Export Behavior and Labor Characteristics

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PRELIMINARY VERSION

Abstract

This article uses a combination of datasets on French firms' export behavior and on employee characteristics to provide new evidence on the distributional effects of trade on wages and skills. The descriptive work is driven by two preliminary questions: i) do we recover the wage export premium on the whole distribution of wages; ii) does the wage premium (at different deciles of the distribution) stand when controlling for skills and occupations.

Our preliminary results show that the distribution of wages of exporting firms dominates the distribution of non-exporting ones. We find evidence of a wage premium both conditional on the firm export status but also on the firm export intensity – the higher the export intensity, the higher the hourly wage. We further find that the magnitude of the wage premium increases in the percentile of the wage distribution. Further, our results on the relation between wage, skills and export status reveal that there are at least two aspects explaining the wage differential between exporters and non-exporters. First, the skill composition of the workforce differs across these two types of firms. Second, exporting firms pay higher wages than non-exporting firms to workers with comparable skills and occupations. Further investigation is needed to identify more specific sources of heterogeneity.

JEL classification: F16, E24, C14, D22.
Keywords: Export Wage premium, Wage distribution, Skills, Employer-employee data, Intensive and extensive export margins.

1 Introduction

Relative to non-exporters, exporters have been shown to be larger, more productive, and to pay higher wages (e.g Bernard and Jensen, 1999; Verhoogen, 2008; Amiti and Davis, 2012; Irarrazabal et al., 2013). If the literature has mostly focused on the export premium (that is the wedge between exporters and non exporters) in terms of productivity (see Wagner, 2007, for a review of the empirical evidence), the export premium in terms of wage is also documented for a variety of cases (see e.g. Breau and Rigby, 2006 on Los Angeles, Mayer and Ottaviano, 2008; Guillou and Treibich, 2015 on France, Amiti and Davis, 2012 on Indonesia, and Irarrazabal et al., 2013 on Norway). All these studies show that on average, exporters' employees receive higher wages than employees working in their non-exporters counterparts. In this work, we want to go beyond the central measure of wage of an exporter. By focusing on the whole distribution of wages and skills using a matched employer-employee panel dataset over the period 2000-2012, we intend to better understand exporters' labor characteristics. Our goal is to characterize the effects of a firm's export status and intensity on skills and wages *within* firms.

The New New Trade Theory (Melitz, 2003; Melitz and Ottaviano, 2008), explains exporters' higher productivity by emphasizing the existence of fixed and variable costs for entering and serving foreign markets that can be sustained only by the most competitive firms. Empirical evidence suggests that in addition to being more productive, exporting firms pay relatively higher wages than non exporters. Such wage premium of exporting does not vanish once observable and unobservable workers' and workplaces' characteristics are controlled for (e.g., Schank et al., 2007). The theoretical literature has investigated the hypotheses that this premium arises because of increasing returns to skills in companies with greater access to foreign markets, hence exporting firms have a greater incentive to adopt more advanced technologies of production (Yeaple, 2005; Helpman et al., 2010; Amiti and Davis, 2012) or to produce higher quality products (Verhoogen, 2008).

Empirical studies have confirmed that the extension of trade, as a consequence of trade liberalization for instance, increases wage inequality within industries (Verhoogen, 2008; Helpman et al., 2010; Baumgarten, 2013).[1] The relation between trade and firms' skill structure has been further studied in different contexts (Bernard and Jensen, 1997; Biscourp and Kramarz, 2007; Serti et al., 2010; Iodice and Tomasi, 2015). These studies have pointed to the fact that, because exporters demand more skilled workers, this induces a rise in their wage bill, explaining the wage premium. Moreover, though trade and offshoring shocks both have a positive effect on wages, only offshoring has heterogenous effects across occupational categories (Carluccio et al., 2015; Hummels et al., 2014).

[1] Technological upgrading following trade liberalization has also been documented by Bustos (2011) in the case of Argentina.

The availability of detailed information on firms' *distribution* of wages and skills in matched employer-employee datasets has recently opened the way to a more precise evaluation of the link between export status, wages and skills. Frias et al. (2012) used Mexican plant-level employer-employee data to evaluate the impact of an exchange-rate devaluation on within-plant wage distributions. They show that the effect of export participation on wages is non-linear, as it does not affect low wages but positively impacts wages above the 10th percentile.

In this article, we use a combination of datasets on French firms' balance sheet variables, export behavior (sales, products and destinations) and employer-employee information (wages and skills at the individual level) to provide additional evidence on the distributional effects of trade on wages and skills. Our descriptive work is driven by two preliminary questions: i) do we recover the wage premium on the whole distribution of wages; ii) does the wage premium (at different deciles of the distribution) stand when controlling for skills and occupations. This work has not been done on French data over the whole distribution of wages at the firm level.

Our preliminary results show that the distribution of wages of exporting firms dominates the distribution of non-exporting ones. We find evidence of an export wage premium both conditional on the firm export status but also on the firm export intensity – the higher the export intensity, the higher the hourly wage. We further find that the magnitude of the wage premium increases in the percentile of the wage distribution. Given that the persistence of a wage premium in favor of exporters could be the result of the skill composition of their workforce, we then turn to the use of our occupational category variable to control for skills. Our results on the relation between wage, skills and export status reveal that there are at least two sources of wage differences between exporters and non exporters: one stems from the type of jobs (groups of skills) which are employed by exporters and the second one comes from within-skill wage differences.

Section 2 describes the sources and the construction of the dataset, and section 3 presents our preliminary results.

2 Data

Three main sources of data are required. The first one records all employees and their characteristics such as wage, labor hours, types of job, gender, type of labor contract, by firm (DADS). The second gathers accounting variables and performance variables per firm (FICUS-FARE). Both are provided by the French National Institute of Statistics (INSEE) and cover the universality of French firms, with the exception of firms with no employees, or belonging to the agricultural or banking and financing sectors. The third dataset is provided by the French customs services (DGDDI) and records all flows of imports and

exports by product and by destination per each firm. All three datasets can be matched by using the firm identifier (SIREN) into a longitudinal dataset covering the period 2000-2012.

In particular, the 'Déclaration Annuelle de Données Sociales' (DADS) - annual declaration of social data - dataset gathers compulsory information provided by firms to the social administration about their employees. Each observation corresponds to a combination of a worker (with an anonymous identifier allowing us to follow workers over time and between establishments) and an establishment (identified by a SIRET number). The variables of interest are the workers' gross wage, number of hours worked, type of contract (mainly used for data cleaning purposes) and occupational category (PCS, 'Professions et catégories socioprofessionnelles', 2003) at the 4-digit level. We then aggregate the 486 occupational categories into six 'skill' groups ordered from highest to lowest skill, following Biscourp and Kramarz (2007): *Executives, Intermediate administrative occupations, Technicians, Skilled production workers, Unskilled production workers and Clerks*. Indeed, in the absence of information about workers' education or job tasks, the occupational category, which gives information on the type of job, is our best proxy to the skill content of jobs. We create a further category of scientists (or researchers) composed of PCS groups 342e, 383a, 384a, 385a, 386a et 388a. This subset of the first category of Biscourp and Kramarz's grouping "Executives" is a good proxy for the technological intensity of the firm.

We build two different datasets. In the first one, we keep the information at the employee-level and merge it with information from the firm in which they operate (in particular, if the firm exports or not). With the help of this first dataset we will study the characteristics of wage distributions for the entire population of employees.

In a second step we are interested in comparing the distribution of wages and skills across firms. To do so we construct firm-level variables by aggregating the information over each SIREN code, such as wage percentiles (the 10th, 25th, 50th, 75th and 90th percentiles), the share of employees from each skill category, the total number of employees and number of hours worked. Other firm-level information taken from the FICUS and FARE databases include sales abroad and within France, allowing us to construct firms' export intensity as the ratio of foreign to total sales. Hourly labour productivity is the ratio of value added over the total number of hours worked.

The customs dataset is provided by the French Customs Office and it reports, at the product-firm level, the quantity (in Kg), the country of destination, the product category (CN8), and the value of the export flow. This dataset will allow us to trace more precisely firms' performance in foreign markets (i.e., portfolio of exported products, their prices proxied by their unit-values, patterns of entry and exit from foreign markets, and variations in exported value over time). However export status and total firm export sales are more closely tracked using the FICUS-FARE datasets because, contrary to the customs dataset,

Table 1: Observations Description

Groups	Number
Total	1,161,403 firms
....Exporters	138,475 firms
....Non-exporters	1,022,928 firms
....Employees	25,379,012 employees
Random Sample 5%	54,937 firms
Random Sample 5% Skill 1 (executives)	123,068 employees
Random Sample 5% Skill 2-3 (interm/tech.)	145,943 employees
Random Sample 5% Skill 5 (skilled product.)	203,863 employees
Random Sample 5% Skill 4-6 (clerks and unskilled prod.)	348,890 employees

they do not condition the report of export sales on a minimum threshold value.

The preliminary results are obtained by using the employer-employee dataset (DADS) in year 2007 merged with the 2007 FICUS dataset. The final sample amounts to 25,379,012 employees hired by 1,161,403 firms of which 138,475 are exporters. All private sectors are covered except the agricultural sector and the banking sector. Thus this dataset is very close to the universality of the French population of employees from the private sector. For technical reasons, at this stage our statistics about the distribution of wages on the whole worker population are obtained by focusing on a random 5% subsample. Table 1 gives the description of the population used in the following empirical exercises.

3 Preliminary results

3.1 Wage Premium over the wage distribution

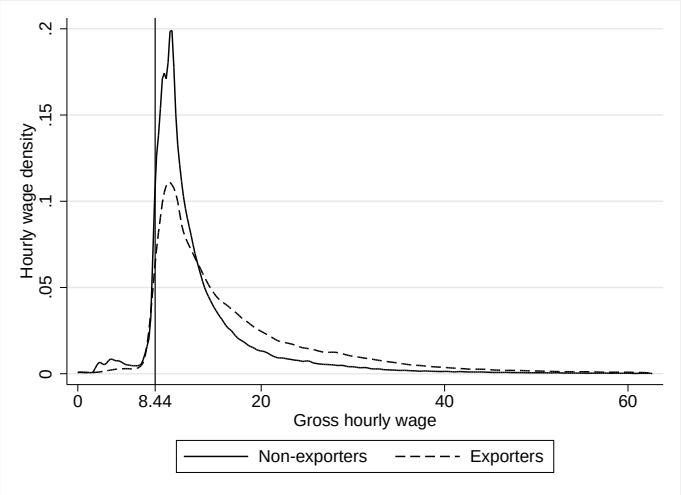
We start by testing for the existence of the wage premium in favor of exporters over the whole wage distribution, going beyond the comparison of the mean wage of exporters and non-exporters.

3.1.1 Wage Premium conditional on export status

In Figure 1, we compare the distribution of gross hourly wages in exporting and non-exporting firms.[2] A vertical line indicates the regulated minimum hourly gross wage at 8.44€. We observe that the distribution mode is very similar between exporters and non exporters while the variance is very different. More wages are located close to the minum wage in the non exporters group of employees. By testing for the equality of wage distributions in the two groups using the Kolmogorov-Smirnov (KS) and Wilcoxon-Mann-Whitney (WMW) tests, we find that wages for non-exporting firms are significantly lower

[2]For computational reasons, we construct the plot based on a 5% randomly drawn sample of workers.

Figure 1: Wage distribution conditional on export status



than for exporting ones, with a p-value of 0. This result remains strongly significant at the 2-digit sector level, as well as within quartiles of the firm-size distribution. We can therefore conclude that the distribution of wages of exporting firms dominates that of non-exporting ones in our sample.

In a second step, we want to test for the existence of a firm-level wage premium at different percentiles of *firms'* wage distributions. According to the hypothesis that there are increasing returns to skills in exporting firms, we expect the wage premium to be larger at higher percentiles of the wage distribution.

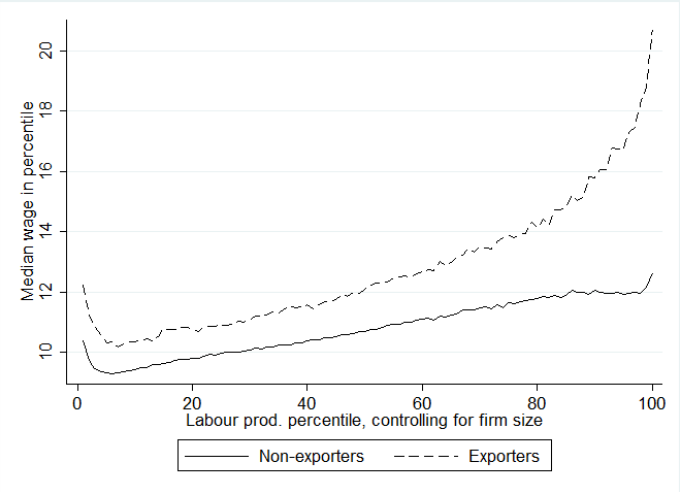
Table 2 presents the results of t-tests of equality of means and Wilcoxon-Mann-Whitney tests for equality of distributions at firms' 10th, 25th, 50th, 75th and 90th percentiles of their wage distribution. If the difference is strongly significant in all cases, note that the gap in the mean value of the percentile across the two groups of firms (i.e. the size of the wage premium) increases with the percentile. At the 10th percentile, the wage premium represents 14.5% of the wage in non-exporting firms, and steadily increases to reach 59% at the 90th percentile.

Table 2: Wage premium at different percentiles of the wage distribution

Percentile in firm	Mean hourly wage		t test	WMW test	% wage
wage distribution	Non-exporters	Exporters	(p. val.)	(p. val.)	premium
10th	9.67	11.07	0	0	14.48
25th	10.54	12.53	0	0	18.88
Median	12.37	15.22	0	0	23.04
75th	15.15	19.79	0	0	30.63
90th	18.61	29.54	0	0	58.73

Does this result only reflect differences in productivity between exporting and non-

Figure 2: Median wage by productivity percentile



exporting firms? Figure 2 represents the median hourly wage in exporting and non-exporting firms for each percentile of the hourly labour productivity distribution. Note that the labour productivity percentiles are computed for each firm-size quartile separately in order to control for the well-known positive correlation between firm size and productivity. We find that, for a given level of productivity, exporting firms pay a higher median wage than non-exporting firms. This would also suggest that for a same level of productivity, non exporters are more profitable than exporters.

Here as well, the size of the wage premium increases in the percentile of the labour productivity distribution. We confirm this graphical result with a simple econometric exercise which allows us to control for 2-digit sectoral effects presented in Table 3. The wage premium, as evidenced from the positive and very significant coefficient of the export dummy variable Exp, is found at all percentiles of wages, with or without controlling for the hourly labour productivity. Again, mirroring the simple test from Table 2, we find that the magnitude of the wage premium increases in the percentile of the wage distribution.

Table 3: Wage premium OLS regressions. T-statistics in parenteses.

Dep var: wage decile	10th	25th	50th	75th	90th
Exporter	0.0679***	1.175***	1.468***	2.169***	6.734***
	(14.14)	(16.30)	(5.33)	(4.46)	(7.40)
R2	0.0148	0.007	0.001	0.001	0.001
F stat	199.9	265.7	28.42	19.91	54.75
Nb. obs.	1,123,329	1,123,329	1,123,329	1,123,329	1,123,329

Dep var: wage decile	10th	25th	50th	75th	90th
Exporter	0.0729***	1.210***	1.469***	2.116***	6.616***
	(15.34)	(16.64)	(5.20)	(4.25)	(7.09)
Labour prod.	0.00008***	0.00009***	0.00011***	0.00011***	0.00012
	(20.77)	(15.70)	(4.80)	(2.81)	(1.54)
R2	0.0148	0.0072	0.0009	0.0007	0.0005
F stat	332.5	261.2	24.98	12.94	26.3
Nb. obs.	1,096,428	1,096,428	1,096,428	1,096,428	1,096,428

3.1.2 Wage Premium conditional on export intensity

To go further, we test whether the intensive margin of export is also related to differences in wage distributions. To do so, we replicate the exercise performed by Carluccio et al. (2015) on the relation between average firm wage and export intensity. Figure 3 (left) is based on the overall population of exporters and plots the relation between the percentile of firms' export intensity (defined as the ratio of the value of exports over the total sales) and the percentile of hourly mean/median wage of the firm (defined as the ratio of the mean/median gross wage over the total number of hours worked). As expected, the higher the export intensity, the higher the hourly wage, the relation between wage and export intensity being very similar when considering the median rather than the mean value.

As for our study of the export status, we are interested in going beyond the central measures of wage distributions. In Figure 3 (right), we focus on the 10^{th} and 90^{th} percentiles of the hourly wage. The positive relation is steeper for the 90^{th} percentile of hourly wage.

Our first series of exercises have shown that the wage premium for exporting firms is observed over the entire wage distribution, alternatively considering the overall population of workers or how wages are distributed within firms. Such a result is robust to sector, size and productivity controls. How can we explain that exporting firms would agree to pay higher wages to all their workers, especially those at the high-end of the wage distribution? Is the wage premium only due to a difference in firms' skill composition? Indeed, previous analyses have shown that the share of skilled workers is higher in exporting firms (Bernard and Jensen, 1997; Biscourp and Kramarz, 2007; Serti et al., 2010; Iodice and Tomasi, 2015). In what follows, we test whether our findings are robust to the inclusion of skill variables, by using our information on occupational categories.

Figure 3: Export Intensity and Wage
Firm level in year 2007

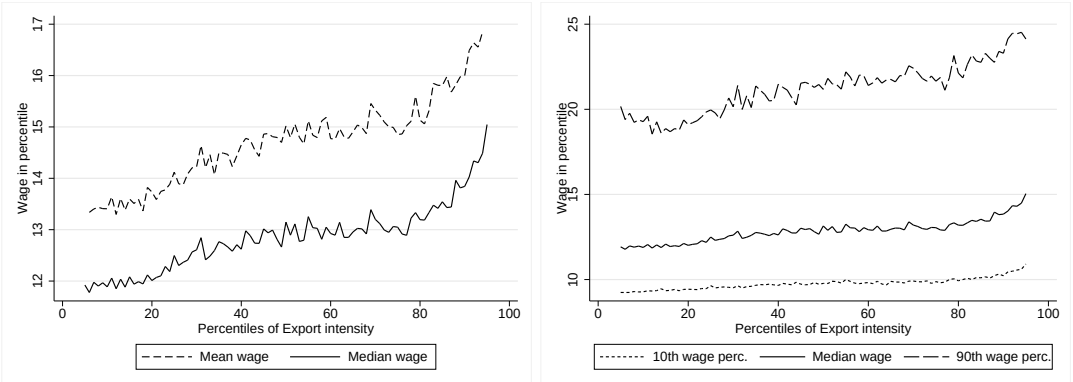
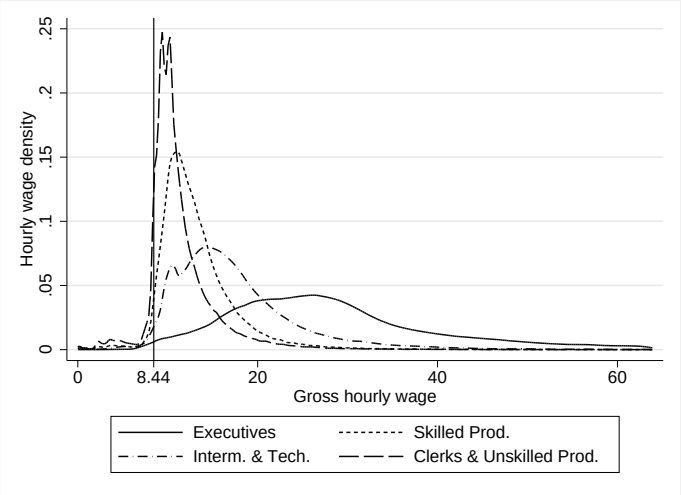


Figure 4: Wage Distribution by groups of skills



3.2 Wage Premium and skills

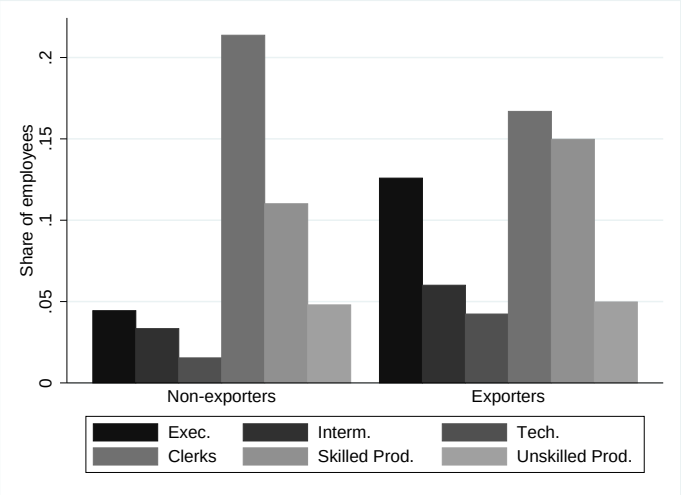
Given that the persistence of a wage premium in favor of exporters could be the result of the skill composition of their workforce, we then turn to the use of our occupational category variable to control for skills. Meanwhile, by also testing for a wage premium within skill categories, we evaluate the need for alternative explanations of the wage premium.

So as to investigate this first point, we observe whether hourly wage distributions depend on our skill groups. Figure 4 displays the hourly wage density per group of skills. The shape of the wage distribution differs across categories, in terms of mean, variance as well as skewness. It is clear that the group of *Clerks* and *Unskilled production workers* is censored to the left by the minimum wage (the vertical line at 8.44€), and therefore presents a distribution which is skewed to the right. Most workers in this category are paid close to the minimum wage. For categories associated with higher skills, would they be in terms of task complexity (*Skilled production workers* and *Technicians*) or managerial duties (*Intermediate administrative occupations* and *Executives*), the range of the wage distributions is much wider, and the dependency on the minimum wage decreases, along with the skewness to the right. The difference in variance across occupational categories is likely to come from the different degrees of homogeneity of skills inside each group. Given the important differences regarding wage distributions by skill group, we can wonder whether the export wage premium results from a different allocation of skills across exporters and non exporters.

We proceed with a comparison of the composition of skill groups between exporting and non-exporting firms. Figure 6 shows the average share of workers from each skill group in firms' total employment, conditional on their export status.[3] For higher-skilled

[3]Skill shares are computed at the firm level and averaged conditional on the export status of the firm.

Figure 5: Average share of skills conditional on export status



worker categories (*Executives, Interm., Skilled production workers, Technicians*), the share in total employment is higher for exporters than non-exporters; the latter relying more heavily on *Clerks*. The share of *Unskilled production workers* seems not to depend on export status. The difference is most apparent for the *Executives* category. Table 4 shows that such differences are statistically different. The last column of Table 4 also shows exporting firms' higher technological intensity as proxied by their share of scientists.

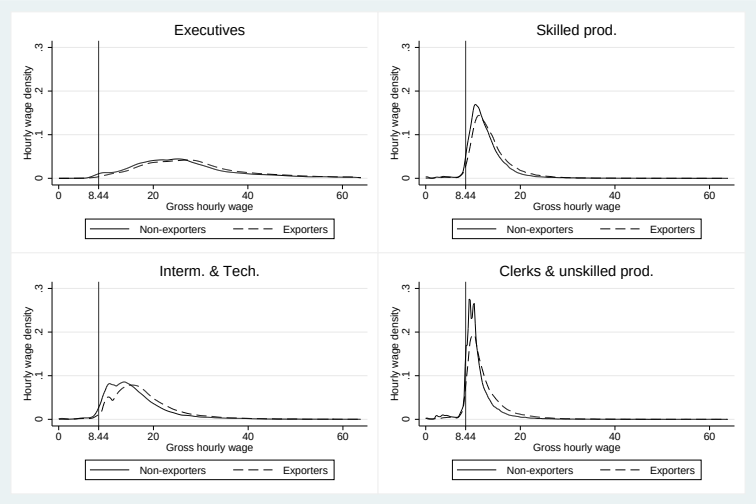
Table 4: Statistical tests of differences in average share of skills by export status

	Executives	Interm.	Tech.	Clerks	Skilled prod.	Unskilled prod.	Scientists
Non-exporters	0.044	0.033	0.015	0.206	0.105	0.046	0.001
Exporters	0.125	0.059	0.041	0.163	0.145	0.048	0.004
t test (p. val.)	0	0	0	0	0	0	0
WMW test (p. val.)	0	0	0	0	0	0	0

Figure 4 raises the question whether we retrieve the export wage premium whichever the group of skills. Figure 6 suggests that the wage premium is likely to be as much the result of different shares of skills in firms' total employment than very different wages for equivalent skills. Further testing through Kolmogorov-Smirnov (KS) and Wilcoxon-Mann-Whitney (WMW) methods confirms the wage premium within skill categories, also when controlling for firm size (with p-values equal to 0). The only exception is the group of *Technicians* in the first firm-size quartile for which the KS and WMW tests diverge, the WMW test not rejecting the equality of wage distributions of exporters and non-exporters.

Our results on the relation between wages, skills and export status reveal that there are at least two sources of wage differences between exporters and non exporters. One stems from the type of jobs (groups of skills) which are employed by exporters, and the second

Figure 6: Wage distribution conditional on skills and export status



one comes from within-skill wage differences. Of course, skill heterogeneity remains at the level of aggregation of occupations that is retained – and it is not possible to totally discard the dominance of the skill shares explanation. As mentioned above, our results demand further investigation for alternative explanations of the export wage premium than solely firms' labor productivity and skills. Part of this investigation includes to improve the measures of skills and of worker productivity.

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