefficient.[11]

The results in column (5), where firm and year fixed effects are included, indicate that switching into importing intermediate inputs is associated with a 2 per cent increase in TFP. The inclusion of time-varying firm controls and industry by year fixed effects raises this premium slightly to 3 per cent. These results for South African manufacturing are consistent, albeit slightly smaller, with those found by Kasahara and Rodrigue (2008) for Chile. In their study the importer TFP premium estimated using comparable regressions ranges from 12.8 per cent when only controlling for industry by year fixed effects to 7 per cent with the inclusion of firm fixed effects.

[11] Background analysis of the data indicates that 43 per cent of the firms did not change importing status over the period.

Table 7: OLS regression of TFP on import participation

	Industry FE				Firm FE	
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy importer intermediates (t)	0.379**	0.230**	0.0961**	0.0914**	0.0231**	0.0295**
	(0.00438)	(0.00612)	(0.00524)	(0.00611)	(0.00771)	(0.00813)
Dummy exporter		0.262**	0.0766**	0.0748**	0.0253**	0.0350**
		(0.00568)	(0.00521)	(0.00581)	(0.00714)	(0.00706)
ln(employment)			0.209**	0.209**		-0.0919**
			(0.00167)	(0.00178)		(0.00731)
Skill share			0.886**	0.893**		-0.0675**
			(0.0145)	(0.0163)		(0.0240)
ln(capital/labour)			0.0121**	0.0121**		-0.0440**
						(0.00268)
Constant	12.66**	12.63**	11.89**	11.93**	12.72**	13.05**
	(0.00448)	(0.00486)	(0.0159)	(0.0155)	(0.00427)	(0.0681)
Observations	120,122	120,122	119,900	119,909	120,132	119,909
R-squared	0.187	0.201	0.353	0.351	0.868	0.874
Industry FE	YES	YES	YES	NO	NO	NO
Province FE	NO	NO	YES	YES	NO	NO
Year FE	YES	YES	YES	NO	YES	YES
Industry by Year FE	NO	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES	YES

Notes: Bootstrapped standard errors in parentheses, ** $p<0.01$, * $p<0.05$, + $p<0.1$. FE—fixed effects.

Source: Authors' elaboration on SARS CIT and transaction trade data.

We perform a number of additional robustness checks. To account for endogeneity concerns, whereby efficient firms self-select into importing, we re-estimate the regressions using lagged values of the importer dummy variable. The results are presented in Table A2 in the Appendix. The importer premium falls to 0.081 (one period lag) and 0.064 (two period lag) in the estimates that include firm controls and industry and year fixed effects (corresponding to column (3) in Table 7). However, the coefficients on the lagged importer dummy variables become insignificant once firm fixed effects are included. One potential explanation for this result is that the sample size falls considerably and too few firms change importer status in the reduced sample. We also restrict the sample to the 2009–12 period to account for potential biases arising from the exclusion of relatively large firms for which income tax data were not available in 2013. The results are very similar to those for the full sample presented in Table 7.

4.3 Results: complementary input channel

Theoretically, Kasahara and Rodrigue (2008; see also Halpern et al. 2015) introduce a production function whereby firms produce final goods using labour, capital, and horizontally differentiated intermediate inputs, domestically produced or imported. Intermediates are complements and TFP increases in the number of varieties of intermediate inputs the firm uses. Access to imports therefore raises firm productivity by increasing the scope of intermediates available to the firm and by substituting for potentially less efficient domestic inputs (as in Goldberg et al. 2010).

To evaluate this channel, through which imports affect productivity, we regress firm TFP on two different measures of imported varieties. As a first indicator, we follow Kasahara and Rodrigue

(2008) and use the share of domestic intermediates in total intermediates.[12] The estimates are presented in the first column of Table 8.

The results reveal an inverse relationship between the share of domestic inputs in costs and firm TFP. A 10 per cent increase in the domestic cost share is associated with a 0.4 per cent decrease in TFP. The relationship for South Africa is marginally stronger than is found by Kasahara and Rodrigue (2008) for Chile. Additional estimates, not reported for reason of space, show that this result is robust to the inclusion of industry, instead of firm, fixed effects and to the exclusion of the year 2013

Table 8: Firm productivity and the share of domestic intermediate goods in total costs

	(1)	(2)	(3)
ln(domestic cost share)	-0.044**		
	(0.012)		
ln(variety imports)		0.0291**	
		(0.00646)	
ln(scope)			0.0181**
			(0.00646)
ln(scale)			0.0758**
			(0.0164)
Constant	13.48**	13.94**	13.89**
	(0.034)	(0.158)	(0.114)
Observations	118,581	27,474	30,312
R-squared	0.876	0.858	0.856

Notes: All estimates include the exporter dummy; the log of employment; the skill share; the capital–labour ratio and firm and year fixed effects. Bootstrapped standard errors in parentheses, ** $p<0.01$, * $p<0.05$, + $p<0.1$.

Source: Authors' elaboration on SARS CIT and transaction trade data.

An alternative approach (adopted by Bas and Strauss-Kahn 2014 and Goldberg et al. 2010) is to test the complementarity channel using the variety of intermediate goods imported by a firm as the key explanatory variable. An imported variety is defined as a product (HS 6-digit level)–country pair. Over the period of analysis, the mean number of varieties imported by importing firms rose from 28 to 32 between 2009 and 2010 as economic growth recovered from the depths of the financial crisis, but then remained stable over the subsequent period.

The results are presented in column (2) of Table 8. Note that the sample only includes firms that import intermediate inputs. A strong positive relationship is found between the variety of intermediate inputs imported by the firm and TFP. Once we look at the relationship within firms over time, we find that a 10 per cent increase in the number of varieties imported by a particular firm is associated with a 0.3 per cent increase in productivity.

Firms can increase the number of varieties imported by importing existing products from new sources or new products from existing sources (or new products from new sources). To better capture these differential sources of varieties, column (3) separately includes firm-level indicators for the average number of products imported per source (scope) and the average number of

[12] Assuming that all intermediate goods are symmetrically produced, then this ratio is equal to the range of domestic inputs purchased relative to the total range available (Kasahara and Rodrigue 2008). The variable is calculated as the (cost of sales—direct imports)/cost of sales. This indicator will over-estimate the domestic share in costs for firms that use indirectly imported intermediate inputs in production.

sources per product (scale). The coefficients on both variables are positive and statistically significant. The coefficient on scale is much larger than that of scope, suggesting a greater responsiveness of firm TFP to increases in the number of destinations per product, which is plausible considering the higher costs faced to source from diverse markets.

These results highlight an important source of firm heterogeneity within importers of intermediate inputs. Firm productivity is affected not only by whether a firm imports, but also by how much and how many varieties it imports. Overall, on the basis of this first set of results, we can conclude that imported inputs have a strong complementary impact on the productivity of South African firms.

4.4 Technology transfer

A second channel through which imported inputs can affect productivity is through improved access to technology and/or higher quality inputs. We try three approaches to assessing the technology/quality channel through which imports affect TFP. First, we extend our earlier estimates (see Table 7) on the relationship between import participation and firm TFP by including an additional dummy variable equal to 1 if 50 per cent or more of firm imports are sourced from high-income countries.[13] The coefficient on this variable captures the marginal impact on TFP of a firm sourcing the bulk of its imports from high-income countries relative to sourcing imports from emerging economies. The expectation, grounded on the existing literature, is that goods from advanced economies embody relatively advanced technology and high skill-intensity, and that their use in production is expected to raise firm TFP (Feng et al. 2012).

Column (1) of Table 9 presents these results. In contrast to our expectation of positive technology transfer, we do not find any significant effect for this coefficient, showing no apparent relationship between importing inputs mainly from advanced countries and firm productivity. To investigate this relationship further, we adopt an additional approach, following Bas and Strauss-Kahn (2014), and regress TFP on the variety of imported inputs sourced from high-income (HI) and emerging economies (non-HI). While the coefficients capture the complementarity effect of imported varieties from each source on TFP, the technology embodied in imports from high-income countries is expected to yield a higher coefficient on this variable relative to varieties imported from emerging economies. The regression results are presented in column (2). Both coefficients are positive and statistically significant, but the coefficient on varieties imported from developed economies (0.0318) exceeds that for emerging countries (0.0213) by a small margin. This seems to be consistent with our prior hypothesis that a larger recourse to potentially more sophisticated and higher quality varieties from advanced economies has a stronger effect on productivity thanks to a larger technology transfer.

[13] High-income countries are defined according to the 2015 World Bank classification of countries by income. High-income economies are those with a Gross National Income per capita of US$12,736 or more. We also use OECD membership as our indicator of advanced economies. The results are very similar.

Table 9: Firm productivity and the technology/quality channel

	(1)	(2)
Dummy importer	0.0378**	
	(0.0101)	
Dummy importer HI	-0.0125	
	(0.00999)	
ln variety imports HI		0.0318**
		(0.00732)
ln variety imports non-HI		0.0213**
		(0.00780)
Constant	13.44**	13.94**
	(0.0355)	(0.122)
Observations	119,909	27,474
R-squared	0.870	0.858

Notes: HI denotes high-income, while non-HI denotes emerging economies. The variable 'Dummy importer from HI' equals 1 if at least 50 per cent of imported intermediate inputs are sourced from high-income countries. All estimates include the exporter dummy; the log of employment; the skill share; the capital–labour ratio and firm and year fixed effects. Bootstrapped standard errors in parentheses, ** $p<0.01$, * $p<0.05$, + $p<0.1$.

Source: Authors' elaboration on SARS CIT and transaction trade data.

5 Importing and exporting

In this final section of the paper, we briefly 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 boosts existing exports, but also allows firms to bear the fixed costs of accessing new product markets. The variety of goods exported by firms is therefore expected to rise.

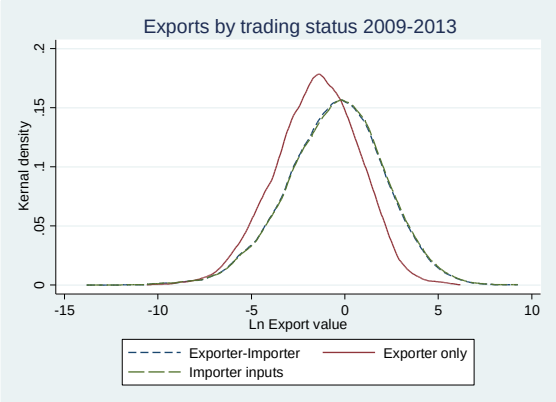
Imports also directly boost exports in two ways. First, international markets allow firms to access cheaper intermediate inputs. Lower cost of inputs directly reduces production costs, which raises firm profits and hence the value and variety of exports. Bas and Strauss-Kahn (2014), in their analysis 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, as discussed in the previous sections, firms are able to access higher quality inputs and new technology embedded in inputs (Feng et al. 2012). This 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. This channel may be particularly relevant for emerging economies, such as South Africa, that export a high proportion of their manufactured goods to advanced economies.

5.1 Background data

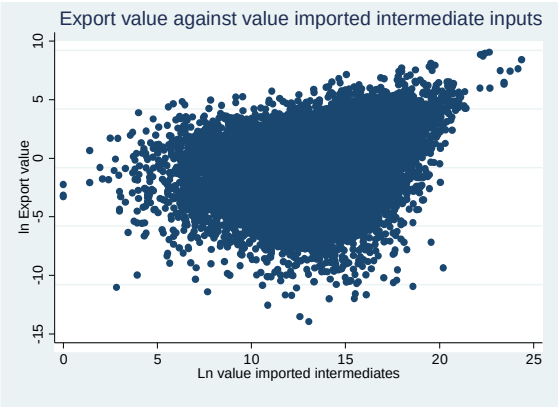
Figure 2 presents a kernel density estimate of the value of exports by trading status (a) and a scatter plot (b) between the value of exports and the value of intermediate inputs for South African manufacturing firms. A clear positive relationship between export value and import status is shown in the kernel density estimate. Exporters that import intermediate inputs tend to export higher values than firms that only export. As shown earlier, in Table 5, exporters that import also export more varieties and more products to more destinations. The scatter plot (b) reveals substantial firm heterogeneity in the relationship between importing and exporting. Firms that import higher values of intermediate inputs have higher values of exports.

Figure 2: The relationships between import status, the value of direct imports of inputs, and export value in South African manufacturing, 2009–13

(a) Kernel density estimate



(b) Scatter plot



Notes: 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.

Source: Authors' elaboration on SARS CIT and transaction trade data.

5.2 Results: exports and imports

To test the relationship in a more rigorous manner, we estimate the following regression equation:

$$X_{ikt} = \alpha + \beta_1 M_{ikt-1} + \beta_2 DX_{ikt-1} + \beta_3 \ln(TFP)_{ikt-1} + \sum_i \lambda_i F_i + \sum_t \lambda_t year_t + \sum_m \delta_m C_{ikt} + \varepsilon_{ikt}$$

where X_{ikt} is an indicator of export performance (value, variety) of firm i at period t operating in industry k. To control for the indirect effect of imports on exports via the productivity channel, the regression includes TFP. M_{ikt} is an indicator of firm import behaviour (import participation, value, variety). TFP and import behaviour are lagged one period to help minimize biases stemming from endogeneity and reverse causation. Time-varying controls such as employment, skill share, and capital–labour ratio are included. All estimates include firm and year fixed effects.

Results are presented in Table 10. In this regression a dummy variable for export participation is regressed (using OLS) on lagged importer status. As shown in column (1), prior import status raises the probability that a firm exports in the subsequent period (by 2.5 per cent). The coefficient is robust to the inclusion of firm controls (column 2). TFP, on the other hand, appears to play no additional role in determining export participation once the effects of prior import and export status and firm size are accounted for.

Table 10: Export participation and importing status

VARIABLES	(1)	(2) Export propensity	(3)	(4) Export value	(5)	(6)	(7) Export variety	(8)
Dummy importer(t-1)	0.0248**	0.0240**						
	(0.00798)	(0.00850)						
ln(value imports)(t-1)			0.0388*			0.0180*		
			(0.0154)			(0.00810)		
ln(variety imports)(t-1)				0.0467			0.0498**	
				(0.0361)			(0.0159)	
ln(variety imports HI)(t-1)					0.0674*			0.0491**
					(0.0342)			(0.0161)
Ln(variety imports non-HI)(t-1)					0.00851			0.0259+
					(0.0295)			(0.0155)
Dummy exporter(t-1)			0.425**	0.427**	0.317**	0.238**	0.236**	0.237**
			(0.101)	(0.110)	(0.0584)	(0.0447)	(0.0411)	(0.0308)
ln TFP(t-1)		0.000807	0.100*	0.105*	0.109**	0.038+	0.039+	0.0441*
		(0.00380)	(0.0441)	(0.0453)	(0.0405)	(0.0201)	(0.0199)	(0.0217)
ln(employment)(t)		0.0163**	0.286**	0.288**	0.224**	0.142**	0.140**	0.112**
		(0.00377)	(0.0687)	(0.0737)	(0.0522)	(0.0371)	(0.0306)	(0.0261)
Skill share(t)		0.0344*	0.552*	0.551*	0.297	0.168	0.168	0.160
		(0.0155)	(0.253)	(0.239)	(0.191)	(0.128)	(0.120)	(0.101)
ln(capital/labour)(t)		0.00445**	0.0893*	0.0901**	0.0768**	0.0289+	0.0278*	0.0207+
		(0.00136)	(0.0359)	(0.0349)	(0.0224)	(0.0159)	(0.0133)	(0.0107)
Constant	0.275**	0.168**	9.245**	9.598**	9.782**	0.664+	0.810*	0.716*
	(0.00315)	(0.0544)	(0.800)	(0.824)	(0.649)	(0.382)	(0.354)	(0.338)
Observations	76,865	76,771	13,297	13,297	20,516	13,297	13,297	20,516
R-squared	0.892	0.892	0.912	0.912	0.900	0.929	0.929	0.914

Notes: Exports are valued in nominal Rands. Aggregate price effects are controlled for through the inclusion of year fixed effects. All estimates include firm fixed effects. Bootstrapped standard errors in parentheses, ** $p<0.01$, * $p<0.05$, + $p<0.1$.

Source: Authors' elaboration on SARS CIT and transaction trade data.

The remaining columns of Table 10 unpack some of the heterogeneity in the export–import relationship by looking at firms that both export and import. More specifically, columns (3–5) analyse the relationship between importing behaviour and the value of exports, while the second set of columns (6–8) focus on importing and the variety of firm exports. The results confirm a strong relationship between importing and exporting. The higher the value of intermediate inputs imported by a firm, the higher the value of exports (column 3) and the variety of goods exported (column 6). This relationship holds even after controlling for the indirect effects of imports on export performance via TFP, which is positively associated with exports.

In columns (4) and (7) we look more closely at the complementary input channel through which imports may affect exports. As shown earlier, an increase in the variety of imported inputs used in production positively raises firm TFP. TFP in turn is positively and statistically significantly related to both export value and export variety (only at 10 per cent level of significance). Therefore, indirectly via TFP, imported varieties enhance the value and variety of exports.[14]

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

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 insignificant, but is positive and statistically significant in explaining export varieties. 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).

The remaining columns analyse the relationship between the origin and quality of the imported varieties and export performance. Column (5) and (8) reveal that imports of varieties from advanced countries have a significant positive association with the value and variety of exports. The coefficient on varieties imported from emerging economies is insignificant in the case of export values, but is marginally significant (at 10 per cent level), with a much smaller coefficient than for imports from advanced economies, in explaining export varieties. A 10 per cent increase in the number of varieties imported by firms from advanced economies is associated with a 6.7 per cent increase in export value and a 4.9 per cent 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. (2012).

6 Conclusion

This work represents a first effort to study the implications of increased international integration through imports at the firm level in the context of South Africa. Based on an original database that combines company tax information with detailed transaction-level data, we are able to unpack some of the key relations and the main mechanisms linking the international sourcing strategy of South African firms with their performance.

Our results are consistent with a range of existing evidence on both advanced and emerging countries, and confirm the potential spillovers that can be achieved by deepening the international integration of South African firms.

Broadly, our results provide support for the idea that South African importers are more productive than South African exporters and non-trading firms. South African firms that do both (import and export) are the most productive in the hierarchy of trading firms. In addition, we make the case for South African importers to raise foreign inputs used in production. Importing a wide range of intermediate inputs, especially from advanced countries, is in fact associated with higher productivity, 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 into new imported ones on the other.

Our results suggest that imports can play a key role in not only enhancing the performance of South African firms in terms of higher productivity, but also in allowing them to produce for the international market. This has important implications for a country in which, for instance, 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 firms involved in international trade 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 access to new technologies in South Africa. 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 the process of economic transformation of the country.

References

Abreha, K.G. (2015) *Empirical Essays on Heterogeneous Firms and International Trade*. PhD dissertation, Department of Economics and Business, Aarhus University, Denmark.

Ackerberg, D., C.L. Benkard, S. Berry, and A. Pakes (2007). 'Econometric Tools for Analyzing Market Outcomes'. In J. Heckman and E. Leamer (eds), *Handbook of Econometrics*. Amsterdam: North-Holland.

Amiti, M., and J. Konings (2007). 'Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia'. *American Economic Review*, 97(5): 1611–38.

Antràs, P., and E. Helpman (2004). 'Global Sourcing'. *Journal of Political Economy*, 112: 552–80.

Bas, M. (2012). 'Input-trade Liberalization and Firm Export Decisions: Evidence from Argentina'. *Journal of Development Econonomics*, 97(2): 481–93.

Bas, M., and V. Strauss-Kahn (2014). 'Does Importing More Inputs Raise Exports? Firm-level Evidence from France'. *Review of World Economics*, 150(2): 241–75.

Bas, M., and V. Strauss-Kahn (2015). 'Input-trade Liberalization, Export Prices and Quality Upgrading'. *Journal of International Economics*, 95: 250–62.

Bernard, A.B., J.B. Jensen, S.J. Redding, and P.K. Schott (2007). 'Firms in International Trade'. *Journal of Economic Perspectives*, 21(3): 105–30.

Bernard, A.B., J.B. Jensen, S.J. Redding, and P.K. Schott (2015) 'Global Firms'. *Journal of Economic Literature* (forthcoming).

Bigsten, A., M. Gebreeyesus, and M. Soderbom (2015). 'Tariffs and Firm Performance in Ethiopia'. *Journal of Development Studies* (forthcoming).

Broda, C., and D.E. Weinstein (2006). 'Globalization and the Gains from Variety'. *Quarterly Journal of Economics*, 121(2): 541–85.

Castellani, D., F. Serti, and C. Tomasi (2010). 'Firms in International Trade: Importers' and Exporters' Heterogeneity in Italian Manufacturing Industry'. *The World Economy*, 33(3): 424–57.

Colantone, I., and R. Crinò (2014) 'New Imported Inputs, New Domestic Products'. *Journal of International Economics*, 92(2014): 147–65.

Damijan, J.P., J. Konings, and S. Polanec (2014) 'Import Churning and Export Performance of Multi-product Firms'. *The World Economy*, 37(11): 1483–506.

de Loecker, J. (2007). 'Do Exports Generate Higher Productivity? Evidence from Slovenia'. *Journal of International Economics*, 73(1): 69–98.

Dunne, P., and L. Edwards (2007). 'Trade, Enterprise Production and Employment'. *Journal for Studies in Economics and Econometrics*, 31(2): 49–68.

Eaton, J., and S. Kortum (2001). 'Technology, Trade, and Growth: A Unified Framework'. *European Economic Review*, 45: 742–55.

Edwards, L. (2001). 'Globalisation and the Skill Bias of Occupational Employment in South Africa'. *South African Journal of Economics*, 69(1): 40–71.

Edwards, L. (2005). 'Has South Africa Liberalised its Trade?'. *South African Journal of Economics*, 73: 754–75.

Edwards, L., and R. Jenkins (2015a). 'The Impact of Chinese Import Penetration on the South African Manufacturing Sector'. *Journal of Development Studies*, 51(4): 447–63.

Edwards, L., and R. Jenkins (2015b). 'Is China Crowding-out South African Exports of Manufactures?'. *European Journal of Development Research*, 27: 903–20.

Fan, H., Y.A. Li, and S.R. Yeaple (2015) 'Trade Liberalization, Quality, and Export Prices'. *Review of Economics and Statistics*, 97(5): 1033–51.

Fedderke, J. (2006). 'Technology, Human Capital and Growth: Evidence from a Middle-income Country Case Study Applying Dynamic Heterogeneous Panel Analysis'. In South African Reserve Bank, Banco de Mexico, and the People's Bank of China (eds), *Economic Growth: Proceedings of a G20 Seminar Held in Pretoria, South Africa, 4–5 August 2005*. Pretoria: South African Reserve Bank.

Feng, L., Z. Li, and D.L. Swenson (2012) 'The Connection between Imported Intermediate Inputs and Exports: Evidence from Chinese Firms'. NBER Working Paper 18260. Washington, DC: NBER.

Fernandes, A., C. Freund, and M. Pierola (2016) 'Exporter Behavior, Country Size and Stage of Development: Evidence from the Exporter Dynamics Database'. *Journal of Development Economics*, 119: 121–37.

Goldberg, P.K., A.K. Khandelwal, N. Pavcnik, and P. Topalova (2010). 'Imported Intermediate Inputs and Domestic Product Growth: Evidence from India'. *Quarterly Journal of Economics*, 125(4): 1727–67.

Grossman, G.M., and E. Helpman (1991). *Innovation and Growth in the Global Economy*. Cambridge, MA: MIT Press.

Halpern, L., M. Koren, and A. Szeidl (2015). 'Imported Inputs and Productivity'. *American Economic Review*, 105(12): 3660–703.

Jenkins, R. (2008). 'Trade, Technology and Employment in South Africa'. *Journal of Development Studies*, 44(1): 60–79.

Kasahara, H., and B. Lapham (2013). 'Productivity and the Decision to Import and Export: Theory and Evidence'. *Journal of International Economics*, 89(2): 297–316.

Kasahara, H., and J. Rodrigue (2008). 'Does the Use of Imported Intermediates Increase Productivity? Plant-level Evidence'. *Journal of Development Economics*, 87(1): 106–18.

Khandelwal, A. (2010). 'The Long and Short (of) Quality Ladders'. *Review of Economic Studies*, 77(4): 1450–76.

Kreuser, F., and C. Newman (2016). 'Total Factor Productivity in South African Manufacturing'. Paper presented at the UNU-WIDER/SARS/National Treasury Policy Seminar—Firm Level Analysis, 21 January, Pretoria.

Kugler, M., and E. Verhoogen (2009). 'Plants and Imported Inputs: New Facts and an Interpretation'. *American Economic Review*, 99(2): 501–7.

Manova, K., and Z. Zhang (2012). 'Export Prices across Firms and Destinations'. *Quarterly Journal of Economics*, 127: 379–436.

Melitz, M. (2003). 'The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity'. *Econometrica*, 71(6): 1695–725.

Rodrik, D. (2008). 'Understanding South Africa's Economic Puzzles'. *Economics of Transition*, 16(4): 769–97.

Schor, A. (2004). 'Heterogeneous Productivity Response to Tariff Reduction: Evidence from Brazilian Manufacturing Firms'. *Journal of Development Economics*, 75(2): 373–96.

Topalova, P., and A. Khandelwal (2011). 'Trade Liberalization and Firm Productivity: The Case of India'. *Review of Economics and Statistics*, 93(3): 995–1009.

Wagner, J. (2012). 'International Trade and Firm Performance: A Survey of Empirical Studies since 2006'. *Review of World Economics*, 148(2): 235–67.

Wagner, J. (2016). 'A Survey of Empirical Studies Using Transaction Level Data on Exports and Imports'. *Review of World Economics*, 152(1): 215–25.

Wooldridge, J.M. (2009). 'On Estimating Firm-level Production Functions Using Proxy Variables to Control for Unobservables'. *Economics Letters*, 104(3): 112–14.

Appendix

Table A1: Annual average number of firms, value of sales and value of trade, 2009–13

	Number	Share	Value (R billion)	Share
Sales				
Manufacturing firms in CIT	40,011	100.0	1,722.0	100.0
Firms with TFP estimates	24,026	60.0	1,336.0	77.6
Exports				
Manufacturing firms in CIT	7,296	100.0	67.8	100.0
Firms with TFP estimates	5,775	79.1	64.0	94.5
Imports				
Manufacturing firms in CIT	7,993.4	109.6	145.2	100.0
Firms with TFP estimates	6,068.6	83.2	122.2	84.1

Notes: We only consider manufacturing firms with positive turnover in the CIT database to rid the sample of dormant or non-producing firms

Source: Authors' elaboration on SARS CIT and transaction trade data.

Table A2: OLS regression of TFP on import participation, robustness tests

	Lagged importer variables				Pre-2013 sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dummy importer intermediates (t)					0.0919**		0.0333**	
					(0.00603)		(0.00913)	
Dummy importer intermediates (t-1)	0.0807**		-0.00265			0.0745**		-0.0115
	(0.00542)		(0.0107)			(0.00726)		(0.0128)
Dummy importer intermediates (t-1)		0.0639**		0.0104				
		(0.00778)		(0.0140)				
Constant	11.97**	12.04**	13.86**	13.95**	11.88**	11.99**	13.17**	14.02**
	(0.0183)	(0.0221)	(0.0755)	(0.124)	(0.0186)	(0.0218)	(0.0859)	(0.112)
Observations	76,768	46,933	76,771	46,933	96,947	58,255	96,956	58,258
R-squared	0.359	0.362	0.899	0.926	0.348	0.354	0.884	0.914
Industry FE	YES	YES	NO	NO	YES	YES	NO	NO
Year FE	YES	YES	YES	YES	YES	YES	NO	NO
Industry by Year FE	NO	NO	NO	NO	NO	NO	YES	YES
Firm FE	NO	NO	YES	YES	NO	NO	YES	YES

Note: Results in columns (3) and (4) include province dummy variables. All estimates include the exporter dummy; the log of employment; the skill share; the capital labour ratio and firm and year fixed effects. Bootstrapped standard errors in parentheses, ** $p<0.01$, * $p<0.05$, + $p<0.1$.

Source: Authors' elaboration on SARS CIT and transaction trade data.