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Global Value Chain Integration and Productivity:

Evidence from Enterprise Surveys in Namibia, South Africa, and Swaziland

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1. Introduction

What is the potential of GVCs to enhance productivity of domestic firms in developing countries? This note focuses on the productivity gains of domestic firms that export and import in global value chains (GVCs). In particular, we estimate the impact of a domestic firm's export share and share of imported inputs on labor productivity for a cross-section of more than 25,000 domestic manufacturing firms in 78 low- and middle-income countries from the World Bank's Enterprise Surveys. We use the dataset by Farole and Winkler (2014) who assess how foreign investor characteristics, domestic firms' absorptive capacity and a country's institutional variables influence intra-industry productivity spillovers to domestic firms from foreign direct investment (FDI). We modify their analysis and focus on the productivity effects from selling and purchasing internationally in GVCs on domestic firms in three Southern African Customs Union (SACU) countries (Namibia, South Africa, and Swaziland), but also report the general results for the rest of the country sample. We also take into account domestic firm heterogeneity as GVC integration affects different types of firms unequally.

In order to adequately measure a firm's participation in GVCs in this context, it is important to first identify the different forms through which GVC integration can affect domestic firms' productivity. Integrating a country's domestic suppliers into GVCs increases the possibility for productivity gains through exporting to a buyer abroad or supplying to a multinational in the country. But countries should not neglect the opportunities for productivity gains that GVC participation can provide from a buyer's perspective. Instead of building a complete array of supply chains at home, firms can join existing supply chains of multinationals through cross-border trade in intermediates and components (Taglioni and Winkler 2015). While Farole and Winkler (2014) focus on the productivity spillovers from multinationals in a country, this note looks at the impact of cross-border sales to international buyers (exporting) or purchases of inputs from international sellers (importing) in GVCs.

While our dataset doesn't allow to directly test for the underlying transmission channels, it is nevertheless useful to understand how GVC integration can impact on firm-level productivity. First, domestic firms can benefit via forward links in GVCs by selling intermediates to international buyers, spurring production in upstream sectors. Similarly, they can benefit via backward links by purchasing international inputs, spurring production in various downstream sectors. Third, domestic firms can improve productivity via technology spillovers in the same or related downstream or upstream sectors as a result of GVC production. Fourth, domestic firms can benefit from productivity spillovers via skills demand and upgrading which is transferred through the training of and demand for skilled labor in the same, downstream or upstream sectors. Fifth, domestic firms can gain from market restructuring effects, as GVC participation increases the competition for limited resources in the country which in the long-term should increase overall productivity and also enables firms to learn from international buyers and foreign investors. Finally, domestic firms may benefit via minimum scale achievements, triggered by investments in infrastructure that would not be profitable without GVC participation and that may spur local production in other sectors (Taglioni and Winkler 2015). Our analysis directly focuses on the first two transmission channels, but indirectly also covers the other channels. Technology spillovers, increased skills demand, and minimum scale effects are all thinkable results of exporting and importing in GVCs.

Besides shedding light on the transmission channels, it is also important to examine which types of domestic firm benefit most from GVC integration which has important policy implications. It is likely that the productivity effects from GVC participation are mixed for different types of firms. The literature on the productivity effects from FDI, for example, suggests that the theoretical postulated spillover effects often do not automatically materialize just because a country is able to attract FDI in the first place. As a result, more and more research has been devoted to understanding the various conditions that may explain these mixed results. Three major types of mediating factors have been identified, including (i) characteristics of foreign firms, which mediate spillover potential; (ii) characteristics of domestic firms, which mediate absorptive capacity to internalize spillovers; and (iii) differences in host country factors (Castellani and Zanfi 2003, Lipsey and Sjöholm 2005), which mediate both domestic and foreign firm characteristics as well as the transmission channels for spillovers (Paus and Gallagher 2008). In this note, we examine the role of domestic firm characteristics for productivity gains in GVCs.

This note is structured as follows. Section 2 reviews the relevant literature with regard to productivity effects from GVC participation as well as the role of domestic firm characteristics in this context. Section 3 introduces the data and econometric model. In section 4 we present our regression results, while section 5 concludes.

2. Literature Review

2.1 GVC Integration and Productivity

Exporting and Productivity

The exporting-productivity nexus has been discussed both at the macro and micro levels for a long time. The macro-economic channels through which export expansion enhances aggregate productivity and growth are well-known. Exports in Ricardo's famed theory allow for specialization in a country's comparative advantage and thereby raise growth. The new trade theory à la Helpman and Krugman (1985) and generalized by Grossman and Helpman (1991) shifted the focus from the static gains from trade to dynamic ones in which the increased investment, knowledge and technology associated with increased productivity growth can transform trade patterns and accelerate overall economic growth. Under the new theory, specialization is a result of scale and concomitant efficiencies.

At the micro-level, researchers have recognized at the latest since the seminal paper by Bernard and Jensen (1995) that exporters outperform non-exporters in the same sector and country in terms of productivity, skills, wages, technology, and capital intensity (see detailed literature review in Wagner 2007). Consequently, researchers started to ask whether exporters perform better because of self-selection into the exporting market and because of learning-by-exporting. Self-selection refers to ex-ante differences across firms, while learning-by-exporting refers to ex-post gains of exporters versus non-exporters. Self-selection relates to the fact that exporting involves additional costs of exporting, including transportation, marketing, and distribution costs, employees with specific skills, and production costs for necessary adjustment which only more productive firms are able to absorb. Learning-by-exporting refers to knowledge flows that exporting firms absorb from international buyers and competitors which renders them more productive (Wagner 2007).

The wide array of existing studies tends to find that more productive firms self-select into exporting, while the positive impact of exporting on productivity is less clear-cut. The increased fragmentation of international trade in GVCs makes learning-by-exporting more likely as selling to international buyers might increase firm-level productivity ex-post via forward and backward linkages, technology spillovers, skills upgrading, and minimum scale effects. There are only few studies for African countries. In a firm-level panel data approach covering Kenya, Ghana, Zimbabwe and Cameroon from 1991 to 1995, Bigsten et al. (2004) confirm that exporting raises productivity. Biesebroeck (2005) confirms the positive productivity effects of exporting at the firm-level for nine Sub-Saharan African (SSA) countries between 1992 and 1996. Using country-level data instead, Songwe and Winkler (2012) also find positive productivity effects of exports for a cross-country sample of 30 SSA countries between 1995 and 2008, which are only significant in manufacturing and services sectors, but not in primary sectors.

This note complements the learning-by-exporting literature, with some important differences. While the latter typically compares productivity growth between year 0 and year *t* of non-exporters with that of export-starters, this note emphasizes whether a higher export share in total sales is associated with a higher productivity level across firms. Using export share as right-hand side variable, we take into account two types of GVC integration, namely (i) GVC entry (as both firms with 0 and positive export shares are included), and (ii) expansion of GVC participation (as both firms with lower and higher export shares are included). The second type should not be neglected, as it is likely that more GVC integration via larger export shares leads to more ex-post productivity gains via the various transmission channels explained above.

Importing Inputs and Productivity

Most of the studies on the effect of imported inputs on productivity focus on developed countries – as part of the offshoring literature which started in the mid-1990s when developed countries began to assess whether importing (or offshoring) of material inputs (typically from lower-income countries) entailed positive welfare effects in the countries of origin. However, the focus was more on the labor market effects. Shifting the focus on total factor TFP growth, Egger et al. (2001) find that materials offshoring to Eastern European countries had a significantly positive impact in 20 Austrian manufacturing industries. There are various ways of measuring offshoring, but in most cases it is the share of imported inputs as percentage of total inputs, value added or output. Since these measures are typically based on input-output tables, this type of studies is often performed at the industry-level.

In the 2000s, this stream of literature gained momentum when the focus shifted on services offshoring. Amiti and Wei (2006, 2009) find evidence that services offshoring significantly increased TFP and labor productivity in US manufacturing between 1992 and 2000, which is estimated at a sectoral level, while the effect of materials offshoring is smaller and often insignificant. Similary, Crino (2008) finds larger substantially larger productivity gains from services offshoring than materials offshoring for nine EU countries between 1990 and 2004. Winkler (2010) finds similar effects for German manufacturing industries covering the period 1995-2006. Michel and Rycx (2011) find evidence for a productivity-enhancing effect of services offshoring in Belgian manufacturing industries between 1995 and 2004, but none for materials offshoring. They also examine the impact of inter-industry spillover effects, but only find little evidence.

Daveri and Jona-Lasinio (2008), by contrast, find for Italy that only materials offshoring increased TFP growth between 1995 and 2003. Ito and Tanaka (2010) find that materials offshoring to Asian countries increased TFP in Japanese manufacturing over the period 1988-2004. Focusing on low-skilled workers, Egger and Egger (2006) find a U-shaped labor productivity effect from materials offshoring in manufacturing sectors of 12 EU countries between 1993 and 1997.

A few studies use firm-level data. Görg and Hanley (2003) analyze the impact of services offshoring on labor productivity for Ireland using plant level data. The effect was positive in the electronics industry between 1990 and 1995. In a more recent plant-level study, Görg et al. (2008) evaluate the productivity effects of materials and services offshoring for Irish manufacturing for the period 1990-1998, differentiating between exporting and non-exporting firms. They only find a significantly positive impact of services offshoring on total factor productivity for exporting firms. However, studies focusing on developing countries are virtually non-existent – especially at the firm-level. This notes feeds into the literature above by focusing on the impact of materials offshoring on labor productivity at the firm-level in three SACU countries.

2.2 The Role of Absorptive Capacity

At the domestic firm level, R&D, human capital, firm size, firm location, export behavior, the technology gap, type of ownership, and sectoral competition are mediating factors that allow countries to adopt complementary policies for levering the opportunities of GVC participation. These factors determine the local firm's absorptive capacity. While the focus here is on spillovers from FDI, many firm characteristics can also be expected to lead to spillovers from GVC participation through international trade and non-equity modes of investment, especially in modular or relational governance forms where the degree of knowledge sharing is relatively high.

The *technology gap* between foreign and domestic firms has been identified as one the most important mediating factors for FDI spillovers (Kokko 1994; Kokko et al. 1996; Grünfeld 2006)[2]. Views on the role of the technology gap for FDI spillovers conflict. Some studies find that a large technology gap is beneficial for local firms since their catching-up potential increases (Findlay 1978; Wang and Blomström 1992; Smeets 2008). Other studies argue that local firms might not be able to absorb positive FDI spillovers if the technology gap between the multinational and local producers is too big or too small (e.g. Blalock and Gertler 2009).

The literature suggests that there is solid evidence for the supportive role of *R&D* in local firms in high income countries, e.g. Spain (Barrios and Strobl 2002; Barrios et al. 2004), the US (Keller and Yeaple 2009), Ireland (Barrios et al. 2004), and Sweden (Karpaty and Lundberg 2004), among others. There are also studies confirming the supportive role of R&D in domestic firms for developing or emerging countries, including the Czech Republic (Kinoshita 2001), India (Kanturia 2000, 2001, 2002), Hungary and Slovakia (Damijan et al. 2003), and Indonesia (Blalock and Gertler 2009), among others. One exception is Damijan et al. (2003) finding a negative role of firm-level R&D on FDI spillovers for Estonia and Latvia (reported in Crespo and Fontura 2007).

A domestic firm's ability to absorb foreign technology might also be positively related to its share of *skilled labor*. Blalock and Gertler (2009), for example, find that the proportion of employees with college degrees significantly increases domestic firms' productivity gains from FDI in Indonesian manufacturing. However, Girma and Wakelin (2007) only confirm such a finding for smaller firms in the U.K. – they find that FDI does not affect large firms with a high proportion of human capital, as these firms are probably the most similar to multinationals in terms of technology and market share. In contrast, Sinani and Meyer (2004) find for a sample of Estonian firms that a larger share of human capital reduces the positive spillover effects for domestic firms, but increases it for large firms. Their explanation for this contradicting result is that the competition effect might reduce workers' possibility to extract additional rents from local

[2] The technology gap is usually measured as a domestic firm's productivity level relative to a benchmark productivity level within the same sector – often of the leading firms (Griffith et al. 2002, Girma 2005, Girma and Görg 2007) or of foreign firms (Castellini and Zanfei 2003).

firms, since multinationals tend to pay better wages. The competition effect might also enable larger firms to keep skilled workers compared to smaller firms who might lose skilled workers to foreign firms.

Firm size has been positively related to a domestic firm's capacity to absorb FDI spillovers (e.g. Jordaan 2011 for Mexico). Larger firms may be better positioned to compete with multinationals and to imitate their tools (Crespo and Fontoura 2007). Analogously, larger firms may pay better wages and therefore find it easier to attract workers employed by multinational firms. Larger firms might also be more visible, e.g. organized in associations, and, thus, more likely selected as local suppliers by foreign firms. While Aitken and Harrison (1999) find negative spillovers from FDI on domestic plants in Venezuela, these effects are only significant for firms with less than 50 employees. This suggests that smaller firms are less competitive and less capable of absorbing positive spillover effects. In contrast, other studies find that small and medium-sized firms benefit more strongly from FDI spillovers, especially those firms with a higher proportion of skilled labor (e.g. Girma and Wakelin 2007; Sinani and Meyer 2004).

Several aspects of domestic firm *location* have shown to be important for the extent of productivity spillovers from FDI. Barrios et al. (2006) find evidence that foreign firms collocating (agglomeration) in the same sector and region significantly increase productivity and employment of local manufacturing firms in Ireland. Some studies contest the positive role of agglomeration for a firm's absorptive capacity. For example, while Sjöholm (1999) confirms positive spillover effects when FDI is measured at the country-sector level in Indonesia, he finds negative spillovers when foreign presence is measured at the region-sector level. Aitken and Harrison (1999) and Yudaeva et al. (2003) find similar results for Russia.

Besides agglomerations, studies focused on other aspects of location. Firm location in special economic zones, for example, can have a negative impact on FDI spillovers if the zone focuses on export processing combined with a high percentage of imported inputs (Abraham et al. 2010). More regional development (e.g. Ponomareva 2000, Torlak 2004, Girma 2005, Girma and Wakelin 2007) and a domestic firm's geographical proximity to multinational firms (Girma and Wakelin 2007, Resmini and Nicolini 2007) seem to have a positive effect.

Exporting has been linked to a domestic firm's absorptive capacity for at least two reasons. First, local exporting firms are generally characterized by a higher productivity, be it via learning-by-exporting or self-selection into exporting, rendering them more competitive to bear up against negative rivalry effects created by multinationals (Crespo and Fontoura 2007). Second, the more a local firm exports, the lower will competitive pressures from multinational firms be felt (assuming that the multinational firm does not enter the same export market), hence, the incentive to improve, which lowers the extent of positive FDI spillovers. However, studies show no clear evidence whether exporting increases or lowers the productivity gains from FDI. While several studies find evidence for lower productivity gains for exporters (e.g. Blomström and Sjöholm 1999, Ponomareva 2000, Sinai and Meyer 2004, Abraham et al. 2010, and

Du et al. 2011). In contrast, some studies find that the gains from FDI are larger for exporting firms (e.g. Barrios and Strobl 2002, Schoors and van der Tol 2002, Lin at al. 2009, Jordaan 2011).

3. Empirical Model

3.1 Data

The World Bank Enterprise Analysis Unit recently published the Enterprise Surveys Indicator Database.[3] This publication covers 215 enterprise surveys for 126 countries over the period 2006 to 2010. Enterprise surveys represent a comprehensive source of firm-level data in emerging markets and developing economies. One major advantage of the enterprise surveys is that the survey questions are the same across all countries. Moreover, the Enterprise Surveys represent a stratified random sample of firms using three levels of stratification: sector, firm size, and region. Sectors are based on the ISIC Rev. 3.1 classification, but in some cases are further aggregated.

The Enterprise Surveys Indicator Database covers a wide range of indicators on firm characteristics, the business environment, innovation and technology, and workforce and skills among others. We merged this dataset with data on firm-level output, value added, and capital stock obtained from the Enterprise Analysis Unit of the World Bank.[4] All local currencies have been converted into US dollars and deflated using a GDP deflator in USD (base year 2000). Exchange rates and GDP deflators have been obtained from the World Development Indicators.

We apply the following rules to the dataset: (i) We include only the most recent Enterprise Surveys for each country; (ii) We include only countries that cover foreign firms in the surveys[5]; (iii) We drop high-income countries to cover only emerging or developing countries[6]; and (iv) We drop countries for which we cannot calculate our FDI spillover measure due to unavailable output and value added data. We focus only on the effects of productivity spillovers on domestic manufacturing firms, since productivity measures were unavailable for services firms.

The procedure above results in more than 25,000 domestic firms and 3,400 foreign firms in 78 countries covering eleven manufacturing sectors. The list of countries, year of most recent survey and number of domestic and foreign manufacturing firms by country can be found in Appendix 1. The coverage across manufacturing sectors is shown in Appendix 2. Note that while we drop foreign firms in the

[3] See http://www.enterprisesurveys.org/~/media/FPDKM/EnterpriseSurveys/Documents/Misc/Indicator-Descriptions.pdf for a description of the indicators. Our analysis is based on the October 2011 release of the Enterprise Surveys Indicator Database.

[4] We thank Federica Saliola and Murat Seker for making these data available to us.

[5] Only Kosovo did not fulfill this criterion.

[6] We drop these, as the database only included eleven high-income countries which were not representative of high-income countries (some OECD countries, some non-OECD countries, and one oil exporter).

regression analysis, we included foreign firms in the computation of some of the mediating factors discussed in the next section.

3.2 Measures and Econometric Model

The baseline equation, which is estimated by ordinary least squares (OLS), takes the following form:

$$\ln lp_{irst} = \alpha + \beta_1 gvc_{irst} + \beta_2 (gvc_{irst} * country_c) + \gamma_1 (gvc_{irst} * MF) + \gamma_2 (gvc_{irst} * MF * country_c) + \ldots$$

$$+ \delta \ln capint_{irst} + country_c + D_r + D_{cs} + D_t + \varepsilon_{irst} \qquad (1)$$

$\ln lp_{irst}$ indicates the labor productivity for domestic firm i in subnational region r, sector s and at time t in natural logarithms, defined as value added per worker. gvc_{irst} designates our measure of GVC integration at the firm level. In the following, we use two alternative measures of GVC integration: a firm's total export share in output, *exp*, and a firm's share of imported inputs in total inputs, *imp* (see Box 1).

Box 1: Mediating Factors, Absorptive Capacity

- ***prod*** = domestic firm's labor productivity relative to median labor productivity of multinational firms in sector in natural logarithms; a higher number indicates a lower productivity gap.
- ***tech*** = domestic firm's technology indicator. *tech* = *iso* + *tech_for* + *website* + *email* with tech ϵ {0, 1, 2, 3, 4}, where *iso* = 1 if firm owns internationally-recognized quality certification and 0 otherwise, *tech_for* = 1 if firm uses technology licensed from foreign firms and 0 otherwise, *website* = 1 if firm uses own website to communicate with clients or suppliers, *email* = 1 if firm uses email to communicate with clients or suppliers. The technology indicator serves as a proxy for R&D intensity which is unavailable;
- ***skills*** = domestic firm's share of high-skilled labor in firm's total labor force;
- ***size*** = domestic firm's total number of permanent and temporary employees in natural logarithms;
- ***aggl*** = region's total number of manufacturing and services firms as percentage of a country's total number of manufacturing and services firms. This measure is a proxy for urbanization economies (locational advantages) and covers both domestic and foreign firms;
- ***exp*** = domestic firm's share of direct or indirect exports in firm sales.
- ***imp*** = domestic firm's share of imported inputs in total inputs.

Source: Modified from Farole and Winkler (2014).

$country_c$ is a country dummy which takes the value of 1 if a country is the country of interest, and 0 otherwise. $\ln capint_{irst}$ is capital intensity in natural logarithms. We also include subnational region, country-sector and time fixed effects. Standard errors are robust to heteroscedasticity.

MF is a vector designating the mediating factor of interest in the form of a dummy variable which takes the value of 1 if the mediating factor lies within a predefined range, and 0 otherwise. The mediating factors tested are listed in Box 1 below, while the thresholds are shown in Table 1. Note that all mediating factors in a panel in Table 1 are included simultaneously into one regression in the form of multiple interaction terms, which is shown as … in equation (1) above.[7]

Table 1: Mediating Factors, Thresholds

Mediating factors	**Thresholds** **dummy = 1 if … and 0 otherwise**
prod50	50% <= *prod* < 80%
prod80	80% <= *prod* < 100%
prod100	*prod* >= 100%
tech2	2 <= *tech* < 4
tech4	*tech* = 4
skills20	20% >= *skills* < 50%
skills50	50% >= *skills* < 80%
skills80	*skills* >= 80%
size10	10 >= *size* < 50
size50	50 >= *size* < 250
size250	*size* >= 250
aggl25	25% >= *aggl* < 50%
aggl50	*aggl* >= 50%
exp50	50% >= *exp* < 80%
exp80	*exp* >= 80%
imp50	50% >= *imp* < 80%
imp80	*imp* >= 80%

The total impact of GVC integration in a country of interest on labor productivity for a specific firm characteristic (the mediating factor) is given by the sum of four coefficients: $\beta_1 + \beta_2 + \gamma_1 + \gamma_2$.

The total impact of GVC integration in countries other than the country of interest on labor productivity for the same firm characteristic is given by the sum of two coefficients: $\beta_1 + \gamma_1$.

In the following analysis, we also report the p-values of the F-tests of joint significance on labor productivity.

[7] In the case of technology, for example, we would have:
$\gamma_1(gvc_{cst}*tech_2) + \gamma_2(gvc_{cst}*tech_2*dummy_c) + \gamma_3(gvc_{cst}*tech_4) + \gamma_4(gvc_{cst}*tech_4*dummy_c)$.

4. Regression Results

4.1 Export Share

In a first step, we focus on the productivity effects of export share without taking into account the mediating factors. Table 2 reports the total coefficients for the country of interest and the rest of the sample, respectively, and are based on the individual regression results for Namibia, South Africa, and Swaziland reported in Appendices 4 to 6. The regressions only include domestic firms. We clearly find a positive association between export share and labor productivity across the sample, and also for our three countries of interest. The positive impact is highest in Namibia, slightly lower in South Africa and the rest of the country sample, but very low in Swaziland.

Table 2: Total Coefficients, Export Share, All Domestic Manufacturing Firms, OLS

	Coefficients
Average firm in Namibia	0.540***
Average firm in rest of sample	0.423***
Average firm in South Africa	0.421***
Average firm in rest of sample	0.423***
Average firm in Swaziland	0.062***
Average firm in rest of sample	0.424***

Source: Appendices 4 to 6. Note: p*<0.1, p**<0.05, p***<0.01 (p-values of F-tests of joint significance in parentheses). The total impact of firm-level export share on labor productivity in a country of interest is given by the sum of two coefficients: $\beta_1 + \beta_2$ in equation (1).

In a next step, we take into account the mediating factors (Table 3). First, we look at the role of productivity gap for the relationship between export share and productivity. Across the sample, the results suggest that export share is more likely to be associated with positive productivity effects the lower the firm's productivity gap relative to foreign firms in its sector is. In fact, across the board firms with the highest productivity gap of below 50 percent relative to foreign firms in the sector (*prod0*) all show negative productivity effects, in particular in South Africa. In Namibia, firms with a medium gap between 50 and 80 percent (*prod50*) also exhibit negative productivity effects from export share which turns strongly positive for firms with a relatively low gap between 80 and 100 percent (*prod80*). The productivity gains from exporting for firms that exceed the median productivity of foreign firms in a sector are positive, but much smaller (*prod100*). In Swaziland, we see a similar pattern, only that the positive productivity effect kicks in only for firms that exceed the median productivity of foreign firms in a sector (*prod100*). Firms with a low gap between 80 and 100 percent (*prod80*) see their initial productivity decline due to their exporting activity. In South Africa, the productivity effect from export share is positive for all firms, but decreases with a higher productivity gap. We see a similar pattern for firms in the rest of the sample.

Second, we examine the role of a firm's technology level. Across the sample we find that firms with the highest technology level (*tech4*) benefit most strongly, especially in Namibia. The differences for firms with lower technology levels, however, are ambiguous. In Namibia and Swaziland we find a U-shape effect on productivity. In Namibia, firms in the lowest category (*tech1*) show higher productivity effects from exporting than firms in the medium category, while in Swaziland such firms show lower productivity losses. In South Africa and the rest of the sample, by contrast, higher technology levels are associated with higher productivity. Nevertheless, South African firms with low technology levels (*tech1*) see their productivity initially decline.

Table 3: Total Coefficients, Export Share, All Domestic Manufacturing Firms, OLS

Mediating factors	Thresholds	Coefficients					
	dummy = 1 if … and 0 otherwise	Average firm in Namibia	Average firm in rest of sample	Average firm in South Africa	Average firm in rest of sample	Average firm in Swaziland	Average firm in rest of sample
prod0	*prod* < 50%	-0.498***	-0.718***	-2.145***	-0.707***	-0.558***	-0.718***
prod50	50% <= *prod* < 80%	-0.305***	0.279***	0.147***	0.280***	n.a.	0.278***
prod80	80% <= *prod* < 100%	51.257***	0.615***	0.556***	0.616***	-1.091***	0.616***
prod100	*prod* >= 100%	2.199***	1.618***	1.774***	1.617***	0.252***	1.623***
tech1	*tech* = 1	1.384***	0.116*	-1.009**	0.122*	-0.863***	0.116*
tech2	2 <= *tech* < 4	0.152***	0.306***	0.337***	0.306***	-1.745***	0.307***
tech4	*tech* = 4	11.542***	0.706***	1.133***	0.695***	1.203***	0.704***
skills0	*skills* < 20%	-0.343***	0.307***	1.500***	0.301***	62.962***	0.305***
skills20	20% >= *skills* < 50%	13.982***	0.366***	0.106***	0.370***	n.a.	0.366***
skills50	50% >= *skills* < 80%	5.763***	0.450***	0.812***	0.456***	0.432***	0.460***
skills80	*skills* >= 80%	2.125***	0.446***	-0.004***	0.451***	-0.070***	0.449***
size0	*size* < 10	1.873***	0.382*	-0.298	0.408*	0.793	0.397*
size10	10 >= *size* < 50	6.450***	0.401***	-0.061***	0.407***	n.a.	0.401***
size50	50 >= *size* < 250	-0.186***	0.451***	0.550***	0.449***	0.050***	0.451***
size250	*size* >= 250	n.a.	0.406***	1.344***	0.400***	-0.451***	0.408***
aggl0	*aggl* < 25%	-0.330***	0.429***	0.664***	0.426***	0.071***	0.428***
aggl25	25% >= *aggl* < 50%	n.a.	0.416***	n.a.	0.416***	n.a.	0.419***
aggl50	*aggl* >= 50%	2.277***	0.415***	0.281***	0.425***	n.a.	0.419***
imp0	*imp* < 50 %	-0.782***	0.440***	0.313***	0.442***	0.233***	0.441***
imp50	50% >= *imp* < 80%	-0.263***	0.504***	0.105***	0.505***	n.a.	0.501***
imp80	*imp* >= 80%	2.233***	0.334***	1.053***	0.331***	-0.176***	0.339***

Source: Appendices 4 to 6. Note: p*<0.1, p**<0.05, p***<0.01 (p-values of F-tests of joint significance in parentheses). The total impact of firm-level export share on labor productivity in a country of interest for a specific firm characteristic is given by the sum of four coefficients: $\beta_1 + \beta_2 + \gamma_1 + \gamma_2$ in equation (1). The total impact of firm-level export share in countries other than the country of interest on labor productivity for the same firm characteristic is given by the sum of two coefficients: $\beta_1 + \gamma_1$ in equation (2). Note that for the first category in each panel, $\gamma_1 = \gamma_2 = 0$.

Third, we look at the role of skill levels where we see different patterns. In Namibia, productivity effects from exporting are negative for firms with the lowest skills levels (*skills0*), while they are highest for skills levels between 20 and 50 percent (*skills20*) and remain positive, but become smaller for higher skill intensities. In South Africa and Swaziland, by contrast, the productivity gains are highest for firms with a share of educated in their workforce of less than 20 percent (*skills20*), while the impact for firms exceeding 80 percent (*skills80*) is slightly negative. In the rest of the sample, we only see a slight increase for firms exceeding a share of 50 percent (*skills50*) which remains constant for higher skill levels.

Fourth, we analyze the role of firm size where we also find different patterns. In Namibia and Swaziland, larger firms show a negative overall productivity effect, but the threshold is different. In Namibia, firms with more than 50 employees (*size50*) are negatively affected, while in Swaziland it is firms with more than 250 workers (*size250*). Moreover, in Namibia the smallest firms show the highest productivity gains (*size0*), whereas in Swaziland its firms with 50 to 250 employees (*size50*). In South Africa, by contrast, firm size is associated with higher productivity effects from exporting. A larger firm size exceeding 50 workers (size50) is beneficial, and the gains increase for very large firms of 250 or more employees (*size250*), while smaller firms face productivity losses (*size10*).

Fifth, we study the role of agglomerations for the export share-productivity nexus. In Namibia the effect is negative for firms in small agglomerations (*aggl0*), while the effect in other SACU countries and the rest of the sample is positive. In South Africa, firms in larger agglomerations benefit less strongly (*aggl50*), while in Namibia such firms show the largest productivity gains. In the rest of the sample, by contrast, we don't see major differences of firm location.

Finally, a firm's share of imported inputs in total inputs also mediates the productivity effects from export share. In Namibia, firms with a small (*imp0*) and medium import share (*imp50*) have negative effects, while large importers (*imp80*) show high productivity gains from exporting. In South Africa, all firms benefit, but large importers (*imp80*) more strongly, followed by small importers (*imp0*). By contrast, Swaziland's large importers (*imp80*) see their productivity decline, while small importers benefit (*imp0*).

In the rest of the country sample, by contrast, we see an inverse U-shaped effect where medium importers (*imp50*) show higher productivity gains than other firms.

4.2 Imported Input ShareIn this section, we focus on the productivity effects of imported input share. We first look at the overall effects for domestic firms without taking into account the mediating factors. Table 4 reports the total coefficients for the country of interest and the rest of the sample, respectively. The coefficients are based on the individual regression results for Namibia, South Africa, and Swaziland reported in Appendices 7 to 9. We clearly find a positive association between imported input share and labor productivity. As was the case for export share, the positive impact is highest in Namibia, slightly lower in South Africa and very low in Swaziland. The positive relationship in the rest of the country sample lies in the middle spectrum. Interestingly, the positive productivity gain in the rest of the country sample is higher for sellers (export share) than for buyers (imported input share) in GVCs. In the three SACU countries, by contrast, the productivity gains from being a buyer in GVCs are relatively and in the case of Swaziland absolutely higher. This implies that access to technology and knowledge embodied in imported inputs via GVC linkages matters more strongly in the SACU context.

We now turn to the mediating factors (Table 5). First, we focus on the role of productivity gap for the relationship between imported input share and productivity. Across the sample, the results suggest that imported input share is more strongly associated with positive productivity effects the lower the firm's productivity gap relative to foreign firms in its sector is. Firms with the highest productivity gap (*prod0*) all have negative productivity effects across the sample. Firms with the second highest productivity gap (*prod50*) in Swaziland and South Africa still see their productivity decline due to importing inputs, and the positive productivity effect kicks in only for firms that have a low productivity gap between 80 and 100 percent relative to foreign firms in a sector (*prod80*). In Namibia and the rest of the sample, the positive productivity effects already start for firms with a gap between 50 and 80 percent (*prod50*).

Table 4: Total Coefficients, Export Share, All Domestic Manufacturing Firms, OLS

	Coefficients
Average firm in Namibia	0.491***
Average firm in rest of sample	0.280***
Average firm in South Africa	0.418***
Average firm in rest of sample	0.277***
Average firm in Swaziland	0.089***
Average firm in rest of sample	0.282***

Source: Appendices 7 to 9. Note: p*<0.1, p**<0.05, p***<0.01 (p-values of F-tests of joint significance in parentheses). The total impact of firm-level export share on labor productivity in a country of interest is given by the sum of two coefficients: $\beta_1 + \beta_2$ in equation (1).

Second, we look at the role of a firm's technology level. In Namibia and the rest of the sample we find that a higher technology level is more beneficial for a firm's productivity effects due to importing inputs. In South Africa, a technology level exceeding 2 leads to positive productivity gains from importing inputs, but we see no additional gains for firms in the highest category (*tech4*). In Swaziland, we see a U-shaped effect where firms with low (*tech1*) and high technology levels (*tech4*) benefit more strongly than firms the middle. Technology particularly pays off in Swaziland and Namibia where firms in the highest technological category gain three and two times as much compared to firms in lower categories, respectively.

Third, we analyze the role of skill levels. We cannot detect a clear trend as in different SACU countries different types of firms benefit more strongly from a higher share of skilled workers. In Swaziland, for example, we see a U-shaped effect where low-skill firms (*skills0*) and high-skilled firms benefit most strongly (*skills80*), but more so the low-skilled ones. Low-to medium skilled firms (*skills20*), by contrast, see their productivity decline. In South Africa firms with the lowest skill intensity (*skills0*) benefit most strongly, followed by firms with a medium-to high skill intensity (*skills50*), while firms with a low-to medium (*skills20*) and high skill intensity *(skills80*) benefit less strongly. In Namibia, firms disposing of the largest share of skilled workers *(skills80*) have the highest productivity gains across the sample. Interestingly, firms with a low *(skills0*) and medium-to high skill level (*skills50*) gain only a fifth, while low-to medium-skilled firms (*skills20*) gain two thirds compared to high-skill-intensive firms. In the rest of the sample, by contrast, all types of firms show similar productivity gains from importing inputs, regardless of their skills levels.

Fourth, we analyze the role of firm size where Swaziland stands out. Here, we find that firm size correlates negatively with productivity effects. Firms with less than 10 employees (*size10*) benefit most strongly, followed by smaller firms with 10 to 50 employees (*size10*), while firms in larger size categories have negative productivity effects. In Namibia, South Africa and the rest of the sample, by contrast, we clearly see that larger firm size pays off in terms of productivity gains. The gains are particularly strong for Namibian firms with 50 to 250 workers (*size50*) and South African firms exceeding 250 workers (*size250*).

Table 5: Total Coefficients, Imported Input Share, All Domestic Manufacturing Firms, OLS

Mediating factors	Thresholds	Coefficients					
	dummy = 1 if … and 0 otherwise	Average firm in Namibia	Average firm in rest of sample	Average firm in South Africa	Average firm in rest of sample	Average firm in Swaziland	Average firm in rest of sample
prod0	*prod* < 50%	-0.354***	-0.890***	-0.978***	-0.881***	-1.531***	-0.881***
prod50	50% <= *prod* < 80%	0.991***	0.214***	-0.034***	0.225***	-1.369***	0.219***
prod80	80% <= *prod* < 100%	0.884***	0.563***	0.632***	0.564***	0.503***	0.566***
prod100	*prod* >= 100%	1.511***	1.539***	1.593***	1.537***	0.985***	1.540***
tech1	*tech* = 1	-0.019	-0.043	-0.019	-0.047	0.951**	-0.050
tech2	2 <= *tech* < 4	0.845***	0.318***	0.491***	0.317***	0.469***	0.322***
tech4	*tech* = 4	1.623***	0.646***	0.444***	0.670***	1.331***	0.657***
skills0	*skills* < 20%	0.191***	0.229***	0.965***	0.220***	0.655***	0.227***
skills20	20% >= *skills* < 50%	0.604***	0.301***	0.410***	0.300***	-0.096***	0.305***
skills50	50% >= *skills* < 80%	0.179***	0.287***	0.677***	0.278***	0.058***	0.287***
skills80	*skills* >= 80%	0.917***	0.269***	0.265***	0.274***	0.174***	0.275***
size0	*size* < 10	0.692	-0.015	-0.013	0.004	5.708***	0.002
size10	10 >= *size* < 50	0.174***	0.153***	0.105**	0.151***	0.212***	0.152***
size50	50 >= *size* < 250	1.120***	0.421***	0.715***	0.415***	-0.045***	0.427***
size250	*size* >= 250	n.a.	0.651***	1.138***	0.644***	-0.450***	0.654***
aggl0	*aggl* < 25%	1.247***	0.319***	0.645***	0.311***	0.236***	0.322***
aggl25	25% >= *aggl* < 50%	n.a.	0.272***	n.a.	0.272***	-0.017***	0.276***
aggl50	*aggl* >= 50%	0.389***	0.232***	0.209***	0.236***	n.a.	0.235***
exp0	*exp* < 50%	0.447***	0.270***	0.403***	0.267***	0.338***	0.272***
exp50	50% >= *exp* < 80%	1.342***	0.383***	0.159***	0.391***	-1.067***	0.399***
exp80	*exp* >= 80%	-0.402***	0.302***	0.734***	0.296***	-0.344***	0.304***

Source: Appendices 7 to 9. Note: p*<0.1, p**<0.05, p***<0.01 (p-values of F-tests of joint significance in parentheses). The total impact of firm-level imported input share on labor productivity in a country of interest for a specific firm characteristic is given by the sum of four coefficients: $\beta_1 + \beta_2 + \gamma_1 + \gamma_2$ in equation (1). The total impact of firm-level imported input share in countries other than the country of interest on labor productivity for the same firm characteristic is given by the sum of two coefficients: $\beta_1 + \gamma_1$ in equation (1). Note that for the first category in each panel, $\gamma_1 = \gamma_2 = 0$.

Fifth, we study the role of agglomerations. While the SACU countries only have firms that fall in two of three agglomeration categories, we tend to find that firms in larger agglomerations benefit less compared to firms in smaller agglomerations. In Swaziland, firms in larger agglomerations (*aggl25*) even show negative productivity effects, while firms in small agglomerations (*aggl0*) benefit from importing inputs. In Namibia and South Africa, the gains for firms in small agglomerations (*aggl0*) are almost four and three times as high, respectively, as for firms in large agglomerations (*aggl50*). By contrast, firms in small agglomerations (*aggl0*) only benefit marginally less than firms in larger agglomeration.

Finally, we find that a firm's export share also mediates the productivity effects from importing inputs. The results, however, vary strongly. We find a U-shaped effect in South Africa and Swaziland, but the coefficient signs differ. While in South Africa, all types of firms benefit, more so the ones with low (*exp0*) and high (*exp80*) export shares, in Swaziland firms with medium export shares (*exp50*) show large productivity declines which become smaller for firms with large export shares (*exp80*). Only firms with low export shares (*exp0*) experience productivity gains. In Namibia, by contrast, we see an inverse U-shaped effect. Firms with medium (*exp50*) see their productivity strongly increase due to importing inputs, while firms with low shares (*exp0*) gain less and firms with high shares even face productivity losses (*exp80*). The inverse U-shaped is also slightly pronounced in the rest of the sample where medium exporters (*exp50*) benefit marginally more from importing inputs than small (*exp0*) and large (*exp80*) exporters.

5. Conclusions

This note focused on the impact of a domestic firm's GVC integration – as proxied by export share and share of imported inputs – on labor productivity for a cross-section of more than 25,000 domestic manufacturing firms in 78 low- and middle-income countries from the World Bank's Enterprise Surveys. Using the dataset by Farole and Winkler (2014), we study the productivity effects from selling and purchasing internationally in GVCs on domestic firms in three SACU countries, but also across the broad country sample. We also take into account domestic firm heterogeneity as GVC integration affects different types of firms unequally.

We find a clear, positive association between export share and labor productivity across the sample, and also for our three SACU countries of interest. The positive impact is highest in Namibia, slightly lower in South Africa and the rest of the country sample, but very low in Swaziland. Similarly, we find a clear, positive association between imported input share and labor productivity. Again, the positive impact is highest in Namibia, slightly lower in South Africa, and very low in Swaziland. The positive relationship in the rest of the country sample lies in the middle of the spectrum. In summary, Namibian and South African firms manage to exhibit productivity gains from GVC participation both as sellers and buyers. Firms in Swaziland, by contrast, appear to face higher hurdles to turn their GVC integration into productivity gains. This may be symptomatic of the wider problems of low levels of investment and slow productivity growth in Swaziland. Another possible factor is Swaziland's almost complete reliance on South Africa, both as a source of imported inputs and as destination market. By contrast South Africa connects more to global than to regional value chains, and even Namibia has significantly greater links unto global value chains and somewhat less reliance on South Africa than does Swaziland. This could potentially impact the nature of technology and learning that may spill over from GVC integration.

Our results also support the hypothesis that firm heterogeneity matters in most cases, especially with regard to import share. In the following, we summarize the general results for the "rest of sample" firms covering 77 countries (Table 6). It is obvious that higher productivity levels (measured relative to the median of foreign firms in the sector) are related to higher productivity gains from GVC integration, and the gains pick up more quickly for firms with higher export shares and imported input shares. Similarly, higher technology levels are associated with higher productivity gains both from exporting and importing in GVCs. But while low technology levels don't increase the productivity gains from imported input share, their influence on the export share-productivity relationship is slightly positive.

On the other hand, differences in firm skills, size, and agglomerations all have a similar positive influence on the relationship between export share and productivity. By contrast, firm heterogeneity with regard to skills, size, and agglomerations matters for the productivity gains from imported input share. Firm size in particular seems to be positively related with the productivity gains from imported input share. Second, while low-skill firms show only weak positive productivity effects from imported input share, the positive effect becomes somewhat larger for firms with higher skill shares. However, differences no longer matter much once skill shares exceed 20 percent. Third, firms in large agglomerations benefit less strongly from importing inputs compared to firms in smaller agglomerations.

Finally, we examine the role of GVC integration both as a seller and buyer. Interestingly, a medium import share is more beneficial for the export share-productivity nexus than low or high import shares. This seems to suggest an inverse U-shaped impact of import share: that is, medium import shares seem to contain a higher potential for productivity effects than low or high import shares (via backward linkages, technology spillovers or skills demand, etc.). Low import shares reflect a smaller integration into GVCs and a lower productivity potential, while large import shares might indicate lacking in-house capabilities. Different extents of export share, by contrast, do not show any differential effects on the productivity gains from importing inputs.

Table 6: Summary Table, Rest of Sample Firms, Absorptive Capacity

Thresholds **dummy = 1 if … and 0 otherwise**	**Rest of sample**	
	Export share	**Imported input share**
prod < 50%	**strong negative**	**strong negative**
50% <= *prod* < 80%	medium positive	weak positive
80% <= *prod* < 100%	**strong positive**	**strong positive**
prod >= 100%	**very strong positive**	**very strong positive**
tech = 1	weak positive	not significant
2 <= *tech* < 4	medium positive	medium positive
tech = 4	**strong positive**	**strong positive**
skills < 20%	medium positive	weak positive
20% >= *skills* < 50%	medium positive	medium positive
50% >= *skills* < 80%	medium positive	medium positive
skills >= 80%	medium positive	medium positive
size < 10	medium positive	not significant
10 >= *size* < 50	medium positive	weak positive
50 >= *size* < 250	medium positive	medium positive
size >= 250	medium positive	**strong positive**
aggl < 25%	medium positive	medium positive
25% >= *aggl* < 50%	medium positive	medium positive
aggl >= 50%	medium positive	weak positive
imp < 50%	medium positive	
50% >= *imp* < 80%	**strong positive**	
imp >= 80%	medium positive	
exp < 50%		medium positive
50% >= *exp* < 80%		medium positive
exp >= 80%		medium positive

Source: Tables 3 and 5. Note: weak: 0 < |coeff.| <= 0.25; medium: 0.25 < |coeff.| <= 0.5; strong: 0.5 < |coeff.| <= 1; very strong: |coeff.| > 1.

In sum, we find that a lower productivity gap and higher technology levels clearly lead to higher productivity gains from export share and imported input share. Larger firm size also increases the productivity effects from imported input share (but not export share). The mediating effect of skills, firm size, and agglomerations is positive for export share, but firm heterogeneity doesn’t seem to matter here. Similarly, export share positively moderates the relationship between imported input share and productivity, but shows no differences across the different categories. Firms with low skill shares and that are located in large agglomerations, on the other hand, experience smaller productivity gains from imported input share than alternative types of firms.

References

Abraham, F., Konings, J., Slootmaekers, V., 2010. FDI spillovers in the Chinese manufacturing sector, Evidence of firm heterogeneity. *Econ. of Transit.* 18, 143-82.

Aitken, B., Harrison, A., 1999. Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *The Am. Econ. Rev.* 89, 605-18.

Amiti, M. and S.-J. Wei, 2006. Service Offshoring, Productivity and Employment: Evidence from the US, CEPR Discussion Paper No. 5475, February 2006.

Amiti, M. and S.-J. Wei, 2009. Service Offshoring and Productivity: Evidence from the US, The World Economy, 32, 2, 203-20.

Barrios, S., Dimelis, S., Louri, H., Strobl, E., 2004. Efficiency spillovers from foreign direct investment in the EU periphery: a comparative study of Greece, Ireland and Spain. *Rev. of World Econ.*. 140, 688-705.

Barrios, S., Strobl, E., 2002. Foreign direct investment and productivity spillovers: Evidence from the Spanish experience. *Rev. of World Econ.* 138, 459-81.

Bernard, A. and Jensen, J. (1995) Exporters, Jobs, and Wages in U.S. Manufacturing: 1976-1987. *Brookings Papers on Economic Activity: Microeconomics*, pp. 67-119.

Biesebroeck, V., 2005. Exporting Raises Productivity in Sub-Saharan African Manufacturing Firms, *Journal of International Economics*, Vol. 67, No. 2, pp. 373-391.

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J., Oduro, A., Oostendorp, R., Pattillo, C., Soderbom, M., Teal, F. and A. Zeufack, 2004. Do African Manufacturing Firms Learn from Exporting?*, Journ. of Dev. Studies*, Vol. 40, No.3, pp.115-141.

Blalock, G., Gertler, P., 2009. How firm capabilities affect who benefits from foreign technology. *J. of Dev. Econ.* 90, 192–99.

Castellani, D., Zanfei, A., 2003. Technology Gaps, Absorptive Capacity and the Impact of Inward Investments on Productivity of European Firms. *Econ. of Innov. and New Technol.* 12, 555–76.

Crespo, N., Fontoura, M., 2007. Determinant Factors of FDI Spillovers – What Do We Really Know?. *World Dev.* 35, 410-25.

Crino, R., 2008. Service Offshoring and Productivity in Western Europe, *Economics Bulletin*, 6 (2008):1-8.

Damijan, J., Knell, M., Majcen, B., Rojec, M., 2003. The role of FDI, R&D accumulation and trade in transferring technology to transition countries: evidence from firm panel data for eight transition countries. *Econ. Syst.*. 27, 2189-204.

Daveri, F. and C. Jona-Lasino, 2008. Off-shoring and Productivity Growth in the Italian Manufacturing Industries, Working Paper No.2288, CESIfo, Munich.

Du, L., Harrison, A., Jefferson, G., 2011. Do Institutions Matter For FDI Spillovers? The Implications Of China's "Special Characteristics". NBER Working Paper 16767, February 2011.

Egger, P., M. Pfaffermayr and Y. Wolfmayr-Schnitzer, 2001. The International Fragmentation of Austrian Manufacturing: The Effects of Outsourcing on Productivity and Wages, *North American Journ. of Econ. and Fin.*, 12, 257-72.

Egger, H. and P. Egger, 2006. International Outsourcing and the Productivity of Low-skilled Labour in the EU, *Econ. Inquiry*, 44, 98-108.

Farole, T. and D. Winkler, 2012. Foreign Firm Characteristics, Absorptive Capacity and the Institutional Framework: The Role of Mediating Factors for FDI Spillovers in Low- and Middle-Income Countries, World Bank Policy Research Working Paper No. 6265, November 2012.

Farole, T. and D. Winkler, 2014. The Role of Mediating Factors for FDI Spillovers in Developing Countries: Evidence from a Global Dataset, in Farole, T. and D. Winkler (eds.), *Making Foreign Direct Investment Work for Sub-Saharan Africa: Local Spillovers and Competitiveness in Global Value Chains*, Washington, DC: The World Bank, 59-86.

Findlay, R., 1978. Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology: A Simple Dynamic Model. *Q. J. of Econ.* 92, 1–16.

Girma, S., 2005. Absorptive Capacity and Productivity Spillovers from FDI: A Threshold Regression Analysis. *Oxf. Bulletin of Econ. and Stat.* 67, 281–306.

Girma, S., Görg, H., 2007. The Role of Efficiency Gap for Spillovers from FDI: Evidence from the U.K. Electronics and Engineering Sectors. *Open Econ. Rev.* 18, 215–32.

Girma, S., Wakelin, K., 2007. Local Productivity Spillovers from Foreign Direct Investment in the U.K. Electronics Industry. *Reg. Sci. and Urban Econ.* 37, 399–412.

Görg, H. and A. Hanley, 2003. International Outsourcing and Productivity: Evidence from Plant Level Data, Research Paper Series: Globalisation, Productivity and Technology, Research Paper No. 20/2003 (University of Nottingham).

Görg, H., A. Hanley, and E. Strobl, 2008. Productivity effects of international outsourcing: evidence from plant-level data', *Canadian Journ. of Econ.*, 41, 2, 670-88.Griffith, R., Redding, S., Simpson, H., 2002. Productivity Convergence and Foreign Ownership at the Establishment Level. Institute for Fiscal Studies Working Paper 22, London.

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

Grünfeld, L., 2006. Multinational Production, Absorptive Capacity, and Endogenous R&D Spillovers. *Rev. of Int. Econ.* 14, 922-40.

Helpman, E. and P. Krugman, 1985. Market Structure and Foreign Trade. Increasing Returns, Imperfect Competition, and the International Economy, Cambridge, MA: MIT Press.

Ito, K. and K. Tanaka, 2010. Does Material and Service Offshoring Improve Domestic Productivity? Evidence from Japanese Manufacturing Industries", RIETI Discussion Paper No. 10-E-010.

Jordaan, J., 2011. Local Sourcing and Technology Spillovers to Mexican Suppliers: How Important are FDI and Supplier Characteristics?. *Growth and Chang.* 42, 287-319.

Kanturia, V., 2000. Productivity spillovers from technology transfer to Indian manufacturing firms. *J. of Int. Dev.* 12, 343-69.

Kanturia, V., 2001. Foreign firms, technology transfer and knowledge spillovers to Indian manufacturing firms: a stochastic frontier analysis. *Appl. Econ.* 33, 625-42.

Kanturia, V., 2002. Liberalisation, FDI, and productivity spillovers – an analysis of Indian manufacturing firms. *Oxf. Econ. Pap.* 54, 688-718.

Karpaty, P., Lundberg, L., 2004. Foreign direct investment and productivity spillovers in Swedish manufacturing. FIEF Working Paper Series No. 194.

Keller, W., Yeaple, S., 2009. Multinational enterprises, international trade, and productivity growth: firm-level evidence from the United States. *The Rev. of Econ. and Stat.,* 91, 821-31.

Kinoshita, Y., 2001. R&D and technology spillovers through FDI: innovation and absorptive capacity. CEPR discussion paper 2775, London: Centre for Economic Policy Research.

Kokko, A., 1994. Technology, market characteristics, and spillovers. *J. of Dev. Econ.* 43, 279-93.

Kokko, A., Tansini, R., Zejan, M., 1996. Local technological capability and productivity spillovers from FDI in the Uruguayan manufacturing sector. *J. of Dev. Studies*, 32, 602-11.

Lin, P., Liub, Z., Zhanga, Y., 2009. Do Chinese domestic firms benefit from FDI inflow?: Evidence of horizontal and vertical spillovers. *China Econ. Rev.* 20, 677-91.

Lipsey, R., Sjöholm, F., 2005. "The Impact of Inward FDI on Host Countries: Why Such Different Answers?", in: Moran, T., Graham, E., Blomström, M. (Eds.), Does Foreign Direct Investment Promote Development?. Washington, D.C.: Institute for International Economics and Center for Global Development, pp.23–43.

Michel, B. and F. Rycx, 2011. Productivity Gains and Spillovers from Offshoring, CEB Working Paper No. 11/018, Centre Emile Bernheim Research Institute in Management Sciences, Solvay Brussels School, Economics & Management.

Paus, E. and K. Gallagher, 2008. Missing Links: Foreign Investment and Industrial Development in Costa Rica and Mexico, *Studies of Comparative Int. Dev.*, 43(1), 53-80.

Ponomareva, N., 2000. Are there positive or negative spillovers from foreign-owned to domestic firms?. Working paper BSP/00/042, Moscow: New Economic School.

Resmini, L., Nicolini, M., 2007. Productivity Spillovers and Multinational Enterprises: In Search of a Spatial Dimension. DYNREG Working Paper 10, Economic and Social Research Institute, Dublin.

Schoors, K., van der Tol, B., 2002. Foreign direct investment spillovers within and between sectors: evidence from Hungarian data. Working paper 2002/157, University of Gent.

Sinani, E., Meyer, K., 2004. Spillovers of technology transfer from FDI: the case of Estonia. *J. of Comp. Econ.* 32, 445-66.

Sjöholm, F., 1999. Productivity growth in Indonesia: the role of regional characteristics and direct foreign investment. *Econ. Dev. and Cult. Chang.* 47, 559-84.

Smeets, R., 2008. Collecting the pieces of the FDI knowledge spillovers puzzle. *World Bank Res. Obs.* 23, 107-38.

Songwe, V. and d. Winkler, 2012. Exports and Export Diversification in Sub-Saharan Africa: A Strategy for Post-crisis Growth, Africa Growth Initiative, Working Paper No. 3, Brookings Institution, December 2012.

Taglioni, D. and D. Winkler, 2015. *Making Global Value Chains Work for Development*, Washington, DC: The World Bank, forthcoming.

Torlak, E., 2004. Foreign direct investment, technology transfer, and productivity growth in transition countries – empirical evidence from panel data. Cege Discussion Paper 26.

Wagner, J., 2007. Exports and Productivity: A Survey of the Evidence from Firm-level Data, *World Econ.*, 30(1), 60-82.

Wang, J., Blomström, M., 1992. Foreign Investment and Technology Transfer. A Simple Model. *Eur. Econ. Rev.* 36, 137–55.

Winkler, D., 2010. Services Offshoring and Its Impact on Productivity and Employment: Evidence from Germany, 1995-2006. *World Econ.,* 33(12), 1672-1701.

Yudaeva, K., Kozlov, K., Malentieva, N., Ponomareva, N., 2003. Does foreign ownership matter? The Russian experience. *Econ. of Transit.* 11, 383-409.

Appendices

Appendix 1: Survey Year and Number of Domestic and Foreign Manufacturing Firms by Country

Country	Survey year	Dom. mfg. firms	For. mfg. firms
Albania	2007	87	23
Algeria	2007	374	10
Argentina	2010	681	111
Armenia	2009	102	12
Azerbaijan	2009	95	23
Belarus	2008	86	13
Bosnia Herzeg.	2009	113	10
Bolivia	2010	118	22
Brazil	2009	851	59
Burkina Faso	2009	81	16
Burundi	2006	110	28
Cameroon	2009	87	29
Chile	2010	673	102
Colombia	2010	641	65
Costa Rica	2010	272	53
Cote d'Ivoire	2009	144	49
Croatia	2007	364	47
Ecuador	2010	97	22
Egypt	2008	1,103	36
El Salvador	2010	104	20
Ethiopia	2006	337	22
Form. Yugoslavia	2009	98	23
Georgia	2008	109	14
Ghana	2007	271	19
Guatemala	2010	315	40
Guinea	2006	122	15
Guinea-Bissau	2006	72	9
Honduras	2010	130	18
India	2006	2,134	37
Indonesia	2009	1,067	89
Jamaica	2010	103	16
Jordan	2006	305	48
Kazakhstan	2009	169	14
Kenya	2007	331	65
Kyrgyzstan	2009	80	16
Latvia	2009	65	24
Lithuania	2009	85	19
Madagascar	2009	125	79
Malaysia	2007	773	321
Mauritania	2006	112	16
Mauritius	2009	157	18
Mexico	2010	1,046	110
Moldova	2009	86	22
Mongolia	2009	115	15
Morocco	2007	354	103
Mozambique	2007	284	56
Namibia	2006	114	37
Nepal	2009	124	4
Nicaragua	2010	115	10
Nigeria	2007	938	10
Pakistan	2007	763	20
Panama	2010	101	14
Paraguay	2010	108	17
Peru	2010	673	87
Philippines	2009	692	262
Poland	2009	137	14
Romania	2009	143	36
Russia	2009	660	39
Rwanda	2006	54	14
Senegal	2007	243	16
Serbia	2009	117	19
South Africa	2007	579	101
St. Vincent & Gr.	2010	124	24
Swaziland	2006	68	38
Tajikistan	2008	98	15
Tanzania	2006	247	39
Thailand	2006	800	230
Turkey	2008	866	29
Uganda	2006	276	58
Ukraine	2008	523	46
Uruguay	2010	327	32
Uzbekistan	2008	87	34
Venezuela	2010	71	14
Vietnam	2009	649	130
Yemen	2010	238	5
Zambia	2007	236	68
SUM		**25,199**	**3,440**

Source: Farole and Winkler (2014), p. 80.

Appendix 2: Number of Domestic and Foreign Manufacturing Firms by Sector

Sector	Domestic firms No.	Domestic firms percent	Foreign firms No.	Foreign firms percent
Manufacturing	25,199	100.0%	3,440	100.0%
Textiles	2,051	8.1%	194	5.6%
Leather	275	1.1%	42	1.2%
Garments	3,439	13.6%	373	10.8%
Food	5,098	20.2%	632	18.4%
Metals and machinery	3,878	15.4%	534	15.5%
Electronics	697	2.8%	188	5.5%
Chemicals and pharmaceuticals	1,986	7.9%	391	11.4%
Wood and furniture	715	2.8%	46	1.3%
Non-metallic and plastic materials	2,653	10.5%	446	13.0%
Auto and auto components	370	1.5%	75	2.2%
Other manufacturing	4,037	16.0%	519	15.1%

Source: Farole and Winkler (2014), p. 81.

Appendix 3: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
$\ln lp_{irst}$	18,287	8.4083	1.7609	-11.4958	20.4382
exp_{irst}	25,538	0.1193	0.2682	0.0000	1.0000
imp_{irst}	24,318	0.2485	0.3407	0.0000	1.0000
$\ln capint_{irst}$	18,807	7.7379	2.1370	-4.0956	19.7083
$prod_{isct}$	16,055	-0.6672	1.5310	-19.0525	7.4185
$tech_{irst}$	25,808	1.3888	1.1632	0.0000	4.0000
$skills_{irst}$	23,964	0.6370	0.3291	0.0000	1.0000
$size_{irst}$	25,442	3.5359	1.3454	0.0000	8.5321
$agglr_{ct}$	25,808	0.3090	0.2566	0.0017	1.0000

Source: Farole and Winkler (2014), pp. 81-82.

Appendix 4: Namibia Absorptive Capacity, Export Share, All Domestic Manufacturing Firms, OLS

Dependent var.: $\ln lp_{irst}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exp_{irst}	0.4231***	-0.7175***	0.1155*	0.3066***	0.3815*	0.4292***	0.4403***
	(0.000)	(0.000)	(0.083)	(0.000)	(0.089)	(0.000)	(0.000)
$exp_{irst}*nam$	0.1172	0.2197	1.2686***	-0.6499	1.4911***	-0.7490*	-1.2227
	(0.858)	(0.905)	(0.000)	(0.131)	(0.000)	(0.080)	(0.402)
$exp_{irst}*prod50_{irst}$		0.9968***					
		(0.000)					
$exp_{irst}*prod50_{irst}*nam_c$		-0.8044					
		(0.682)					
$exp_{irst}*prod80_{irst}$		1.3326***					
		(0.000)					
$exp_{irst}*prod80_{irst}*nam_c$		50.4221***					
		(0.000)					
$exp_{irst}*prod100_{irst}$		2.3352***					
		(0.000)					
$exp_{irst}*prod100_{irst}*nam_c$		0.3613					
		(0.830)					
$exp_{irst}*tech2_{irst}$			0.1905***				
			(0.007)				
$exp_{irst}*tech2_{irst}*nam_c$			-1.4223**				
			(0.030)				
$exp_{irst}*tech4_{irst}$			0.5906***				
			(0.000)				
$exp_{irst}*tech4_{irst}*nam_c$			9.5670***				
			(0.000)				
$exp_{irst}*skills20_{irst}$				0.0591			
				(0.560)			
$exp_{irst}*skills20_{irst}*nam_c$				14.2664***			
				(0.000)			
$exp_{irst}*skills50_{irst}$				0.1531			
				(0.103)			
$exp_{irst}*skills50_{irst}*nam_c$				5.9534			
				(0.150)			
$exp_{irst}*skills80_{irst}$				0.1389			
				(0.129)			
$exp_{irst}*skills80_{irst}*nam_c$				2.3294***			
				(0.000)			
$exp_{irst}*size10_{irst}$					0.0194		
					(0.933)		
$exp_{irst}*size10_{irst}*nam_c$					4.5575		
					(0.496)		
$exp_{irst}*size50_{irst}$					0.0693		
					(0.761)		
$exp_{irst}*size50_{irst}*nam_c$					-2.1278***		
					(0.001)		
$exp_{irst}*size250_{irst}$					0.0243		
					(0.917)		
$exp_{irst}*size250_{irst}*nam_c$					0.0000		
					(.)		
$exp_{irst}*aggl25_{rct}$						-0.0129	
						(0.888)	
$exp_{irst}*aggl25_{rct}*nam_c$						0.0000	
						(.)	
$exp_{irst}*aggl50_{rct}$						-0.0146	
						(0.881)	
$exp_{irst}*aggl50_{rct}*nam_c$						2.6112***	
						(0.001)	
$exp_{irst}*imp50_{rct}$							0.0641
							(0.528)
$exp_{irst}*imp50_{rct}*nam_c$							0.4550
							(0.784)
$exp_{irst}*imp80_{rct}$							-0.1062
							(0.200)
$exp_{irst}*imp80_{rct}*nam_c$							3.1215**
							(0.017)
$lncapint_{irst}$	0.2683***	0.2490***	0.2738***	0.2665***	0.2684***	0.2683***	0.2677***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nam_c	5.3049***	4.9330***	5.5607***	4.0337***	5.3916***	5.4062***	3.4878
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(.)
$constant_t$	3.0540***	2.0232***	1.6068***	3.1897***	3.0528***	3.0543***	4.2141
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(.)
Observations	15,878	14,192	10,919	15,698	15,878	15,878	15,791
R-squared	0.64	0.67	0.55	0.64	0.64	0.64	0.64

Source: Modified from Farole and Winkler (2012). Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region, and year fixed effects.

Appendix 5: South Africa Absorptive Capacity, Export Share, All Domestic Manufacturing Firms, OLS

Dependent var.: $lnlp_{irst}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exp_{irst}	0.4233***	-0.7072***	0.1220*	0.3014***	0.4079*	0.4261***	0.4416***
	(0.000)	(0.000)	(0.068)	(0.000)	(0.070)	(0.000)	(0.000)
$exp_{irst}*zaf$	-0.0028	-1.4380**	-1.1305**	1.1987*	-0.7057	0.2376	-0.1286
	(0.992)	(0.024)	(0.021)	(0.061)	(0.348)	(0.623)	(0.712)
$exp_{irst}*prod50_{irst}$		0.9867***					
		(0.000)					
$exp_{irst}*prod50_{irst}*zaf_c$		1.3051**					
		(0.041)					
$exp_{irst}*prod80_{irst}$		1.3232***					
		(0.000)					
$exp_{irst}*prod80_{irst}*zaf_c$		1.3780*					
		(0.052)					
$exp_{irst}*prod100_{irst}$		2.3240***					
		(0.000)					
$exp_{irst}*prod100_{irst}*zaf_c$		1.5950**					
		(0.028)					
$exp_{irst}*tech2_{irst}$			0.1839***				
			(0.009)				
$exp_{irst}*tech2_{irst}*zaf_c$			1.1620**				
			(0.037)				
$exp_{irst}*tech4_{irst}$			0.5729***				
			(0.001)				
$exp_{irst}*tech4_{irst}*zaf_c$			1.5689				
			(0.124)				
$exp_{irst}*skills20_{irst}$				0.0684			
				(0.502)			
$exp_{irst}*skills20_{irst}*zaf_c$				-1.4621**			
				(0.048)			
$exp_{irst}*skills50_{irst}$				0.1546			
				(0.101)			
$exp_{irst}*skills50_{irst}*zaf_c$				-0.8424			
				(0.254)			
$exp_{irst}*skills80_{irst}$				0.1491			
				(0.104)			
$exp_{irst}*skills80_{irst}*zaf_c$				-1.6537**			
				(0.042)			
$exp_{irst}*size10_{irst}$					-0.0012		
					(0.996)		
$exp_{irst}*size10_{irst}*zaf_c$					0.2381		
					(0.780)		
$exp_{irst}*size50_{irst}$					0.0410		
					(0.858)		
$exp_{irst}*size50_{irst}*zaf_c$					0.8068		
					(0.328)		
$exp_{irst}*size250_{irst}$					-0.0075		
					(0.974)		
$exp_{irst}*size250_{irst}*zaf_c$					1.6493*		
					(0.061)		
$exp_{irst}*aggl25_{rct}$						-0.0099	
						(0.914)	
$exp_{irst}*aggl25_{rct}*zaf_c$						0.0000	
						(.)	
$exp_{irst}*aggl50_{rct}$						-0.0014	
						(0.989)	
$exp_{irst}*aggl50_{rct}*zaf_c$						-0.3813	
						(0.503)	
$exp_{irst}*imp50_{rct}$							0.0631
							(0.536)
$exp_{irst}*imp50_{rct}*zaf_c$							-0.2714
							(0.587)
$exp_{irst}*imp80_{rct}$							-0.1109
							(0.184)
$exp_{irst}*imp80_{rct}*zaf_c$							0.8508
							(0.184)
$lncapint_{irst}$	0.2683***	0.2487***	0.2740***	0.2663***	0.2683***	0.2684***	0.2678***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
zaf_c	-1.8395***	2.0355**	0.7822***	1.0890	-1.8291***	-1.8491***	-0.0074
	(0.000)	(0.042)	(0.007)	(0.408)	(0.000)	(0.000)	(0.988)
$constant_t$	3.0539***	2.0252***	1.6044***	3.1918***	3.0545***	3.0536***	4.2317
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(.)
Observations	15,878	14,192	10,919	15,698	15,878	15,878	15,791
R-squared	0.64	0.67	0.55	0.64	0.64	0.64	0.64

Source: Modified from Farole and Winkler (2012). Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region, and year fixed effects.

Appendix 6: Swaziland Absorptive Capacity, Export Share, All Domestic Manufacturing Firms, OLS

Dependent var.: $\ln lp_{irst}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exp_{irst}	0.4238***	-0.7178***	0.1157*	0.3048***	0.3965*	0.4280***	0.4406***
	(0.000)	(0.000)	(0.082)	(0.000)	(0.075)	(0.000)	(0.000)
exp_{irst}*swz	-0.3621	0.1598	-0.9790***	62.6577***	0.3965	-0.3567	-0.2072
	(0.554)	(0.706)	(0.003)	(0.009)	(0.369)	(0.562)	(0.784)
exp_{irst}*$prod50_{irst}$		0.9958***					
		(0.000)					
exp_{irst}*$prod50_{irst}$*swz_c		0.0000					
		(.)					
exp_{irst}*$prod80_{irst}$		1.3340***					
		(0.000)					
exp_{irst}*$prod80_{irst}$*swz_c		-1.8672*					
		(0.062)					
exp_{irst}*$prod100_{irst}$		2.3407***					
		(0.000)					
exp_{irst}*$prod100_{irst}$*swz_c		-1.5312***					
		(0.000)					
exp_{irst}*$tech2_{irst}$			0.1913***				
			(0.007)				
exp_{irst}*$tech2_{irst}$*swz_c			-1.0775***				
			(0.000)				
exp_{irst}*$tech4_{irst}$			0.5881***				
			(0.000)				
exp_{irst}*$tech4_{irst}$*swz_c			1.4783***				
			(0.004)				
exp_{irst}*$skills20_{irst}$				0.0612			
				(0.545)			
exp_{irst}*$skills20_{irst}$*swz_c				0.0000			
				(.)			
exp_{irst}*$skills50_{irst}$				0.1554*			
				(0.098)			
exp_{irst}*$skills50_{irst}$*swz_c				-62.6862***			
				(0.008)			
exp_{irst}*$skills80_{irst}$				0.1438			
				(0.115)			
exp_{irst}*$skills80_{irst}$*swz_c				-63.1761***			
				(0.008)			
exp_{irst}*$size10_{irst}$					0.0042		
					(0.985)		
exp_{irst}*$size10_{irst}$*swz_c					0.0000		
					(.)		
exp_{irst}*$size50_{irst}$					0.0545		
					(0.810)		
exp_{irst}*$size50_{irst}$*swz_c					-0.7980		
					(0.102)		
exp_{irst}*$size250_{irst}$					0.0110		
					(0.962)		
exp_{irst}*$size250_{irst}$*swz_c					-1.2546**		
					(0.033)		
exp_{irst}*$aggl25_{rct}$						-0.0095	
						(0.918)	
exp_{irst}*$aggl25_{rct}$*swz_c						0.0000	
						(.)	
exp_{irst}*$aggl50_{rct}$						-0.0091	
						(0.926)	
exp_{irst}*$aggl50_{rct}$*swz_c						0.0000	
						(.)	
exp_{irst}*$imp50_{rct}$							0.0606
							(0.549)
exp_{irst}*$imp50_{rct}$*swz_c							0.0000
							(.)
exp_{irst}*$imp80_{rct}$							-0.1018
							(0.221)
exp_{irst}*$imp80_{rct}$*swz_c							-0.3080
							(0.725)
$\ln capint_{irst}$	0.2684***	0.2491***	0.2738***	0.2666***	0.2685***	0.2684***	0.2678***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
swz_c	3.6926***	3.9846***	3.7657***	3.2918***	3.5925***	3.6926***	1.3810
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(1.000)
$constant_t$	3.0535***	2.0217***	1.6076***	3.1882***	3.0523***	3.0535***	4.2248
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.999)
Observations	15,878	14,192	10,919	15,698	15,878	15,878	15,791
R-squared	0.64	0.67	0.55	0.64	0.64	0.64	0.64

Source: Modified from Farole and Winkler (2012). Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses).
All regressions include country-sector, subnational region, and year fixed effects.

Appendix 7: Namibia Absorptive Capacity, Imported Input Share, All Domestic Manufacturing Firms, OLS

Dependent var.: $\ln lp_{irst}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
imp_{irst}	0.2797***	-0.8899***	-0.0433	0.2288***	-0.0152	0.3191***	0.2700***
	(0.000)	(0.000)	(0.410)	(0.001)	(0.797)	(0.000)	(0.000)
$imp_{irst}*nam$	0.2116	0.5357**	0.0243	-0.0379	0.7076*	0.9277	0.1765
	(0.417)	(0.034)	(0.945)	(0.899)	(0.053)	(0.149)	(0.507)
$imp_{irst}*prod50_{irst}$		1.1040***					
		(0.000)					
$imp_{irst}*prod50_{irst}*nam_c$		0.2410					
		(0.264)					
$imp_{irst}*prod80_{irst}$		1.4529***					
		(0.000)					
$imp_{irst}*prod80_{irst}*nam_c$		-0.2151					
		(0.367)					
$imp_{irst}*prod100_{irst}$		2.4292***					
		(0.000)					
$imp_{irst}*prod100_{irst}*nam_c$		-0.5641**					
		(0.025)					
$imp_{irst}*tech2_{irst}$			0.3613***				
			(0.000)				
$imp_{irst}*tech2_{irst}*nam_c$			0.5028*				
			(0.071)				
$imp_{irst}*tech4_{irst}$			0.6897***				
			(0.000)				
$imp_{irst}*tech4_{irst}*nam_c$			0.9519***				
			(0.008)				
$imp_{irst}*skills20_{irst}$				0.0719			
				(0.422)			
$imp_{irst}*skills20_{irst}*nam_c$				0.3411			
				(0.428)			
$imp_{irst}*skills50_{irst}$				0.0586			
				(0.452)			
$imp_{irst}*skills50_{irst}*nam_c$				-0.0702			
				(0.870)			
$imp_{irst}*skills80_{irst}$				0.0399			
				(0.598)			
$imp_{irst}*skills80_{irst}*nam_c$				0.6864			
				(0.106)			
$imp_{irst}*size10_{irst}$					0.1682**		
					(0.013)		
$imp_{irst}*size10_{irst}*nam_c$					-0.6867*		
					(0.054)		
$imp_{irst}*size50_{irst}$					0.4366***		
					(0.000)		
$imp_{irst}*size50_{irst}*nam_c$					-0.0086		
					(0.989)		
$imp_{irst}*size250_{irst}$					0.6657***		
					(0.000)		
$imp_{irst}*size250_{irst}*nam_c$					0.0000		
					(.)		
$imp_{irst}*aggl25_{rct}$						-0.0469	
						(0.605)	
$imp_{irst}*aggl25_{rct}*nam_c$						0.0000	
						(.)	
$imp_{irst}*aggl50_{rct}$						-0.0873	
						(0.254)	
$imp_{irst}*aggl50_{rct}*nam_c$						-0.7706	
						(0.274)	
$imp_{irst}*exp50_{rct}$							0.1134
							(0.296)
$imp_{irst}*exp50_{rct}*nam_c$							0.7824***
							(0.000)
$imp_{irst}*exp80_{rct}$							0.0321
							(0.685)
$imp_{irst}*exp80_{rct}*nam_c$							-0.8805
							(0.302)
$\ln capint_{irst}$	0.2647***	0.2263***	0.2675***	0.2630***	0.2631***	0.2647***	0.2656***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nam_c	4.4645***	-1.2710	0.7880**	-0.3267	3.9507***	4.8998***	3.0990
	(0.000)	(0.128)	(0.029)	(0.727)	(0.000)	(0.000)	(0.999)
$constant_t$	2.8885***	7.8776***	6.7775***	7.4195***	3.1341***	2.8934***	4.2836
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.999)
Observations	15,845	14,164	10,900	15,669	15,845	15,845	15,791
R-squared	0.64	0.69	0.55	0.64	0.64	0.64	0.64

Source: Modified from Farole and Winkler (2012). Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses).
All regressions include country-sector, subnational region, and year fixed effects.

Appendix 8: South Africa Absorptive Capacity, Imported Input Share, All Domestic Manufacturing Firms, OLS

Dependent var.: lnlp_{irst}	(1)	(2)	(3)	(4)	(5)	(6)	(7)
imp_{irst}	0.2774***	-0.8807***	-0.0473	0.2199***	0.0035	0.3114***	0.2673***
	(0.000)	(0.000)	(0.371)	(0.002)	(0.953)	(0.000)	(0.000)
imp_{irst}*zaf	0.1409	-0.0974	0.0279	0.7450	-0.0160	0.3340	0.1359
	(0.403)	(0.622)	(0.906)	(0.123)	(0.949)	(0.138)	(0.440)
imp_{irst}*$prod50_{irst}$		1.1059***					
		(0.000)					
imp_{irst}*$prod50_{irst}$*zaf_c		-0.1615					
		(0.472)					
imp_{irst}*$prod80_{irst}$		1.4451***					
		(0.000)					
imp_{irst}*$prod80_{irst}$*zaf_c		0.1647					
		(0.668)					
imp_{irst}*$prod100_{irst}$		2.4172***					
		(0.000)					
imp_{irst}*$prod100_{irst}$*zaf_c		0.1538					
		(0.559)					
imp_{irst}*$tech2_{irst}$			0.3644***				
			(0.000)				
imp_{irst}*$tech2_{irst}$*zaf_c			0.1464				
			(0.604)				
imp_{irst}*$tech4_{irst}$			0.7176***				
			(0.000)				
imp_{irst}*$tech4_{irst}$*zaf_c			-0.2544				
			(0.637)				
imp_{irst}*$skills20_{irst}$				0.0802			
				(0.369)			
imp_{irst}*$skills20_{irst}$*zaf_c				-0.6349			
				(0.242)			
imp_{irst}*$skills50_{irst}$				0.0581			
				(0.453)			
imp_{irst}*$skills50_{irst}$*zaf_c				-0.3462			
				(0.561)			
imp_{irst}*$skills80_{irst}$				0.0536			
				(0.477)			
imp_{irst}*$skills80_{irst}$*zaf_c				-0.7535			
				(0.130)			
imp_{irst}*$size10_{irst}$					0.1479**		
					(0.029)		
imp_{irst}*$size10_{irst}$*zaf_c					-0.0304		
					(0.922)		
imp_{irst}*$size50_{irst}$					0.4115***		
					(0.000)		
imp_{irst}*$size50_{irst}$*zaf_c					0.3158		
					(0.366)		
imp_{irst}*$size250_{irst}$					0.6408***		
					(0.000)		
imp_{irst}*$size250_{irst}$*zaf_c					0.5101		
					(0.208)		
imp_{irst}*$aggl25_{rct}$						-0.0394	
						(0.666)	
imp_{irst}*$aggl25_{rct}$*zaf_c						0.0000	
						(.)	
imp_{irst}*$aggl50_{rct}$						-0.0753	
						(0.332)	
imp_{irst}*$aggl50_{rct}$*zaf_c						-0.3614	
						(0.276)	
imp_{irst}*$exp50_{rct}$							0.1235
							(0.254)
imp_{irst}*$exp50_{rct}$*zaf_c							-0.3675
							(0.146)
imp_{irst}*$exp80_{rct}$							0.0290
							(0.717)
imp_{irst}*$exp80_{rct}$*zaf_c							0.3018
							(0.325)
ln$capint_{irst}$	0.2647***	0.2263***	0.2675***	0.2629***	0.2632***	0.2647***	0.2657***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
zaf_c	-1.7731***	1.6574	1.0761**	-0.0277	-1.6964***	-1.8396***	-0.1680
	(0.000)	(0.284)	(0.015)	(0.957)	(0.000)	(0.000)	(0.749)
$constant_t$	2.8897***	7.8718***	6.7754***	7.4182***	3.1323***	2.8940***	4.2970
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(.)
Observations	15,845	14,164	10,900	15,669	15,845	15,845	15,791
R-squared	0.64	0.69	0.55	0.64	0.64	0.64	0.64

Source: Modified from Farole and Winkler (2012). Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses).
All regressions include country-sector, subnational region, and year fixed effects.

Appendix 9: Swaziland Absorptive Capacity, Imported Input Share, All Domestic Manufacturing Firms, OLS

Dependent var.: lnlp_{irst}	(1)	(2)	(3)	(4)	(5)	(6)	(7)
imp_{irst}	0.2823***	-0.8812***	-0.0497	0.2267***	0.0022	0.3216***	0.2721***
	(0.000)	(0.000)	(0.340)	(0.001)	(0.970)	(0.000)	(0.000)
$imp_{irst}*swz$	-0.1930	-0.6498*	1.0011**	0.4284	5.7060***	-0.0860	0.0658
	(0.532)	(0.094)	(0.014)	(0.751)	(0.000)	(0.852)	(0.857)
$imp_{irst}*prod50_{irst}$		1.1006***					
		(0.000)					
$imp_{irst}*prod50_{irst}*swz_c$		-0.9390					
		(0.223)					
$imp_{irst}*prod80_{irst}$		1.4467***					
		(0.000)					
$imp_{irst}*prod80_{irst}*swz_c$		0.5873					
		(0.164)					
$imp_{irst}*prod100_{irst}$		2.4209***					
		(0.000)					
$imp_{irst}*prod100_{irst}*swz_c$		0.0951					
		(0.851)					
$imp_{irst}*tech2_{irst}$			0.3718***				
			(0.000)				
$imp_{irst}*tech2_{irst}*swz_c$			-0.8547***				
			(0.000)				
$imp_{irst}*tech4_{irst}$			0.7069***				
			(0.000)				
$imp_{irst}*tech4_{irst}*swz_c$			-0.3276				
			(0.568)				
$imp_{irst}*skills20_{irst}$				0.0785			
				(0.375)			
$imp_{irst}*skills20_{irst}*swz_c$				-0.8293			
				(0.579)			
$imp_{irst}*skills50_{irst}$				0.0604			
				(0.434)			
$imp_{irst}*skills50_{irst}*swz_c$				-0.6574			
				(0.605)			
$imp_{irst}*skills80_{irst}$				0.0480			
				(0.521)			
$imp_{irst}*skills80_{irst}*swz_c$				-0.5291			
				(0.692)			
$imp_{irst}*size10_{irst}$					0.1496**		
					(0.024)		
$imp_{irst}*size10_{irst}*swz_c$					-5.6457***		
					(0.000)		
$imp_{irst}*size50_{irst}$					0.4244***		
					(0.000)		
$imp_{irst}*size50_{irst}*swz_c$					-6.1779***		
					(0.000)		
$imp_{irst}*size250_{irst}$					0.6521***		
					(0.000)		
$imp_{irst}*size250_{irst}*swz_c$					-6.8102***		
					(0.000)		
$imp_{irst}*aggl25_{rct}$						-0.0457	
						(0.618)	
$imp_{irst}*aggl25_{rct}*swz_c$						-0.2073	
						(0.737)	
$imp_{irst}*aggl50_{rct}$						-0.0864	
						(0.254)	
$imp_{irst}*aggl50_{rct}*swz_c$						0.0000	
						(.)	
$imp_{irst}*exp50_{rct}$							0.1266
							(0.242)
$imp_{irst}*exp50_{rct}*swz_c$							-1.5314*
							(0.050)
$imp_{irst}*exp80_{rct}$							0.0317
							(0.690)
$imp_{irst}*exp80_{rct}*swz_c$							-0.7134
							(0.322)
ln$capint_{irst}$	0.2647***	0.2264***	0.2674***	0.2630***	0.2631***	0.2647***	0.2656***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
swz_c	4.2491***	0.2635	0.1451	2.4131**	0.3484	4.2221***	2.7575
	(0.000)	(0.704)	(0.266)	(0.013)	(.)	(0.000)	(.)
$constant_t$	2.8863***	6.6159***	6.7714***	4.8742***	6.8081	2.8908***	4.2881
	(0.000)	(0.000)	(0.000)	(0.000)	(.)	(0.000)	(.)
Observations	15,845	14,164	10,900	15,669	15,845	15,845	15,791
R-squared	0.64	0.69	0.55	0.64	0.64	0.64	0.64

Source: Modified from Farole and Winkler (2012). Note: p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). All regressions include country-sector, subnational region, and year fixed effects.