Dissecting the Exporter Wage Gap in Spain

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Abstract

It is well known that exporter firms pay higher wages and are more skill intensive than domestic firms. In this paper we measure and decompose the exporter wage gap into several explanatory components by estimating counterfactual distributions for the Spanish manufacturing sector between 1995 and 2010. We find that conditional wages are more compressed at exporter firms, differences in characteristics are relatively less important at the center and that differences in unobservable characteristics have a U-inverted shape. Separate analysis by education and sex shows that the higher educated workers receive a lower premium than low and medium educated workers at exporter firms. Women earn less than men but differences are overcome –even inverted– at the highest education levels. The evolution over time reveals that the exporter wage gap varies pro-cyclically and in opposite direction than economy-wide wage inequality due to changes in wage premia but more importantly due to changes in composition. These findings imply that the exporter sector contributes ambiguously to generate –between and within group– wage inequality, depending on the position of the economy along the business cycle.

Keywords: wage inequality, international trade, quantile regressions, export wage premium, linked employer-employee data.
JEL codes: F12, F16, E24.

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1 Introduction

Over recent years wage inequality has grown in industrialized countries (e.g. OECD, 2011). The evidence not only confirms a tendency towards increasing unconditional inequality, but also a growing wage inequality within skill groups defined in terms of education or experience.[1] International trade is often seen as an explanatory source for wage inequality, since it changes the relative demand for skills and generates a relative expansion of exporting firms. On the other hand, exporters are larger, more productive, more skill and capital intensive and, importantly, pay higher wages than domestic firms (Bernard and Jensen, 1995).[2] This means that shocks that affect with different intensities exporters versus domestic firms are going to produce relative changes in the labor demand for skills, and, as a consequence, on the relative wages paid by exporter firms. Moreover, inequality caused by international trade is likely to be more abrupt if exporting firms better compensate their workers skills. These two basic transmission channels rise wage dispersion both between and within skill groups, and, are at the heart of the new theories that establish a linkage between international trade and wage inequality.

The aim of this paper is to explain the level and the changes of the exporter wage differences along the wage distribution and over time using detailed information of individuals by type of firm. Most studies use plant-level data to estimate a wage premium between domestic and exporter firms. However, without controlling for workers characteristics, and simply relying on firm-level data, the exporter wage premium is likely overestimated and therefore the contribution of characteristics tend to be underestimated.[3] We use a large matched employer-employee dataset of the Spanish manufacturing sector for several years covering the period 1995–2010 and perform a decomposition analysis to explain the sources of the exporter wage gap at different parts of the wage distribution.

In a first inspection of the data we confirm previous findings that workers at exporter firms earn higher *average* salaries, are more educated and have more experience than at domestic firms *on average*. For example, in the year 1995 a 20.4% of workers at exporter firms were younger than 30 years, while this percentage was 23.9% at domestic companies and, similarly, the share of workers with 10 or more years of tenure was 52.3% at exporter firms and 44.9% at domestic firms. This suggests that differences of labor force composition among exporter and domestic oriented firms are likely to generate large differences in wages. Nevertheless larger

[1] See Juhn, Murphy, and Pierce (1993) for the U.S., or a more recent review by Autor, Katz, and Kearney (2008). Similar evidence has been found for other industrial countries (e.g. Dustmann, Ludsteck, and Schönberg 2009, for Germany) and for Spain (Lacuesta and Izquierdo 2012; Carrasco, Jimeno, and Ortega 2011, and Bonhomme and Hospido 2012).

[2] In subsequent work, the same authors have documented the existence of an exporter wage premium for the U.S. ranging from 7% to 11% (see Bernard and Jensen, 1997). Focusing on firm-level data, similar magnitudes have been documented for other countries. For instance, Egger, Egger, and Kreickemeier (2013) find an exporter premium of about 6% in six European countries (Bosnia-Herzegovina, Croatia, France, Serbia and Slovenia), a similar exporter wage premium is estimated by Fariñas and Martín-Marcos (2007) for Spain.

[3] If exporter firms tend to hire more skilled and able workers, then the wages paid by the firm will be capturing a simple composition effect and not a wage premium. In this context, empirical studies using linked employer-employee datasets show that the wage dispersion among exporters and non-exporters is only partially explained by observed and unobserved individuals characteristics (see Schank, Schnabel, and Wagner 2007; Munch and Skaksen 2008; Frias, Kaplan, and Verhoogen 2009) suggesting that most of the differences might be attributed to wage premia.

exporter wage dispersion is often seen in the literature as a result of higher wages paid at those firms (e.g. exporter wage premium).

Larger wage dispersion at exporter firms should be looked with caution because large differences in the labor force composition between domestic and exporter firms could potentially have different effects on the upper and lower parts of the wage distribution. For example, it is well known that the Mincer (1974) canonical model predicts that earnings trajectories tend to be more dispersed when individuals have too lower experience and education or when experience and education is high.[4] As a result, greater concentration of educated or experienced workers at exporting firms would likely generate higher residual wage dispersion across domestic and exporter firms due to a composition effect and not to a price or premium effect. Moreover, changes over time in labor force composition across type of firms will impact on wage dispersion even if prices remain unchanged. This composition versus price effect should be accounted properly when comparing the wages of domestic firms with exporters and the changes of those wages over time.

We use a variant of the Juhn, Murphy, and Pierce (1993) decomposition to split the overall exporter wage gap into three components: the first one due to a pure composition effect that reflects the differences in characteristics of the workforce, the second one is a price effect (premium) that explain the differences in returns of those characteristics, and the third one that is due to differences in residuals. Using this technique we describe the three components of the exporter wage gap along the whole distribution of wages, and thus we are able to analyze the wage structure and its changes over time. We follow the basic approach and the inference procedures from Machado and Mata (2005), Melly (2005) and Chernozhukov, Fernández-Val, and Melly (2013) to estimate counterfactual distribution functions based on quantile regressions.

The quantile regression approach allows a better match of the theory of heterogeneous agents with the data. The conventional approach to measure the exporter wage premium consists in estimating a Mincerian equation for wages upon the mean of the conditional wage distribution, thus capturing only a "between-group" gap component. Under this approach, it is obtained a summary statistics that gives a partial snapshot of the effect of the covariates and restricts the effect of the covariates to act as a simple "location shift" coefficient. Nevertheless, the mean does not necessary describe the effect of the covariates over the whole distribution of wages.[5] Instead, we employ quantile regressions methods (e.g. Koenker, 2005) to estimate quantile-specific effects that describe the impact of covariates not only at the center but also on the upper and lower tails of the conditional distribution of wages, and, as a result, they allow for a characterization of the dispersion of conditional wages (i.e. residual wage dispersion). Thus, the main advantage of this method is due to the fact that a worker ability is not typically observed directly. However, some

[4]This implies that the theory predicts higher wage dispersion at the extremes than at the center of the wage distribution. This is consistent with a large body of evidence showing higher wage dispersion for college and more experienced workers.

[5]More precisely, the mean effect could be a good summary statistics of the whole effect only in the case that both the mean and the quantile are affected in the same way by the covariates. This is not the case if some variables, such as education, impact wages differently on the upper than at the lower parts of the distribution, as is typically observed in the earnings inequality literature (e.g. Machado and Mata, 2005) or predicted by trade models with worker heterogeneity (e.g. Helpman, Itskhoki, and Redding, 2010).

theoretical models make predictions that are valid for both, worker's observables and worker's ability (e.g. Helpman, Itskhoki, and Redding, 2010). Hence, our approach links directly workers' ability in the models to quantiles of the wage distribution. That is, the higher the quantiles the higher is the probability of finding high ability workers.

Another advantage of our approach is that the technique allows to use the conditional quantile to simulate the impact of changing the characteristics or the returns of those characteristics on the distribution of wages. For example, applying the distribution of skills in domestic firms and the wage structure of exporter firms we can estimate the counterfactual distribution function of wages for workers at domestic firms if they would had been paid according to labor market prices prevailing at exporter firms. Interestingly, this simulation captures the effect of composition on both, the between-group and the residual wage dispersion.

To the best of our knowledge, this is the first paper that provide estimates on the exporter wage premium on the conditional quantile. By looking at the conditional wage differentials along the wage distribution we are able to provide evidence of the heterogeneous effect of exporting for each quantile and, thus, to explore the patterns of compression or dispersion of the wage structure prevailing at the exporter sector. This approach is particularly addressed to understand the contribution of exporting to wage inequality. Moreover, given that the exporting wage premium might differ between and within skill groups, we also present quantile analysis by sex and educational level. Comparing the structure of wages across skill groups we assess the exporting component of the between-group inequality while comparing the wage structure along the distribution for each skill group we assess the exporting component of the within-group inequality. Apart from examining the exporter wage gap across individuals with different characteristics, we also document the wage gap within ex-ante identical workers by looking at the residual wage gap between exporters and non-exporters. Given the different periods covered by the data, we analyze the evolution of previous decompositions over time, and therefore, the regularities that emerge from the patterns of changes regarding the contribution of exporting to the changes of within and between group wage inequality.

Our findings show that the exporter wage gap has a U-inverted profile along the wage distribution, being mostly explained by differences in wages and only partially explained by differences in characteristics. Differences in unobserved characteristics are close to zero, but vary significantly in some parts of the distribution. This pattern is quite stable over time periods. A more detailed description of the results shows that the wage structure prevailing at the export sector is systematically more compressed (i.e. higher at the bottom and lower at the top) than the one prevailing at the domestic sector. The differences in characteristics are important in explaining the wage gap, but are relatively more important at the center than at the extremes of the distribution. When studying the evolution of the exporter wage gap over time, we find that it is pro-cyclical. Interestingly, the increasing wage dispersion in the export sector occurred between 1995 and 2006 is mostly due to large changes in the characteristics of the workforce and only explained by changes in the returns of those characteristics in the upper part of the wage distribution. However, in the period that comprises the Great Recession (2006-2010) overall wage dispersion increased but the exporter wage gap shrunk. This fact is explained by both changes

in characteristics –driven by jobs destruction– and changes in coefficients, –specially large in the upper part of the distribution– in spite of the strong wage rigidity that features the collective bargaining system in Spain. This reveals a relatively unknown fact of the export sector, i.e. that exporter firms are more flexible in setting wages than domestic firms. Lastly, when we analyze separately the role of education and sex, we find that the high educated individuals perceive a lower premium than low and medium educated workers. Women earn higher salaries in exporter firms, but lower than men. However, the gender wage gap diminishes along two dimensions: the higher the position on the wage distribution and the higher the educational level.

Although we do not quantify the effect of exporting to economy-wide wage inequality, our results have implications for the between and within components of the wage dispersion over time. First, we find that in periods of lower wage dispersion in the economy (1995-2006), the change of the exporter wage premium contributed to increase wage inequality, while in the latest period (2006-2010) the increasing overall wage inequality was countervailed by the changes in the wage structure of the export sector. The bottom line is that in a period of rapid economic integration (1995-2010) exporter firms generated lower wage inequality in Spain, although the results are driven by the sharp cyclical adjustment experienced in the latest period. Second, given that low and medium educated workers earn a higher wage premium at exporter firms, the changes in the exporter wage premium over the whole period of the highly educated –in comparison with the rest– are turning wider, and therefore, contributing to a reduction of the wage dispersion between skill groups. And third, even within highly educated workers, wage dispersion reduced over the period analyzed but not within medium educated individuals, where within group dispersion polarized (i.e. increased at the queues and lowered at the center of the distribution).

Our study is related to a limited number of papers that perform decomposition analysis to quantify the role of exporting in explaining the rising wage inequality. Bernard and Jensen (1997) show that employment demand shifts at exporting firms account for almost all of the increase in the wage gap between production and non-production workers. Their approach is, therefore, focused on the between-group component of wage inequality, but, is silent about the contribution of exporting to the within-group inequality, which is the most important driver of rising wage dispersion in the U.S. and in other advanced countries. Moreover, they rely on firm-level and not on worker-level data, and thus, their results are affected by the composition effect. Beside that, the skill structure they observe at firm-level is limited to two categories: the share of production and non-production workers. Baumgarten (2013) sorts out the previous limitations exploring a deeper decomposition analysis using a matched employer-employee –the LIAB dataset– for Germany. He finds that the rise in the exporter wage premium contributed to the rise of wage inequality –mainly through the rise of the within-group component–, whereas the employment expansion of exporter firms contributed to a reduction of wage inequality, also mainly through the reduction of the within-group dispersion. He concludes that the resulting net contribution of exporting to wage inequality is positive but moderate. In his approach, the exporter wage premium does not differ across skills, although if might differ within skill groups. In another recent contribution Klein, Moser, and Urban (2013) analyze the skill structure of the

export wage premia across skill groups and occupations also using the LIAB dataset. In their approach, however, they allow for the exporter wage premia to differ across skills groups, but not within skill groups. We differ from Baumgarten (2013) and Klein, Moser, and Urban (2013) in the treatment of discrimination and, importantly, on relaxing the assumption that the wage discrimination is the same for all individuals estimating the conditional quantile exporter wage gap.[6] We fill this gap offering a more complete description of the wage dispersion along both the within and between skill group dimensions. We differ as well in the analysis of changes over time of the sources of the exporter wage gap by focusing not only in a long period, but also in shorter subperiods to explore cyclical changes. Through this approach we are able to highlight a relative unknown dimension of the role of exporting on wage dispersion, the different adjustment patterns followed by exporters versus domestic firms to face aggregate shocks.

The paper is organized as follows. In section 1.1 we review the theoretical and empirical literature on the exporter wage premium. In section 2 we describe the data used. In particular we emphasize the sample coverage and the construction of the variables of interest. In section 3 we provide a general overview of the Spanish economy regarding growth, unemployment, wages and internationalization, and a snapshot of the extent of exporter wage gap during the period analyzed. In section 4 we describe the methodology employed in the empirical analysis. In section 5 we perform several decompositions of the exporter wage gap in the Spanish manufacturing sector. Lastly, in section 6 we conclude.

1.1 Literature

The Melitz (2003) model is a departure point to analyze exporters behavior. Firms differ in productivity and given the existence of fixed costs of serving foreign markets, only the most productive firms export.[7] Under this framework, trade liberalization reallocates resources within the industry across firms: some firms disappear –small and low productive–, some others contract, and some others –large and highly productive– expand since the cost of serving foreign markets makes exporting more profitable. However, in the Melitz (2003) t. In some extensions, such as Bustos (2011) and Yeaple (2005), firm-level wages differ across firms because exporters become more skill-intensive or adopt more productive technologies than non-exporters after trade liberalization. Under this view, exporter firms pay higher salaries due to composition effects and not because of a premium. This means that workers with the same characteristics are paid the same salary and that the conditional wage differential should vanish when worker characteristics are controlled for.[8] There is no test for these theories, but is generally observed that the exporter wage premium tends to diminish or vanish when workers' characteristics are taken into consideration (see Wagner, 2012, for a survey of the recent literature). Regarding the predictions these models make for wage inequality, we should observe that exporting generates

[6] Although the technique employed by Baumgarten (2013) allows for separated analysis at the lower and at the higher tails of the distribution he does not focus on measuring the wage differential throughout the whole distribution.

[7] The most productive firms not only become exporters but also are larger since they serve both the domestic and the foreign markets.

[8] Although the Yeaple (2005) model does not distinguish between observed and unobserved worker characteristics, the same prediction applies to both of them.

more between-group wage inequality as exporter firms become more skill-intensive. Since the models do not feature wage differential among identical individuals there is no implication for the within-group inequality.

Ex-ante individuals may earn different wages when employed at exporting firms. This may be induced by the existence of imperfect and costly screening of workers abilities and by some complementarity between the firm productivity and either the technology adopted by the firm (see Davidson, Matusz, and Shevchenko, 2008) or the workers ability (see Helpman, Itskhoki, and Redding, 2010). In the Helpman, Itskhoki, and Redding (2010) model all the firms share the same technology to screen workers abilities, and, importantly, the model exhibits a complementarity between the firm productivity and the average workforce ability. This feature induces the most productive firms to engage in both exporting and in a more intense screening process. Trade liberalization affects within group wage inequality through two different channels: first, it reallocates resources from non-exporters to exporters, and, second, it intensifies the screening process favoring a more efficient matching assignment between workers and firms.[9] Similar transmission channels are obtained when firms pay fair-wages, as in Egger and Kreickemeier (2012) or Amiti and Davis (2012), and firm-level wages depend on profits. In this setting, firms with higher profits pay higher wages with the goal to elicit their workers' full effort. Trade impacts wages due to firm selection and resource reallocation as in the Melitz (2003) model, and trade also affects the wage structure because firms are unevenly affected by trade.[10] Firms may also pay efficiency wages because they differ in the monitoring technology to detect worker's shrinking (see Davis and Harrigan, 2011). In this case trade openness does not impact on the structure of wages but it generates also reallocation of jobs across firms, giving place to a wider within group wage dispersion. In all these models wage differentials are due to firm heterogeneity and not to worker's heterogeneity.

Finally, a third group of theories combines search-and-matching frictions into a dynamic model of trade with homogenous workers producing wage inequality across and within firms. Firms grow smoothly due to convex adjustment costs and random search (Cosar, Guner, and Tybout, 2013) or directed search (Felbermayr, Impullitti, and Prat, 2014). In all these theories wage inequality is the result of employer specific wage-levels.

All of these papers have clear implications for the relationship of trade and within-group inequality. However, the theory is very sensitive to the details of the labor market imperfections and the matching process of workers to firms, and thus, difficult to test. Recently, a growing number of empirical studies are providing evidence in favor of these mechanisms using firm-level and matched employer-employee data. Some papers use firm-level data –without controlling for workers' characteristics– with different purposes. For instance, Amiti and Davis (2012) estimate a reduced form equation which is consistent with their model using Indonesian data, and Egger, Egger, and Kreickemeier (2013) provide a structural estimation of a particular fair-wage mechanism for six European economies. Alcalá and Hernández (2010) present firm-level evidence for Spain of an increasing exporter premium related to the remoteness of the export

[9] As a result, exporters end up having workforces of higher average ability than non-exporters and hence pay higher wages.

[10] According to the fair wage-effort mechanisms, exporting firms have to share profits with their workers.

market and provide a model to explain it. Some other papers exploit matched employer-employee panel data and follow the approach from Abowd, Kramarz, and Margolis (1999).[11] Generally, unobserved worker abilities and firm effects are captured with worker and firm fixed effects. Those effects are estimated under the identifying assumptions that switches of workers between firms are random conditional on the covariates.[12] Nevertheless, models with matching frictions suggest that matches respond to observed or unobserved characteristics, and worker-firm-specific match productivity can be relevant. This is often controlled by worker-firm-spell effects.[13]

Most of the empirical evidence cited above aims at either test or quantify the effect of trade on wages under very different assumptions regarding the functioning of the labor market. However, with some exception, it is not always clear the implications of the exporting on wage dispersion or on the wage structure. Moreover, none of them provide a decomposition analysis of the exporter wage gap along the wage distribution and do not allow for changes over different periods.

2 Data

The data used in the paper is from the Wage Structure Survey–WSS (*Encuesta de Estructura Salarial*) collected by the Spanish National Statistics Institute (INE). The WSS is a linked employer-employee dataset for Spain that contains detailed information of salaries, workers, and job characteristics for a large sample of wage-earners and establishments in four independent waves: 1995, 2002, 2006, and 2010. The survey design makes possible the analysis of wage inequality and its changes.

In each wave, the sampling takes place in two different stages. In the first one, establishments are randomly selected from the Social Security registers to ensure representativeness across sectors, regions, and firm sizes. In the second stage, workers are randomly selected within the sample of establishments. During 1995 and 2002 the population of scope for firms were establishments of 10 or more employees, while for 2006 and 2010 establishments of less than 10 employees were included.[14] The population of scope for workers are individuals whose major source of income is the salary; this excludes members of Boards of Directors.

Wage is defined as the real gross monthly salary plus any extraordinary payments made

[11] See for example the set of papers of the American Economic Review Vol. 102, No.3 (May 2012) devoted to *Trade and Labor Markets: Evidence from Matched Employer-Employee Data*. See also Frias, Kaplan, and Verhoogen (2009) that study the exporter wage premium after a large devaluation in Mexico, Hummels, Jorgensen, Munch, and Xiang (2014) analyze the wages effect of offshoring and exporting for Denmark, or Helpman, Itskhoki, Muendler, and Redding (2012) that estimate structurally a model similar to Helpman, Itskhoki, and Redding (2010) to infer the effects of trade liberalization on wage inequality in Brazil.

[12] The alternative possibility is that the assignment of workers to firms is endogenous due to characteristics of the individual that are observed by the firm but unobserved by the econometrician. In a recent contribution Krishna, Poole, and Senses (2014) test for the assumption of exogenous conditional mobility using Brazilian data and reject it, while Card, Heining, and Kline (2013) do not find any pattern of endogenous mobility for Germany.

[13] The identification of firm–individual fixed effects comes through workers changing their salaries over time while remaining in a given firm that changes the export status or the export share over time.

[14] Given the relevance of small firms in Spain, this makes some results not applicable for the whole economy. Moreover, since the reference population of firms changed between 2002 and 2006, some of the changes shown in the data during this period are likely due to sampling and not to the causal channels at work. Putting the emphasis on a longer period (1995-2010) we expect bias attenuation.

by the firm during the month of October in 2006 euros.[15] We calculate the amount of hours actually worked with the information of regular and irregular hours and discounting non-paid days. Finally, we divide the monthly wage by the total number of hours worked in order to get the hourly wage. Throughout the paper we use log of real hourly wages as our dependent variable.

We define an exporter establishment as a categorical variable taking the value one for businesses whose main market is the foreign market.[16] With this definition we are excluding establishment that export but which for whom regional and national sales constitute the main market. Moreover, since we do not have data on the amount of exports we cannot obtain alternative measures used in the literature.[17] That is, our sample is likely to comprise large and regular exporters. Moreover, our final sample only considers full-time workers, establishments from the manufacturing sector and excludes a few public firms. Therefore, the final results are conditional to the sample selected.

3 Economy description

The Spanish economy has undergone an extraordinary evolution during the years 1995 and 2010. In this section we summarized some of the main features of the Spanish economy regarding growth, unemployment, wages, and internationalization. We also provide an exhaustive comparison on the wage gap and workforce characteristics of exporters versus domestic firms, by skill level and along the unconditional wage distribution.

3.1 Growth, collapse and wage inequality

The period studied covers the years 1995 and 2010. Both –initial and final– years coincide with the aftermath of two severe recessions.[18] In 1995 the economy initiated an long period of economic growth that lasted until the second quarter of 2008 with annual growth rates abnormally high, suddenly over 3%. A similar extraordinary trajectory was followed by the unemployment rate, it went from 22.7% in 1995 to 8.5% in 2006 in the period of rapid economic growth. However, during the Great Recession (2008-2009) the unemployment rate climbed and in 2010 turned again to be over 20%. Meanwhile, average wages experienced another abnormal evolution. In 1995 the average annual wage was 26,492 Euros and it declined continuously until 2006 where it reached 25,245 Euros. It is noticeable that in the period of the Great Recession average

[15] These surveys only include workers who were on payroll at 31st October in 1995 and during the whole month of October for the remaining periods.

[16] We have information about firm's main market, i.e. regional, national, European Union, and rest of the world. The domestic firms are, therefore, those whose main markets are the regional and national markets.

[17] For example, Schank, Schnabel, and Wagner (2007) or Munch and Skaksen (2008) use the export intensity as an explanatory variable. However, based on Melitz (2003) there is no theoretical reason to expect a positive relationship between exports share and productivity conditioned on exporting. Keeping the exporter variable as a categorical variable we keep closer to the theory.

[18] Previously, in the second quarter of 1992 the Spanish economy began an important recession that lasted until the third quarter of 1993, accumulating a GDP fall of 2.5%. In 2008 the global recession hit the Spanish economy producing –between the second quarter of 2008 and the four quarter of 2009– an accumulated fall of the GDP of 5.2%.

wages were growing by 8.6% and continued growing until 2011 where wages started a significant decline.[19]

Table 1: Economy description

	1995	2002	2006	2010
GDP growth (in %) [a]	2.8	2.7	4.1	-0.2
Unemployment Rate (in %) [a]	22.7	14.4	8.5	20.1
Average Annual Real Wage (in Euros) [a]	26,492	25,741	25,245	27,888
Mean (log hourly) Wage [c]	2.11	2.18	2.21	2.34
Std. Deviation (log hourly) Wage [c]	0.52	0.49	0.46	0.49
Exports (as % of GDP) [b]				
-Goods and Services	19.3	25.6	26.3	27.9
-Goods	12.9	17.1	17.8	19.2
Employment at Exporting Firms (in %) [c]	21.7	27.0	26.3	32.5
Exporting Firms (in %) [c]	14.8	18.2	16.4	20.3

Source: Spanish National Statistics Institute (items marked with [a] and [c]) and Eurostat (items marked with [b]).
Notes: Average annual real wages are expressed in 2012 Euros. Variables marked with [c] are from WSS data set. Data from the WSS refers to the sample workers used in the analysis, which is restricted to full time wage earners in the manufacturing private sector, as defined in the text.

The pattern of wage inequality during the period analyzed is related to the business cycle, but also to the abnormal evolution of wages.[20] In Table 1 we also show the standard deviation of (log of) wages and see that during the years of rapid job creation and decreasing average wages our measure of wage inequality was reduced, from 0.52 in 1995 to 0.46 in 2006. Furthermore, in the latest years with wages and unemployment increasing, inequality rose in 2010 to reach the same levels as in 2002. This evolution differs from the observed wage inequality in other European economies. For instance, during the same period, the standard deviation of log wages increased in Germany, with no evidence of having a cyclical profile (Card, Heining, and Kline, 2013).

Since 1995 the Spanish economy has strengthened its integration into the global economy. In the early nineties former communists countries start joining the European Community initiating

[19]It is widely recognized that the Spanish labor market is so different and dysfunctional when compared with other European labor markets (see Jaumotte 2011, or Bentolila, Cahuc, Dolado, and Barbanchon 2012). Major differences stands out by the prominence of the province and sector-level wage bargaining instead of a coordination at national or firm-level; and by the high severance payments on permanent contracts. Regarding the first difference, wage agreements are automatically extended to the entire province or sector, including firms and workers that did not participate in the bargaining being the possibility that a firm opts-out from the agreement very restrictive. On the other hand, severance payments are too high for permanent workers and too low for temporary workers. Both features produce an insider-outsider divide where unions representing permanent workers do not internalize the employment implications of wage claims. In June 2010 the Spanish government started a series of labor market reforms to tackle some of the previous problems.

[20]Bonhomme and Hospido (2012) in an exhaustive study using annual data until 2010 also show that the 90/10 percentile ratio of log wages follows closely the unemployment rate.

thereafter an enlargement of export markets for Spanish firms. In 1994 Spain enters into the European Monetary Union reducing greatly the fluctuations of the exchange rate and spurring Spanish exports into other partner economies. A third external shock comes in 2001 with China's accession the World Trade Organization. All these shocks affected Spanish exports significantly. This is visible in Table 1 through the growing share of exports in GDP. The fraction of goods and services exported increased by 44.6% –from 19.3% to 27.9%–; while the fraction of exported goods rose by 48.8% –from 12.9% to 19.2%– over the period analyzed. The rise of exports supposed important changes in the employment share of exporters. Data from WSS reveal that the fraction of employment at exporters increased extraordinarily by 49.8% –from a 21.7% to a 32.5%–. Interestingly, part of this change is due to the extraordinary increase of the fraction of exporter firms in the economy representing 14.8% in 1995 and 20.3% in 2010. That is, the continuous trade openness of the Spanish economy yields an intense labor reallocation process between exporter and domestic firms. This is consistent with models of heterogeneous firms and exporting, where lower trade costs implies not only increasing export shares of existing exporters (intensive margin), but also, increasing number of exporter firms (extensive margin).

Finally, it is important to highlight the impact of the Great Recession (2008-2009) on international trade flows. From the second quarter of 2008 to the third quarter of 2009 global trade plunged by 29%. This sudden drop meant a reduction of 20% of global trade as a proportion of global GDP (see Eaton, Kortum, Neiman, and Romalis, 2011). The Spanish economy was also affected by the global shock suffering a visible reduction of the export volume of goods and services by 11% and of imports of about 22.4%. Therefore, in 2010 –the last year analyzed– both the domestic and the export markets were exposed to a severe contraction.

3.2 Exporters vs domestic wages

A preliminary view of the wage differential paid by domestic versus exporter firms can be obtained from a Kernel density estimate of the unconditional wage distribution. In Figure 1 we observe that there are important differences in the wage distribution between the two type of firms. Exporter firms pay higher salaries across the whole distribution than domestic firms. In all the years but in 2010 there is a higher density of individuals around the mode and a lower dispersion for wage earners at domestic firms. In 2010 both modes concentrate the same density and dispersion is also similar. This suggest that during the period of the Great Recession domestic firms have experienced a significant reduction in employment and that wages have compressed at exporter firms much faster than at domestic firms.

To give a quantitative snapshot of the wage gap across establishment types and over time we present in Table 2 – Panel A – real hourly wages (in Euros) for different percentiles of the actual wage distribution. We can observe several stylized facts from the data. First, wages paid at exporter establishments from the lowest to the highest percentiles are larger than the wages paid by domestic establishments. Second, the wage gap is lower at the queues and larger at the center of the distribution. For example, in 2006, the wage gap at the lowest percentile (p=10th) was 19 per cent, at the median was 36 per cent and at the highest percentile (p=90th) was 25 per cent. Third, during the period of rapid expansion of the Spanish economy (1995-2006)

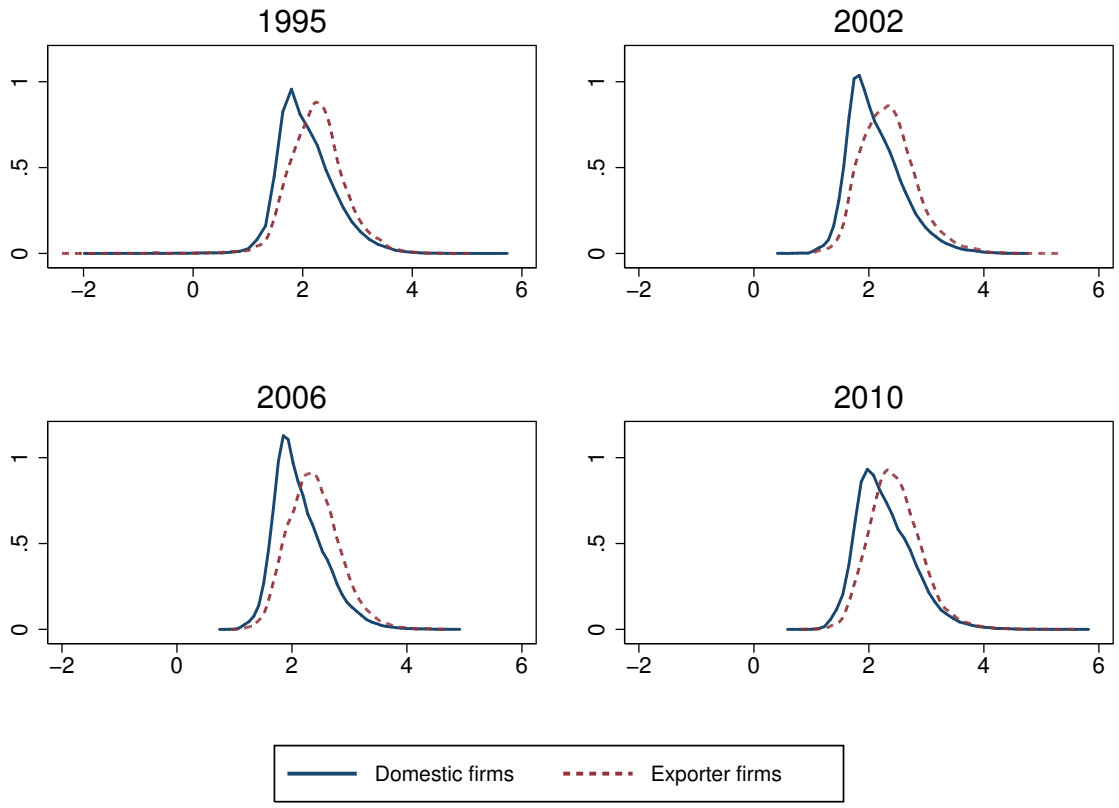

Figure 1: Kernel density estimates of the wage distribution: Domestic firms (*Solid*) versus Exporter firms (*Dashed*).

the exporters' wage gap has grown for each percentile, and interestingly, in the recession period (2006-2010) captured by the data, the exporters' wage gap has reduced for all the percentiles with the exception of the lowest one (p=10th). And fourth, although wages has kept growing even during the initial years of the Great Recession for all type of firms and percentiles, the wages of the exporter sector has adjusted much faster than the domestic sector, more at the upper than at the lower tails of the wage distribution. This fact suggests that not only the wages paid by exporter are greater, but also that the dynamics followed by wages are different at exporter firms.

Most of the wage gap among firms are likely due to differences in composition of their workforce. If exporting firms have more skilled workers than domestic firms, we should observe higher wages at exporter firms. In Table 2 – Panel B – we show also employment shares for exporter and domestic establishments according to a wide range of skills. Exporters tend to hire more male workers, older individuals, with more experience –with 10 or more years– and education –with medium and higher levels–. That is, if those skills are rewarded by the labor market, almost a part of the wage gap is due to composition effects.

To check whether skills demanded by exporter firms are more rewarded in the labor market we compare mean log wages paid by exporter versus domestic firms by skill-cells using the skill categories defined in Table 2. We define a skill-cell as a worker of certain sex, age (younger than

Table 2: Descriptive statistics

	1995		2002		2006		2010	
	Exporter	**Domestic**	**Exporter**	**Domestic**	**Exporter**	**Domestic**	**Exporter**	**Domestic**
PANEL A								
Hourly Wage								
10th percentile	5.3	4.6	5.9	5.0	6.3	5.3	6.8	5.7
25th percentile	7.0	5.6	7.5	5.9	8.0	6.2	8.6	6.9
50th percentile	9.5	7.3	10.1	7.6	10.6	7.8	11.3	9.1
75th percentile	12.9	10.6	13.9	10.9	14.4	11.0	15.5	13.2
90th percentile	18.0	15.6	19.2	15.8	19.4	15.5	20.9	18.7
PANEL B								
Sex								
Male	80.1	79.4	76.1	77.1	76.0	76.8	74.6	72.4
Female	19.9	20.6	23.9	22.9	24.0	23.2	25.4	27.6
Age								
Younger than 30	20.4	23.9	25.2	28.6	18.7	23.3	12.9	15.7
Between 30 and 49	57.8	56.1	53.5	53.9	58.0	56.9	65.1	63.6
50 or older	21.8	20.0	21.3	17.5	23.3	19.7	22.0	20.7
Education								
Low	65.5	71.1	53.8	63.7	47.2	60.6	38.6	42.0
Medium	24.4	20.6	32.6	25.8	35.1	26.6	38.1	34.2
High	10.1	8.3	13.6	10.5	17.7	12.8	23.4	23.8
Tenure								
Less than 2	15.6	18.6	22.1	30.5	18.9	29.1	13.2	17.8
Between 2 and 6	21.6	25.4	27.6	29.4	26.6	29.5	27.8	31.8
Between 7 and 9	10.4	11.1	6.9	7.0	11.5	10.4	11.9	12.0
10 or more	52.3	44.9	43.4	33.1	43.0	31.0	47.0	38.4
Observations	19,179	69,051	21,593	58,493	20,246	56,761	18,114	37,610

Notes: Panel A shows real hourly wage in constant 2006 Euros at different percentiles of the wage distribution. Panel B displays employment shares in percentage and the number of observations in the regression sample.

30, between 30 and 49, or 50 or older), education level (low, medium or high) and tenure (less than 2 years, between 2 and 6 years, between 7 and 9 years, or with 10 or more years). In total we create seventy two skill-cells that represent different job markets. Figure 2 plots the mean log wage of those cells paid by exporter versus domestic establishments compared with the 45 degree line. With some exception, skill-level wages paid by exporters are *on average* higher than wages paid by domestic firms.

4 Methodology

The existing literature shows evidence of the mean exporter wage premium. This effect is often measured as a location shift coefficient in a regression where all the remaining parameters are constrained to be the same across exporter and non-exporter firms. We deviate from the existing literature in two ways. First, we do not focus on the mean but in quantile regressions; and, second, we follow the Blinder-Oaxaca method to estimate the *discrimination* effect.

The difference in average wages paid at exporter versus domestic firms can be decomposed –using the traditional method introduced by Blinder (1973) and Oaxaca (1973)– into differences in individuals characteristics and differences in coefficients. The later are considered *explained*

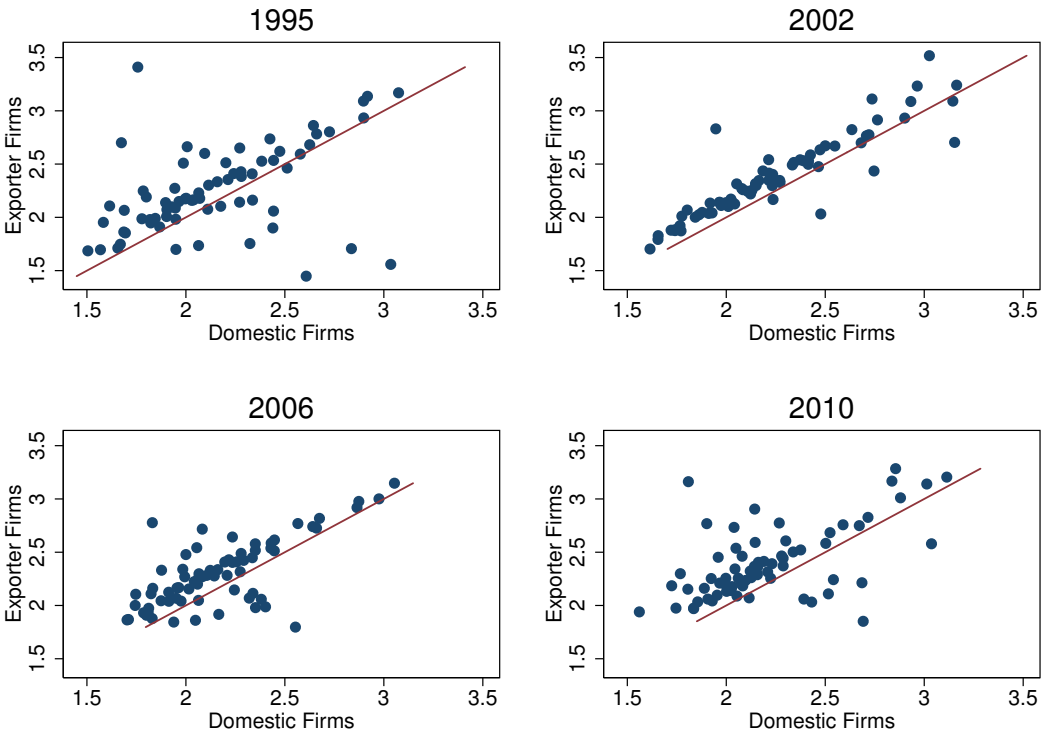

Figure 2: Mean wages across skill-cells

differences while the former is the *price differential* or wage premium. To formalize the method, let d denote the population of the wage earners working at domestic firms and e the population of workers at exporting firms. Let define Y_m the (log) wage and X_m the relevant market attributes that affect wages for the two populations, $m \in \{d, e\}$. The conditional distribution function of wages at domestic and at exporter firms can be denoted as $F_{Y_d|X_d}(y|x)$ and $F_{Y_e|X_e}(y|x)$ respectively. The empirical distribution function of wages for workers at domestic firms is denoted by $F_{Y\{d|d\}}$ and the observed distribution function of wages for workers at exporter firms is $F_{Y\{e|e\}}$. The counterfactual distribution function of wages for workers at domestic firms if they would had been paid according to the wage structure prevailing at exporter firms, $F_{Y\{e|d\}}$, is obtained as follows:

$$F_{Y\{e|d\}}(y) := \int_{\chi_e} F_{Y_e|X_e}(y|x) dF_{X_d}(x). \tag{1}$$

that is, we integrate the conditional distribution function of wages paid at exporter firms to the characteristics of the population of individuals working at domestic firms.

The Blinder-Oaxaca difference in wages paid at exporter firms respect to the wages paid at domestic firms can be expressed as:

$$F_{Y\{e|e\}} - F_{Y\{d|d\}} = [F_{Y\{e|e\}} - F_{Y\{e|d\}}] + [F_{Y\{e|d\}} - F_{Y\{d|d\}}] \tag{2}$$

where the first bracket represents wage gap due to differences in coefficients (i.e. wage premium) and the second bracket represents the wage gap due to differences in characteristics (i.e.

composition effect).

While the traditional method focuses on the average of the conditional distribution function of wages, we use quantile regressions to offer a more complete description of the distribution, as suggest the descriptive data presented in section 2. To do so, we follow the Koenker and Bassett (1978) quantile regression estimator, and the decomposition approach used by Machado and Mata (2005). Thus, the method combine quantile regression with a bootstrap approach based on the asymptotic theory developed by Chernozhukov, Fernández-Val, and Melly (2013) to assess the counterfactual decomposition of differences in distributions. The proposed methodology enables the identification of the sources of wage disparities across two populations, $m \in \{d, e\}$, using the covariate distribution, F_{X_m}, the conditional distribution function, $F_{Y_m|X_m}$, and its associated conditional quantile distribution function, $Q_{Y_m|X_m}$.

Our main interest lies on the counterfactual distribution functions associated to $F_{Y_m|X_m}$ and $Q_{Y_m|X_m}$ that represent the distribution of wages that would have prevailed in the domestic firms' population if all covariates had been distributed as in the exporter firms. They are represented as follows:

$$F_{Y\{e|d\}}(y) := \int_{\chi_e} F_{Y_e|X_e}(y|x) dF_{X_d}(x) \tag{3}$$

$$Q_{Y\{e|d\}}(\theta) := F^{\leftarrow}_{Y\{e|d\}}(\theta), \quad \theta \in (0,1) \tag{4}$$

where $F^{\leftarrow}_{Y\{e|d\}}(\theta)$ is the left inverse function of $F_{Y\{e|d\}}(\theta)$.

To obtain the counterfactual distribution $F_{Y\{e|d\}}$ we first sample the covariate X_m from the distribution F_{X_m} and then sample $Y\{e|d\}$ from the conditional distribution $F_{Y_e|X_d}(\cdot|X_m)$. Machado and Mata (2005) show that this mechanism admits a representation of the form:

$$Y_{\{e|d\}} = Q_{Y_e|X_e}(U|X_d) \tag{5}$$

where $U \sim U(0,1)$ independently of $X_d \sim F_{X_d}$.

The important advantage of this representation is that it allows to connect conditional quantile models with conditional distribution models through the relation:

$$F_{Y_e|X_e}(y|x) \equiv \int_{(0,1)} 1\{Q_{Y_e|X_e}(u|x) \leq y\} du \tag{6}$$

With the counterfactual distribution functions (3) and (4) we can perform several decompositions of the type represented in (2). Our interest lies on the Oaxaca-Blinder quantile decomposition:

$$Q_{Y\{e|e\}} - Q_{Y\{d|d\}} = [Q_{Y\{e|e\}} - Q_{Y\{e|d\}}] + [Q_{Y\{e|d\}} - Q_{Y\{d|d\}}] \tag{7}$$

where the first bracket on the right-hand side captures the effect of the wage premium obtained in exporter firms and the second bracket measures the composition effect of the workforce.

The distribution is estimated using a linear quantile regression implemented by Koenker (2005) for separate years (i.e. 1995, 2002, 2006 and 2010). Given the interest in the literature on accounting for the effects of the unobserved heterogeneity in the wage dispersion, we implement

the Oaxaca-Blinder decomposition by taking into account the distribution of residuals, as in Juhn, Murphy, and Pierce (1993). Under this approach changes in the exporter wage gap would have three components: changes in observable characteristics, changes in coefficients and changes in residual inequality. Note, that we do not track neither establishments nor individuals over time. This means that individuals in a given quantile are not the same across time periods, and our results should be interpreted as a description of the wage distribution and its changes over time.

The four samples contain a large number of observations as shown in Table 2. To approximate the conditional distribution function we estimate 150 different quantile regressions. We use the bootstrap method to estimate consistently the distribution of coefficients. To this purpose we set the number of replications to 30 given the high cost in terms of computation time that the method requires.

5 Results

In a first stage we analyze the extent of the exporter wage differential and in a second stage we introduce changes in the empirical specification as a robustness check.

5.1 Baseline model

Now we present the baseline specification of our model. The dependent variable is the (log) hourly wage measured in 2006 Euros. The explanatory variables include as covariates the conventional human capital controls –several indicator variables that characterize the individuals (i.e. sex, three age categories, three educational levels and four tenure levels)– and dummies for eight industries, eight occupations, and seven regions.[21,22] With this specification we are controlling for all the relevant sources of observable worker heterogeneity and for the potential changes in the returns to skill. Importantly, this specification fits close to the Melitz-type of models of firm heterogeneity, because it simply focus on a single source of plant heterogeneity: the exporter versus domestic status. In concordance with the theory, firms with higher productivity become larger and simultaneously engage in export activities. That is, the model features an exporter wage premium conditional of firm productivity, so that it doesn't feature an exporter wage premium conditional on firm size.[23] Hence, given the systematic relationship between firm characteristics and the export participation present in all the models featured in Section 1.1, the exporting status summarizes in one single statistic the basic causal channel at

[21] Using industry, occupation and region dummies we account for unobserved wage differentials such as a wide range of compensatory wages. Moreover, in theoretical models of wage differentials based on Melitz (2003) are one industry models, meaning that trade generates labor reallocation and wage disparities within the industry across firms.

[22] Table A-1 from the Appendix show means and standard deviations for the variables used in our sample.

[23] As Baumgarten (2013) argues, none of the models based in Melitz (2003) predicts that there should be an exporter wage premium that is distinguishable from premia for other *arbitrary* firm characteristics. Therefore, in a structural estimation there is no room for adding simultaneously to the export status any other firm characteristics, such as size or productivity. In addition, the Oaxaca approach makes unnecessary to construct sophisticated productivity measures since the two subpopulation of firms are easily identified with the export/domestic variable.

work.[24]

The empirical literature has documented that the exporter wage premium is upwards bias when there is omission of variables related positively with the export status or with the export intensity of the firm. However, the potential bias should not be a problem if we assume that the conditional wage difference between exporter and domestic establishments and the conditional propensity to work in an exporter establishment are driven by the export status and not by other circumstances that affect the firm depending on their size. In Section 5.2 we explore some alternative explanations.

5.1.1 Basic decomposition

In Figure 3, we describe the magnitude of the wage disparities paid at exporter versus domestic firms and each component along the whole distribution of wages. In each plot, we represent for each year the estimated unconditional exporter wage gap as a curved solid line, the coefficients effect (the wage premium) in short-dashed line, the characteristics effect in dashed-dotted line and the residuals in long-dashed line. Notice, that given the type of decomposition adopted, the total wage gap (solid line) is the sum of the remaining (dashed) effects. For comparisons, we also represent the conditional mean effect as a horizontal solid line.

The total estimated –unconditional– exporter wage gap has an inverted-U shape in all the periods and its magnitude has increased extraordinarily for all wages during the periods of rapid expansion of domestic and international markets (1995-2006); and it has reduced in the period that includes a sharp contraction (2006-2010). The coefficients effect keeps a slightly decreasing –around the value 0.15– U-inverted profile, quite constant in the periods of rapid expansion but clearly lower –below the 0.15– and decreasing for the whole distribution in 2010.[25] The characteristics effect was almost constant after the recession period in 1995 and turned increasing along the distribution in the periods of rapid employment growth. In the aftermath of the global recession in 2008-2009 the characteristics became decreasing as we moved up through the wage distribution. On the other hand, the residuals effect has an inverted-U shape that is replicated in the estimate of the total exporter wage gap. The differences in residuals are non-different from zero for most parts of the distribution and years, but they are positive for the center and negative at the extremes.

In Table 3 we show the exact magnitude and the relative importance of the three effects for selected quantiles of the distribution. A great share of the exporter wage gap in 1995 (Panel A) is clearly due to the differences in the wage structure (i.e. coefficients effect). Although the magnitude is quite constant, it experiences a significant reduction at the upper end. Meanwhile the relative magnitude is very high –of about 91%– at the queues and smaller –of about 66%– at the center of the distribution. The composition effect was relatively less important than the

[24]Some other authors have also used the export status or the employment size as proxies for the productivity level (e.g. Verhoogen 2008 or Frias, Kaplan, and Verhoogen 2009).

[25]It is noticeable that the quantile effects are above the mean effect during the first three periods. This is due to the sensitiveness of the conditional mean to the outliers, in this case located at the extremes of the distribution. Note that the method exclude estimates for the lower –below 0.1–, and upper –above 0.9– quantiles due to lack of precision.

Table 3: Decomposition of the exporter wage gap (Baseline).

	Panel A: 1995				Panel B: 2002				Panel C: 2006				Panel D: 2010			
	Wage Gap	**Coef.**	**Char.**	**Res.**	**Wage Gap**	**Coef.**	**Char.**	**Res.**	**Wage Gap**	**Coef.**	**Char.**	**Res.**	**Wage Gap**	**Coef.**	**Char.**	**Res.**
Mean	0.192	0.132	0.060		0.228	0.137	0.091		0.247	0.139	0.091		0.179	0.119	0.060	
	(0.004)	(0.003)	(0.003)		(0.004)	(0.003)	(0.003)		(0.004)	(0.003)	(0.003)		(0.004)	(0.003)	(0.003)	
	100%	69%	31%		100%	60%	40%		100%	56%	44%		100%	66%	34%	
$\theta = .10$	0.167	0.152	0.059	-0.044	0.186	0.154	0.067	-0.035	0.193	0.155	0.088	-0.051	0.196	0.135	0.083	-0.021
	(0.007)	(0.006)	(0.004)	(0.005)	(0.005)	(0.005)	(0.003)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
	100%	91%	35%	-26%	100%	83%	36%	-19%	100%	80%	46%	-26%	100%	68%	42%	-10%
$\theta = .25$	0.220	0.157	0.070	-0.007	0.235	0.158	0.082	-0.006	0.250	0.162	0.099	0.010	0.220	0.131	0.076	0.008
	(0.005)	(0.004)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.005)	(0.003)	(0.003)
	100%	71%	32%	-3%	100%	67%	35%	-2%	100%	65%	39%	-4%	100%	60%	34%	6%
$\theta = .50$	0.240	0.158	0.067	0.015	0.269	0.159	0.094	0.015	0.291	0.165	0.108	0.018	0.205	0.120	0.068	0.018
	(0.004)	(0.004)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
	100%	66%	28%	6%	100%	59%	35%	6%	100%	57%	37%	6%	100%	54%	31%	15%
$\theta = .75$	0.202	0.148	0.061	-0.006	0.241	0.153	0.098	-0.010	0.273	0.165	0.109	-0.001	0.164	0.105	0.059	-0.001
	(0.006)	(0.004)	(0.003)	(0.003)	(0.005)	(0.005)	(0.004)	(0.003)	(0.005)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)
	100%	73%	30%	-3%	100%	63%	41%	-4%	100%	60%	40%	0%	100%	64%	36%	0%
$\theta = .90$	0.139	0.127	0.056	-0.045	0.197	0.140	0.103	-0.047	0.221	0.156	0.113	-0.048	0.107	0.091	0.058	-0.042
	(0.010)	(0.006)	(0.005)	(0.007)	(0.010)	(0.005)	(0.005)	(0.008)	(0.009)	(0.005)	(0.005)	(0.006)	(0.007)	(0.006)	(0.004)	(0.007)
	100%	91%	40%	-31%	100%	71%	53%	-24%	100%	71%	51%	-22%	100%	85%	54%	-39%

The Oaxaca-Blinder decomposition is shown in row Mean. The remaining rows display the Juhn-Murphy-Pierce decomposition at different quantiles. Percentages indicate the share of the exporter wage gap explained by differences in coefficients, characteristics and residuals. 95% bootstrap standard errors are reported in parenthesis.

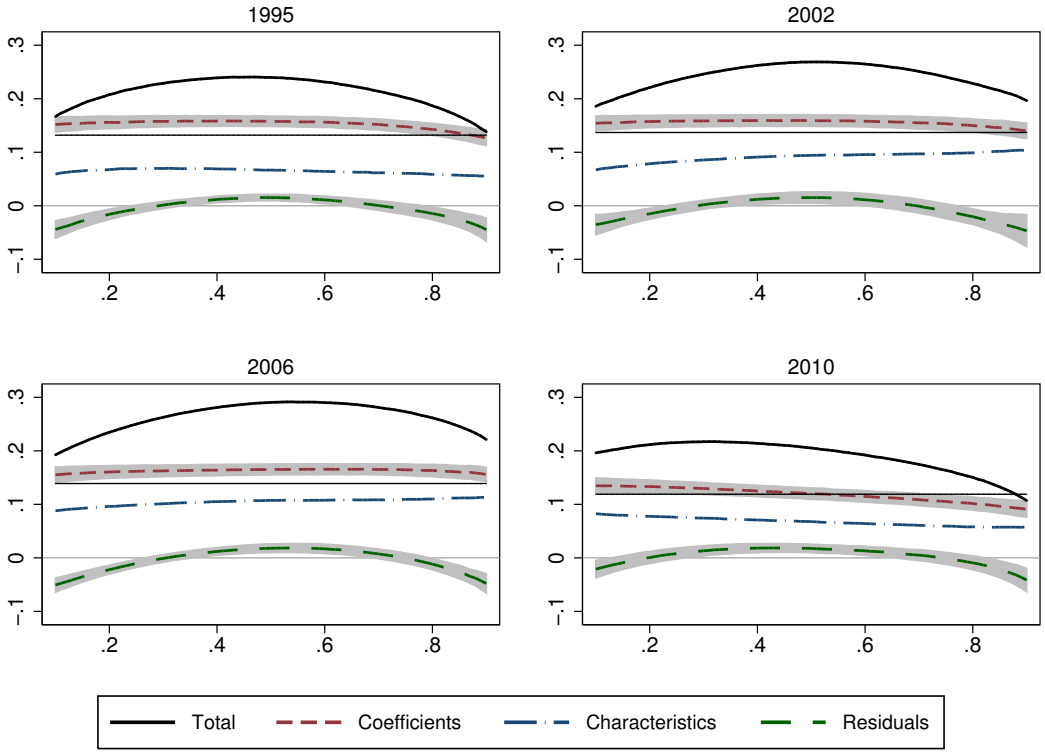

Figure 3: Wage gap decomposition (Baseline). The solid horizontal line represents the least squares conditional mean estimate. Shades represent 95% confidence intervals for coefficients and residuals differences.

wage structure –ranging from more than 35% at the extremes to 28% at the center. Interestingly, given the flatter profiles of the previous effects, the residuals line keeps the U-inverted shape of the wage gap. At the extremes the difference on the residuals are negative –ranging around -26% to -31% at the lower and upper parts respectively– but at the center are positive and around 6%.

The economic downturn in the world economy occurred in 2008-2009 and reflected in 2010 (Table 3–Panel B) reveals important changes in the absolute and relative magnitude of the three effects. While the absolute exporter's wage gap experienced a general decline –with the exception of the lower part that increased– the wage structure also contracted. However, the composition effect does not seem to have changed in absolute terms in most parts of the wage distribution with the exception of the lower queue that increased. The differences explained by the residuals maintain negative values at the extremes and positive at the center, although the U-inverted shape is now flatter. Importantly, the data show that the overall wage contraction in the Spanish exporting sector in 2010 has been due to changes in the coefficients and not in the characteristics of workers.[26] That is, exporters are reacting to market shocks much faster than domestic firms.

[26]In the Appendix we also show the equivalent tables for 2002 and 2006.

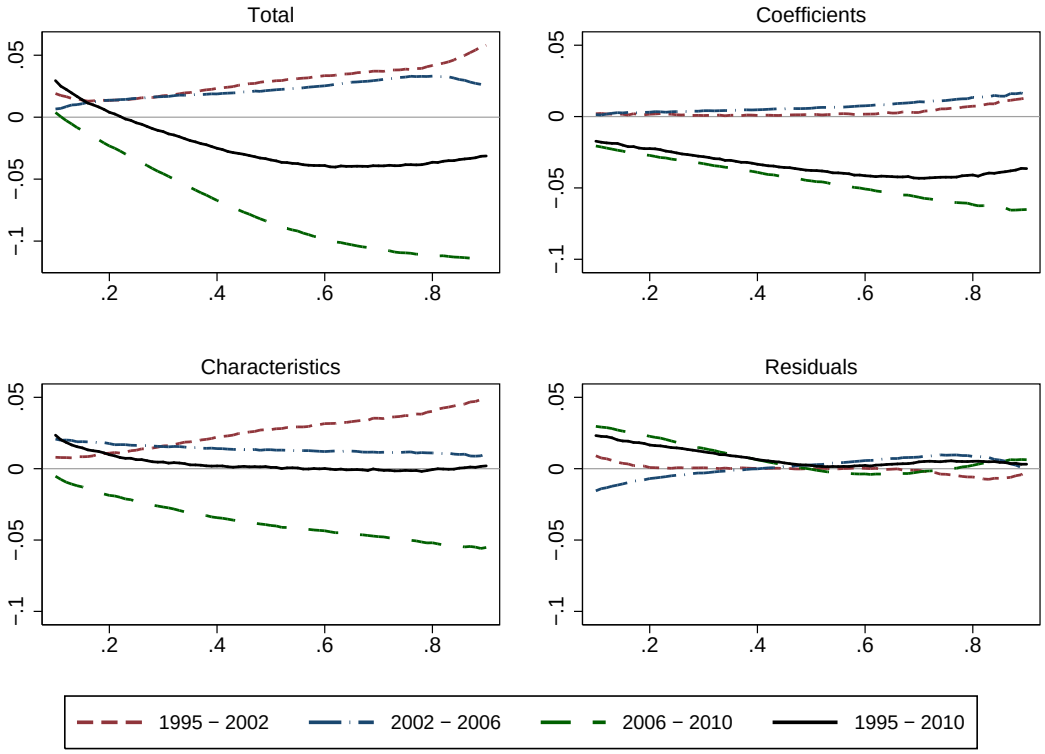

Figure 4: Exporter wage gap changes (Baseline).

5.1.2 Evolution over time

From the previous figures we cannot capture with precision the changes of the exporter wage gap over the different periods and parts of the distribution. In Figure 4 we show the changes across quantiles of the different effects that define the exporter wage gap in the first subperiod (1995-2002), in the second subperiod (2002-2006), in the third subperiod (2006-2010), and in the whole period (1995-2010). Interestingly, in the first two periods the –total– exporter wage gap rose for all the wages, following an increasing pattern across quantiles. That is, the exporter wage gap increased more for the higher part of the wage distribution. However, in the latest period the exporter wage gap decreased extraordinarily for all the distribution. The reduction was very pronounced the higher the wages and specially inclined for the lower tail of the distribution. Therefore, in the third period the export sector is contributing to the reduction of wage inequality in the economy. Lastly, the overall pattern followed during the whole period is clearly affected by the economic downturn occurred in 2009. Between 1995 and 2010 the change in the total wage gap was negative, and had a negative slope for the top-three quarters of the wage distribution. Hence, even in the period 1995-2010, the relative changes of wages in the exporter sector contributed to lower the unconditional wage inequality of the Spanish economy.

Regarding the patterns followed by the changes in coefficients during different periods, we observe a similar profile that in the changes of the total wage gap. In the first two subperiods (1995-2002 and 2002-2006) the changes in coefficients were low and positive but increasing in the upper part of the wage distribution. The change in the wage structure in those periods

generated a greater wage inequality in the economy. In the last period (2006-2010), nevertheless, the changes in coefficients were negative for all the distribution, being more negative as we move up through the wage distribution. This entails a great compression of wages within exporter firms that contributed to a reduction of wage dispersion.

Meanwhile, changes in characteristics are positive in the first subperiod and increasing along the distribution, contributing to explain most of the total change in the exporter wage gap and to generate greater wage inequality. In the second subperiod the changes in composition of the workforce at exporter firms also contributed to explain part of the changes in the total wage gap, but more in the lower part than in the upper part of the wage distribution. In the third subperiod the changes in characteristics are reducing the wage gap, with a downward slope along the distribution, and, thus, contributing to a reduction in wage inequality. In the overall period the changes in characteristics were positive for the lower part and null for the rest of the distribution, meaning that changes in characteristics have had a neutral impact on the exporter wage gap between 1995 and 2010, except for the lower tail of the distribution. Finally, the residuals do not seem to have changed that much from period to period, but, in any case, positive changes have occurred at the lower part of the wage distribution with the exception of the period 2002-2006, where changes were below zero for the lower quantiles.

In sum, these findings summarized in Figure 4 suggest a variable role –by period of analysis– of characteristics and coefficients in explaining the exporter wage gap along the wage distribution. Between 1995 and 2002 the increase in the total wage gap was due to an impressive change in the characteristics of the workforce at exporter firms and a minimal role of changes in coefficients. Between 2002 and 2006 changes in characteristics also explained most of the total wage gap, but coefficients changes contributed relative more than in the previous period, specially in the upper part of the distribution. However, between 2006 and 2010 the exporter wage gap suffered an abrupt fall explained by similar changes in coefficients and characteristics along the wage distribution. Overall, since 1995 the changes occurred in the total wage gap between exporters and domestic firms are largely explained by changes in coefficients. To some extent, these findings reveal a new fact about exporters, that the wage setting mechanism prevailing at exporter firms is more flexible to adjust to market shocks. Simultaneously, the changes in the wage structure imply that exporting has contributed to reduce wage inequality, although this is a consequence of the large contraction experienced in the latest subperiod.

5.1.3 Decomposition by skills

Now in Figure 5 we focus on the separate effects of sex and education skills exclusively on the exporter wage premium at the initial and final years. The plots of the gender variable show an exporter premium for female workers, but also show that females perceive a lower premium than male workers for all the quantiles. The gender wage gap is almost the same for each wage level. However, in 2010 the distance between male and female individuals have shortened. Interestingly, this is largely explained by the contraction of the wage premium of males. Changes in coefficients during the period has moved in opposite direction for men and women being the wage compression higher as we move up through the wage distribution. Thus, exporting has

contributed to a reduction of the wage dispersion between sexes in Spain.

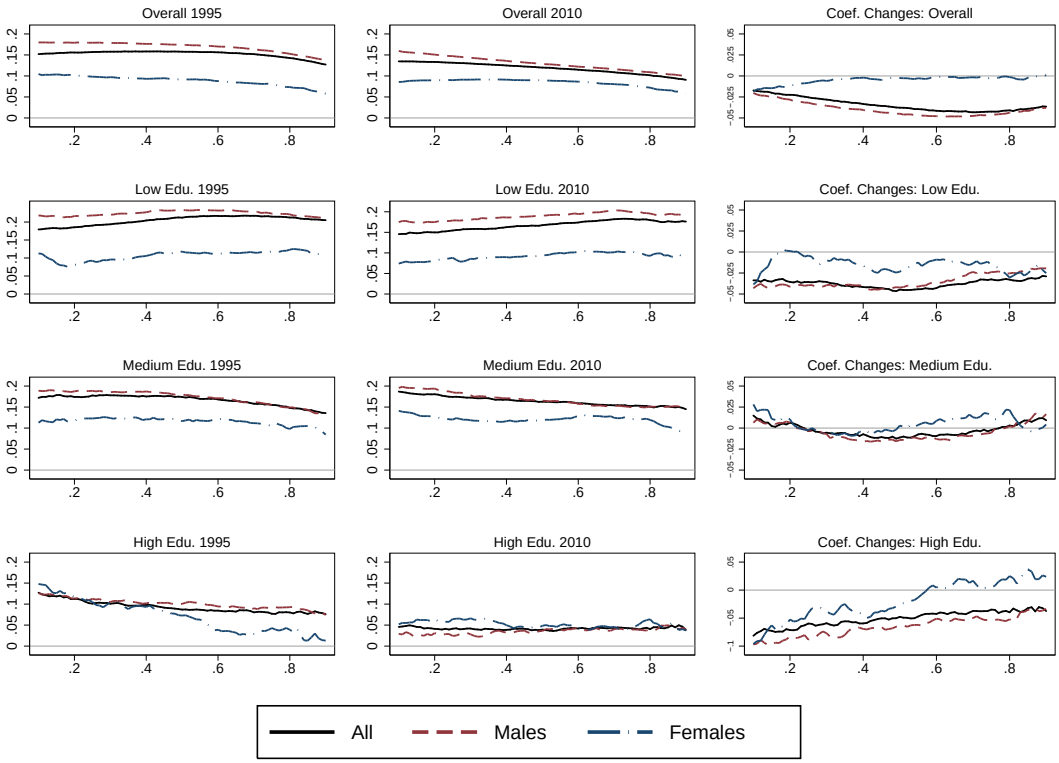

Figure 5: Quantiles of the exporter premium by skill group (Baseline).

The plots of the low education level show for both years a great dispersion of wages within this group, being the premia higher at the top than at the bottom of the distribution. Again, we observe a gender wage gap among low educated individuals. The exporter wage premium has decreased during the period for low educated men and women, being this reduction lower in the upper part of the wage distribution. A different pattern is observed when we look at the plots of the medium education levels. In both years the exporter premium is higher at the bottom than at the top of the distribution. The gender wage gap is also present in both years, but it has lowered as we move up through the distribution. The changes in coefficients are positive at the extremes and negative at the central part of the distribution implying convergence for men and women wages. Regarding the high education plots, in 1995 the exporter wage premium was a decreasing function along the distribution, for both, men and specially for women in the upper tail of the quantile distribution. The gender gap was null for the lower wage levels but not for the higher levels. However, in 2010 the wage premium profile was flat with narrow differences across female and male workers.

Focusing on the comparison across skill groups we observe that, in each period, low and medium educated individuals obtain a superior wage premia than the highly educated.[27] For example, in 1995 a low educated individual at the 20th percentile perceives a wage premium

[27]This is also true for the other periods considered in the analysis but omitted for space reasons. In the appendix we show the information of the remaining periods.

of 18.5% while in the same quantile position a highly educated worker gets a wage premium of 11.2%. Similarly, in 2010 the low educated worker at the 20th percentile obtains a premium when working at an exporting firm of 15% while a highly educated worker gets a premium of 3.9%. The changes between the whole period reveal that the exporter wage premium has diminished for both low educated and for high educated workers although the pattern throughout the distribution is flat for the less educated and increasing for the more educated workers. Interestingly, the pattern of changes along the distribution for medium educated individuals shows a U-shape, being positive at the extremes and negative at the center.

These results display strong implications for the between/within group dispersion associated to exporting. First, the changes in the wage structure occurred between 1995 and 2010 imply that wages have lowered more for highly educated workers than for low or medium educated workers independently of the position they occupy in the wage distribution. To give some numbers, in 1995 the exporter wage premium was 7.3 percentage points higher for low educated individuals (vs. high educated) at the 20th percentile and in 2010 the premium widened at 10.9 percentage points. Similarly, the same difference for the 80th percentile went from 13.3 to 13.9 percentage points. This suggests that exporting is contributing to a reduction of the wage dispersion across educational groups in the economy. Second, within education groups wage dispersion has evolved under different profiles. For the low and medium educated workers exporting is contributing to wage polarization given that the higher reductions take place at the center of the distribution. For example, in 2010 a worker at the 20th percentile perceive a wage premium 0.6 percentage points higher than in 1995 at the export sector, at the median is 1.1 percentage points lower and at the 80th percentile is 0.3 percentage point higher. However, high educated individuals have lowered the exporter premium more at the bottom than at the top of the distribution generating greater wage dispersion within this group.

The analysis of the data for the remaining periods reveals that the pattern of wage dispersion varies along the business cycle, with an exporter wage premium for the most educated growing more than the rest between 1995 and 2006. Interestingly, wages of low and medium educated workers do not show great variation within groups in the period of expansion. However, between 1995 and 2006 the premia received by the most educated shows an increasing profile with higher increases at the top than at the bottom of the distribution.

5.2 Robustness

In this section we check the robustness of our findings with respect to the Mincerian function used to estimate the wage model. In the baseline specification we have considered the standard human capital variables in the covariates set and focused on the conditional wage differences upon the export status of the firm. We have motivated the omission of other workplace characteristics to better match the empirical analysis with the heterogeneous firm theory. However, wage differences across individuals and the conditional probability of being employed at an exporting firm might also reflect some other workplace characteristics not related to trade along the wage distribution. Simultaneously, some other trade un-related shocks are likely affecting the changes in the conditional wage gap or the propensity to work at an exporting establishment. To

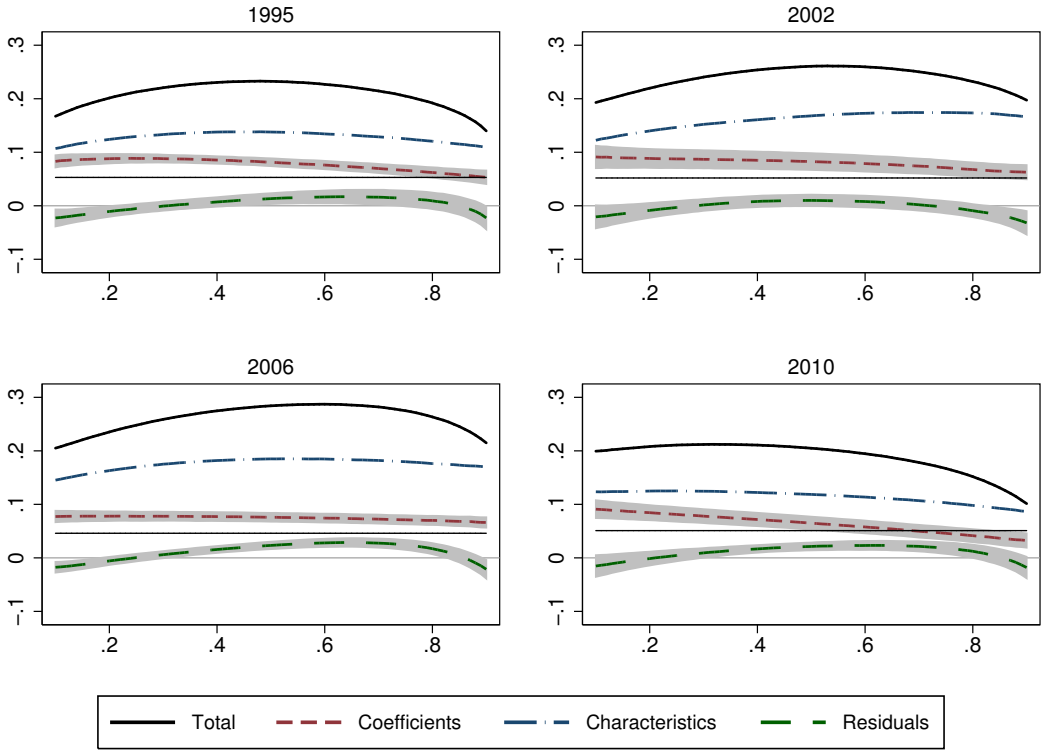

Figure 6: Wage Gap Decomposition (Robustness). The solid horizontal line represents the least squares conditional mean estimate. Shades represent 95% confidence intervals for coefficients and residuals differences.

explore this possibility we introduce in the baseline model two set of dummy variables. First, we introduce a dummy that takes the value one if the firm has its own collective agreement and zero if it relies on an external superior level agreement. Although wages are usually set at the province and industry-levels by collective bargaining, some firms deviates from the initial wage floor with a mark-up bargained at the firm-level with the unions. We interpret that having a firm-level collective agreement allows an important rent-sharing mechanism to work.[28] In addition, although in the Melitz (2003) model there is no justification for expecting an exporter wage premium conditional on size, there are some other potential sources of wage premium that act through size. Thus, we also include three establishment-size dummies based on employment classes.

In Figure 6 we present the overall decomposition of the exporter wage gap. The coefficients effect is now of lower magnitude –below 10%– and differs from zero for all the distribution. This is consistent with previous findings (i.e. Schank, Schnabel, and Wagner, 2007) where firm heterogeneity is explaining an important part of the exporter wage premium. Moreover, the exporter wage premium continues to be higher at the bottom and lower at the top of the wage distribution for all the years. The composition effect takes different profiles in different years, and the residuals effect also maintains the U-inverted shape that dominates in the total effect.

[28] See Felbermayr, Prat, and Schmerer (2011) for theoretical support and Felbermayr, Hauptmann, and Schmerer (2013) for empirical evidence on this channel.

However, the positive part has now moved to the right.

In Table 4 we show that the exporter wage premium is lower and less important than the composition effect along the distribution. Interestingly, the wage premia is more relevant at the lower extreme and the composition effect has gained more weight at the upper extreme in both years. The residuals effect are negative at the extremes being larger in the upper extreme.

Next, in Figure 7 we analyze the changes in the exporter wage gap components in the different periods. In the first period (1995-2002) the changes in coefficients were almost null but with a positive difference in the upper part of the distribution. The change in characteristics was positive and increasing along the wage distribution while the changes in residuals were null except in the upper part, where they diminished. Therefore, the increase in the total wage gap is explained basically by the change in the characteristics of the workforce. In the second period (2002-2006) the change in coefficients were negative for most of the distribution and had a positive slope. The changes in the composition of the workforce were positive but diminishing and the residuals only changed positively for the upper end of the distribution. This means that the changes in the wage distribution in this period are basically explained by a change in the characteristics in the lower part and by changes in the non-observed heterogeneity in the upper part of the wage distribution. In the third period (2006-2010) the wage structure suffered important changes compared with previous periods, in the lower part the exporter wage premium increased but changes in coefficients turned negative for the remaining part. The slope was negative entailing a wage compression within exporter firms, and, as a consequence for the whole economy. The changes in the characteristics were negative for all the distribution and had a negative slope, while the changes in the residuals were quite constant along the distribution. This implies that the sudden reduction in the exporter wage gap was due to a combination of changes in the composition of the workforce and changes in the wage structure. Although the magnitude of these two effects differs, both are impacting very similarly along the wage distribution, affecting relatively more to employees with higher wages. Lastly, in the whole period of analysis (1995-2010) changes in coefficients and changes in characteristics display a very similar profile, being negative for most of the individuals and more pronounced the higher the wages along the distribution. That is, the changes displayed in the total wage gap were produced by similar changes in both coefficients and characteristics.

In the plots of Figure 8 we only analyze the coefficients effect across sex and education groups at the initial and the final years and the changes occurred in the overall period. As in the baseline model we find that female workers earn less than male workers at exporting firms. However, the gender gap diminishes in the upper part of the distribution. Interestingly, the coefficients change non-negatively for women at almost all the distribution and change negatively for men.

The low education plots show now that the exporter wage premium is not increasing, but constant or decreasing for the most parts of the distribution in both years. In 2010 the gender wage gap decreased, especially for low educated women at the upper part of the distribution. The exporter wage premium decreased almost constantly along the distribution between 1995 and 2010 for males and in overall. Regarding the patterns shown by the medium education, in both years the premium decreased as we move up through the distribution for both male

Table 4: Decomposition of the exporter wage gap (Robustness).

	Panel A: 1995				Panel B: 2002				Panel C: 2006				Panel D: 2010			
	Wage Gap	**Coef.**	**Char.**	**Res.**	**Wage Gap**	**Coef.**	**Char.**	**Res.**	**Wage Gap**	**Coef.**	**Char.**	**Res.**	**Wage Gap**	**Coef.**	**Char.**	**Res.**
Mean	0.192	0.053	0.139		0.228	0.052	0.176		0.247	0.046	0.201		0.179	0.051	0.129	
	(0.004)	(0.003)	(0.003)		(0.004)	(0.003)	(0.003)		(0.004)	(0.003)	(0.003)		(0.004)	(0.003)	(0.003)	
	100%	28%	72%		100%	23%	77%		100%	19%	81%		100%	28%	72%	
$\boldsymbol{\theta = .10}$	0.167	0.083	0.107	-0.023	0.193	0.091	0.122	-0.021	0.205	0.077	0.145	-0.017	0.199	0.091	0.124	-0.015
	(0.006)	(0.005)	(0.004)	(0.005)	(0.006)	(0.009)	(0.004)	(0.007)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.007)	(0.005)	(0.007)
	100%	50%	64%	-14%	100%	47%	63%	-10%	100%	38%	71%	-9%	100%	46%	62%	-8%
$\boldsymbol{\theta = .25}$	0.213	0.088	0.130	-0.005	0.231	0.088	0.147	-0.003	0.248	0.078	0.170	0.000	0.211	0.081	0.125	0.004
	(0.004)	(0.003)	(0.003)	(0.003)	(0.005)	(0.007)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.006)	(0.005)	(0.004)
	100%	41%	61%	-2%	100%	38%	63%	-1%	100%	31%	69%	0%	100%	38%	59%	3%
$\boldsymbol{\theta = .50}$	0.233	0.081	0.138	0.013	0.261	0.083	0.168	0.010	0.284	0.076	0.185	0.023	0.205	0.065	0.119	0.021
	(0.004)	(0.003)	(0.003)	(0.003)	(0.005)	(0.007)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)	(0.005)	(0.002)
	100%	35%	59%	6%	100%	32%	64%	4%	100%	27%	65%	8%	100%	32%	58%	10%
$\boldsymbol{\theta = .75}$	0.205	0.066	0.125	0.014	0.243	0.071	0.174	-0.003	0.275	0.071	0.180	0.024	0.167	0.046	0.103	0.018
	(0.005)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.003)
	100%	32%	61%	7%	100%	29%	72%	-1%	100%	26%	65%	9%	100%	27%	62%	11%
$\boldsymbol{\theta = .90}$	0.140	0.053	0.109	-0.023	0.197	0.063	0.167	-0.032	0.215	0.066	0.170	-0.021	0.101	0.033	0.087	-0.018
	(0.006)	(0.005)	(0.004)	(0.007)	(0.009)	(0.006)	(0.006)	(0.007)	(0.007)	(0.004)	(0.006)	(0.008)	(0.008)	(0.006)	(0.007)	(0.007)
	100%	38%	78%	-16%	100%	32%	85%	-16%	100%	31%	79%	-10%	100%	32%	86%	-18%

The Oaxaca-Blinder decomposition is shown in row Mean. The remaining rows display the Juhn-Murphy-Pierce decomposition at different quantiles. Percentages indicate the share of the exporter wage gap explained by differences in coefficients, characteristics and residuals. 95% bootstrap standard errors are reported in parenthesis.

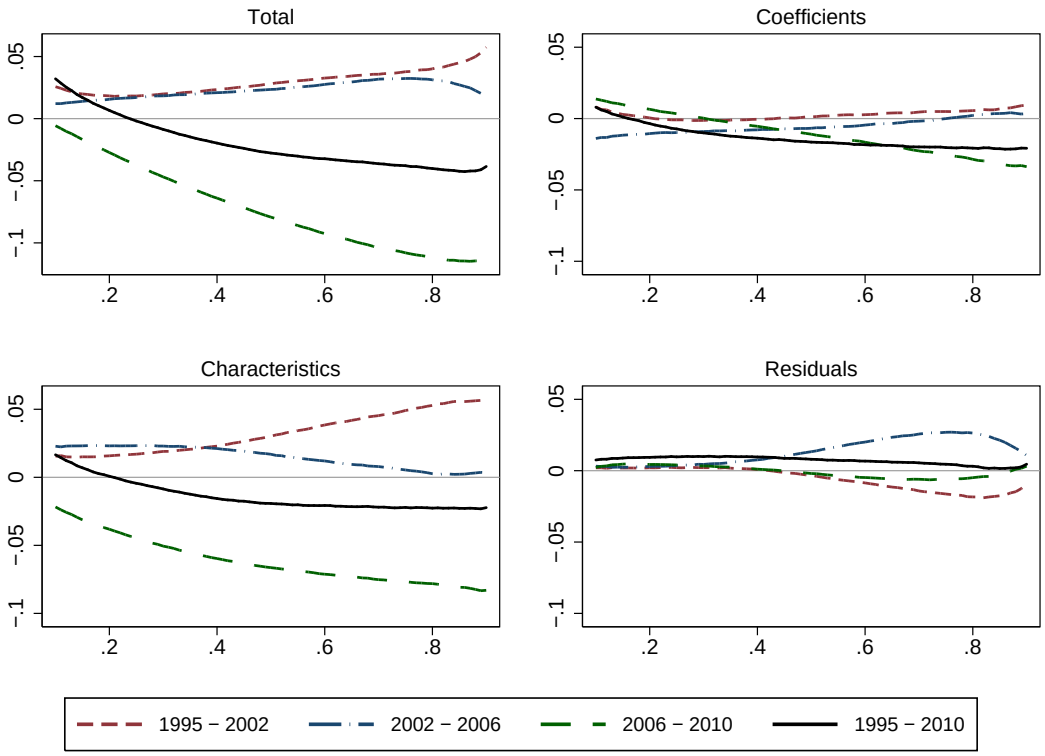

Figure 7: Wage gap changes (Robustness).

and female workers. Coefficients have changed negatively for men above the quantile 0.2 and positively for women throughout the whole distribution following a negative slope. The plots of the higher education level also show a negative slope in both years, for both sexes. The gender wage gap has experimented an important change in the period given that in 2010 the exporter wage gap was more favorable for female than for male workers with higher education, specially for women above the quantile 0.7.

5.3 Discussion

When comparing the two specifications from Sections 5.1 and 5.2 we observe that the exporter wage premium exists and is decreasing along the wage distribution. This means that under different assumptions there is an exporter wage premium as suggested by the non-neoclassical labor market theories. This finding is a stylized fact across time periods and for most skill groups defined by education and gender. Moreover, when comparing the coefficients across educational groups, the exporter wage premium is systematically higher at individuals with low and medium education. Both facts feature a Spanish labor market with a highly compressed wage structure which is the result of a rigid collective bargaining system and seem at odds with the higher wage dispersion predicted by models of heterogeneous agents when the economy opens up to international trade.

Over the period analyzed (1995-2010) wage dispersion in Spain has moderately reduced and so do the wage differences across exporters and domestic firms. The exporter wage gap short-

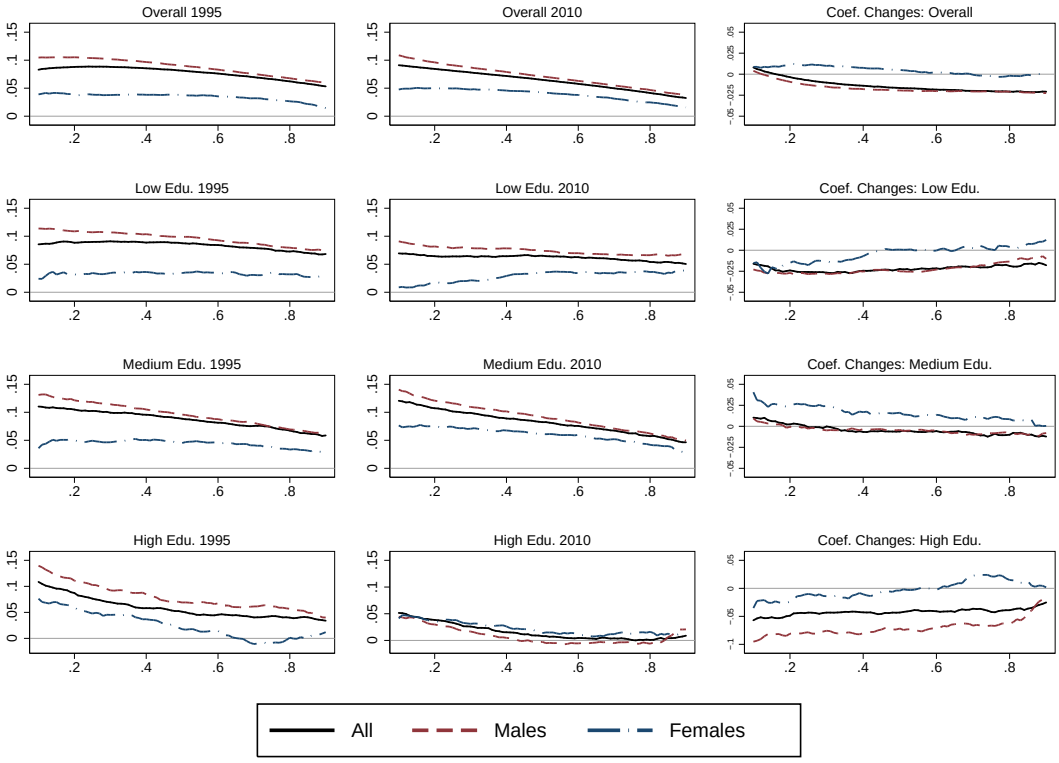

Figure 8: Quantiles of the exporter premium by skill group (Robustness).

ened mostly due to the sharp adjustment –in both employment and wages– made by exporter firms during the latest subperiod covered by our analysis (2006-2010). Overall, both changes in coefficients and in characteristics at exporters are contributing to rising wage inequality in periods of average economic growth and intense openness (1995-2006) and the opposite is true in the period that includes the Great Recession and the sudden drop of trade. This finding highlights a relatively unknown fact about the characteristics of exporting firms, i.e. that exporters enjoy a more flexible collective bargaining than domestic firms to face shocks.[29] An immediate consequence is that changes in wage structure prevailing at exporter firms is contributing to an overall reduction wage inequality in the labor market when shocks are negative and to an increase of wage dispersion when shocks turn out positive. This is in line with the theory predictions made by Helpman, Itskhoki, and Redding (2010) and by the evidence shown by Baumgarten (2013) for Germany where changes in coefficients at exporting firms explained an increase in wage dispersion of about 8.6% in a period of rapid expansion of export markets.

The analysis performed, as previously noted, suggests some implications of the role of exporting on the between and within components of wage dispersion. Changes in the exporter wage premium is contributing to a reduction in the wage dispersion across different skill groups, but again, this effect is likely driven by the business cycle position of the economy. When the economy grows, the exporter wage premia of the most educated rises disproportionately more than

[29]This flexibility arises in models of a rent-sharing, as in Egger and Kreickemeier (2012) and Felbermayr, Prat, and Schmerer (2011).

the wages of the less educated generating more between group wage dispersion in the economy. Alternatively, in periods of contraction the exporter wage premium reduces more for the more educated and, as a result, exporting contributes to a reduction of wage inequality. These facts are obviated in the literature of the exporter wage premium and require further inquiry. For example, Baumgarten (2013) and Klein, Moser, and Urban (2013) find that exporting increased between-group wage inequality, however they do not separately explain whether the origin is due to exporting or to the business cycle.

Our results could differ from others not simply because of the effect of different business cycles, but also because of the institutional differences in the labor market across countries. In Spain, the collective bargaining system makes difficult to produce large wage differences for individuals with similar demographic characteristics, and, as a result, wages tend to be highly compressed within groups.[30] However, when firms and workers agree to have a firm or plant-level collective agreement the possibility that wages differ from firm to firm increases and, therefore, demand shocks are more likely to produce wage dispersion across firms.

6 Conclusion

In this paper we study the wage differences paid by exporters versus domestic firms along the wage distribution. We use a method that decompose differences in distributions across exporters and domestic firms into several explanatory factors. We generated counterfactual scenarios that consist, on the one hand, in changing the distribution of the characteristics of workers and, on the other hand, in changing the conditional distribution of wages given the characteristics. This approach resembles the traditional Oaxaca-Blinder methodology that decompose the wage differences into the discrimination effect –that emerge as the differences in wages across workers with the same characteristics when working at exporter and domestic firms– and the effect of characteristics –arising when individuals perceive a different salary due to different characteristics–. We also extend the counterfactual analysis to include a third component, as in Juhn, Murphy, and Pierce (1993), that reflect the differences in wages due to differences in residuals. The estimates and inference procedures of counterfactual distributions are based on Machado and Mata (2005), Melly (2005), and Chernozhukov, Fernández-Val, and Melly (2013).

We use matched employer-employee data for Spain for the years 1995, 2002, 2006, and 2010. During this period of rapid export expansion, overall wage inequality in the labor market and the exporter wage differentials have moved in opposite directions: first, reducing wage inequality –and increasing the exporter wage gap– between 1995 and 2006, and, then, increasing wage inequality –and reducing the exporter wage gap– between 2006 and 2010. We find that the exporter wage premium tends to be quite constant, but higher at the low end of the distribution. In addition, the differences in characteristics explain relatively more at the extremes rather than at the center. The U-inverted shape of the exporter wage gap is due to the profile of the residual's

[30] In two related papers Akerman, Helpman, Itskhoki, Muendler, and Redding (2013) show a smaller contribution from between-firm differences in wages in Sweden than the one Helpman, Itskhoki, Muendler, and Redding (2012) find for Brazil. The first authors attribute that difference to the influence of labor market institutions in reducing wage dispersion.

differences. Splitting the education variable into three levels and allowing the decomposition to differ in each category, we find that the coefficients effect is higher at the low-medium education levels. Additionally, a gender discrimination against women exists in the exporter sector, but tend to diminish over time and along the distribution, specially the higher the educational level. Interestingly, the discrimination turns against men in 2010 for highly educated women working at the exporter sector and all the wages. When we examine the evolution of wage differential over time we show that in periods of economic expansion the exporter premium rises, and in periods of contraction the exporter premium diminishes, suggesting that exporter firms tend to adjust wages faster and more intensely to the business cycle. Moreover, the wage structure at exporter firms produces wage inequality during periods of expansion and reduces it during periods of contraction.

A Appendix

A.1 Additional Figures and Tables

Figure A-1: Quantiles of the exporter premium by skill group (2002-2006)

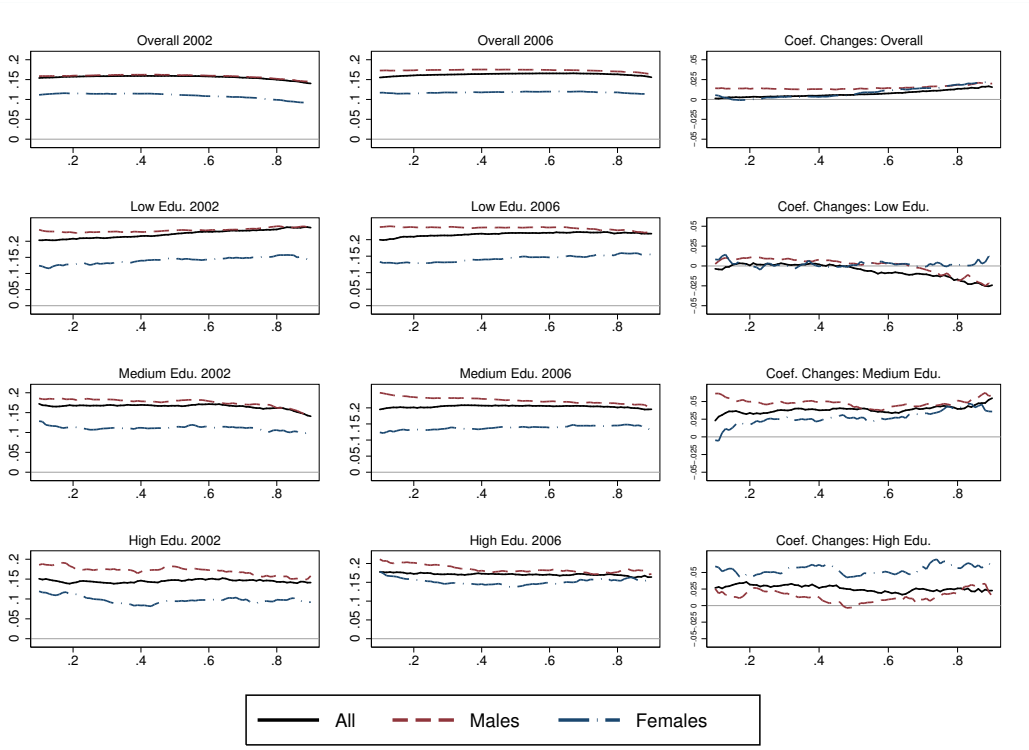

Table A-1: Summary statistics

	1995	2002	2006	2010
Gender				
Male	0.80	0.77	0.77	0.73
Female	0.20	0.23	0.23	0.27
Age				
Younger than 30	0.23	0.28	0.22	0.15
Between 30 and 50	0.57	0.54	0.57	0.64
50 or older	0.20	0.19	0.21	0.21
Tenure				
Less than 2	0.18	0.28	0.26	0.16
Between 2 and 6	0.25	0.29	0.29	0.31
Between 7 and 9	0.11	0.07	0.11	0.12
10 or more	0.46	0.36	0.34	0.41
Education				
Low	0.70	0.61	0.57	0.41
Medium	0.21	0.28	0.29	0.35
High	0.09	0.11	0.14	0.24
Size				
Less than 50	0.43	0.38	0.42	0.32
Between 50 and 199	0.32	0.32	0.31	0.29
200 or more	0.23	0.27	0.26	0.37
Collective Agreement				
Firm-level Agreement	0.28	0.23	0.22	0.29
Higher-level Agreement	0.72	0.77	0.78	0.71
Sector				
Food, Textile, Leather, and Footwear	0.25	0.22	0.20	0.18
Wood, Cork, and Paper	0.08	0.08	0.08	0.06
Publishing and Graphics	0.05	0.05	0.05	0.20
Refining, Chemicals, and Plastics	0.15	0.14	0.15	0.14
Other non-metal Minerals	0.09	0.09	0.09	0.04
Metallurgy and Metal Products	0.10	0.12	0.13	0.09
Machinery and Equipment	0.15	0.15	0.15	0.11
Transport, Furniture, and Recycling	0.14	0.14	0.15	0.18
Occupation				
Directors and Managers	0.03	0.02	0.03	0.04
Professionals	0.04	0.05	0.05	0.13
Technicians	0.10	0.14	0.14	0.23
Clerical Workers	0.10	0.07	0.09	0.08
Service and Trade Workers	0.01	0.01	0.01	0.01
Manual Skilled Workers	0.25	0.24	0.30	0.24
Machine Operators	0.36	0.38	0.31	0.21
Unskilled Workers	0.11	0.08	0.08	0.07
Region				
North West	0.12	0.12	0.13	0.13
North East	0.22	0.21	0.21	0.19
Madrid	0.11	0.10	0.10	0.14
Center	0.13	0.13	0.14	0.12
East	0.28	0.28	0.27	0.28
South	0.12	0.12	0.12	0.11
Canary Islands	0.03	0.03	0.03	0.03

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