International Labour Office

RESEARCH DEPARTMENT WORKING PAPER NO. 26

Exporting, importing and wages in Africa: Evidence from matched employer-employee data

MARTA DUDA-NYCZAK
AND CHRISTIAN VIEGELAHN

MARCH 2018

Research Department Working Paper No. 26

Exporting, importing and wages in Africa: Evidence from matched employer-employee data*

Marta Duda-Nyczak† and Christian Viegelahn‡

March 2018
International Labour Office

* All views expressed in this paper are those of the authors and do not reflect those of the institutions they are affiliated with.

† United Nations Economic Commission for Africa (UNECA). Email: mdudanyczak@uneca.org.
‡ Research Department, International Labour Organization (ILO). Email: viegelahn@ilo.org.

Table of contents

Acknowledgements

This paper is forthcoming as a chapter in a volume on *Trade and Poverty* published by the World Bank and the World Trade Organization. All views expressed in this paper are those of the authors and do not reflect those of the institutions they are affiliated with. The authors would like to thank colleagues from the International Labour Organization, the African Development Bank, the World Bank and the World Trade Organization for their comments on earlier versions of this paper. In particular, we would like to thank Paul Brenton, Michela Esposito, Marcus Bartley Johns, Linguère Mously Mbaye, Mustapha Sadni Jallab, Roberta Piermartini, Robert Teh and Anne Vorce. The authors would also like to thankfully acknowledge comments from participants of the African Economic Conference in Addis Abeba in December 2017.

Abstract

This paper studies wages in exporting and importing firms of the manufacturing sector in Africa, using firm-level data and employer-employee-level data from the World Bank Enterprise Surveys. We find that exporters pay on average higher wages to their workers than non-exporters. It is gains from economies of scale that explain the positive wage premium of exporters, rather than differences in skill utilization, the employment of certain types of workers, or technology transfers. In contrast, there is no evidence for a positive firm-level wage premium of importing, at least after controlling for firm age, and the wage premium of importing at the employee-level is estimated to be negative. The paper also finds indirect evidence for a weaker bargaining power of workers employed by importers. These results fit into the African context, where the comparative advantage of firms in export markets is mainly based on low costs than on quality, and where firms import predominantly out of necessity than out of choice. Finally, the paper provides evidence that a gender wage gap is absent within trading firms, while we find evidence for a gender wage gap in non-trading firms.

Keywords: Africa, employer-employee data, employment, exporters, firm level data, gender wage gap, importers, labour market, wages

JEL classification: F14, F15, F16

1 Introduction

The economic and social development of the African continent has been on the agenda of policy makers and the international community for decades. With over a billion inhabitants and the fastest growing population worldwide, the African market presents an enormous potential. Despite remarkable economic growth rates, however, many countries on the continent struggle to translate this potential into significant improvements in socio-economic indicators. International trade is considered by many as one of the main contributors to reductions in poverty and the improvement of livelihoods (Dollar and Kraay, 2004; Le Goff and Singh, 2014). This stance has been adopted in global policy making, with trade forming an integral part of the 2030 Sustainable Development Agenda of the United Nations. The Sustainable Development Goals (SDG) include the objective to double the share of least developed countries' (LDC) exports in global exports by 2020. Thirty-four of the 48 LDCs are located on the African continent, implying that this endeavor is particularly relevant for Africa.

Not only globally but also in Africa itself, international trade is by a large number of policy makers viewed as a potential driver of sustainable economic and social development. This has found expression in the rapid shift towards a more integrated African market in recent years. Especially within some of the Regional Economic Communities (REC), trade has been liberalized continuously, promoting free trade. Current trade policy focuses on connecting some of the already existing free trade areas with the objective to create an even larger internal market, with the ultimate objective of a customs union that integrates all countries in Africa. Policy makers are taking steps in this direction. Negotiations for the Tripartite Free Trade Area, a free trade agreement between the Common Market for Eastern and Southern Africa, the East African Community and the Southern Africa Development Community, consisting of 27 countries, were concluded in 2015. Also the negotiations for the Continental Free Trade Area are expected to conclude in 2017, integrating the trade in goods and services between 54 member states of the African Union.

These developments are likely to increase the number of African firms that are able to engage in trade. The question arises whether this opening up to trade can benefit workers in terms of higher wages. Wages are an important form of labour income in many countries. The share of workers in wage and salaried employment has been growing rapidly, even in Africa where informal employment arrangements still tend to dominate. According to ILO estimates (ILO, 2018), almost one third of all workers in Africa were wage earners in 2017, many of them employed by the private sector. The wage level determines these workers' standard of living, and low wage levels are often directly related to the prevalence of poverty. Indeed, labour income in Africa is often not sufficient to lift workers above poverty levels, and about 56% of all African workers lived in either moderate or extreme poverty, on less than 3.10$ PPP a day, in 2017.

This paper uses a novel dataset that includes firm-level and employee-level data to explore the relationship between exporting, importing and wages in African manufacturing firms. This dataset forms part of the World Bank Enterprise Survey and comprises 65 firm-level surveys conducted in 47 African countries over 2006-2014, with information on firms' export and import status, as well as information on the average wage. For 16 of these firm-level surveys, matched employee data with information on individual worker wages are available to complement the firm-level analysis. These data are comparable across all countries included and enable us to control for individual worker characteristics, which is unique for Africa. The data also facilitates analysis of the relationship between firms' export and import status, and wages, by sector and by country.

There is a large body of literature that has looked at the relationship between trade at the firm level and average wages that firms pay to their workers, with studies largely confirming a wage premium of firms engaged in trade. For manufacturing firms in the United States, it has been documented that both importers and exporters pay higher wages on average than non-traders (Bernard et al., 2007, 2012). Based on employer-employee level data for Germany and Italy, it has been found that exporters pay higher wages than non-exporters, after controlling for various firm and worker characteristics (Schank et al., 2007; Macis and Schivardi, 2016). There is also evidence of a positive wage premium of exporting for China, driven by different firm characteristics such as ownership, export orientation and location (Fu and Wu, 2013). Also for Mexico, exporting has been found to increase wages, especially at the upper end of the wage distribution (Frías et al., 2012). Firm-level evidence from Indonesia suggests that increased access to foreign inputs through trade liberalization has led to higher wages, while the impact of a decline in output tariffs is less pronounced (Amiti and Davis, 2011).

There are various channels through which firms' export and import status can affect wages at the firm-level. For a firm to participate in international trade, it is important to have a high-skilled workforce, which in the presence of a skill premium on wages then leads to a higher average firm-level wage. The trading activity of a firm can also give rise to technology upgrading, induced by technology transfers from the trading partner, which may increase workers' productivity and can therefore lead to higher wages. Moreover, the extension of a firm's business to export markets increases the scale of a firm, allowing it to benefit from economies of scale, and some of these benefits may be passed on to workers in terms of higher wages. Assuming a certain degree of rent sharing between firms and workers, any standard bargaining model would predict that the gains in productivity that are reaped by the firm would at least partially passed on to workers in terms of higher wages, depending on workers' bargaining power.

The wages that firms are able to pay are strongly related to firm performance. Both exporting and importing involves fixed costs that only the most productive firms can afford to pay, which implies that only firms whose productivity exceeds a certain threshold engage in trade (Melitz, 2003; Kasahara and Lapham, 2013). At the same time, firms can learn by exporting, as they have to satisfy the needs of foreign customers which may be more demanding in terms of product quality, and also face competition from foreign producers, which may force them to become more productive (De Loecker, 2013). But it is also likely that firms can derive productivity gains from importing once they have started to import, for example through learning from new technologies embedded in foreign inputs, access to a better quality of inputs, or access to a larger variety of inputs (Ethier, 1982; Markusen, 1989; Grossman and Helpman, 1991). The empirical literature confirms such a positive impact of increased access to foreign inputs on firm productivity (Amiti and Konings, 2007; Stone and Shepherd, 2011; Halpern et al., 2015), while restricted access to foreign inputs in turn can lead to within-firm input reallocation with a negative impact on firm performance (Vandenbussche and Viegelahn, 2016).

There is a vast body of literature that confirms that wages that women receive are on average lower than those of men (Blau and Kahn, 2017). The question arises whether the wage premium of exporting and importing for women differs from the corresponding premium for men. Empirical evidence has so far been mixed. Using employer-employee-level data from Norway, the gender wage gap has been found to be larger within exporting firms than within non-exporting firms, provided that women are perceived by employers to be less committed workers than men (Boler et al., 2015). Policy measures that decrease these perceived gender differences in commitment are found to narrow differences in the gender wage gap. Other studies in contrast find evidence for a lower gender wage gap in exporting firms and higher wages for women in exporting firms World Bank (2012).

The number of studies that look into the firm-level consequences of trade in the African context is limited, given the scarcity of firm-level databases from this region. Milner and Tandrayen (2007) investigate the

relationship between exporting and wages, using employer-employee matched data for manufacturing firms in six countries in Sub-Saharan Africa. They find a positive overall association between individual earnings and the export status of the firm. Yet, they find that the wage premium is positive only when firms export to African markets, and it turns negative when exporting to more competitive markets. In a study with larger country coverage, exporting is found to have positive spinoffs on employment and wages across a wide range of developing countries, including countries on the African continent (Brambilla et al., 2017). There are to our knowledge no studies in the African context that focus on importing and its impact on the labour market.

Other studies focus on the relationship between exporting and productivity. Based on firm-level data from Cameroon, Ghana, Kenya and Zimbabwe, there is evidence for both firm self-selection into exporting and learning-by-exporting (Bigsten et al., 2004). A causal relationship between exporting and productivity has also been found on the basis of firm-level data for Ethiopian manufacturing firms, with strong evidence in favour of both the self-selection and learning-by-exporting hypotheses, demonstrating that exporters pay higher average wages and employ more workers than non-exporters (Bigsten and Gebreeyesus, 2009). Mengistae and Pattillo (2004) show an average total factor productivity premium and a premium in productivity growth for exporting manufacturers in Ethiopia, Ghana and Kenya. Some evidence also has recently been provided on the impact of increased access to foreign inputs. Bigsten et al. (2016) analyze firm-level data for Ethiopian manufacturing firms and show that a reduction in output tariffs has no impact on firms' productivity, while reductions in input tariffs increase firms' productivity.

This paper contributes to the literature in four ways. First, this is among the first papers that uses employer-employee level data in the African context. With these data, we are able to measure the average firm-level wage premium of exporting and importing, controlling for a variety of firm-level characteristics. Similarly, we are able to determine the average wage premium of individual workers, after controlling not only for firm-level but also for individual worker characteristics. Second, this paper considers the relationship of both exporting and importing to wages, adding to the literature that has predominantly, and in the context of wages exclusively, focused on exporting. Third, this paper investigates the channels that make trading firms pay wages that are different from non-trading firms. Finally, this paper adds to the so far scarce literature on the gender wage gap and its relation to firms' exporter and importer status.

The results presented in this paper suggest that firm-level wages paid by exporters to their workers are on average higher than in firms not engaged in exporting, even after controlling for firm characteristics such as capital intensity, electricity intensity, foreign ownership and firm age. The average wages paid by importers and non-importers are statistically not significant from each other, after adding firm age as a control variable. A positive exporting premium on wages is confirmed when using employer-employee data, which allows us to control for individual worker characteristics. On the basis of these data, we also do not find any positive wage premium of importing, in line with the firm-level results. If anything, workers employed by importers receive lower wages, when compared to their counterparts in non-importing firms.

This paper also investigates the channels that are driving our results. We find that neither productivity gains through increased skill utilization or the employment of certain types of workers, nor productivity gains through technology transfers can fully explain the positive wage premium of exporting. Instead, it appears that the positive wage premium of exporters is due to productivity gains through economies of scale. The paper also finds indirect evidence for a weaker bargaining power of workers employed by importers, when compared with those employed by non-importers. Finally, the paper shows that there is no significant gender wage gap within trading firms in the sample. This is different from non-trading firms, where a statistically significant wage gap can be identified.

The next section describes in more detail the data that are used in this paper. Section 3 presents the underlying empirical methodology to estimate the wage premium of exporting and importing, both at the firm level and at the employee level. Section 4 discusses the results. Section 5 provides some robustness checks. The final section concludes.

2 Data

2.1 Firm level data

This paper uses firm-level data for manufacturing firms from the World Bank Enterprise Surveys. The data are cross-section data, comparable across different surveys. The database consists in total of over 15,391 observations for manufacturing firms, comprising data from 65 surveys conducted in 47 African countries between 2006 and 2014. For one country, the Democratic Republic of Congo, data from three surveys are available. For 16 countries, we have data from two surveys. For the remaining 30 countries, data have only been collected once. For different surveys, the sample size varies between 21 observations for a survey conducted in 2009 in Liberia, and 2,015 observations for a survey conducted in 2013 in Egypt. The average sample size across surveys is 237 observations. Appendix A lists all the surveys that are considered in this paper.

The firm-level data that are included in the database are representative of formally registered, privately owned firms that employ at least 5 workers. On the basis of the information provided in the survey, firms can be assigned to the manufacturing sectors in which they operate. We distinguish between 8 manufacturing industries, namely food and beverages, textiles and garments, wood and paper, chemicals, non-metals and plastics, metals and machinery, furniture and all other manufacturing not included in the preceding categories.

Table 1: Descriptive statistics on African manufacturing firms

	Mean	Sd.	Min	Max	N
Exporter dummy (1=exporter)	0.23	0.42	0.00	1.00	14972
Importer dummy (1=importer)	0.53	0.50	0.00	1.00	13837
Firm age	17.40	15.29	0.00	190.00	9808
Ownership (1=foreign)	0.11	0.31	0.00	1.00	15075
Capital stock value over sales	2.16	4.47	0.00	51.37	9244
Electricity costs over sales	0.03	0.06	0.00	0.48	12273
Sales (million 2011 USD)	17.03	595.31	0.00	52578.34	13757
Average wage (000 2011 USD)	6.17	119.89	0.00	9453.91	13270
Labour productivity (000 2011 USD)	24.84	146.25	0.00	6460.50	11185
Log(TFP)	-0.02	0.59	-2.03	2.70	8817
Production workers' average education (years)	8.68	3.77	1.55	14.92	10833
Employment (full-time, permanent)	82.40	609.68	1.00	64000.00	15207
Female share in employment (%)	21.25	25.58	0.00	100.00	13847
Production worker share in employment (%)	76.69	18.03	0.00	100.00	12113
Temporary employment share (%)	11.93	19.36	0.00	99.67	14585

Source: Monetary values are converted into 2011 constant USD, using data on exchange rates and GDP deflators from World Bank's *World Development Indicators* Database.

Table 1 shows basic descriptive statistics for the firm-level database that is used in this paper. The table indicates that 53% of all firms in the sample are importers, while only 23% are exporters. Out of all firms, 17% are both exporters and importers, 5% are exporters but do not import, 36% do not export but are importers, and 42% do neither export nor import. Firms are on average 17.4 years old and 11% of them are foreign-owned, defined as foreign investors having an ownership share that is greater than 50%. In terms of workforce characteristics, the average number of full-time permanent employees reported by firms is 82. Twenty-one percent of these workers are women and 77% are production workers. The average share of temporary employees in total employment (temporary plus full-time permanent) is almost 12%. The average years of education of firms' production workforce is 8.7 years.[1] The average repurchase value of firms' capital stock is more than double its annual sales revenue. Firms pay electricity costs that on average amount to around 3% of their sales revenue. The annual average wage is just above 6170 USD (constant 2011).

To measure technological advancement, we estimate total factor productivity (TFP), where a Cobb Douglas production function is estimated in logarithmic form, separate for each survey. As input factors, we consider the repurchase value of the capital stock, labour costs and raw material expenses. The estimated residual corresponds to TFP. More details on the TFP estimation procedure can be found in Appendix B.

2.2 Matched employer-employee level data

Employee-level data for at least some firms are available in 16 of the 65 surveys. In total, we have data for 7692 employees working in 1,385 firms, with between 1 and 10 employees per firm. For 353 firms, data on 10 employees are collected. For 25 firms, only data on one employee are available. The employee data are available from surveys in Angola, Botswana, Burundi, Democratic Republic of Congo, Gambia, Ghana, Guinea, Guinea-Bissau, Mauritania, Namibia, Rwanda, South Africa, Swaziland, Tanzania, Uganda and Zambia, which are all Sub-Saharan African countries. Data are from surveys conducted in 2006 and 2007.

Table 2 shows employee-level descriptive statistics. We find that 21% of employees in our sample work for exporters while 56% work for importers. The respective shares of workers that work for exporters and importers are hence very similar to the share of exporting and importing firms in the firm-level database, reported in Table 1. Among the employees, 28% are women, 53% are married and 94% have a full-time permanent contract. With regards to the education level, 22% of employees have no or only primary education, 17% took part in vocational training and 6% have a university degree. The remaining 55% of employees have secondary education. Twenty-one percent of workers are trade union members. The average worker age is 32 years. Workers have on average more than 8 years of work experience, of which more than 5 years is experience with the current employer. The average monthly wage of a worker in the database is 540 USD (constant 2011), which translates into an annual wage of 6480 USD (constant 2011), which is very close to the average annual firm-level wage reported in Table 1. The average monthly wage of female workers in the database is 850 USD (constant 2011), translating into an annual wage of 10200 USD (constant 2011). While the average wage for women is higher than the average wage for men in the sample, the standard deviation of women's wage is almost double the standard deviation of the overall wage, indicating a large wage variation among women.

[1] The average years of education of firms' production force are reported only for less than two thirds of all firms. The remaining firms report intervals (e.g. 0-3 years, 3-6 years etc.) instead. For these firms, we transform intervals into years, by using the corresponding average value for each category that is obtained on the basis of the sample of firms that report the exact years. For example, the category from 0-3 years translates into a value of 1.55, as 1.55 is the average years of education for firms that fall into that category, based on available data.

Table 2: Descriptive statistics on employees in African manufacturing firms

	Mean	Sd.	Min	Max	N
Exporter dummy (exporter=1)	0.21	0.41	0.00	1.00	7682
Importer dummy (importer=1)	0.56	0.50	0.00	1.00	7692
Employee wage (monthly, 000 2011 USD)	0.54	6.78	0.00	364.89	6648
Female employee wage (monthly, 000 2011 USD)	0.85	12.19	0.00	364.89	1835
Female (yes=1)	0.28	0.45	0.00	1.00	7692
Married (yes=1)	0.53	0.50	0.00	1.00	7649
Full-time permanent employed (yes=1)	0.94	0.24	0.00	1.00	7667
No or primary eduction only (yes=1)	0.22	0.42	0.00	1.00	7692
Vocational training (yes=1)	0.17	0.37	0.00	1.00	7692
University degree (yes=1)	0.06	0.25	0.00	1.00	7692
Trade union member (yes=1)	0.21	0.41	0.00	1.00	7672
Age (years)	31.98	8.21	12.00	71.00	7669
Experience with current employer (years)	5.23	4.86	0.00	48.00	5880
Total experience (years)	8.11	6.62	0.00	54.00	5838

Source: Monetary values are converted into 2011 constant USD, using data on exchange rates and GDP deflators from World Bank's *World Development Indicators* Database.

3 Methodology

In this paper, we run two types of empirical analyses. First, we use firm-level data to estimate the wage premium of exporting and importing, controlling for a variety of firm-level characteristics. Then we take the estimation to the employer-employee level, which enables us to add individual worker characteristics to our set of firm-level control variables. Reported standard errors are always robust.

At the firm-level, we estimate the following equations:

$$\log W_{ctmi} = \alpha + \beta \cdot EX_{ctmi} + \gamma \cdot IM_{ctmi} + \delta X_{ctmi} + \epsilon_{ct} + \epsilon_m + \epsilon_{ctmi} \quad (1)$$

$$\log W_{ctmi} = \alpha_m + \beta_m \cdot EX_{ctmi} + \gamma_m \cdot IM_{ctmi} + \delta_m X_{ctmi} + \epsilon_{ct} + \epsilon_{ctmi} \quad (2)$$

$$\log W_{ctmi} = \alpha_{ct} + \beta_{ct} \cdot EX_{ctmi} + \gamma_{ct} \cdot IM_{ctmi} + \delta_{ct} X_{ctmi} + \epsilon_{ctmi} \quad (3)$$

where equation (1) is estimated on the full sample of manufacturing firms, equation (2) is estimated by manufacturing sector m and equation (3) is estimated by survey conducted in country c and year t. Index i stands for a particular firm that belongs to a manufacturing sector m and is observed in the survey conducted in country c and year t.

The dependent variable $\log W$ stands for the logarithm of the average wage paid by the firm to its employees, calculated as total labour costs divided by the number of full-time permanent employees.[2] The exporter dummy variable EX takes a value of one if the firm exports at least some of its goods, including direct exports and exports through an intermediary. Similarly, the importer dummy variable IM takes a value of one if the firm imports at least some of its raw material inputs, including both direct imports and imports through an intermediary. β, β_m and β_{ct} are the main coefficients of interest and

[2] This measure for the average wage is a proxy, given that labour costs in the numerator are the costs for all workers, while full-time permanent employment in the denominator does not include all workers. The use of the ratio between labour costs and the sum of full-time permanent and temporary employment as an alternative proxy, does not affect any of our main results in this paper.

measure the overall, sector-specific and survey-specific wage premium of exporting. γ, γ_m and γ_{ct} are the respective coefficients that measure the wage premium of importing. ϵ_{ct} is a survey fixed effect, ϵ_m is a sector fixed effect and ϵ_{ctmi} is the error term.

With regards to firm-level control variables, as summarized in vector X, we control for the type of economic activity by including capital intensity (the ratio between the repurchase value of the capital stock and sales) and electricity intensity (the ratio between electricity costs and sales) into the regression. The latter is intended to control for the type of technology that is used. Electricity costs are likely to be lower if production mainly occurs through manual labour than if production is largely automated. Moreover, we include foreign ownership status and firm age as variables that might be correlated with the average wage. Finally, we include the logarithm of firm age to control for differences in wages between start-ups and firms that have been longer in the market.

When moving to the employer-employee level, the estimated equations look as follows:

$$\log W_{ctmiw} = \alpha + \beta \cdot IM_{ctmi} + \gamma \cdot EX_{ctmi} + \delta_1 X_{ctmi} + \delta_2 Y_{wt} + \epsilon_{ct} + \epsilon_m + \epsilon_{ctmi} \quad (4)$$

$$\log W_{ctmiw} = \alpha_m + \beta_m \cdot IM_{ctmi} + \gamma \cdot EX_{ctmi} + \delta_{1m} X_{ctmi} + \delta_{2m} Y_{wt} + \epsilon_{ct} + \epsilon_{ctmi} \quad (5)$$

$$\log W_{ctmiw} = \alpha_{ct} + \beta_{ct} \cdot IM_{ctmi} + \gamma \cdot EX_{ctmi} + \delta_{1ct} X_{ctmi} + \delta_{2ct} Y_{wt} + \epsilon_{ctmi} \quad (6)$$

where equation (4) is estimated on the full sample of manufacturing firms, equation (5) is estimated by manufacturing sector m and equation (6) is estimated by survey conducted in country c and year t. The equations are similar to (1)-(3), but now include variables that carry a subscript w that stands for an individual employee. Now wages are employee-specific and we also add a new vector of control variables, measuring individual worker characteristics, Y.[3]

As control variables, we include dummy variables that respectively take on a value of one when the worker is a woman, married, full-time permanent employed, or trade union member. We also consider dummy variables that indicate workers' education level, including no or only primary education, vocational training or a university degree. We include workers' age, workers' total work experience, and workers' experience with the current employer as explanatory variables. Moreover, we account for the same set of firm characteristics as in the firm-level regressions, with the exception of firm age, which is only available in 3 out of the 16 surveys that have employee data.[4]

In order to investigate the differences in the gender wage gap between exporting and non-exporting, and between importing and non-importing firms, we also estimate equation (4) after adding as explanatory variables two interaction terms between the dummy variable that indicates whether a worker is a woman, and firms' exporter and importer status, respectively.

4 Results

4.1 Firm level results

This section starts by showing evidence derived from firm-level data. Table 3 shows the Africa-wide coefficients for firms' exporting and importing status, which respectively correspond to the estimated

[3] The survey fixed effects in equations (1) and (2) correspond to country-year fixed effects. The survey fixed effects in equations (4) and (5) also correspond to country-year fixed effects, which in this case are equivalent to country fixed effects, given that there is only one survey with employer-employee level data per country.

[4] The employee-level data also includes information on whether a worker is foreigner, which could have an impact on the wage level. Still we decided to not use this variable as control variable, as only 5% of all workers in our sample are foreigners. We made sure that the main results of this paper also hold when excluding foreigners from our sample.

average difference in wages between exporters and non-exporters, and between importers and non-importers. In the most basic specification, in which there are no control variables aside from sector and survey fixed effects, exporters are estimated to have a wage premium of 18% over non-exporters (column 1), while importers' wage premium over non-importers is estimated at 19% (column 2). This is in line with previous results in the literature that firms engaged in trade pay higher wages (Bernard et al., 2007, 2012).

Table 3: Exporting, importing and the average wage (firm-level) – full sample

Dependent variable: Log(Wage)						
	(1)	(2)	(3)	(4)	(5)	(6)
Exporter	0.178***		0.210***	0.268***	0.234***	0.175***
	(0.038)		(0.037)	(0.035)	(0.036)	(0.062)
Importer		0.191***	0.155***	0.081***	0.064**	-0.004
		(0.028)	(0.028)	(0.027)	(0.027)	(0.051)
Capital stock over sales				-0.032***	-0.031***	-0.034***
				(0.005)	(0.005)	(0.007)
Electricity costs over sales				-2.351***	-2.327***	-2.108***
				(0.401)	(0.398)	(0.520)
Foreign owned					0.322***	0.344***
					(0.045)	(0.088)
Log(Firm age)						0.071***
						(0.026)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.71	0.73	0.73	0.80	0.80	0.75
Number of observations	13137	12319	12254	8818	8787	3827

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the full sample of firms.

The positive wage premium of exporters and importers is confirmed when including both exporting and importing status simultaneously as explanatory variables into the regression (column 3). Also, the estimated wage premia of exporters and importers remain positive and statistically significant after controlling for capital stock value and electricity costs relative to sales, and foreign ownership (columns 4 and 5). The difference between exporters and non-exporters is estimated to be larger than the difference between importers and non-importers.

Results change partially, however, when adding firm age as an additional control variable. The coefficient for importer status then becomes insignificant, while the coefficient for exporter status remains significant and implies that exporters pay almost 18% higher wages than non-exporters (column 6). This implies the absence of any differences in wages between importers and non-importers that have the same firm age.

Table 4: Exporting, importing and the average wage (firm-level) – by sector

Dependent variable: Log(Wage)						
Sector		*Regressors:* Exporter Importer			*Regressors:* Exporter Importer Capital stock over sales Electricity costs over sales Foreign owned Log(Firm age)	
	N	Exporter	Importer	N	Exporter	Importer
Food & beverages	3079	0.299***	0.110**	851	0.120	-0.036
Textiles & garments	2365	0.191***	0.045	815	0.344***	-0.050
Wood & paper	1364	0.155	0.171**	433	0.392**	-0.102
Chemicals	752	0.255**	0.100	242	0.229	-0.063
Non-metals & plastics	1159	0.278**	0.145	444	0.393*	0.109
Metals & machinery	1582	0.215	0.245***	502	0.135	0.012
Furniture	1314	-0.130	0.006	314	-0.238	-0.281
Other manufacturing	639	0.137	0.391***	226	0.052	0.399**

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (2) with OLS on samples of firms from different sectors.

Table 4 indicates that results are not driven by a particular sector, but hold across many sectors. The table shows the results obtained from estimating the specifications in columns (3) and (6) of Table 3 on samples that are restricted to firms in particular sectors. In the more basic specification, a positive wage premium of exporting is found for firms in the food and beverages, textiles and garments, chemicals, and non-metals and plastics sectors. In this specification, importing can be associated with a positive wage premium in the food and beverages, wood and paper, and metals and machinery sectors, as well as in other manufacturing that is not classified in any of the other sectors. In the more elaborate specification, exporting remains associated with higher wages in firms that belong to the textiles and garments, and non-metals and plastics sectors, and becomes associated with higher wages in the wood and paper sector. The wage premium of importing, in contrast, disappears for all sectors except other manufacturing.

Table 5 includes results obtained from estimating the specifications in columns (3) and (6) of Table 3 on individual survey datasets. We only run the regression on samples with at least 100 firm-level observations. We again find strong evidence for a wage premium of exporting. Out of 34 survey datasets with at least 100 observations, we find for 18 survey datasets evidence for a positive wage premium of exporting and only for one dataset evidence for a negative premium. Also in the more elaborate specification, we find evidence for positive wage premia of exporting for 2 out of 10 survey datasets. With the inclusion of firm age as a control variable, the underlying number of observations is too small to obtain reliable results for most of the countries.

Based on the specification that only includes exporter and importer status, we estimate a positive wage premium of importing for 18 out of the 34 survey datasets and a negative premium for 3 datasets. When in addition controlling for capital intensity, electricity intensity, ownership and firm age, we estimate one significantly positive and one significantly negative coefficient for the relationship between firms' importing status and the wages they pay to their workers on average.

Table 5: Exporting, importing and the average wage (firm-level) – by survey

Dependent variable: Log(Wage)						
Sector		*Regressors:* Exporter Importer			*Regressors:* Exporter Importer Capital stock over sales Electricity costs over sales Foreign owned Log(Firm age)	
	N	Exporter	Importer	N	Exporter	Importer
Angola 2006	212	0.096	-0.097			
Botswana 2006	113	0.069	0.189			
Burundi 2006	102	0.802***	0.688***			
Cote d'Ivoire 2009	152	1.036***	0.944***			
DRC 2006	149	0.359	0.294***			
DRC 2010	104	1.381	-0.209			
DRC 2013	212	1.079*	0.480*			
Egypt 2013	1776	0.231***	0.053	1195	0.306***	0.038
Ethiopia 2011	191	0.792**	0.344			
Ghana 2007	292	0.169	-0.319***			
Ghana 2013	286	0.330	0.356*	105	0.256	-0.258
Guinea 2006	135	0.181	0.249			
Kenya 2007	396	0.175*	0.308***			
Kenya 2013	321	0.318*	0.524***	206	0.270	0.238
Madagascar 2009	180	0.027	0.148	107	0.030	0.153
Madagascar 2013	214	0.081	-0.042	110	-0.262	0.160
Mali 2007	301	0.448***	0.190***			
Mauritius 2009	131	0.082	0.204			
Morocco 2013	132	-0.089	0.246			
Mozambique 2007	341	0.810**	0.291***			
Namibia 2006	103	0.470*	0.361*			
Nigeria 2007	948	0.620***	-0.274***			
Nigeria 2014	622	-0.759*	-0.733*	256	0.551	-1.746***
Senegal 2007	259	0.610***	0.263***			
Senegal 2014	179	0.617**	0.736***			
South Africa 2007	680	0.438***	0.148**			
Tanzania 2006	272	-0.030	0.431***			
Tanzania 2013	173	0.113	0.690***	103	-0.014	0.646***
Tunisia 2013	297	0.010	-0.142	224	0.044	-0.200
Uganda 2006	307	0.382**	0.476***			
Uganda 2013	221	0.223	0.106			
Zambia 2007	304	0.406***	0.290**			
Zambia 2013	270	0.397**	0.601***	110	0.294	0.115
Zimbabwe 2011	353	0.298*	0.027	327	0.289*	0.035

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (3) with OLS on samples of firms belonging to different surveys.

The results presented in this section so far point to only limited evidence for a wage premium of importing, with no wage premium estimated in the specification that includes firm age as a control variable. The results, however, point strongly to the existence of a positive wage premium of exporting. To explore why exporters pay higher wages than non-exporters, the next section investigates which channels contribute to the wage premium of exporting.

4.2 What are the channels?

There are numerous channels that can explain differences in wages between trading and non-trading firms. This section empirically investigates the role of some of the main channels that have been discussed in the literature over the recent years.

Discussion of the channels

One channel that can explain differences in wages between trading and non-trading firms involves differences in *skill utilization* across firms (Brambilla et al., 2012; Frazer, 2014). Exporters often need to produce high quality products to compete successfully in foreign markets, especially if these markets are in developed economies (Verhoogen, 2008). To produce high quality products, exporters are likely to have a large share of high-skilled workers in their workforce. Importers are likely to require high-skilled workers to be able to absorb and work with the knowledge and technology embedded in imported inputs (Kugler and Verhoogen, 2012). Both exporters and importers rely on operational services related to logistics, marketing and finance, tasks that are typically executed by highly-skilled workers (Matsuyama, 2007). Provided that skills are remunerated through higher wages, trading firms would be expected to pay higher average wages, simply because they have on average a higher-skilled workforce.

There are also *other workforce composition effects* that may be a channel for wage differences between trading and non-trading firms. Trading and non-trading firms may differ in the share of temporary employees, female employees and production workers in their total workforce. This will affect the average wage level, provided that temporary employees, female employees and production workers have a wage that differs from the wage paid to permanent employees, male employees and non-production workers, respectively.

Recent evidence points to an increased use of temporary employment among trading firms (Machikita and Sato, 2016). This may be driven by a preference for lower dismissal costs and more flexibility which come with temporary employment contracts (Aleksynska and Berg, 2016). It may also be driven by reduced incentives for firms to employ workers that acquire firm-specific skills, which typically are permanent rather than temporary employees. Similarly, there is also evidence for a more female workforce, especially among exporters (Duda-Nyczak and Viegelahn, 2016). Also, due to the increased need of firms for trade-related operational services, the share of production workers is likely to be lower in trading firms. All these workforce composition effects can have an impact on the average wage that is paid at the firm level.

The trading activity of a firm can also give rise to *technology upgrading*, induced by technology transfers from the trading partner, which may increase workers' productivity and can therefore lead to higher wages. Export destination has been shown to play a crucial role in determining the wage premium in the case of South Africa (Rankin and Schoer, 2013). Exporters pay higher wages only when exporting to more-developed economies, whereas firms exporting to regional less-developed markets are actually characterized by negative wage premia. Also, a causal relationship between exporting to high-income markets and paying higher wages has been demonstrated globally (Brambilla and Porto, 2016).

Finally, the extension of a firm's business to export markets increases the *scale* of a firm, thus lowering average costs in the presence of increasing returns to scale. This will increase workers' productivity, and hence potentially their wages. The relevance of international scale economies for productivity within exporting firms has empirically been shown for the case of Taiwan (China) (Hwang, 2003).

Empirical results

Table 6 shows results from regressions at the firm level, where we investigate in columns 1-4 the role of

the four above-described channels in explaining differences between trading and non-trading firms. In the following, we consider four different variables as measures of the four channels discussed above. To proxy for skills utilization, we use the average number of production workers' years of education. To account for other workforce characteristics, we respectively use the share of women and production workers in full-time permanent employment, and the share of temporary workers in total employment. To proxy for the level of technology, we use total factor productivity (TFP), which corresponds to the portion of output that is not explained by the amounts of inputs used in production. Finally, for economies of scale, we use firms' total sales.

We start by including these variables one by one as explanatory variables and observe how the estimated coefficients for firms' export and import status react. As expected, we find firms' skill utilization, measured by the average number of production workers' years of education, to positively affect wages (column 1). But even after controlling for skills utilization, the coefficient on exporting remains positive and significant, the coefficient implying a wage premium of 18.2%, which is very close to the 17.5%, obtained from the specification where this variable was not included. This suggests that skill utilization does not explain the difference in wages between exporters and non-exporters. Importing status remains insignificant, even after including a measure for skills utilization in the regression.

Similarly, the coefficient on exporting remains positive and significant when including individual workforce characteristics, including the share of temporary, female and production worker employment, as additional explanatory variables (column 2). The difference between exporters and non-exporters is estimated to be 20.6%. Importing status once more remains insignificant, even after including measures for different workforce characteristics in the regression.

We then include TFP as a proxy for technology into the regression (column 3). Once more the coefficient on exporting remains positive and significant, with an estimated value of 17.9%. Differences in technology that may arise from technology transfers from trading partners are therefore unlikely to be responsible for the wage premium of exporters. Including TFP into the regression also does not change the statistical insignificance of the estimated importer coefficient.

As proxy for the fourth channel, we include the firm's total sales into the regression (column 4). The positive wage premium of exporting vanishes and even becomes negative. Moreover, the wage premium of importing becomes negative and statistically significant. This finding suggests that economies of scale play a major role in explaining differences between trading and non-trading firms. Achieving economies of scale through exporting hence appears to be a key channel through which exporting firms have higher average wages than non-exporting firms.

All channels that explain wage differences between trading and non-trading firms will work through increased labour productivity. For example, technology transfer in favour of exporting firms can only result in a wage premium if it boosts labour productivity. Labor productivity hence summarizes all channels in one variable. When including labour productivity as an explanatory variable (calculated as the difference between sales and raw material expenses per full-time permanent worker), we find no evidence for a positive wage premium of exporting (column 5). However, we find weak evidence for a negative wage premium of importing. In other words, when comparing importers and non-importers with identical labour productivity, importers pay on average lower wages than non-importers. This result suggests that workers in importing firms reap a smaller share of the value added that is generated per worker, compared to non-importers, which could be evidence in favour of reduced bargaining power of workers in these firms. This, for example, would be in line with evidence for Belgium that associates increased import competition with decreased bargaining power for workers (Abraham et al., 2009).

Finally, we include all variables introduced in this section at the same time into the regression (column 6). It should be noted that TFP, sales, and labour productivity are highly correlated by construction, as all include sales as an ingredient, which makes it impossible to interpret the signs of the respective coefficients. More importantly, however, exporter and importer status are insignificant, as expected.

Table 6: Exporting, importing and the average wage (firm-level) – different channels

Dependent variable: Log(Wage)						
	Skill utilization	Workforce characteristics	Technology	Scale	Labour productivity	All
	(1)	(2)	(3)	(4)	(5)	(6)
Exporter	0.182***	0.206***	0.179***	-0.154**	0.072	0.013
	(0.064)	(0.062)	(0.060)	(0.061)	(0.057)	(0.058)
Importer	0.010	0.023	0.026	-0.199***	-0.086*	-0.071
	(0.052)	(0.051)	(0.048)	(0.049)	(0.046)	(0.044)
Capital stock over sales	-0.030***	-0.037***	-0.018***	-0.009	-0.006	-0.009**
	(0.005)	(0.007)	(0.005)	(0.008)	(0.009)	(0.004)
Electricity costs over sales	-1.981***	-1.892***	-1.049*	0.107	0.823*	0.651
	(0.537)	(0.532)	(0.554)	(0.456)	(0.484)	(0.481)
Foreign owned	0.370***	0.450***	0.280***	0.033	0.059	0.037
	(0.090)	(0.093)	(0.090)	(0.081)	(0.077)	(0.087)
Log(Firm age)	0.074***	0.056**	0.069***	-0.059**	0.010	0.011
	(0.026)	(0.026)	(0.024)	(0.024)	(0.023)	(0.020)
Log(Av. production workers' years of education)	0.106**					0.025
	(0.044)					(0.039)
Female worker share		-0.004***				-0.000
		(0.001)				(0.001)
Production worker share		-0.004**				-0.001
		(0.002)				(0.002)
Temporary worker share		0.006***				0.001
		(0.001)				(0.001)
Log(TFP)			0.348***			-0.480***
			(0.041)			(0.061)
Log(Sales)				0.290***		0.002
				(0.015)		(0.017)
Log(Labour productivity)					0.503***	0.723***
					(0.023)	(0.042)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.76	0.76	0.78	0.78	0.81	0.86
Number of observations	3530	3513	3507	3827	3575	2970

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (1) with OLS on the full sample of firms.

4.3 Employee level results

The previous section did not find any evidence of a positive wage premium of importing, after controlling for firm age, but strong evidence for a positive wage premium of exporting. An empirical analysis of the channels that are likely to drive this result suggested that the positive wage premium of exporting is mainly the result of productivity gains from economies of scale. Technology transfers from the trading partner, as well as the composition of firms' workforce in terms of skills, gender, type of contract, and type of task in contrast do not account for the wage differences observed between exporters and non-exporters.

Table 7: Exporting, importing and the average wage (employee-level) – full sample

Dependent variable: Log(Wage)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exporter	0.163***		0.186***	0.166***	0.106***		0.125***	0.090**
	(0.034)		(0.035)	(0.036)	(0.037)		(0.037)	(0.037)
Importer		-0.053**	-0.088***	-0.097***		-0.045*	-0.070***	-0.082***
		(0.027)	(0.028)	(0.029)		(0.026)	(0.026)	(0.028)
Capital stock over sales				-0.004				-0.006*
				(0.003)				(0.003)
Electricity costs over sales				-0.145				0.234
				(0.353)				(0.387)
Foreign owned				-0.140***				-0.085*
				(0.050)				(0.048)
Female					-0.044	-0.041	-0.038	-0.018
					(0.028)	(0.028)	(0.028)	(0.029)
Married					0.076***	0.074***	0.075***	0.077***
					(0.027)	(0.027)	(0.027)	(0.027)
No or primary education					-0.263***	-0.266***	-0.261***	-0.260***
					(0.029)	(0.029)	(0.029)	(0.030)
Vocational training					0.331***	0.330***	0.330***	0.332***
					(0.034)	(0.035)	(0.034)	(0.035)
University degree					1.017***	1.033***	1.022***	1.038***
					(0.053)	(0.053)	(0.053)	(0.055)
Trade union member					0.005	0.025	0.006	0.017
					(0.031)	(0.029)	(0.031)	(0.032)
Experience with employer					0.007**	0.007**	0.007**	0.007**
					(0.003)	(0.003)	(0.003)	(0.003)
Total experience					0.012***	0.013***	0.012***	0.013***
					(0.003)	(0.003)	(0.003)	(0.003)
Worker age					0.009***	0.009***	0.009***	0.009***
					(0.002)	(0.002)	(0.002)	(0.002)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.83	0.83	0.83	0.82	0.87	0.87	0.87	0.87
Number of observations	6641	6648	6641	6286	5067	5074	5067	4855

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the full sample of employees (16 surveys).

While the previous section considered firm-level wages, this section uses matched employer-employee data from 16 surveys, and analyzes whether employee-level wages differ between workers employed by trading firms and those that are employed by non-trading firms. Table 7 shows the relation of firms' exporter and importer status with wages of employees, using different specifications. Without any control

variables, we find for our sample of workers that wages of workers in exporting firms are 16% higher than the wages of workers that work for firms not engaging in export markets (column 1). This coefficient is quantitatively similar to that estimated in the firm-level regressions, reported in Table 3. In contrast, the wages of workers in importers are now on average around 5% lower (column 2). Even when including firms' exporter and importer status simultaneously as explanatory variables in the regression, exporter status remains positively associated with wages, while importer status remains negatively associated with wages (column 3). This also holds after including capital intensity, electricity intensity and ownership status of the firm that employs the worker (column 4).

When including individual worker characteristics as control variables, the wage premium of importers remains negative and significant, while the wage premium of exporters remains positive and significant. This holds in all specifications (columns 5-8). As expected, workers that are married and older age receive a higher wage on average. Gender and trade union membership, in contrast, do not appear to be related to individual workers' wages. The education level of workers explains to a large extent individual worker wages, with no or only primary education being associated with lower wages, vocational training being associated with higher wages, and a university degree being associated with much higher wages than workers with secondary education. Total work experience also relates to wages positively, in particular work experience with the current employer.

Table 8: Exporting, importing and the average wage (employee-level) – by sector

	Dependent variable: Log(Wage)					
Sector	*Regressors:* Exporter, Importer, Individual worker characteristics			*Regressors:* Exporter, Importer, Capital stock over sales, Electricity costs over sales, Foreign owned, Individual worker characteristics		
	N	Exporter	Importer	N	Exporter	Importer
Food & beverages	1427	0.300 ***	0.046	1375	0.301 ***	0.038
Textiles & garments	866	-0.324 ***	-0.339 ***	821	-0.146	-0.464 ***
Wood & paper	646	0.312 ***	-0.084	623	0.313 ***	-0.085
Chemicals	360	-0.113	0.013	360	-0.119	-0.016
Non-metals & plastics	376	0.074	-0.088	347	0.037	-0.174
Metals & machinery	582	0.396 ***	-0.148 **	568	0.362 ***	-0.076
Furniture	635	0.463 ***	0.027	586	0.003	0.019
Other manufacturing	175	-0.572 ***	0.208	175	-0.541 ***	-0.023

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (5) with OLS on samples of employees from different sectors.

The employee-level regressions include the same firm-level control variables as the firm-level regressions. The exception is firm age which was included in the firm-level regression, but cannot be included in the employee-level regressions, as it is only available for 3 out of the 16 surveys, resulting in a sample size that is too small.

These results are largely in line with the results obtained from the firm-level regressions. There is strong evidence of a positive wage premium of exporting, and of the absence of a positive wage premium of importing, and even evidence for a negative wage premium. Worker characteristics are also found to only partially explain the differences in wages between trading and non-trading firms, which also confirms the results obtained from firm-level data.

Table 9: Exporting, importing and the average wage (employee-level) – by survey

Dependent variable: Log(Wage)						
Sector	*Regressors:* Exporter Importer Individual worker characteristics			*Regressors:* Exporter Importer Capital stock over sales Electricity costs over sales Foreign owned Individual worker characteristics		
	N	Exporter	Importer	N	Exporter	Importer
Angola 2006	266	0.000	-0.058	246	0.000	-0.062
Botswana 2006	113	0.476 **	0.127			
Burundi 2006	107	0.162	-0.061			
DRC 2006	342	-0.111	0.032	342	-0.122	0.027
Ghana 2007	566	-0.000	-0.011	546	0.024	-0.020
Guinea 2006	224	-0.009	0.293 ***	193	-0.179	0.181
Mauritania 2006	124	-0.620	-0.140	121	0.478 **	-0.043
Namibia 2006	279	0.053	0.367 ***	259	0.086	0.454 ***
Rwanda 2006	171	0.051	-0.233	171	0.066	-0.250 *
South Africa 2007	1087	0.134 ***	-0.105 **	1073	0.136 ***	-0.103 **
Swaziland 2006	116	0.227	0.131			
Tanzania 2006	336	-0.120	-0.065	326	-0.222 *	-0.088
Uganda 2006	323	0.010	-0.670 ***	307	-0.075	-0.720 ***
Zambia 2007	899	0.069	0.070	896	0.043	0.104

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (6) with OLS belonging to different surveys.

Tables 8 and 9 show the estimations of the specification in columns (3) and (6) of Table 7 by sector and by survey, respectively. The sector-specific results indicate that the negative wage premium for workers in importing firms is particularly driven by workers in the textiles and garments, and metals and machinery sector. The results for workers in exporting firms are dependent on the sector. There is a positive wage premium of exporting in the food and beverages, furniture, wood and paper, and metals and machinery sector. The wage premium is in contrast negative for textiles and garments, and other manufacturing. The results by survey vary greatly, with both significantly positive and significantly negative coefficients being estimated.

4.4 Gender and the difference in wages

This section examines whether firms' exporting and importing status is related to gender wage differentials. The literature provides plentiful empirical evidence that wages of female workers are on average lower than wages paid to male workers (Blau and Kahn, 2017). Depending on the market, the gender wage gap has various causes, ranging from discriminatory labour practices to overall cultural attitudes. There is, however, no strong theoretical premise that this gender wage gap would be significantly more or less pronounced in exporting compared with non-exporting firms, or in importing compared with non-importing firms.[5]

Table 10: Gender and the differences in average wages between trading and non-trading firms (employee-level) – full sample

Dependent variable: Log(Wage)				
	(1)	(2)	(3)	(4)
Exporter	0.092**		0.115**	0.069
	(0.045)		(0.045)	(0.045)
Exporter*Female	0.044		0.033	0.067
	(0.066)		(0.067)	(0.068)
Importer		-0.058*	-0.082***	-0.093***
		(0.030)	(0.030)	(0.031)
Importer*Female		0.048	0.041	0.043
		(0.053)	(0.054)	(0.055)
Capital stock over sales				-0.006*
				(0.003)
Electricity costs over sales				0.246
				(0.389)
Foreign owned				-0.085*
				(0.048)
Female	-0.055*	-0.069*	-0.070*	-0.059
	(0.031)	(0.037)	(0.038)	(0.039)
Married	0.076***	0.074***	0.075***	0.076***
	(0.027)	(0.027)	(0.027)	(0.027)
No or primary education	-0.262***	-0.266***	-0.261***	-0.260***
	(0.029)	(0.029)	(0.029)	(0.030)
Vocational training	0.331***	0.331***	0.331***	0.333***
	(0.035)	(0.035)	(0.035)	(0.035)
University degree	1.017***	1.034***	1.022***	1.038***
	(0.053)	(0.053)	(0.053)	(0.055)
Trade union member	0.005	0.024	0.006	0.017
	(0.031)	(0.029)	(0.031)	(0.032)
Experience with employer	0.007**	0.007**	0.007**	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)
Total experience	0.012***	0.013***	0.012***	0.013***
	(0.003)	(0.003)	(0.003)	(0.003)
Worker age	0.009***	0.009***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
Sector FE	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes
R2	0.87	0.87	0.87	0.87
Number of observations	5067	5074	5067	4855

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the full sample of employees (16 surveys).

[5] Boler et al. (2015) argue that exporters require a higher commitment from their employees due to more exposure to competition. If commitment is remunerated especially in exporting firms and women are perceived by employers to be less committed, this could explain a more pronounced gender wage gap within exporting firms.

While we did not find any statistically significant gender wage gap on average for the full sample of workers (see columns 5-8 of Table Table 7), there might still be differences in the gender wage gap that depend on whether firms are exporters or importers. Therefore we re-do the analysis, but now include two interaction terms between the dummy variable that indicates whether the worker is a woman, and respectively the dummy variables that indicate firms' exporter and importer status. Including these interaction terms enables us to separate workers that are employed by firms engaged in exporting, importing or both, from workers that are employed by non-trading firms. As shown in Table 10, the coefficient estimated for *Female* indicates a gender wage gap for non-trading firms in 3 of the 4 specifications. In turn, positive coefficients on interaction terms suggest that there is no evidence for a gender wage gap in trading firms. The results indicate that the wage premium of exporting and importing does not significantly vary with the sex of the worker.

5 Robustness checks

5.1 Controlling for outliers

To validate the findings presented above we checked that the estimated coefficients are not exceedingly driven by certain outliers. The first robustness check considers whether outlier observations overly affect the results of the employee-level analysis. The highest and lowest wage observation per firm are dropped from the dataset, and the same employee-level analysis is conducted as in section 4.3.

Excluding for each firm the worker observation with the highest and lowest wage, we obtain results that are very similar to those based on the full-sample analysis. Table A1 of Appendix C presents the estimated coefficients for the variables of interest in specifications (1)-(6), where the control variables respectively correspond to the control variables included in the regressions whose results were shown in Table 7 of this paper. In the case of both importing and exporting premia, the coefficients maintain the same sign as in the full-sample estimation, i.e. negative for importing and positive for exporting. In addition, they are significant in all the estimated specifications, which is also the case in the original regressions. Results are hence not driven by outlier observations for wages.

5.2 Limiting country coverage

The results of firm-level and employee-level regressions on the full sample cannot be directly compared. While the results of firm-level regressions are based on 65 surveys from 47 countries, the employee-level regressions are based on 16 surveys from 16 countries. One way to make these regressions somewhat comparable is to run the firm-level regressions on the data from the same 16 surveys/countries for which also employee data are available.

Table A2 of Appendix C shows results of the firm-level regressions presented in Table 3, but for the restricted sample. The coefficients on both exporting and importing status are positive and statistically significant in all but the last specification. This corresponds to the results obtained from the regressions run on the full sample. Estimated magnitudes of the coefficients based on the restricted sample tend to be larger than those based on the full sample, reinforcing earlier findings. When including firm age in the regression (column 6), however, both exporting and importing status become insignificant. When estimated on the full-sample, this was only the case for importing status. Given, however, that firm age is only available in 3 out of the 16 surveys, the number of observations is too small to draw any reliable conclusions from that.

5.3 Limiting country and firm coverage

As a third robustness check, we further limit the firm-level sample to include only those firms for which employee data exist (employee data are not available for all firms that form part of the 16 surveys that collected employee-level data). The model specifications are identical with the regressions used in the firm-level analysis of section 4.1 and reported in Table 3 of this paper.

Running the firm-level regressions on the sample restricted in size to firms represented in the employee dataset yields similar results, as illustrated in Table A3 of Appendix C. Exporting and importing status are both positively associated with wages. The specification that includes firm age as a control variable results in a sample that is too small to provide any meaningful results.

6 Conclusions

This paper studies the relationship between exporting, importing and wages in Africa, using firm-level data and employer-employee-level data from the World Bank Enterprise Surveys. On the basis of firm-level data, we find that the average wage paid by exporters to their workers is higher, even after controlling for such firm characteristics as capital intensity, electricity intensity, foreign ownership and firm age. The average wage paid by importers relative to non-importers is in contrast not higher, after adding firm age as a control variable. On the basis of employer-employee data, we can confirm a positive exporting premium on wages, even after controlling for individual worker characteristics. Workers that are employed by importers are found to if anything receive lower wages, when compared to workers employed by non-importers.

We endeavour to identify the channels that can explain our findings. Productivity gains through economies of scale explain the positive wage premium of exporters; neither productivity gains through increased skill utilization or the employment of certain types of workers, nor productivity gains through technology transfers, contribute to exporters' wage premium. Workers in importers are found to have weaker bargaining power than those employed in non-importers, and are thus able to only reap smaller shares of the value added that is generated.

These results are somewhat surprising, given that the trade literature has typically found that both exporting and importing can be associated with higher wages. The arguments provided by this literature go beyond a mere effect of trade on firm performance through higher sales. The trade literature also associates exports with gains due to increased foreign competition and skill premia, and imports with gains due to access to new technologies, and a better quality and wider variety of inputs. If these gains exist and are at least partially passed on to workers, we would expect to find higher wages in exporting and importing firms.

This paper clearly indicates that there are other factors that contradict these general findings in the African context. On the one hand, African exporters are frequently incapable of competing in terms of product quality in more sophisticated markets outside of Africa, thus, economies of scale resulting in lower prices remain the only viable channel to enter export markets, largely at the regional level. The strong price sensitivity of African customers, generally characterized by low personal income, reinforces this rationale. This particular mechanism of competing through quantity as opposed to quality can thus explain why economies of scale drives the positive premium on wages of exporters in Africa, and why other channels, such as skill utilization may play a smaller role. On the other hand, the non-existent or even negative wage premium of importing is likely to be rooted in the nature of imports on the continent. The limited diversification of African economies means that some inputs can only be obtained

by importing. This reduces the potential gains reaped from imported inputs, which are rather a source of higher costs than a way of having a comparative advantage over firms sourcing domestically. In the absence of domestic raw material inputs, the higher material costs oblige firms to seek savings by cutting other spending, including wages. In addition, high unemployment and large shares of informality in African countries shifts the bargaining power towards employers, which is confirmed by the negative regression results when controlling for labour productivity.

The paper also included an analysis of the gender dimension. The findings indicate that there is no significant gender wage gap within trading firms in the sample, while there is some evidence for a gender wage gap within non-trading firms. These results suggest that trading firms in the African context appear to contribute to gender equality, at least based on the data sample that this paper has worked with.

Given the ongoing regional and subregional integration efforts of African countries, it is important to understand under which conditions firms are able to benefit from the gains of trade, what the potential bottlenecks to these gains are, and how the gains can be translated into decent jobs for all workers. For trade liberalization to be sustainable and inclusive, it is important to understand under which conditions workers can reap at least some of the gains that are being made, especially in a continent like Africa. This paper aims to contribute to a better understanding of these mechanisms in the African context.

References

Abraham, F.; Konings, J.; Vanormelingen, S. 2009. "The effect og globalization on union bargaining and price-cost margins of firms", in *Review of World Economics*, Vol. 145, pp. 13–36.

Aleksynska, M.; Berg, J. 2016. *Firms' demand for temporary labour in developing countries: Necessity or strategy?*, Conditions of Work and Employment Series No. 77, INWORK, Geneva: International Labour Office.

Amiti, M.; Davis, D. 2011. "Trade, firms, and wages: Theory and evidence", in *Review of Economic Studies*, Vol. 79, pp. 1–36.

Amiti, M.; Konings, J. 2007. "Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia", in *American Economic Review*, Vol. 97, No. 5, pp. 1611–1638.

Bernard, A.B.; Jensen, J.B.; Redding, S.J.; Schott, P.K. 2007. "Firms in international trade", in *Journal of Economic Perspectives*, Vol. 21, No. 3, pp. 105–130.

—. 2012. "The empirics of firm heterogeneity and international trade", in *Annual Review of Economics*, Vol. 4, pp. 283–313.

Bigsten, A.; Collier, P.; Dercon, S.; Fafchamps, M.; Gauthier, B.; Gunning, J.; Oduro, A.; Oostendorp, R.; Pattillo, C.; Soederbom, M.; Teal, F.; Zeufack, A. 2004. "Do African manufacturing firms learn from exporting?", in *Journal of Development Studies*, Vol. 40, No. 3, pp. 115–141.

Bigsten, A.; Gebreeyesus, M. 2009. "Firm productivity and exports: Evidence from Ethiopian manufacturing", in *Journal of Development Studies*, Vol. 45, No. 10, pp. 1594–1614.

Bigsten, A.; Gebreeyesus, M.; Soederbom, M. 2016. "Tariffs and firm performance in Ethiopia", in *Journal of Development Studies*, Vol. 52, No. 7, pp. 986–1001.

Blau, F.D.; Kahn, L.M. 2017. "The gender-wage gap: Extent, trends, and explanations", in *Journal of Economic Literature*, Vol. 55, No. 3, pp. 789–865.

Boler, E.A.; Javorcik, B.; Ulltveit-Moe, K.H. 2015. *Globalization: A woman's best friend? Exporters and the gender wage gap*, CEP Discussion Papers 1358, London: Centre for Economic Performance.

Brambilla, I.; Depetris-Chauvin, N.; Porto, G. 2017. "Examining the export wage premium in developing countries", in *Review of International Economics*, Vol. 25, No. 3, pp. 447–475.

Brambilla, I.; Lederman, D.; Porto, G. 2012. "Exports, export destinations, and skills", in *American Economic Review*, Vol. 102, No. 7, pp. 3406–3438.

Brambilla, I.; Porto, G. 2016. "High-income export destinations, quality and wages", in *Journal of International Economics*, Vol. 98, pp. 21–35.

De Loecker, J. 2013. "Detecting learning by exporting", in *American Economic Journal: Microeconomics*, Vol. 5, No. 3, pp. 1–21.

Dollar, D.; Kraay, A. 2004. "Trade, growth and poverty", in *The Economic Journal*, Vol. 114, pp. F22–F49.

Duda-Nyczak, M.; Viegelahn, C. 2016. "Exporters, importers and employment: Firm-level evidence from Africa", in *Indian Journal of Labour Economics*, Vol. 59, No. 3, pp. 309–341.

Ethier, W. 1982. "National and international returns to scale in the modern theory of international trade", in *American Economic Review*, Vol. 72, pp. 389–405.

Frías, J.; Kaplan, D.; Verhoogen, E. 2012. "Exports and within-plant wage distributions: Evidence from Mexico", in *American Economic Review: Papers and Proceedings*, Vol. 102, No. 3, pp. 435–440.

Frazer, G. 2014. *Imports, import sources and skill utilization*, Working Paper.

Fu, D.; Wu, Y. 2013. "Export wage premium in China's manufacturing sector: A firm level analysis", in *China Economic Review*, Vol. 26, pp. 182–196.

Grossman, G.; Helpman, E. 1991. *Innovation and growth in the global economy* (Cambridge, Massachusetts, MIT Press).

Halpern, L.; Koren, M.; Szeidl, A. 2015. "Imported inputs and productivity", in *American Economic Review*, Vol. 105, No. 12, pp. 3660–3703.

Hwang, A.R. 2003. "Exports, returns to scale, and total factor productivity: The case of Taiwanese manufacturing industries", in *Review of Development Economics*, Vol. 7, No. 2, pp. 204–216.

ILO 2018. *World Employment and Social Outlook: Trends 2018* (Geneva, International Labour Organization).

Kasahara, H.; Lapham, B. 2013. "Productivity and the decision to import and export: Theory and evidence", in *Journal of International Economics*, Vol. 89, pp. 297–316.

Kugler, M.; Verhoogen, E. 2012. "Prices, plant size and product quality", in *Review of Economic Studies*, Vol. 79, No. 1, pp. 307–339.

Le Goff, M.; Singh, R.J. 2014. "Does trade reduce poverty? A view from Africa", in *Journal of African Trade*, Vol. 1, No. 1, pp. 5–14.

Machikita, T.; Sato, H. 2016. *Temporary jobs and globalization*, IDE Discussion Paper No. 585, Chiba: Institute of Developing Economies, Japan External Trade Organization (JETRO).

Macis, M.; Schivardi, F. 2016. "Exports and wages: Rent sharing, workforce composition, or returns to skills?", in *Journal of Labour Economics*, Vol. 34, No. 4, pp. 945–978.

Markusen, J. 1989. "Trade in producer services and in other specialized intermediate inputs", in *American Economic Review*, Vol. 79, pp. 85–95.

Matsuyama, K. 2007. "Beyond icebergs: Towards a theory of biased globalization", in *Review of Economic Studies*, Vol. 74, No. 1, pp. 237–53.

Melitz, M.J. 2003. "The impact of trade on intra-industry reallocations and aggregate industry productivity", in *Econometrica*, Vol. 71, No. 6, pp. 1695–1725.

Mengistae, T.; Pattillo, C. 2004. "Export orientation and productivity in Sub-Saharan Africa", in *IMF Staff Papers*, Vol. 51, No. 2, pp. 327–353.

Milner, C.; Tandrayen, V. 2007. "The impact of exporting and export destination on manufacturing wages: Evidence for Sub-Saharan Africa", in *Review of Development Economics*, Vol. 11, No. 1, pp. 13–30.

Rankin, N.; Schoer, V. 2013. "Export destination, product quality and wages in a middle-income country: The case of South Africa", in *Review of Development Economics*, Vol. 17, No. 1, pp. 64–73.

Saliola, F.; Seker, M. 2011. *Total factor productivity across the developing world*, Enterprise Surveys, Enterprise Note Series, Enterprise Note No. 23, Washington DC: World Bank.

Schank, T.; Schnabel, C.; Wagner, J. 2007. "Do exporters really pay higher wages? First evidence from German linked employer-employee data", in *Journal of International Economics*, Vol. 72, No. 1, pp. 52–74.

Stone, S.; Shepherd, B. 2011. *Dynamic gains from trade: The role of intermediate inputs and equipment imports*, OECD Trade Policy Papers No. 110, Paris: Organization for Economic Co-operation and Development.

Vandenbussche, H.; Viegelahn, C. 2016. *Trade protection and input switching*, CEPR Working Paper No. 11395, London: Centre for Economic Policy Research.

Verhoogen, E. 2008. "Trade, quality upgrading and wage inequality in the Mexican manufacturing sector", in *The Review of World Economics*, Vol. 123, No. 2, pp. 489–530.

World Bank 2012. "Globalization's impact on gender equality: What's happened and what's needed", in *World Development Report 2012: Gender equality and development* (Washington D.C.).

A Appendix: Surveys

Angola	**2006**, 2010
Benin	2009
Botswana	**2006**, 2010
Burkina Faso	2009
Burundi	**2006**, 2014
Cameroon	2009
Cape Verde	2009
Central African Republic	2011
Chad	2009
Congo, Republic of	2009
Cote d'Ivoire	2009
DRC	**2006**, 2010, 2013
Djibouti	2013
Egypt	2013
Eritrea	2009
Ethiopia	2011
Gabon	2009
Gambia	2006
Ghana	**2007**, 2013
Guinea	**2006**
Guinea-Bissau	2006
Kenya	2007, 2013
Lesotho	2009
Liberia	2009
Madagascar	2009, 2013
Malawi	2009, 2014
Mali	2007, 2010
Mauritania	**2006**, 2014
Mauritius	2009
Morocco	2013
Mozambique	2007
Namibia	**2006**, 2014
Niger	2009
Nigeria	2007, 2014
Senegal	2007, 2014
Rwanda	**2006**, 2011
Sierra Leone	2009
South Africa	**2007**
South Sudan	2014
Sudan	2014
Swaziland	**2006**
Tanzania	**2006**, 2013
Togo	2009
Tunisia	2013
Uganda	**2006**, 2013
Zambia	**2007**, 2013
Zimbabwe	2011

Notes: This table lists all the surveys with firm-level data that are included in the analysis. The surveys for which also employee-level data are available are marked in bold.

B Appendix: Estimation of firm-level total factor productivity

This paper relies on firm-level estimates of total factor productivity (TFP) as a measure of firm efficiency. To estimate TFP, we follow Saliola and Seker (2011) and use a simple Cobb-Douglas production function, that can be specified as follows:

$$Y = TFP \cdot L^{\alpha} K^{\beta} M^{\gamma} \tag{7}$$

with Y denoting output, L denoting labour input, K denoting capital input and M denoting material inputs. We estimate this production function in logarithmic form, where the estimated equation can be written as:

$$\log Y = \alpha \log L + \beta \log K + \gamma \log M + \epsilon \tag{8}$$

As measure of output, we use firm-level sales. The capital stock is measured as the replacement value of machinery, vehicles, equipment, land and buildings. Labour input is given by the number of full-time permanent employees, while material input in the data corresponds to raw material expenses. The residual of the estimated equation corresponds to an estimate of total factor productivity, in logarithmic form.

C Appendix: Results of rubustness checks

Table A1: Importing, exporting and the average wage (employee-level) – no outliers

Dependent variable: Log(Wage)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exporter	0.135***		0.164***	0.141***	0.091**		0.116***	0.074*
	(0.039)		(0.041)	(0.041)	(0.043)		(0.043)	(0.042)
Importer		-0.076**	-0.108***	-0.124***		-0.061**	-0.087***	-0.105***
		(0.031)	(0.032)	(0.033)		(0.030)	(0.030)	(0.031)
Capital stock over sales				-0.004				-0.009*
				(0.004)				(0.005)
Electricity costs over sales				-0.179				0.137
				(0.382)				(0.386)
Foreign owned				-0.128**				-0.080
				(0.061)				(0.058)
Female					-0.002	0.003	0.006	0.029
					(0.029)	(0.030)	(0.029)	(0.030)
Married					0.031	0.027	0.030	0.034
					(0.030)	(0.030)	(0.030)	(0.030)
No or primary education					-0.239***	-0.243***	-0.237***	-0.237***
					(0.032)	(0.032)	(0.032)	(0.033)
Vocational training					0.326***	0.325***	0.327***	0.327***
					(0.037)	(0.038)	(0.037)	(0.038)
University degree					0.913***	0.930***	0.918***	0.945***
					(0.062)	(0.062)	(0.063)	(0.066)
Trade union member					-0.006	0.013	-0.005	0.003
					(0.037)	(0.034)	(0.037)	(0.038)
Experience with employer					0.008**	0.008**	0.008**	0.009**
					(0.004)	(0.004)	(0.004)	(0.004)
Total experience					0.009***	0.009***	0.009***	0.009***
					(0.003)	(0.003)	(0.003)	(0.003)
Worker age					0.009***	0.009***	0.009***	0.009***
					(0.002)	(0.002)	(0.002)	(0.002)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.86	0.86	0.86	0.86	0.89	0.89	0.89	0.89
Number of observations	4161	4166	4161	3931	3253	3258	3253	3121

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the sample of employees (16 surveys), where the employees with the highest and lowest wage per firm have been excluded.

Table A2: Importing, exporting and the average wage (firm-level) – only surveys represented in employee-level data

Dependent variable: Log(Wage)						
	(1)	(2)	(3)	(4)	(5)	(6)
Exporter	0.314***		0.257***	0.227***	0.191***	-0.002
	(0.043)		(0.043)	(0.044)	(0.044)	(0.153)
Importer		0.245***	0.195***	0.180***	0.157***	-0.099
		(0.033)	(0.033)	(0.033)	(0.033)	(0.142)
Capital stock over sales				-0.036***	-0.035***	-0.063**
				(0.006)	(0.006)	(0.028)
Electricity costs over sales				-2.867***	-2.794***	-7.144***
				(0.640)	(0.626)	(2.010)
Foreign owned					0.331***	0.388
					(0.052)	(0.461)
Log(Firm age)						0.135**
						(0.057)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.85	0.85	0.85	0.86	0.86	0.92
Number of observations	2961	2961	2960	2838	2837	164

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the sample of firms that belong to the 16 surveys for which also employee data are available.

Table A3: Importing, exporting and the average wage (firm-level) – only firms represented in employee-level data

Dependent variable: Log(Wage)						
	(1)	(2)	(3)	(4)	(5)	(6)
Exporter	0.325***		0.292***	0.272***	0.254***	-0.079
	(0.064)		(0.065)	(0.066)	(0.065)	(0.189)
Importer		0.176***	0.130***	0.120***	0.100**	0.005
		(0.046)	(0.046)	(0.045)	(0.045)	(0.184)
Capital stock over sales				-0.038***	-0.036***	-0.121**
				(0.007)	(0.006)	(0.046)
Electricity costs over sales				-2.731***	-2.802***	-1.451
				(0.631)	(0.636)	(5.662)
Foreign owned					0.301***	-0.565**
					(0.072)	(0.267)
Log(Firm age)						0.015
						(0.084)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.86	0.86	0.86	0.87	0.87	0.93
Number of observations	1382	1383	1382	1311	1310	80

Notes: *, ** and *** respectively indicate statistical significance at the 10, 5 and 1% level. Reported standard errors are robust. Regression results are obtained from estimating equation (4) with OLS on the sample of firms that belong to the firms within the 16 surveys that also report employee data.