EXPORTING AND THE WAGE PREMIUM: THE CASE OF SOUTH AFRICAN MANUFACTURING FIRMS

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Abstract

There is much literature to support the view that exporters (both developed and developing countries) pay higher wages than non-exporters. While this so-called 'export wage premium' has also been found to be prevalent in South Africa, it has not been thoroughly researched, with studies to date having relied on cross-sectional sample data rather than the population of firms and workers. Using a newly constructed employer-employee matched panel dataset on South African manufacturing firms, the study examined the factors contributing to the export wage premium in these firms – from firm, individual and job characteristics (both observable and unobservable) to firms' distribution of wages and export destinations (e.g. SACU-only[1], Africa-only[2] or international[3]). One of the key findings was that the export wage premium is not about being labelled an exporter. It is however because of the "type of firm" (unobservable firm characteristics) exporters are, the "type of workers" (unobservable individual characteristics) they employ and the "type of jobs" (unobservable job characteristics) they create.. Policy-makers should therefore be aware that simply expanding the pool of exporters will not necessarily give momentum to the export wage premium phenomenon. Rather, policy measures should be aimed at increasing firm-level productivity.

Keywords: Wage premium, employer-employee data, South African manufacturing exporters.

JEL codes:F10, F16

[1] Firms exporting only to Southern African Customs Union countries.

[2] Firms exporting only to African countries.

[3] Firms exporting to both African and non-African countries.

1. Introduction

Exporters are known to pay higher wages than non-exporters (Bernard & Jensen, 1999). There is ample evidence of this in both developed and developing countries (Bernard & Jensen, 2004; Bernard *et al.*, 2007; Alvarez & López, 2005; Hahn, 2005). Africa is no different. For example, Van Biesebroeck (2005) studied the effect of export status on productivity in a range of manufacturing firms in nine sub-Saharan African countries and found that exporters paid on average 40% more than non-exporters. The so-called 'export wage premium' is also in evidence in South Africa, as revealed in two studies by Matthee *et al*. (2016) and Edwards *et al.* (2016), respectively.

The question should be asked: why do exporting firms pay higher wages? There could be a number of reasons. Firstly, exporting firms have different observable firm characteristics from non-exporting firms (such as firm size, capital intensity and output per worker) (see Bernard & Jensen, 1997; Bernard & Wagner, 1997; Greenaway & Yu, 2004). Secondly, the observable individual characteristics of the workforce (such as age and length of tenure) in exporting firms might differ from those of non-exporting firms (Schank *et al*., 2007; Munch & Skaksen, 2008; Klein *et al*., 2013). Thirdly, the export wage premium might be due to unobservable firm and individual characteristics (e.g. Schank *et al*., 2007; Munch & Skaksen, 2008; Fafchamps, 2009). Finally, the distribution of wages and the higher (on average) wages paid by exporting firms might disguise the fact that exporting firms pay more at certain parts of the wage distribution, according to where in the wage distribution it matters most (Fu & Wu, 2013; Koenker & Hallock, 2001).

Limited research has been conducted on the export wage premium in South Africa. The phenomenon was examined in a study by Rankin and Schöer (2013), using employer-employee matched data. However, the study was limited to cross-sectional survey data. Furthermore, while the authors found evidence of an export wage premium (even after controlling for firm and individual characteristics), the premium differed by export destination. Among the findings were that the wages of firms exporting to the regional market of SADC (Southern African Development Community) were lower than those of firms producing domestically, whereas the wages of firms exporting outside the region were higher than those of both regional exporters and domestic producers.

This article helps to fill the gap in the literature by using newly available administrative data to study the export wage premium among manufacturing exporters in South Africa. A panel dataset was constructed by merging three sets of administrative records collected by SARS (South African Revenue Service), namely employee income tax data (IRP5 or PAYE), company income tax return data (ITR and ITR14) and customs transaction data. This new employer-employee matched panel dataset on South African manufacturing firms allows one to control not only for observable (and unobservable) firm characteristics, but also for observable (and unobservable) individual and job characteristics (which constitutes a unique firm–individual match). The article examines whether the export wage premium is due to observable or unobservable firm, individual or job characteristics, or to the distribution of wages, or to actual exporting activities (the firm's export status).

The article makes a further contribution by considering other dynamics that potentially add to the wage premium. It does this by taking into account the influence of different export destinations – that is, both regional (African-only) and *international* (both African and non-African) destinations – as well as quantile regressions. By showing the wage premium at different parts of the wage distribution, the quantile regressions illustrate how the observed export wage premium is distributed.

The rest of this article is structured as follows: section 2 comprises a literature review on the export wage premium phenomenon in firm-level studies, with a specific focus on employer-employee matched datasets; section 3 presents the empirical analysis, starting with a description of the data (section 3.1) and then proceeding to descriptive statistics on exporters and monthly wages (section 3.2), the estimation strategy (section 3.3) and the regression results (section 3.4); and section 4 brings the article to a close with a number of conclusions.

2. Literature review

Exporting and the impact of exports on a country's economy have sparked considerable research interest, from as early as 1955 (North, 1955). In the 1990s, Bernard and Jensen took the theme forward with a series of firm-level studies on the differences between exporters and non-exporters (Bernard *et al.*,1995; Bernard & Jensen, 1999; 2004; Bernard *et al.*, 2004). . They inspired a body of literature focusing specifically on the export wage premium. These include studies on Germany (Bernard & Wagner, 1997; Arnold & Hussinger, 2005), Taiwan (Liu *et al.*,

1999), the United Kingdom (Greenaway & Yu, 2004), Chile (Alvarez & López, 2005), Korea (Hahn, 2005), sub-Saharan Africa (Van Biesebroeck, 2005), Spain (Fariñas & Martín-Marcos, 2007) and five European countries (Egger *et al*., 2013). Most studies on the export wage premium used firm-level (plant-level) data which allowed the researchers to control for observable (and sometimes unobservable) firm characteristics. For example, Van Biesebroeck (2005), Bernard and Wagner (1997), Liu *et al*. (1999) and Hahn (2005) controlled for firm size, capital intensity, firm age, location, industry and other firm-specific characteristics. In general, these studies showed evidence of an export wage premium. This suggests that the observed export wage premium is not just because a firm is larger, more capital-intensive and more experienced; it is also due to something else.

Critics argue that this export wage premium is overestimated because the individual characteristics of workers are not controlled for (Klein *et al*., 2013; Schank *et al*., 2007; Munch & Skaksen, 2008). The basis of this argument is that exporters are more likely to employ different types of workers from those employed by non-exporters. These workers may be 'better' in that they have more skills and experience and higher levels of education, which make them more productive. To be able to include individual characteristics requires employer-employee matched data, which Breau and Rigby (2006:298) called 'a non-trivial task'. As there were no variables in the Census Bureau of the United States that directly matched workers to firms. Therefore, Breau and Rigby (2006) had to construct their own employer-employee dataset from three different sources.

2.1 Employer-employee level studies

Schank *et al.'s* (2004) study was one of the first to tackle the challenging task of linking individual workers to firms for the purpose of analysis. They used an employer-employee combined dataset (which matched the employment statistics of the German Federal Labour Services with plant-level data from the IAB Establishment Panel) for Germany to calculate the export wage premium, taking into account individual characteristics. Their results showed that the export wage premium disappeared after controlling for individual characteristics.

In a similar vein, Breau and Rigby (2006) linked worker characteristics (from the Decennial Household Census) to the manufacturing firm data (from the Longitudinal Research Database) for manufacturers in Los Angeles in 1990 and 2000. They, too, found no evidence of an export

wage premium for workers with similar characteristics after controlling for specific individual characteristics (such as age, education, gender, race and nationality). Similar results were obtained by Heyman *et al.* (2007) when using an employer-employee matched dataset on the entire Swedish private sector because the wage premium of foreign-owned firms (relative to domestically-owned firms) faded when controlling for individual and firm heterogeneity. Therefore, they did not find that foreign firms paid higher wages for identical workers.

Schank *et al.* (2007) analysed the same dataset as Schank *et al.* (2004), but also differentiated between different types of workers (blue-collar versus white-collar) in exporting and non-exporting firms. Their results showed that blue-collar workers in an exporting firm (with a 60% export-to-sales ratio) earned 1.8% more than blue-collar workers in a non-exporting firm. For white-collar workers, the export wage premium was 0.9%. A study by Munch and Skaksen (2008) on the export wage premium in Denmark also used employer-employee matched data (a FIDA dataset, which was based on administrative registers from 1999 to 2002) and distinguished between different kinds of workers (based on skill intensity) and different export intensity levels (ratio of exports to output). Their results indicated that firms with a high level of export intensity did have an export wage premium and this premium was even higher when export-intensive firms had higher-skilled workers (Munch & Skaksen, 2008).

Fafchamps (2009) investigated the export wage premium for Morocco using survey data on manufacturing firms from September to December 2000. By interacting export status with worker education in a fixed-effects regression, he considered the possibility of an education wage premium in exporting firms. Even though the results indicated that exporters employed more educated workers, it did not show that they paid these educated workers more relative to non-exporters. On the other hand, when he added skills (which are not the same as education), an export wage premium was found among skilled production workers.

Fafchamps (2009) further determined that firm characteristics had a greater impact on the wage premium than individual characteristics. This was evidenced in the fact that there was an export wage premium when controlling for individual characteristics, namely education, experience, gender, length of tenure and vocational training. But this premium declined (or even disappeared) when controlling for firm capital and labour (firm characteristics). Breau and Brown (2011) investigated whether exporters and foreign-controlled establishments in the

Canadian manufacturing industry paid a wage premium relative to non-exporters and domestically controlled establishments. By using employer-employee data created from two micro data sources (the 1999 Annual Survey of Manufacturers and the 2001 census) their results suggested that there was an export wage premium (14%) and a foreign-controlled (30%) wage premium. The premium declined (but still held) as more and more firm characteristics (plant size, capital intensity and multi-unit firm status) and individual characteristics (age, years of schooling, gender and nationality) were controlled for. In line with the findings of Fafchamps (2009), Breau and Brown (2011) observed that firm characteristics had a more pronounced effect on the wage premium than individual characteristics.

The employer-employee matched data has also been used to explore the export dynamics of firms, workers and jobs (firm-worker spells, as they have been called by Martins & Opromolla, 2009). By adding firm-fixed effects, individual-fixed effects and job-fixed effects to the estimations of the export wage premium, some studies have determined what happened to a firm's (and individual's) wages when they entered the export market (Schank *et al*., 2007; Fafchamps, 2009; Martins & Opromolla, 2009). The average wages of a firm seemed to increase when they entered the export market, whereas an individual's wages did not increase (or increased by less than 0.01 log points) when they joined an exporting firm or when the firm in which they worked started to export (Schank *et al.*, 2007; Fafchamps, 2009; Martins & Opromolla, 2009).

Using employer-employee matched panel data, Schank *et al.* (2010) tracked German firms over time. They found that the export wage premium had already existed some years before the firm entered the export market. This suggests that the wage premium was not the result of exporting per se, but was rather explained by the type of firm (more productive and better paying) that, through a process of self-selection, went into exporting.

The export wage premium can be overestimated, as the average wage in an exporting firm could be driven up by a specific group of workers within an exporting firm (Fu & Wu, 2013). It is therefore important to consider the wage distribution of firms. In other words, the average wage premium is not necessarily representative of the wage differentials between different quantiles of the wage distribution. For example, when workers with higher ability/ more talent is employed by exporting firms, the average wage of exporting firms would be driven up and

the export wage premia would be overestimated (Fu & Wu, 2013). To identify the effects of unobservable talent/ability of workers on the export wage premium, the use of quantile regression analysis (to show the wage distribution) has become more popular in wage differential studies with respect to education, gender and working condition (Choi & Jeong, 2007).

It is not only individual and firm characteristics that influence the export wage premium, but also the export destination. A Spanish study distinguished between the wages of firms operating purely in the domestic market and those selling to the domestic and European Union markets as well as the rest of the world. The study demonstrated that the export premium increased in relation to the remoteness of the market and to employee education levels, after controlling for individual and firm characteristics (Alcalá & Hernández, 2010).

The destination's remoteness and/or classification seemed to have an impact on wages. There was a significant difference between the productivity and wages of firms exporting to low-income destinations (LID) and high-income destinations (HID), respectively (Turco & Maggioni, 2013; De Loecker, 2007; Park *et al.*, 2010; Shevtsova, 2012). Firms exporting to HID paid higher average wages than those exporting to low-income destinations (Brambilla *et al*., 2012). This supports the hypothesis of Verhoogen (2008), Brambilla *et al.* (2012) and Brambilla and Porto (2016) that the export destination influences product quality, which in turn influences worker quality and ultimately wages. Verhoogen (2008) studied Mexican manufacturing exporters by using the Annual Industrial Survey data for the periods 1993-2001 and 1984-2001. His results showed that when firms exported to high income countries, their products needed a quality upgrade, which required more skilled workers. In a similar vein, there was a so-called "skills-bias" in export destinations for Argentinian manufacturing exporters in a study by Brambilla *et al.* (2012). This "skills-bias" can be seen in that exports to high income countries (relative to middle-income or their domestic market), necessitated higher worker skill levels, which in-turn implied higher wages (Brambilla *et al.*, 2012). A more recent study by Brambilla and Porto (2016) confirmed this. By studying 82 countries they showed that high-income countries demanded higher quality goods (and firms exporting to these destinations subsequently paid higher wages). Sutton (2007) linked the relationship between labour cost and quality by arguing that the higher a country's labour cost, the higher the product quality should be (while not

jeopardising international competitive). Higher-quality products in turn require improved technology, which goes hand in hand with more educated workers.

2.2 South African literature

In the South African context, firm-level studies confirmed that South African exporting firms have superior characteristics to those of non-exporting firms (Rankin, 2001; Edwards *et al*., 2008; Naudé *et al*., 2010; Matthee & Krugell, 2012; Rankin, 2013; Naughtin & Rankin, 2014). Among other things, exporters were found to pay a wage premium (Rankin, 2001; Edwards *et al.*, 2008; Rankin, 2013). However, there were two main limitations to these studies. Firstly, they relied on samples rather than the population of firms and workers. The use of administrative data allows one to look at the whole population of firms –rather than just a sample (which can be influenced by sampling procedures). Secondly, they were on a firm level which did not take worker characteristics into account. Two papers by Matthee *et al.*, (2016), Edwards *et al.* (2016) addressed the first limitation and a paper by Rankin and Schöer (2013) addressed the second limitation.

The United Nations University World Institute for Development Economics Research (UNU-Wider), in collaboration with the National Treasury and the South African Revenue Service (SARS), launched a project with the aim of understanding the factors underpinning the expansion of high productivity firms in South Africa. Using newly available tax administrative data, this project gave researchers insight – for the first time – into the export dynamics of South African firms (Matthee *et al.,* 2016; Edwards *et al*., 2016). Following Bernard *et al.*'s (1995) approach to identifying the 'export premia' on firm-level data, both studies showed exporters (and two-way traders) to be larger, more productive and better paying than non-exporters. More specifically, Matthee *et al.* (2016) found that firms exporting multiple products to multiple destinations had the highest export wage premium.

Edwards *et al.* (2016) grouped South African trading firms into three clusters, namely those that only exported, those that only imported and two-way traders. The export wage premium was the highest among two-way traders, followed by importers only and then exporters only. Although the specific export wage premium was not the main focus of these studies, both verified that a wage premium existed. As these two studies were conducted on a firm level (as opposed to an employer-employee level), the export wage premium might have been

overestimated as it did not control for individual characteristics (as suggested by Schank *et al.*, 2007; Munch & Skaksen, 2008; and Klein *et al.*, 2013).

The study by Rankin and Schöer (2013) is the only South African study to have used an employer-employee matched dataset to investigate the export wage premium. Using the World Bank's Investment Climate Assessment Survey conducted in 2004 (this was a cross-sectional dataset) the authors examined the influence of the export destination on wages. They found an export wage premium, even after controlling for firm characterisics (firm size and productivity measures) and individual characteristics (age and education). However, the premium differed by destination. According to the authors, South Africa has two distinct export markets, namely a regional market and an *international* market. The wages of firms exporting to the regional market are lower than those of firms producing for the domestic market, whereas the wages of firms exporting outside the region are higher than those of both regional exporters and domestic producers. Therefore, there is an export wage premium and a skills premium among South African firms. These results support the hypothesis of Verhoogen (2008) and Brambilla *et al.* (2012). Though insightful, the Rankin and Schöer (2013) study was limited to cross-sectional survey data from 2004.

3. Empirical analysis

3.1 Data

This article used newly available tax administrative data to conduct a firm-, individual- and job-level analysis, which formed part of a project launched by the National Treasury in collaboration with UNU-WIDER. The data was supplied by the South African Revenue Service (SARS). There were three main sources of tax administrative data: firstly, the job-level tax form data (IRP5 certificates) completed by employers on behalf of their employees; secondly, the customs data for all South African export transactions; and the company income tax (CIT) return data submitted by corporate firms. In order to construct an employer-employee matched dataset, the CIT and customs data (employer data) were merged into the IRP5 (employee) data. The merging was made possible by the use of a conjunction table (linking the firms' identifiers from each dataset) provided by SARS. The three datasets pertained to

different reporting years; therefore, the dates were aligned to arrive at a panel dataset from 2010 to 2014.

The IRP5 certificates provided information about workers on a job level (a job being defined as a unique individual–firm match). The raw IRP5 data was adjusted to remove duplicate certificates, multiple job spells and invalid periods worked. The IRP5 certificates included information on the number of days an individual worked in a specific job (start and end dates), their income (in South African Rand) and their birth date (from which their age could be determined). It is important to note that there was no data on the skill-level, education or gender of workers and the data was limited to worker's age and length of tenure. As the number of days worked differed from one job to the next, the monthly wages variable was calculated by taking the income and dividing it by the number of days worked (to get the daily wage equivalent). This was then multiplied by 30 to get the monthly equivalent wages. Even though the final panel dataset was from 2010 to 2014, the tenure of each job was calculated by using the IRP5 data from 2008 to 2014. To create a measure of firm size, the number of employees per firm was calculated by using a full-time equivalent over each year (that is, number of days worked across all workers in a firm divided by 365).

The customs transaction data included information about the trader (firm), the product exported (on Harmonised System six-digit code (HS6) level), the export destination country, the value of the transaction (in South African Rand) and its statistical value (number of units). The raw customs data was cleaned by removing duplicate transactions and excluding small and sporadic exporters trading less than R10 000 (this still left 99% of the export data). To link the customs transaction data to the IRP5 data, the former was merged onto the firm level. The reason for this was that the only link between these two datasets was the conjunction table provided by SARS, which links firms' identifiers from each dataset (the IRP5, customs and CIT). From the customs data, a variable was created that indicated the export destination group that a firm served. An exporter can be in one of three destination groups, namely *SACU only* (firms exporting only to Southern African Customs Union countries), *Africa only* (firms exporting only to African countries) and *international* (firms exporting to both African and non-African countries).

The income tax returns submitted by corporate firms (CIT) included each firm's annual income statements and balance sheets. From these financial statements, the *Property Plant and Equipment* line item was used to measure capital intensity and the *Sales* line item was used to measure output. The main industry code (profit code classifier) of each firm was used to identify the sector in which it operated. The profit code classifier was condensed to the four-digit ISIC classification used by SARS to select the firms in the manufacturing sector (ISIC 4 classification: codes 1010–1033).

The final panel therefore included employer-employee matched data from 2010 to 2014 for all manufacturing firms in South Africa that submitted both their tax returns (CIT) and IRP5 forms.

3.2 Descriptive statistics on exporters and monthly wages

Figure 1 illustrates that, on aggregate, more jobs[4] are provided by exporting firms than non-exporting firms. To be more specific, it is the exporters exporting *internationally* (to both African and non-African countries) that provide the most jobs in the manufacturing sector.

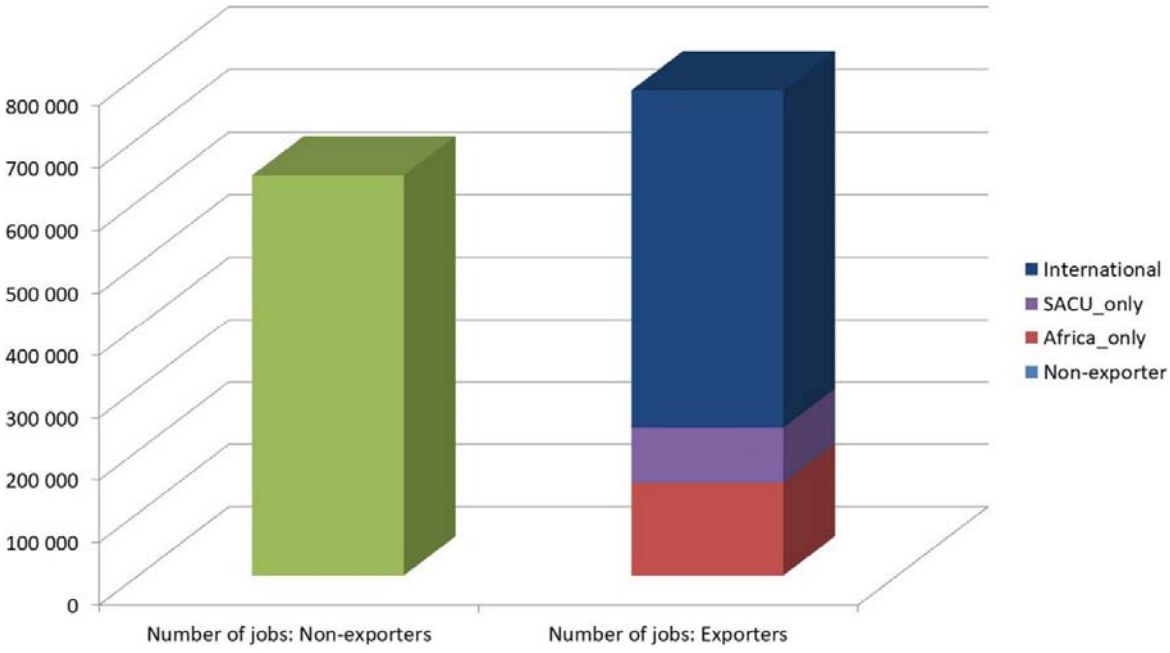

Figure 1: Number of jobs – exporters versus non-exporters (average 2010–2014)
Source: Authors' own calculations][5]

[4] These 'jobs' are job-incidence and not full-year-equivalent jobs per firm (that is, the jobs have not been 'weighted' per firm).
[5] See tables A1 and A2 for more descriptive stats on the data

In terms of the wage distribution of jobs in the South African manufacturing sector, Figure 2 provides an indication of how the export destination determines influences the monthly wages of workers.[6] Rankin and Schöer (2013) found that, on average, the wages of South African firms exporting to the regional market (SADC) were lower than those of non-exporting firms. Furthermore, they showed that the average wages of firms exporting outside the region were higher than those of both regional exporters and domestic producers (Rankin & Schöer, 2013).

The data in this article shows similar results, with the average wages of firms exporting to the *international* market being the highest, followed by those of firms exporting to *Africa only* and thereafter by those of firms serving either *SACU only* or the domestic market. At the 5th percentile of the wage distribution, the difference between the monthly wages earned by those employed at an exporting firm (serving the *international*, *Africa-only* or *SACU-only* market) or a non-exporting firm is small. As one moves to the upper tail of the distribution, there is a bigger difference in the monthly wages in firms serving different destinations. A job at a firm that exports to the *international* market pays the most, followed by one at a firm that exports to *Africa only*. A job at a firm that is either a non-exporter or exports to *SACU* only pays the least.

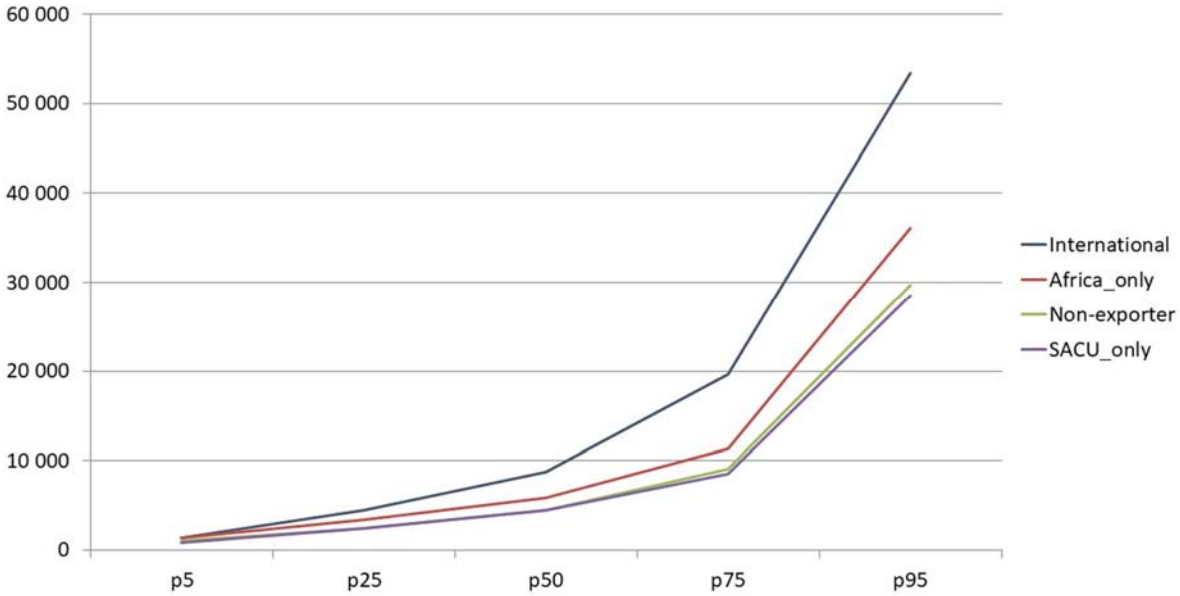

Figure 2: Wage distribution (average Rand amount 2010–2014) per export destination
Note: These are absolute figures of monthly wages (levels) with no control variables.
Source: Authors' own calculations]

[6] This is calculated on the individual-job level (not on the aggregate-firm level).

Figures 3 presents the kernel densities of wages for the different export destinations. From the figure it is clear that the shapes of the kernel densities for non-exporters and *SACU-only* exporters are very similar. Relative to these two, the *Africa-only* kernel density is slightly more to the right, with a small bulge. The distribution of wages for *international* exporters is more to the right of the distribution of wages for *Africa only*, indicating that workers earn higher wages.

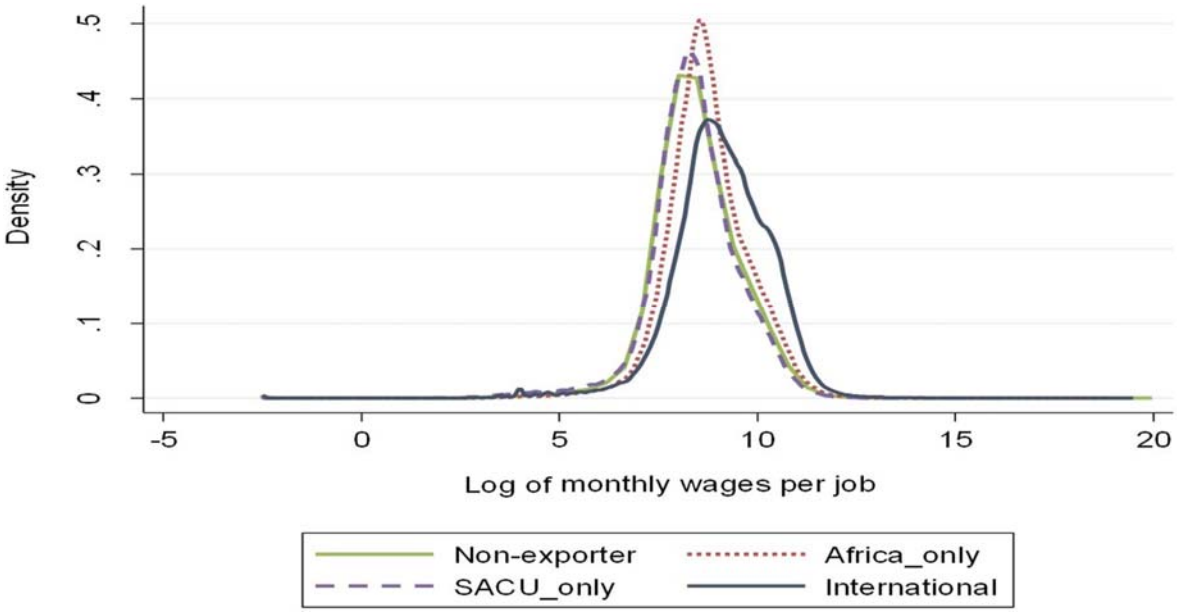

Figure 3: Kernel density – exporters versus non-exporters per export destination
Source: Authors' own calculations]

3.3 Estimation strategy

The descriptive statistics and literature confirm that exporting firms pay higher average wages. The question that arises is why they do so. As noted earlier, there could be different reasons for the export wage premium, stemming from observable firm and individual characteristics, which require further analysis. The starting point for this analysis is to estimate a standard Mincerian earnings function using control variables that control for observable individual and firm characteristics.

$$\ln(X)_{ijt} = \alpha + \beta_1 Exporter_{jt} + \beta_2\, individual_{ijt} + \beta_3 firm_{jt} + \beta_4 Industry_t + \beta_5 year + v_j + z_i + n_{ij} + u_{ijt} \quad (1)$$

Where:

X_{ijt} –monthly wages per job (for worker *i*, in firm *j*, at time *t*)

$Exporter_{jt}$– dummy variable indicating export status (exporter=1 and non-exporter=0)

$Individual_{ijt}$– observable individual characteristics (age, age-squared and tenure[7])[8]

$Firm_{jt}$– logarithm observable firm characteristics, namely firm size: number of workers, capital per worker and output per worker

$Industry_t$– control dummy (four-digit ISIC classification) to account for industry heterogeneity and industry-fixed effects

$year$ – control dummy for the years

β_1 – export premia

v_j – firm-specific effects

z_i – individual-specific effect

n_{ij} – job-specific effects

μ_{ijt}- individual error term

The model is estimated initially with controls for observable individual (age, age-squared and tenure) characteristics and firm (size, capital and labour productivity) characteristics. To control for unobservable factors a series of fixed effects are then added. Since the data is on a job level (a unique individual and firm combination), it allows for fixed-effect controls on a firm level. Following the work of Schank *et al*. (2007), Munch and Skaksen (2008) and Fafchamps (2009), v_j is used to control for firm-fixed effects. In this specification the export coefficient is identified by firms switching in and out of exporting.

The third estimation of the model follows Fafchamps (2009) by including individual-fixed effects (z_i). With individual-fixed effects the export coefficient is identified by either one of two possible occurrences: firstly, if a worker switches jobs from a non-exporting firm to an

[7] Tenure is defined as working in the same job (individual-firm match) from one year to the next (calculated from 2008 to 2014).

[8] The age, age-squared and tenure variables have been entered as levels (that is, not as logarithms).

exporting firm (or vice versa), and secondly, if a worker stays in the same job but the firm they work for switches into or out of exporting.

Since the data is on a job level, one can also use job-fixed effects to control for all observable and unobservable job characteristics. In this specification, the export coefficient is identified by a worker staying in a job and the firm they work for starts, or stops, exporting. Following Martins and Opromolla (2009), job-fixed effects (n_{ij}) are used to control for unchanging job specific characteristics. These job-fixed effects measure the difference in wages within a job, when a firm becomes an exporting firm. Through the addition of these different fixed-effects the model becomes more and more restrictive, but gives insight into what drives the export wage premium and firm dynamics (therefore also more realistic).

This article considers another possible approach to studying the export wage premium – that is, by examining it in various parts of the wage distribution. The advantages of using quantile regressions rather than the OLS method were summarised by Koenker and Hallock (2001). OLS regression results are less robust to outliers than quantile regressions. Quantile regressions give parameter estimates at different quantiles, whereas OLS provides these at the mean. With quantile regressions, the whole sample of data is used, with observations closer to each quantile weighted more heavily. By using quantile regressions, equation 1 is estimated to see the export wage premium at the 5th, 25th, 50th, 75th and 95th percentiles of the wage distribution.[9]

3.4 Regression results

3.4.1 Mincerian earnings function with fixed effects

3.4.1.1 Export wage premium

Table 1 shows the results of estimating equation 1 with controls for observable individual and firm characteristics (see columns 1–4), adding control for firm-fixed effects (column 5), individual-fixed effects (column 6) and job-fixed effects (column 7). Column 1 shows the wage

[9] Quantile regressions with fixed effects are also estimated. This is done by means of the quantile regression estimator for panel data (QRPD) developed by David Powell (2016). The results are available from the authors on request.

premium (of 54.65%[10]) for jobs in exporting firms relative to non-exporting firms in South Africa's manufacturing sector (controlling for year and industry). When adding individual characteristics (age, age-squared and tenure) in column two, the wage differential drops to 43.48%. Therefore, 11.17% of a person's monthly wages can be explained by these individual characteristics (note that there is no data on skills and education, therefore this will be "controlled" for in column 6 - where the wage premium almost disappears). Once firm characteristics are controlled for (column 3) – this includes firm size, capital intensity and output per worker – the wage differential drops by 43.07 percentage points to 10.96% (compare columns 1 and 3). Therefore, a large part of a person's monthly wage can be explained by the characteristics of the firm they work in. Fafchamps (2009) and Breau and Brown (2011) also found firm characteristics to have a bigger impact on the export wage premium than individual characteristics.

In column 5, firm-fixed effects are added. The export coefficient is identified by firms that change their export status. The wage differential seen in columns 1 to 4 has disappeared (-1.24%). Therefore, when a firm enters the export market, the average wages of its workers fall. One possible explanation for this is a change in the composition of the workforce (that is, the addition of more lower-paid workers). This decrease in average wages of a firm is in contrast to the findings of Schank *et al.* (2007), Fafchamps (2009) and Martins and Opromolla (2009) who found the average wages of firms to increase as they entered the export market.

Column 6 reports results when adding individual-fixed effects (z_i). This regression compares identical workers in two consecutive years. The small export coefficient (2.45%) is identified by two possible scenarios: firstly, workers moving from non-exporting to exporting firms (switching into different jobs/firms), and secondly, if a worker stays in a job and the firm switches into, or out of, exporting. From column 5 (firm-fixed effects), it is clear that when a firm switches into exporting its average wages fall. However, from a worker's perspective (column 6), when they enter a job at an exporting firm, they earn a wage premium compared to what they would earn if they worked in a non-exporting firm. Interestingly, a similar study on Morocco found no evidence of a wage premium when an individual switched into a job at an exporting firm (Fafchamps, 2009).

[10] The regression estimates the impact on ln (wage); therefore, the percentage is calculated as follows: exponent(beta) -1.

Job-fixed effects (n_{ij}) are added in column 7. By comparing identical jobs in two consecutive years, the identification of the export coefficient (using job-fixed effects) takes place when a worker stays in the same job and their firm becomes an exporting firm, or leaves exporting. Thus, the export coefficient of 1.44% (column 7) indicates that if a worker is employed in the same job and the firm starts exporting, the worker's wages increase by 1.44%. The firm-fixed effects (column 5) show that a firm's average wages fall when it switches into exporting, but within a job (job-fixed effects), wages rise. Therefore, when a firm starts to export, its average wages decrease but the continued jobs in that firm pay more. This suggests that the jobs that are added by these firms pay relatively lower wages than those occupied by the firms' current workforce.

Table 1: Export wage premium

	Monthly income (wages)						
	(1)	**(2)**	**(3)**	**(4)**	**(5) Firm fe**	**(6) Indiv fe**	**(7) Job fe**
Exporter	0.436***	0.361***	0.104***	0.0514***	-0.0125***	0.0242***	0.0143***
	(0.00192)	(0.00184)	(0.00103)	(0.000977)	(0.00232)	(0.00108)	(0.00118)
Age		-0.111***		-0.103***	-0.0876***	-0.174***	-0.114***
		(0.00110)		(0.000495)	(0.000452)	(0.0124)	(0.0104)
Agesqr		1.652***		1.528***	1.299***	2.357***	1.705***
		(0.0136)		(0.00613)	(0.00561)	(0.0167)	(0.0152)
Tenure		0.125***		0.121***	0.130***	0.0360***	0.0311***
		(0.000668)		(0.000296)	(0.000319)	(0.000373)	(0.00138)
Ln (no. of workers)			0.0541***	0.0535***	0.0421***	0.0190***	0.0387***
			(0.000241)	(0.000228)	(0.00170)	(0.000383)	(0.000877)
Ln (capital/worker)			0.0235***	0.0194***	0.00381***	0.00818***	0.00338***
			(0.000206)	(0.000195)	(0.000454)	(0.000215)	(0.000230)
Ln (output/worker)			0.295***	0.280***	0.0757***	0.0603***	0.0510***
			(0.000430)	(0.000408)	(0.00156)	(0.000519)	(0.000793)
Year control	Yes	Yes	Yes	Yes		Yes	Yes
Industry controls	Yes	Yes	Yes	Yes		Yes	Yes
Observations	6,296,730	6,296,730	6,296,730	6,296,730	6,296,730	6,296,730	6,296,730
R-squared	0.144	0.233	0.235	0.313	0.100	0.097	0.119
Number of: Firms/ID/job					49,462	2,679,640	3,011,765

Note: Premium relative to non-exporters ***p<0.01 **p<0.05 *p<0.1*

(is significant at the 1% level, 5% level and 10% level respectively)

Source: Authors' own calculations

3.4.1.2 Export wage premium to African and non-African countries

Table 2 distinguishes between the different export destinations and segregates the export wage differential (seen in Table 1) in terms of *international*, *Africa-only* and *SACU-only* exporters. In column 1 there is a substantial difference between *SACU-only*, *Africa-only* and *international* exporters. A worker at a firm exporting to *SACU* earns less or equal to a worker at a domestically orientated firm (columns 1–4). Working at a firm exporting to *Africa only* pays slightly more than a non-exporting firm. The highest wage premium is earned at a firm exporting to the *international* market (relative to non-exporting firms).

After adding firm-fixed effects (column 5), the differences in the wage premium between the destinations narrow substantially. With firm-fixed effects the export coefficient is identified by firms that switch into exporting (involving different destinations). The decrease in average wages of a firm that enters the export market, shown in Table 1 (column 5), can now be better understood. It is the workers in firms entering SACU *only* and *Africa only* whose average wages fall (-0.32% and -0.05% respectively). The average wages of workers in a firm entering the *international* market increase somewhat (0.05%). A possible reason for this is that *SACU-only* exporting firms add lower-paying jobs (that is, jobs that pay relatively less than the average workers in those firms earn) when switching into the export market (-0.32%), whereas firms switching into the *international* and *African* export markets are expanding their workforce by adding workers that earn relatively similar wages to the average within those firms (0.05% more for *international* and 0.05% less for *Africa*).

The individual-fixed effects (column 6) regression compares identical workers in two consecutive years. Therefore, the export coefficients (per destination) are identified by workers either moving from a non-exporting firm to an exporting firm or staying in the same job but their firm becomes an exporter. In column 6, the individual-fixed effects show an increase in wages (relative to non-exporters), but there is a hierarchy in the export coefficients as a firm exports to more distant destinations (*SACU only*, *Africa only* and *international*).

In column 7, the job-fixed effects indicate the same hierarchy as in column 6. But here the small export coefficient (per destination) is identified by a worker staying in the same job and the firm in which they are employed switching into exporting (that is, the firm starts to export to a certain destination).

Thus far, this article has considered the export wage premium by using OLS regressions to compare the average wages of exporters (serving different destinations) to those of non-exporters. Another perspective to consider is how the wage premium is dispersed over the wage distribution (from the 5th to the 95th percentiles). Hence, by examining the wage distribution, one can see at which income percentile the export wage premium is the highest. Section 3.4.2 continues to estimate equation 1 (with a series of fixed effects) by using quantile regressions to illustrate the wage premium over the wage distribution.

Table 2: Export wage premium (to African and non-African countries)

	Monthly income (wages)						
	(1)	**(2)**	**(3)**	**(4)**	**(5) Firm fe**	**(6) Indiv fe**	**(7) Job fe**
International	0.555***	0.469***	0.182***	0.116***	0.00548**	0.0389***	0.0169***
	(0.00210)	(0.00201)	(0.00119)	(0.00114)	(0.00279)	(0.00127)	(0.00141)
Africa only (excluding SACU)	0.252***	0.2080***	0.0705***	0.0338***	-0.00555**	0.0226***	0.00841***
	(0.00327)	(0.00310)	(0.00148)	(0.00140)	(0.00276)	(0.00134)	(0.00139)
SACU only	0.0431***	-0.0010***	-0.0729***	-0.108***	-0.0320***	0.00544***	0.00169***
	(0.00407)	(0.00386)	(0.00182)	(0.00172)	(0.00285)	(0.00149)	(0.00145)
age		-0.111***		-0.103***	-0.0875***	-0.174***	-0.114***
		(0.00109)		(0.000494)	(0.000452)	(0.0124)	(0.0104)
agesqr		1.646***		1.525***	1.299***	2.354***	1.705***
		(0.0136)		(0.00613)	(0.00561)	(0.0167)	(0.0152)
tenure		0.122***		0.120***	0.130***	0.0359***	0.0311***
		(0.000664)		(0.000296)	(0.000319)	(0.000373)	(0.00138)
Ln (no. of workers)			0.0447***	0.0458***	0.0417***	0.0175***	0.0388***
			(0.000251)	(0.000238)	(0.00170)	(0.000389)	(0.000877)
Ln (capital/worker)			0.0204***	0.0168***	0.00386***	0.00804***	0.00347***
			(0.000207)	(0.000196)	(0.000455)	(0.000215)	(0.000230)
Ln (output/worker)			0.288***	0.274***	0.0753***	0.0592***	0.0509***
			(0.000432)	(0.000410)	(0.00156)	(0.000521)	(0.000793)
Year control	Yes	Yes	Yes	Yes		Yes	Yes
Industry controls	Yes	Yes	Yes	Yes		Yes	Yes
Observations	6,296,730	6,296,730	6,296,730	6,296,730	6,296,730	6,296,730	6,296,730
R-squared	0.156	0.243	0.238	0.315	0.100	0.102	0.119
No. Firms/ID/job					49,462	2,679,640	3,011,765

Note: Premium relative to non-exporters ***p<0.01 **p<0.05 *p<0.1*

(is significant at the 1% level, 5% level and 10% level respectively)

Source: Authors' own calculations

3.4.2 Quantile regressions

3.4.2.1 Distribution of the export wage premium

Figure 4 presents a graphic illustration of the export premium (while controlling for observable individual and firm characteristics as well as industry and year) from the normal OLS regression (Table 1, column 4) relative to the quantile regression. The OLS regression minimises the sum of squared residuals. Therefore, it provides the impact (premium) at the mean (Fu & Wu, 2013). From the quantile regression, the impact (premium) at each quantile of the wage distribution is evident. The results of the quantile regressions are reported at the following five percentiles: 5th; 25th, 50th, 75th, and 95th. When considering the quantile regression results, the highest export wage premium is for workers either at the lower tail or at the upper tail of the wage distribution.

It is also interesting to note that, across the distribution, from the lowest to the highest quantile, there is a certain premium level in working in an exporting firm (while controlling for observable firm and individual characteristics). A worker at the bottom of the wage distribution (5th percentile) working in an exporting firm will still be paid 5% more than if they worked in a non-exporting firm with similar observable characteristics.

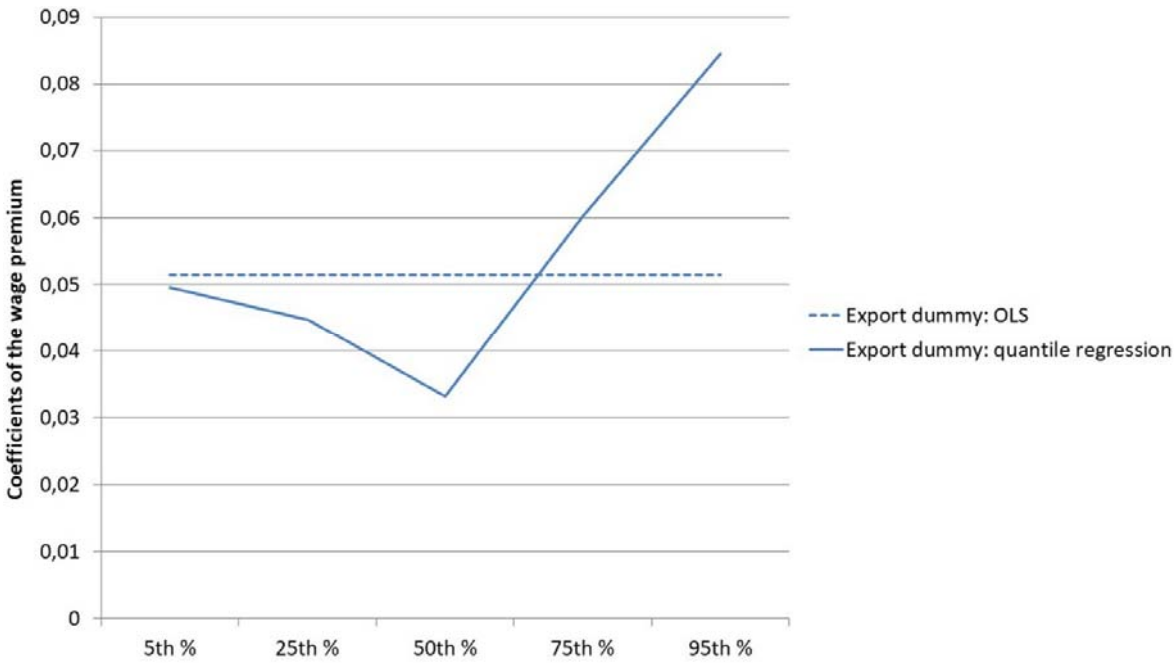

Figure 4: Distribution of the coefficients of the export wage premium

Note: Premium relative to non-exporters (controlling for observable individual and firm characteristics as well as industry and year) & all the coefficients of the quantile regression are significant at the 1% level]

Source: Authors' own calculations

3.4.2.2 Distribution of wage premium per export destination

Figure 4 pertains to exporters in general, but the South African firm-level literature shows that the wage premium differs between the regional and *international* markets (Rankin & Schöer, 2013). By distinguishing between the different export destinations (Figure 5), it is clear that the wage premium arising from working in an *international* firm is fairly constant throughout the distribution (but is still the highest premium). The wages paid by *Africa-only* and *SACU-only* exporters are driving the U-shape that is seen in Figure 4. Relative to non-exporters, there is no wage premium in working for *SACU-only* exporters (they pay lower wages than non-exporters). Working in *Africa-only* exporters there is an export premium at the upper and lower tail of the distribution, but not at the 50th percentile. Alcalá and Hernández (2010) also found that for Spanish firms the export premium increased with the remoteness of the market.

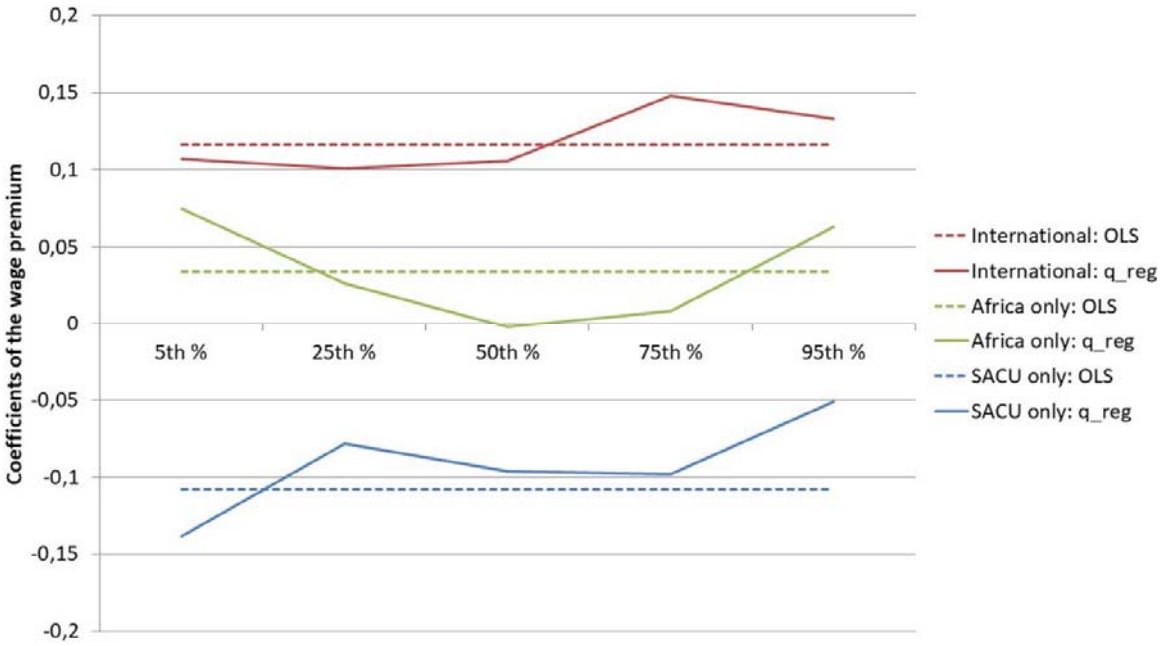

Figure 5: Distribution of the coefficients of the wage premium per export destination
Note: Premium relative to non-exporters (controlling for observable individual and firm characteristics as well as industry and year) & all the coefficients of the quantile regression are significant at the 1% level
Source: Authors' own calculations]

4. Conclusion

In keeping with the literature on exporting firms' characteristics in developed and developing countries, South African exporters have been found to pay higher average wages than non-exporters. Studies on the export wage premium in South Africa have, however, been limited to either panel or cross-sectional sample data (where results might have been influenced by sampling procedures) or to firm-level data (which does not allow one to control for individual characteristics). By using a newly constructed employer-employee matched panel dataset on South African manufacturing firms, this study examined whether the export wage premium is due to observable or unobservable firm, individual or job characteristics, or the distribution of wages, or exporting activities themselves (export status). The study makes a further contribution by considering other dynamics that could add to the wage premium – that is, taking the influence of different export destinations (regional versus *international*) as well as quantile regressions into account.

The results show that there is a 54.65% wage premium paid to workers in exporting firms in the South African manufacturing industry (when year and industry are controlled for). Around 11.817% of the wage premium can be explained by individual characteristics (namely age, age-squared and length of tenure) and 43.48% is due to specific firm characteristics (firm size, capital intensity and output per worker). Therefore, the export wage premium decreases from 54.65% to 5.27% once observable firm and individual characteristics are controlled for.

By estimating regressions with firm-, individual- and job-fixed effects, the change in average wages of firms and individuals can be identified as they start or stop exporting (switch into or out of exporting). The estimates indicate that when a firm starts to export to *SACU*, they add relatively lower-paying jobs (that is, jobs that pay relatively less than what the average worker in that firm earns). Firms switching into the *international* and *African* export markets are expanding their workforce by adding workers that earn relatively similar wages to the average worker within the firm (0.05% more for *international* and 0.05% less for *Africa*). When workers switch jobs and start working in an exporting firm, they earn a wage premium on what they would earn in a non-exporting firm. However, there is a hierarchy in the export coefficients as a firm exports to more distant destinations (*SACU only*, *Africa only* and *international*). When workers stay in the same job and their firm starts to export, there is an increase in their wages.

From a firm's point of view, when entering the export market it adds 'similar or lower-paying' jobs (relative to the firm's average wages); therefore, such a firm is adding relatively 'similar or lower-paid' workers. But for the workers starting to work at an exporting firm (relative to a non-exporting firm), they have 'better-paying jobs' than they would have if they were starting to work at a non-exporting firm. Individuals staying in the same job when their firm starts to export also see an increase in their wages.

In terms of the distribution of wages, the highest export wage premium is found among workers either at the lower tail or at the upper tail of the wage distribution. It is also interesting to note that, across the distribution, from the lowest to the highest quantile, there is a certain premium level in working in an exporting firm (while controlling for observable firm and individual characteristics). When taking export destinations into account, it is clear that the wage premium arising from working in a firm serving the *international* market is the highest and is fairly constant throughout the distribution (from the 5^{th} to the 95^{th} percentile). When working in *Africa-only* exporters, there is an export premium at the upper and lower tail of the distribution, but not at the 50^{th} percentile. Furthermore, there is no wage premium when working for *SACU-only* exporters (they pay lower wages than non-exporters).

It is only when firm-, individual- and job-specific unobservable characteristics (firm-, individual- and job-fixed effects) are controlled for that the observed export wage premium becomes so small that it effectively disappears. Therefore, the difference seen in the wage premium paid by an *international* exporter is not about being labelled an exporter. Rather, it is because of the 'type of firm' (unobservable firm characteristics) that exports, the 'type of workers' (unobservable individual characteristics) it employs and the 'type of jobs' (unobservable job characteristics) it creates. On the other hand, the 'type of firm' (unobservable firm characteristics) could in effect determine if a firm is an exporter or not. In other words, it could be those firms with superior characteristics that opt to go into exporting. There is an endogeneity issue in this analysis that cannot be disentangled. This endogeneity comes from the unobservable firm characteristics that possibly make a firm the type that exports.

From a policy perspective, it is clear that just creating exporters (changing a firm's export status) is not going to suddenly create an export wage premium. Rather, it is about changing the unobservable firm characteristics of a firm to create the 'type of firm' that is most likely to

be or become an exporter. A typical 'type of firm' that is most likely to become an exporter is usually larger and more productive (and tends to employ 'better' workers who have more skills, experience and higher levels of education, thus making them more productive). Policy-makers should therefore focus on formulating policies that increase firm-level productivity.

This article showed that the export premium is due to specific types of workers being selected for specific jobs (and firms). As the literature confirms, exporters are usually more capital intensive, they are larger and their workers have unobservable individual characteristics (could be higher skills) who then earn higher wages. As the panel dataset utilised in this article was limited in terms of individual characteristics (having no education and skills variables), a potential next avenue of research is to conduct a qualitative analysis on the specific characteristics of the individuals who are employed by exporters.

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Table A1 and A2 provides more information (descriptive statistics) on the data.

Table A1: Number of firms and jobs

	2010	**2011**	**2012**	**2013**	**2014**
Number of firms	29 916	32 429	32 013	35 373	30 249
Non-exporter	24 959	25 561	24 868	27 256	22 992
Exporter by switches	**4 957**	**6 868**	**7 145**	**8 117**	**7 257**
Continuous	3 956	5 396	5 234	5 663	3 956
Enter	-	2 912	1 749	2 883	1 594
Exit	-	457	570	519	663
Exporter by destination	**4 957**	**6 868**	**7 145**	**8 117**	**7 257**
SACU only	1 124	1 726	1 770	2 027	1 636
Africa only (excluding SACU)	1 836	2 284	2 454	2 719	2 590
International	1 997	2 858	2 921	3 371	3 031
Number of jobs per year	1 325 662	1 437 020	1 418 586	1 567 477	1 340 419

Table A2: Descriptive stats on firms and workers per group

Firm and worker	Non-exporters	Exporters			Switchers
		International	SACU_only	Africa_only	
Firm size (number of employees)	7	32	12	19	15
Firm productivity	545 235	1 185 082	758 971	962 327	8 702 434
Firm capital per worker	22 677	55 492	27 257	32 426	36 494
Worker average age	36.1	37.0	36.5	37.1	36.3
Average job tenure	4	5.5	4.3	4.6	4.9