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GVC INVOLVEMENT AND THE GENDER WAGE GAP: MICRO-EVIDENCE ON EUROPEAN COUNTRIES

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Abstract

We examine linkages between involvement in global value chains (GVCs) and gender wage inequalities. We use merged data from Structure of Earnings Survey and the World Input Output Database covering 18 European countries. We employ information on employees' personal and company characteristics and a sectoral involvement in GVCs. In general, the wages of workers from sectors more involved in GVCs are lower. However, the relationship between GVC and wages differs according to gender: women are more affected by the negative impact of greater trade involvement than men. There is some education/skill heterogeneity: workers with a medium level of education and medium skills are most affected. Our results show different patterns for concentrated and competitive industries: a greater female wage penalty due to GVC intensification is observed in less competitive sectors. Finally, using the RIF decomposition we differentiate GWG into explained and unexplained part with GVC being responsible for the latter.
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1. Introduction

International production fragmentation processes shape the current landscape of labour market outcomes. The changing nature of global production and distribution processes has been widely studied through the lens of global value chains (GVCs). The bulk of research is devoted to the impact of global production links on demand for skills, labour force structure and polarisation of the labour market. Against this background, social issues related to GVCs have begun to come to the fore in GVC analyses in recent years. Apart from the economic upgrading related to strengthening the positions of firms, sectors and countries in global chains, social upgrading, defined as "the process of improvements in the rights and entitlements of workers as social actors, which enhances the quality of their employment" (Barrientos, Gereffi & Rossi, 2011, p. 324) is also gaining increasing importance (Taglioni & Winkler, 2016). Regarding gender issues, GVC participation is claimed to be a positive driver of women's empowerment in developing countries (Said-Allsopp & Tallontire, 2015). However, if we take into account gender inequalities like gender segregation in types of occupation and activity, gender gaps in terms of wages and working conditions and gender-specific constraints in access to productive resources, infrastructure and services, a positive impact of global trade intensification no longer remains obvious (Bamber & Staritz, 2016). Indeed, recent studies show that access to the benefits of integration in GVCs may be limited due to gender issues. In other words, the opportunities related to GVCs differ for men and women as a result of gender-based segregation (Bamber & Staritz, 2016). The growing interest in gender issues within the GVC framework is reflected in numerous studies on women's participation in GVCs, women's working conditions and finally the gender wage gap (GWG) (among others, see (Barrientos, 2014; Barrientos, Bianchi, & Berman, 2019; Ben Yahmed, 2012; Juhn, Ujhelyi, & Villegas-Sanchez, 2014; McCarthy, Soundararajan, & Taylor, 2021). However, most of the studies available are country-specific and there have been few investigations at the international level.

As the empirical evidence on the GWG and trade liberalisation nexus is somewhat inconclusive, in this paper we aim to go deeper into the gender dimension of GVC participation. In particular, we examine the extent to which men and women may gain from upgrading or lose out in global production processes. Our main research question is therefore as follows. To what extent may differences in wages between men and women be influenced by the level of sectoral trade intensification? The main contribution of our research is that it provides international evidence of the extent to which involvement in global production links may explain the gender wage gap.

We use a dataset combining the employee-employer Structure of Earnings Survey (SES) and international trade data from the World Input-Output Database (WIOD). Our final sample consists of over 6 million observations in 18 European countries for the years 2002, 2006, 2010 and 2014. To explain wage inequalities, we employ the standard Mincerian wage equation augmented with information on involvement in GVCs at the sectoral level[1]. Our results show female wage penalty among European employees regardless of the model specification. The impact[2] of foreign added value embodied in exports (FVA/Exp) as a proxy measure of GVC intensification on wages is negative and statistically significant. Moreover, the influence of GVCs on wages differs according to gender. Women are more affected by the negative impact of greater trade involvement than men. Workers with a medium education level and medium skills are predominantly affected. Finally, we find different patterns for concentrated and competitive

[1] SES data allow us to explore firm heterogeneity to a certain extent. Specifically, in our analysis we include some company characteristics such as size, type of financial control – public versus private – and collective pay agreement level, but we should acknowledge the limitations considering the fact that firms operating in the same industry (and therefore affected by the same level of GVC integration) can adopt different wage policies. An growing literature has highlighted the role of firm heterogeneity in both economic performance and wages and as such a significant part of overall wage inequality seems to be explained by between-firm heterogeneity (for a review, see Zwysen, 2022) . We thank a referee for pointing this out.

[2] Please note that we use the term "impact" in the sense of "association", as conclusion about causality should be make carefully. The data has strong constraints which make the causality a problematic issue. Specifically: a) individuals and firms are not followed over time and therefore estimates are affected by unobserved heterogeneities; (b) the main variable of the analysis - GVC - is firm invariant, therefore individuals working in the same sectors are correlated to the same level of GVC intensity. We thank an anonymous referee for pointing this out.

industries. Greater female wage disparity is observed for originally concentrated trade-affected sectors.

2. Wages, the gender wage gap and international trade: literature review

In general, the mechanisms which are observed in wage determination in relation to international trade involvement are complex and additionally differ between developed and developing countries. Given the scope of our paper, we leave aside empirical studies on the GVC-wage nexus in developing countries. For developed countries, in short, the consequences of trade involvement may be diversified for heterogeneous groups of workers. Existing studies show that the association between GVCs and wages may differ according to workers' skills (among others, see Baumgarten et al., 2013; Geishecker & Görg, 2013; Hummels et al., 2014) or task composition and occupation (Baumgarten et al., 2013; Geishecker & Görg, 2013). A review by Hummels et al. (2018) indicates that the relationship between different measures of offshoring and wages is not straightforward. Importantly, a recent meta-analysis by Cardoso et al. (2021) shows that the wage impact of offshoring is "not significantly different from zero in either the origin or the destination countries" (Cardoso et al., 2021, p. 149). Moreover, the association between offshoring and wages is dependent on, among other things, the methodology's offshoring measure, the nature of goods and services, and the skill level of workers (Cardoso et al., 2021).

Going further, the way in which wages are affected by involvement in international production fragmentation processes may be dependent on the type of GVC involvement. As Amiti & Davis (2011) argue, linkages between trade and wages may be diversified: a wage loss may be observed for import-competing firms while wage gains may materialise for exporting ones. Initial works using traditional measures of offshoring show a negative impact on wages from offshoring to low-wage countries (see among others (Egger, Kreickemeier, & Wrona, 2015;

Wolszczak-Derlacz & Parteka, 2018) and especially for medium- and low-skilled workers (Geishecker & Görg, 2013). A study by Geishecker et al. (2010) in turn reveals that the effect of offshoring may be negative and small for some countries (Germany) or positive (UK) or non-significant for others (Denmark). If all stages of production of the final goods are captured, Parteka & Wolszczak-Derlacz (2020) find the impact of GVC on wages is negative but small in economic terms.

Moving to gender issues, one may start by recalling the goal set in the United Nations 2030 Agenda for Sustainable Development (United Nations, 2015). In particular, the fifth goal, "achieve gender equality and empower all women and girls," assumes among other things that policies need to be adopted and strengthened by enforceable legislation to promote equal chances for women and to ensure women's effective participation in economic life. Several theoretical approaches try to explain whether the impact of globalisation narrows or widens the gender wage gap. According to neoclassical theory, the pressure of international competition arising with trade liberalisation should lead to a reduction in wage discrimination and make it more costly. It is postulated that market structure plays an important role in the impact of trade on the GWG: in initially more concentrated sectors increased competition coming from involvement in international trade should create greater pressure to reduce gender wage differences than in less concentrated sectors which have already experienced competition (Becker, 1957). Indeed, it is expected that firms which are more exposed to international competition through greater involvement in global production-sharing processes are less prone to gender wage discrimination (Meng, 2004). Moreover, as Black & Brainerd (2004) assert, discriminators are forced by market pressure to minimise or stop their practices since they have fewer chances to compete with discriminating employers.

Another possible scenario assumes that more profitable companies, such as exporting ones, are more willing to use costly discrimination to achieve wage gains (Melitz, 2003).

Moreover, trade liberalisation creates different employment opportunities for women and men. Export-oriented companies aiming to cut labour costs are more willing to employ women in labour-intensive sectors (Coniglio & Hoxhaj, 2018). Moreover, it has been postulated that the extension of export opportunities enables women's empowerment through entry in the formal labour market providing an independent income (among others, see Bamber & Staritz, 2016; Shepherd, 2018; Tallontire, Dolan, Smith & Barrientos, 2005). Considering that the share of women employees is greater in companies involved in trade and the growth of GVCs is mainly related to increases in trade in services, where the share of women employed is greater than in manufacturing (Shepherd & Stone, 2017), a possible upgrading of opportunities for women may result.[3] On the other hand, globalisation may negatively impact female workers' bargaining power (Coniglio & Hoxhaj, 2018) as women dominate in labour-intensive sectors. Moreover, the global intensification of trade may also result in lower wages, as women are perceived to be less committed due to household responsibilities (Bøler, Javorcik & Ulltveit-Moe, 2015). A theoretical setting created by Ben Yahmed (2012) indicates that trade openness reduces the GWG in the lower part of the skill distribution but increases it among highly skilled workers.

Empirical evidence from developed countries shows that the impact of international trade on the gender wage gap differs according to the skill distribution. It is postulated that the impact of trade openness and involvement in GVCs on gender wage inequalities may be attributed to differences in worker characteristics such as skill level, task composition and occupation type (Ben Yahmed, 2012; Juhn et al., 2014), and also to the industry position in a GVC (Chen, 2017) and the export structure (Busse & Spielmann, 2006). Using US data for the period 1976-1993,

[3] Note that the wage-gender nexus in developing countries results in ambiguity in women's well-being (Barrientos et al., 2011; Rossi, 2013). Since women are over-represented in labour-intensive value chains and are therefore located in lower value-added components of GVCs, their working conditions, including wages, may be worse than those for men (Seguino, 2005; World Trade Organization, 2019). Some studies find that international trade involvement increases the GWG (Berik et al., 2004; Menon & Van der Meulen Rodgers, 2009), while another strand of research indicates a narrowing of the GWG (Coniglio & Hoxhaj, 2018; Hazarika & Otero, 2004; Robertson, Lopez-Acevedo & Savchenko, 2019).

Black & Brainerd (2004) find that the increasing competition resulting from international trade may reduce the GWG.

To the best of our knowledge, there is little evidence on European workers. Using Norwegian manufacturing employer-employee data, Bøler, Javorcik & Ulltveit-Moe (2018) find that a firm's involvement in export activities increases the GWG by 3 percentage points for college-educated workers, which confirms their preliminary assumption. Another study on the Norwegian manufacturing sector conducted by Bøler et al. (2015) reveals that women are perceived to be less committed workers than men and they may be more wage-discriminated against in export-connected companies than in non-exporters. However, changes in institutional settings (like extension of parental leave only for fathers) narrow the difference between the GWGs in exporting and non-exporting firms. Gagliardi, Mahy & Rycx (2021), in turn, using Belgian manufacturing firm-level data combined with a measure of firms' positions in GVCs, report inequalities in the social upgrading of workers resulting in unfair remuneration of women in comparison to men at any level of earnings. Heinze & Wolf (2010) use linked employer-employee data from Germany and find that increased trade involvement which boosts competition in the labour market reduces the wages of less-skilled workers, who are mainly women, and therefore it does not reduce the GWG.

Another strand of literature examines linkages between sector concentration and the GWG. Empirical evidence of the impact of market competition and pressure reducing differences in pay between men and women remains inconclusive. Some studies confirm Becker's (1957) assumption of a positive impact of increased market competition narrowing the GWG (see Black & Strahan (2001) for evidence from the US; Meng (2004) for Australia), while in other studies the effect is opposite (see Heyman, Svaleryd & Vlachos (2013) for evidence from Sweden and Li & Dong (2011) for China).

Even fewer studies examine the impact of involvement in GVCs on the GWG in an international setting. Cross-country empirical evidence gives mixed results. A study by Oostendorp (2009) using ILO data for the period 1983-99 covering 80 countries around the world finds a heterogeneous impact of international trade on the GWG depending on the skill level. In particular, the GWG in low-skill occupations may be narrowed thanks to trade intensification, but in the case of high-skill occupations this effect is only maintained in richer countries. An opposite impact is witnessed in the case of highly skilled workers in poor countries. Furthermore, Wolszczak-Derlacz (2013), performing an analysis at the sector level of 18 countries, finds different effects for concentrated and non-concentrated industries. Specifically, she finds lower (higher) growth in the high-skilled (medium- and low-skilled) gender wage gap in concentrated trade-affected industries while the opposite is true for competitive industries.

3. Data and methodology

This study relies on a combination of two large data sets. The first of these is the Structure of Earnings Survey (SES), containing individual employee-employer data from European countries. SES is a large-enterprise survey containing detailed information on wages, the individual characteristics of workers (sex, age, occupation, tenure, education level) and those of enterprises (size, economic sector). The survey covers enterprises with at least 10 employees in economic sectors B to S (excluding O) according to NACE Rev. 1.1 (2002 and 2006 waves) and NACE Rev.2 (2010 and 2014 waves).[4] Given the availability of the data, our final dataset contains detailed information on firm and worker characteristics from 18 European countries embedded

[4] Information on public administration (NACE Rev. 1.1 Section L until 2006 and NACE Rev. 2 Section O from 2010) and on enterprises with fewer than 10 employees is also available from some countries on a voluntary basis (https://ec.europa.eu/eurostat/web/microdata/structure-of-earnings-survey accessed on 29 December 2020).

in the years 2002, 2006, 2010 and 2014.[5] In order to examine the impact of GVC involvement on the GWG, we merge the SES data with industry-level statistics on GVCs from the World Input-Output Database (WIOD) released in November 2016 (Timmer, Dietzenbacher, Los, Stehrer & De Vries, 2015). The WIOD contains input-output data for 43 countries and 56 sectors according to the ISIC Rev. 4 classification. We therefore match the SES data with data from the WIOD according to the statistical classification of firms' economic activities. Moreover, we add country-level data including coordination of wage setting[6] derived from the ICTWSS database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (Visser, 2016) in order to check whether national labour market arrangements influence the relationship between GVC measures and gender wage inequalities. Additionally, to control for the influence of country openness on the interaction between global trade involvement and the GWG we add country-level data from the Penn World Table version 9.0 (Feenstra, Inklaar & Timmer, 2015). In particular, we include the share of merchandise exports in real GDP at current PPP (and alternatively the share of merchandise imports in real GDP at current PPP) as measures of country openness. In this way, we obtain a valuable dataset enabling us to assess the impact of involvement in global production links on gender wage inequalities. After harmonising and cleaning the data,[7] the final dataset results in 6,431,017 observations (64 percent male and 36 percent female) in manufacturing sectors[8] containing on the one hand a wealth of

[5] SES is a large four-yearly cross-country cyclical enterprise survey. The data we use are from waves: 2002, 2006, 2010 and 2014. The micro-level SES data was obtained from Eurostat on an individual request (research proposal 225/2016-EU-SILC-SES). Methodological aspects of SES and the microdata access procedures are available at https://ec.europa.eu/eurostat/web/microdata/structure-of-earnings-survey.

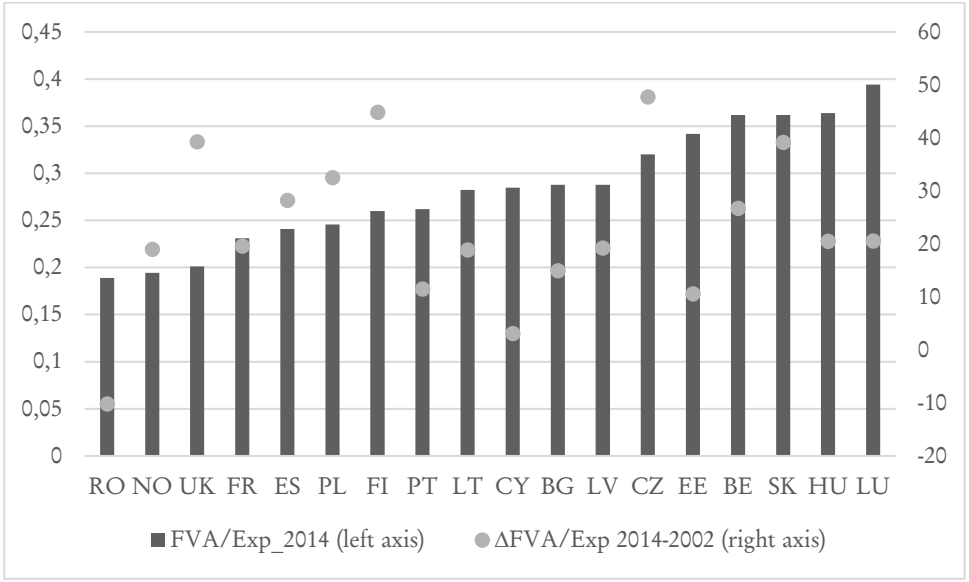
[6] We use the Coord variable (coordination of wage-setting) in Visser (2016) and recode it into a 0-1 variable. 0 is for countries with mixed industry and firm-level bargaining, little or no pattern bargaining and relatively weak government coordination through a minimum wage or indexation and for fragmented wage bargaining confined largely to individual firms or plants. Value 1 stands for centralised or industry-level bargaining.

[7] In particular, we focus on eliminating from the dataset extreme observations and outliers which may distort our results. For the wage variable and the GVC-related variables we perform a correction at the top and bottom of the distribution using the winsor2 package for Stata (Yu-jun, 2014). In this way we cut the observations below the 1st and above 99th percentile and replace them with the values for the 1st and 99th percentiles.

[8] After combining the SES with the WIOD file we obtained 22 manufacturing sectors, among which some are more highly aggregated. A detailed description of the aggregation procedure is available on request.

information on employees' personal characteristics (sex, age, education level, tenure, type of employment contract and occupation) and company characteristics (size, form of economic and financial control and bargaining scheme coverage) and on the other hand information on industries' position and involvement in GVCs. The latter is simplified by using the measure of foreign added value embodied in exports (FVA/Exp[9]) of given industries proposed by Feenstra (2017). Higher FVA/Exp means that the exports of the given country are more dependent on inputs that were previously imported. The ratio of foreign added value to total exports is commonly used as a measure of production fragmentation and is obtained by decomposing exports into domestic and foreign components (see among others Johnson & Noguera, 2017; Koopman et al., 2014). Figure 1 presents noticeable cross-country variability in FVA embodied in exports in the year 2014.

Fig. 1. Foreign value added embodied in exports (FVA/Exp) in 2014 and the relative change between the years 2002 and 2014 (in percentages) by countries.



Notes: mean values weighted by sectors' value added

Source: own elaboration based on WIOD.

[9] Export decomposition is done with the usage of package decompr from Quast and Kummritz (2015). See also: Szymczak et al. (2022).

As Figure 1 shows, international trade involvement assessed using the share of foreign added value in exports varies among countries. The highest values for FVA/Exp are reported for Luxembourg, Hungary and the Slovak Republic and the lowest for Romania and Norway (for the year 2014). The greatest increases in FVA/Exp over the period 2002-2014 are recorded for the Czech Republic (47.7 percent) and Finland (44.8 percent), while Romania is the only country with a decrease in FVA/Exp.

As the dependent variable in our wage regressions, we use the average gross hourly wage in the reference month. Nominal wages in the national currency are converted to USD using exchange rates from the OECD[10] expressed in real terms and inflation rates from Eurostat.[11] Table A1 in the Appendix presents the ratios of mean male and female wages. The mean gender wage differences represent raw gender wage gaps as here neither individual nor job/company characteristics are taken into account. Differences between men's and women's wage levels are present in all the countries in the analysis. Importantly, men's wages are higher than women's, which motivates further investigation of this problem. The highest disparities are in the Slovak Republic, Portugal and Cyprus and the lowest in Belgium and Norway. Furthermore, to find determinants which may explain the differences in wages between women and men we employ a set of individual-, company- and country-level characteristics. Table A2 in the Appendix shows detailed descriptive statistics of the variables used in the estimation process. As Table A2 shows, we consider a wide range of individual-, company- and country-level characteristics to explain the differences in wages between men and women. To do this we use a traditional Mincer-type wage

[10] We accessed the data from the OECD web site doi: 10.1787/037ed317-en on 29 December 2020.

[11] In particular, we use the HICP for 2010 (https://ec.europa.eu/eurostat/web/hicp/data/database accessed on 29 December 2020). We first deflate the wages into 2010 real terms and then convert into USD using the 2010 exchange rate.

equation employing OLS-weighted[12] estimation methods with robust standard errors clustered by industry. In this way, we examine how the involvement of national industries in global production may affect gender wage disparities.

4. Empirical analysis

4.1 Model specification

In our analysis we want to check the association between involvement in GVCs and the wages of individual workers. Specifically, our main aim is to investigate potential differences between female and male wages. In order to check whether women and men are equally impacted (gain or lose equally) by involvement in GVCs we estimate the following regression:

$$lnw_{ijc,t} = \alpha + \beta_1 Sex_i + \beta_2 GVC_{jct-1} + \beta_3 Sex_i \times GVC_{jct-1} + \beta_4 Ind_{it} + \beta_5 Firm_{it} + \beta_6 Sector_{jct} + \beta_7 Country_{ct} + D_t + D_j + D_c + \varepsilon_{ijct}, \quad (1)$$

where i denotes workers, j the employment sector, c the country and t time. The dependent variable $w_{ijc,t}$ is the wage of individual workers. *Ind* is the set of individual and job characteristics (with three dummies for age, three dummies for low, medium and high education level, four dummies for skill level classified according to the occupation and a dummy for full-time employment). *Firm* refers to firm characteristics (company size, form of economic and financial control, type of collective pay agreement) and *Sector* to the size of the sector measured using the number of employees and the sector concentration referring to the price-cost margin (PCM). Following Aghion, Braun & Fedderke (2008), we measure PCM at the sector level as the proportion of the difference between gross output (GO) and labour (LAB) and capital (CAP)

[12]Specifically, we recalculate the grossing-up factor for employees (from SES) in such a way that the observations from each country in the pooled sample of 18 countries sum to 10,000 in order to give each country equal weight in the model. We thank Piotr Paradowski for the Stata codes. For more, see LIS Self Teaching Package 2018, Stata version: http://www.lisdatacenter.org/wp-content/uploads/files/resources-stata-Part-II.pdf

costs in the gross output of the given sector (PCM=(GO-(LAB+CAP))/GO).[13] The values of PCM range from zero to one, where the higher the score is the greater the concentration of the sector. *Country* contains a dummy for the level of collective wage bargaining and measures of country openness (the ratio of exports and imports to GDP) and country development (GDP per capita). Additionally, we control for time effects, D_t (pooling the samples from 2002, 2006, 2010 and 2014), industry effects, D_j (considering all the remaining industry-specific characteristics) and country effects, D_c (picking up all the other country-specific labour-market variables that can have effects on wages). Our main variable of interest, *GVC,* is the sector's involvement in global value chains measured as the ratio of foreign added value embodied in exports (FVA/Exp). This is included in the regression as a lagged variable in order to allow the effect to materialise.[14] We assume that the effect of GVCs on individual wages can be different for female and male workers. Therefore, in addition to the plain measures of sex and GVCs we incorporate the interaction $Sex \times GVC$, where the variable *Sex* is a dummy equalling 0 for females and 1 for males. The marginal effect of *GVC* on female workers is $\frac{\delta lnwage}{\delta GVC} = \beta_2$ and on males is $\frac{\delta lnwage}{\delta GVC} = \beta_2 + \beta_3$.

4.2 Results

Table 1 present our baseline estimations. It can be seen that all the individual worker coefficients are of the expected sign and are statistically significant. In particular, younger people, those with low and medium levels of education, those in temporary employment, those with a shorter tenure in their jobs and those in less skilled occupations predominantly earn less.

[13] Our intention is to measure sector concentration and since we do not possess data on the sales of individual firms we cannot calculate e.g. the Herfindahl index on sales so it is proxied by the price cost margin (PCM). The PCM shows the Lerner index of pricing power. The index is in the range (0,1), The higher the index, the higher the pricing power and the lower the competition pressure (higher concentration). A similar approach is employed in Wolszczak-Derlacz (2013) among others.

[14] The inclusion of a lagged GVC variable can also solve potential endogeneity problems.

Table 1. Estimation results – wage regression, including the interaction between *Sex* and *FVA/EXP* (eq.1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sex_i	0.136***	0.160***	0.144***	0.148***	0.148***	0.155***	0.139***	0.139***
	[0.027]	[0.019]	[0.017]	[0.016]	[0.013]	[0.014]	[0.011]	[0.011]
FVA/Exp_{jt-1}	-0.430*	-0.376*	-0.365*	-0.346*	-0.501***	-0.489***	-0.346**	-0.359**
	[0.222]	[0.193]	[0.177]	[0.174]	[0.141]	[0.143]	[0.154]	[0.154]
$Sex_i \times FVA/Exp_{jt-1}$	0.216**	0.143**	0.176***	0.105*	0.101*	0.075	0.143***	0.142***
	[0.086]	[0.060]	[0.053]	[0.051]	[0.055]	[0.057]	[0.047]	[0.047]
$ageyoung_{it}$		-0.220***	-0.090***	-0.069***	-0.069***	-0.068***	-0.064***	-0.064***
		[0.014]	[0.008]	[0.008]	[0.009]	[0.010]	[0.009]	[0.009]
$ageaverage_{it}$		-0.044***	0.000	0.004	0.004	0.005	0.009**	0.010**
		[0.006]	[0.004]	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]
$loweduc_{it}$		-0.537***	-0.533***	-0.226***	-0.210***	-0.208***	-0.209***	-0.209***
		[0.018]	[0.017]	[0.011]	[0.008]	[0.008]	[0.009]	[0.009]
$mededuc_{it}$		-0.403***	-0.406***	-0.151***	-0.138***	-0.137***	-0.139***	-0.139***
		[0.015]	[0.015]	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]
$indefinite_{it}$			0.078***	0.060***	0.078***	0.076***	0.072***	0.072***
			[0.012]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]
$shortdur_{it}$			-0.300***	-0.264***	-0.192***	-0.196***	-0.204***	-0.204***
			[0.021]	[0.019]	[0.013]	[0.013]	[0.013]	[0.013]
$meddur_{it}$			-0.215***	-0.189***	-0.126***	-0.127***	-0.133***	-0.133***

			[0.021]	[0.020]	[0.014]	[0.014]	[0.014]	[0.014]
longdur$_{it}$			-0.112***	-0.096***	-0.054***	-0.055***	-0.061***	-0.062***
			[0.013]	[0.013]	[0.010]	[0.010]	[0.009]	[0.009]
full time$_{it}$			0.063***	0.051***	0.012	0.014*	0.015*	0.014*
			[0.009]	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]
skill_1$_{it}$				-0.582***	-0.586***	-0.589***	-0.595***	-0.595***
				[0.010]	[0.010]	[0.010]	[0.008]	[0.008]
skill_2$_{it}$				-0.453***	-0.450***	-0.452***	-0.454***	-0.454***
				[0.012]	[0.012]	[0.012]	[0.012]	[0.012]
skill_3$_{it}$				-0.242***	-0.248***	-0.248***	-0.248***	-0.248***
				[0.006]	[0.005]	[0.005]	[0.006]	[0.006]
size_small$_{it}$					-0.298***	-0.301***	-0.308***	-0.308***
					[0.023]	[0.023]	[0.021]	[0.021]
size_medium$_{it}$					-0.123***	-0.125***	-0.128***	-0.128***
					[0.013]	[0.013]	[0.012]	[0.012]
public$_{it}$					0.009	0.013	0.03	0.03
					[0.023]	[0.023]	[0.022]	[0.022]
nationagr$_{it}$						0.048**	0.005	0.003
						[0.021]	[0.018]	[0.018]
industagr$_{it}$						-0.031***	-0.030***	-0.031***
						[0.009]	[0.008]	[0.008]
ln_H_EMPE$_{jt}$							-0.026*	-0.026**

							[0.012]	[0.012]
PCM_{jt}							0.099	0.101
							[0.115]	[0.112]
Coordination of wage-setting$_{ct}$							-0.059***	-0.064***
							[0.009]	[0.011]
ln_GDPpc$_{ct}$							0.790***	0.785***
							[0.029]	[0.032]
Exp/GDP$_{ct}$							0.118***	
							[0.040]	
Imp/GDP$_{ct}$								0.190***
								[0.049]
R^2	0.808	0.839	0.848	0.865	0.871	0.868	0.874	0.874
N	6431017	6430840	6256011	6220408	6146698	6005878	6005878	6005878

Notes: Country, industry and time dummies included. Normalised weighted regression with robust standard errors clustered at industry level. The weights are based on the grossing-up factor for employees (from SES) normalised by the number of observations per country (see the main text for details); Default categories: ageold, higheduc, temporary, vlongdur; skill_4, large, enterprise agreement, *p ≤ .10, **p≤ .05, ***p ≤.01.

Source: own elaboration based on data from SES and WIOD

Turning to company-level variables, those employed in small and medium-sized enterprises and those involved in an industry-level collective pay agreement scheme are also subject to lower wages than those with an enterprise agreement. Moreover, in countries with centralised wage coordination and greater openness wages turn out to be higher.

In controlling for the above-mentioned factors, our main aim is to investigate gender wage differences[15]. First, we discover that average hourly wages are lower for women than for

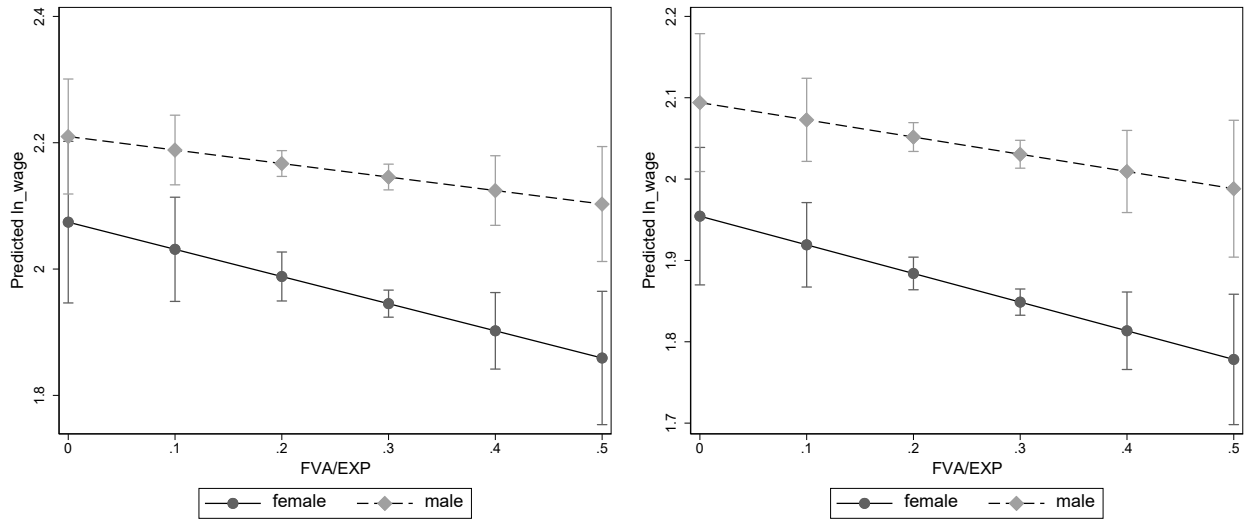
[15] We write rather about wage differences than about discrimination as discrimination cannot be shown with this type of data as there is no information on unobservables. Some of the difference is likely discrimination, but equally likely is unobserved differences and distribution over firms or micro-sectors within sectors. On the other hand

men for all the model specifications with different control variables (models 1-8 in Table 1). We can assume that part of the difference is likely due the discrimination. However equally likely due to unobserved differences and distribution over firms or micro-sectors within sectors.[16] Turning to the core of our analysis focusing on the impact of sectoral involvement in GVCs on gender wage inequalities, two main patterns are revealed. First, the impact of FVA/Exp on wages is negative and statistically significant regardless of the model specification. This means that the higher the share of imported goods and services in the value of a sector's exports, the lower the wages of the employees in the sector are. Moreover, looking at gender through a GVC lens, we observe that women and men are affected in different ways. In particular, the coefficient for the interaction between sex and GVCs suggests that the negative effect of GVCs on wages is lower for men than for women. Figure 2 shows predicted wages for changes in FVA/EXP for females and males (illustrating the results in columns 1 and 7 in Table 1). Indeed, the wage disparity for females is greater, resulting in a larger GWG at the higher levels of FVA/EXP. In other words, women are in general more negatively affected by international production fragmentation than men. Our findings are in line with previous evidence of a positive relation between global trade involvement and the gender wage gap documented in Berik et al. (2004), Domínguez-Villalobos & Brown-Grossman (2010) and Menon & Van der Meulen Rodgers (2009).

Fig. 2 Predicted wages due to changes in FVA/EXP for females and males (illustrating the results in Table 1, Column 1 (left panel) and Column 7 (right panel))

please see the decomposition into explained and unexplained effects presented in part Extensions and sensitivity analysis. Indeed GVC should be considered as an unexplained part of gender wage differences.

[16] We thank referee for pointing this out.



Source: own elaboration based on data from SES and WIOD

To conduct a deeper analysis of the nexus between GVCs and female/male wages, we run additional estimations for distinct group of workers. Tables 2 shows the results, with the same predictors – the same individual, job, firm, sector and country controls – as in the model in Table 1[17] but performed for work at different education levels. Analogous Table A3 in the Appendix presents the results for different skill categories.

Table 2. Estimation results– wage regression, workers with different education levels

	Low education		Medium education		High education	
	(1)	(2)	(3)	(4)	(5)	(6)
Sex_i	0.145***	0.180***	0.138***	0.129***	0.147***	0.142***
	[0.020]	[0.016]	[0.014]	[0.011]	[0.022]	[0.020]
FVA/Exp_{jt-1}	-0.089	-0.047	-0.431**	-0.483***	-0.113	-0.048
	[0.199]	[0.197]	[0.182]	[0.160]	[0.147]	[0.125]
$Sex_i \times FVA/Exp_{jt-1}$	0.154**	-0.026	0.156***	0.188***	0.006	0.018
	[0.071]	[0.064]	[0.047]	[0.048]	[0.077]	[0.070]

[17] Individual, job, firm, sector and country controls are included in all the specifications but are not reported. The detailed results are available from the authors on request.

Personal and job controls	yes	yes	yes	yes	yes	yes
Firm controls	no	yes	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes	yes	yes
R^2	0.879	0.885	0.878	0.879	0.802	0.811
N	1074434	1024347	4313027	4184004	832947	797527

Notes: Country, industry and time dummies included. Normalised weighted regression with robust standard errors clustered at the industry level. The weights are based on the grossing-up factor for employees (from SES) normalised by the number of observations per country (see the main text for details). Personal controls: ageyoung, ageaverage, indefinite, shortdur, meddur, full time, skill_1, skill_2, skill_3. Firm controls: size_small, size_medium, public, nationagr, industagr. Sector controls: ln_H_EMPE, PCM. Country controls: coordination of wage-setting, ln_GDPpc, Exp/GDP. Default categories as in Table 1. *p ≤ .10, **p≤ .05, ***p ≤.01.

Source: own elaboration based on data from SES and WIOD

The male premium exists for workers at all education and skill levels. The results indicate that the negative association between GVCs and wages is stronger for workers with medium-level education, with women being hit more. Similarly, the same pattern is most evident for workers with a medium skill level (skill level 2). Additionally, the wages of highly educated men are positively correlated with sectoral involvement in international production sharing and the same applies to more skilled males (skill level 3). In this way, our analysis confirms the preliminary assumption found in the literature (Ben Yahmed, 2012) of a differentiated impact of involvement in international trade on the GWG according to skill and education levels.

Finally, we re-run the estimations separately for specific occupations, specifically for the nine different categories in the ISCO-08 1-digit classification. This should not only help to identify the different effects of GVCs on specific groups of workers but should also address the different distributions of female and male workers in different occupations (e.g. more female jobs) and hence possible heterogeneous remuneration due to the type of jobs they perform. The results are presented in Table A4 in the Appendix. When we compare the effects of GVCs on

female and male wages in the same occupation we obtain some interesting results. First of all, the average hourly wages are higher for men in all the different occupations but the male premium is different across occupations, i.e. it is lowest for managers but also relatively low for elementary occupations, which is a sign of a bimodal GWG. GVCs are associated with lower wages for craft and related trade workers (occupation 7) and for plant and machine operators and assemblers (occupation 8).[18] Additionally, for technicians and associated professionals (occupation 3) the production fragmentation measured using FVA embodied in exports is associated with higher wages for male workers. In contrast, for clerical support workers (occupation 4) and for service and sales workers (occupation 5) FVA in export impacts is somewhat negatively correlated with male wages, which can be due to the fact that these are rather feminised occupations. This is partially in line with previous evidence in Ben Yahmed (2012) suggesting that trade intensification increases the GWG most among high-skill workers.

4.3. Extensions and sensitivity analysis

According to both theory and earlier empirical studies, the impact of trade on the GWG can depend on the original concentration of the sector in which workers are employed (Berik et al., 2004; Menon & Van der Meulen Rodgers, 2009; Wolszczak-Derlacz, 2013). In the previous sub-section we included the measure of sector concentration (PCM) as one of the independent variables. In most of the specifications (see, e.g., columns 7 and 8 in Table 1) the coefficient for PCM was not statistically significant. However, in order to check the above proposition more thoroughly we estimate equation (1) augmented with a three-way-interaction between Sex, GVC and sector concentration using the following regression:

[18] The coefficient of FVA/Exp is also negative and statistically significant for skilled agricultural, forestry and fishery workers (occupation 6) but since we limit our analysis to manufacturing sectors the number of workers reporting this type of job is negligible (0.08 percent of all observations).

$$lnw_{ijc,t} = \alpha + \beta_1 Sex_i + \beta_2 GVC_{jct-1} + \beta_3 PCM_{jct} + \beta_4 Sex_i \times GVC_{jct-1} + \beta_5 Sex_i \times PCM_{jct} + \beta_6 GVC_{jct-1} \times PCM_{jct} + \beta_7 Sex_i \times GVC_{jct-1} \times PCM_{jct} + \beta_8 Ind_{it} + \beta_9 Firm_{it} + \beta_{10} Sector_{jct} + \beta_{11} Country_{ct} + D_t + D_j + D_c + \varepsilon_{ijct} \quad (2)$$

Now the conditional marginal effect of GVC is $\frac{\delta lnwage}{\delta GVC} = \beta_2 + \beta_4 Sex + \beta_6 PCM + \beta_7 Sex \times PCM$ and it depends on both the PCM and the worker's sex.

The results for eq. 2 are presented in Table 3. In regression (2) we include all the possible interactions between Sex, GVC and PCM in order to quantify the effect of GVCs on wages in concentrated (versus competitive) sectors, potentially differing by the sex of the worker. Since the augmented model comprises different interaction terms, to assess the impact of GVCs on wages we must calculate the marginal conditional effects. For an easy interpretation of the results, we present plots of the wages predicted for female and male workers using model (2) for different levels of sector concentration in Figure 3. The upper panel shows the results in column 3 in Table 3. We see that female wages are lower if there is intensification of production fragmentation regardless of the level of sector concentration, while male wages decrease for originally concentrated (PCM=0.9) sectors and increase for less concentrated ones (PCM=0.16).[19] This is also illustrated by the contour plot in the upper panel of Figure 4. The highest male wages (darkest colour) are found in sectors with low concentration and relatively high FVA/EXP and/or in sectors with high concentration and a low level of international production fragmentation. When we add more control variables, the distinct effect for concentrated versus non-concentrated sectors is not only seen for men but also for women. The lower panels in Figures 3 and 4 present the results in column 7 in Table 3. These results indicate that in concentrated sectors involvement in global value chains is associated with lower female wages. This negative effect is not seen in competitive sectors. Our results are in line with

[19] For example manufacture of food products, beverages, tobacco products are relatively concentrated in Belgium while manufacture of textiles, wearing apparel, leather and related products are relatively less concentrated in Lithuania.

Becker's (1957) assumption of a positive impact of growing competition narrowing the GWG, as is documented by, amongst others, Black & Strahan (2001) and Meng (2004).

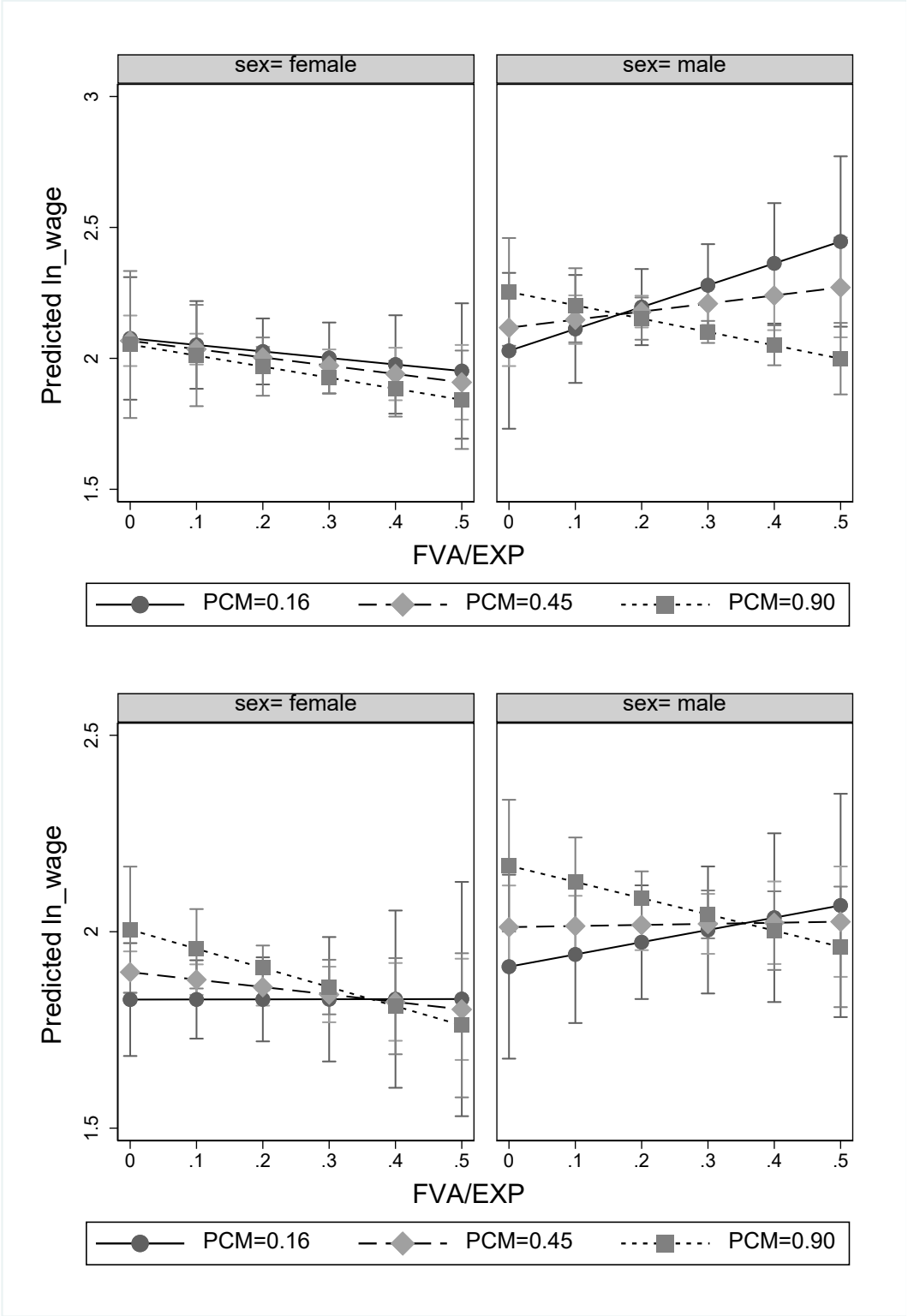
Table 3. Estimation results – wage regression with three-way interaction between Sex, PCM and FVA/EXP, eq. 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
sex	-0.101	-0.135	-0.153	-0.169	0.153	0.135	0.066	0.067
	[0.155]	[0.145]	[0.129]	[0.137]	[0.102]	[0.105]	[0.111]	[0.111]
FVA/Exp	-0.211	-0.34	-0.573	-0.562	-0.441	-0.376	0.108	0.103
	[0.554]	[0.548]	[0.564]	[0.630]	[0.643]	[0.638]	[0.506]	[0.502]
Sex × FVA/Exp	1.337**	1.242**	1.427***	1.337**	0.052	0.101	0.36	0.353
	[0.573]	[0.530]	[0.478]	[0.516]	[0.403]	[0.416]	[0.432]	[0.433]
PCM	-0.031	-0.068	-0.126	-0.192	0.006	0.021	0.24	0.245
	[0.312]	[0.265]	[0.265]	[0.291]	[0.263]	[0.268]	[0.186]	[0.185]
Sex × PCM	0.335	0.433*	0.435**	0.467**	-0.006	0.033	0.107	0.106
	[0.247]	[0.216]	[0.193]	[0.201]	[0.147]	[0.152]	[0.161]	[0.160]
FVA/Exp × PCM	-0.234	-0.003	0.346	0.393	-0.082	-0.157	-0.662	-0.673
	[0.998]	[0.871]	[0.878]	[0.974]	[1.024]	[1.030]	[0.871]	[0.866]
Sex × FVA/Exp × PCM	-1.583*	-1.597*	-1.810**	-1.798**	0.063	-0.048	-0.318	-0.311
	[0.886]	[0.782]	[0.709]	[0.759]	[0.580]	[0.603]	[0.622]	[0.623]
r2	0.808	0.839	0.847	0.864	0.871	0.868	0.873	0.873
N	6431017	6430840	6256011	6220408	6146698	6005878	6005878	6005878

Notes: Country, industry and time dummies included. Normalised weighted regression with robust standard errors clustered at the industry level. The weights are based on the grossing-up factor for employees (from SES) normalised by the number of observations per country (see the main text for details); Specifications (1)-(8) have different sets of control variables as in Table 1. *p ≤ .10, **p≤ .05, ***p ≤.01.

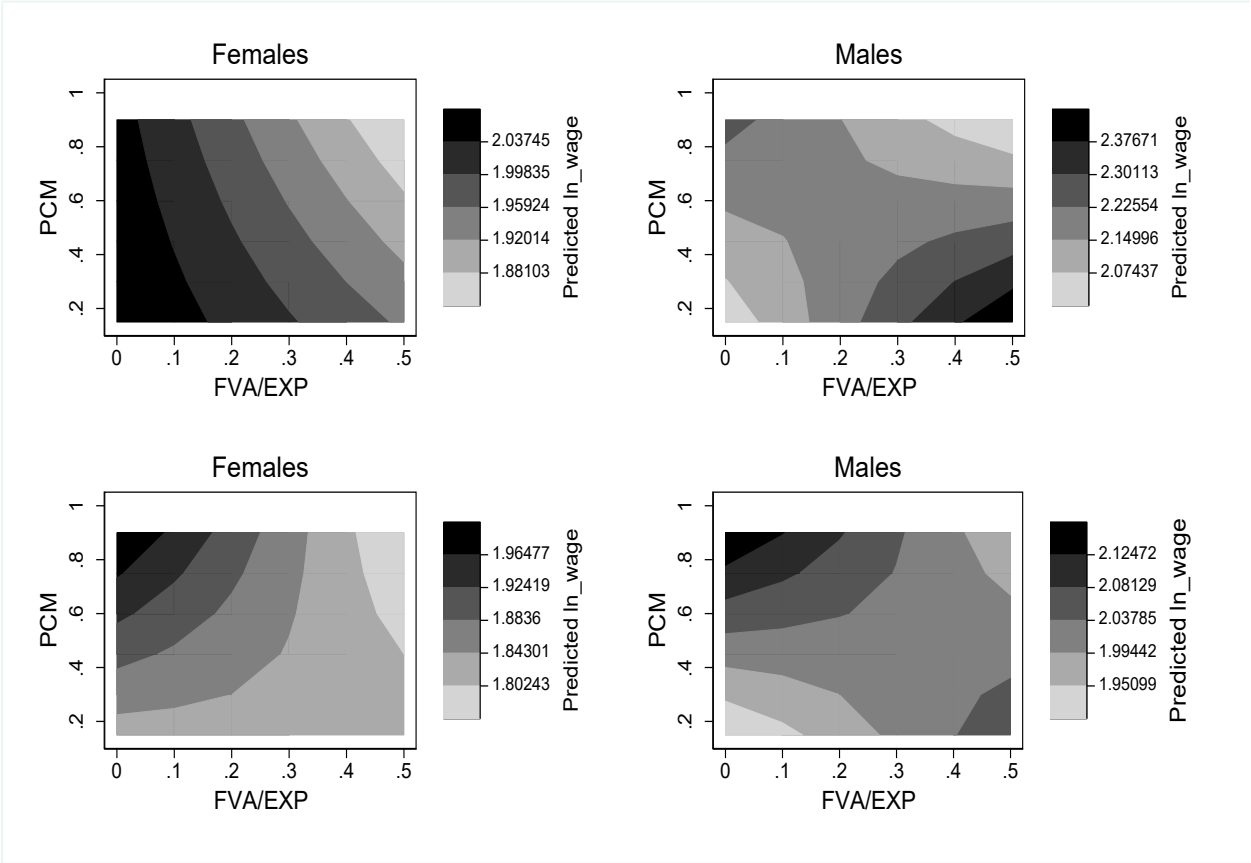
Source: own elaboration based on data from SES and WIOD

Fig. 3 Predicted wages due to changes in FVA/EXP at different values of sector concentration (PCM) for females (sex = 0) and males (sex = 1) (illustrating the results in Table 3, Column 1 (upper panel) and Column 7 (lower panel))



Source: own elaboration based on data from EU-SES and WIOD

Fig. 4 Contour plots with log hourly wage (illustrating the results in Table 3, Column 1 (upper panel) and Column 7 (lower panel))



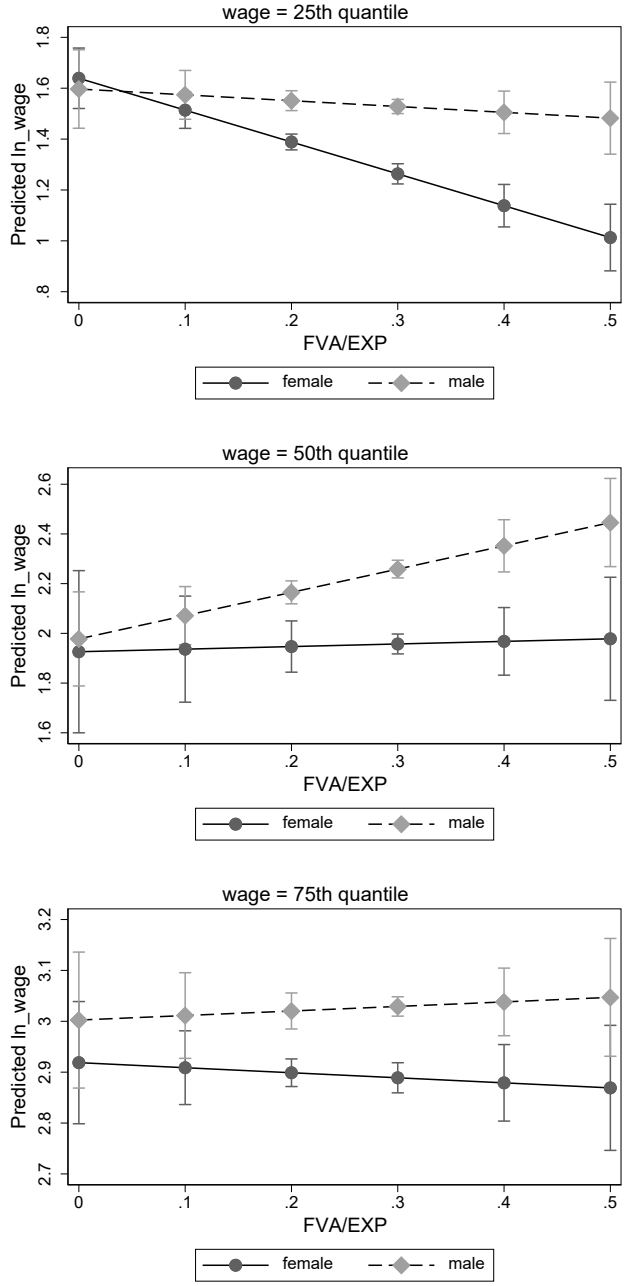
Source: own elaboration based on data from EU-SES and WIOD

Next, some limitations of the SES database should be acknowledged. Specifically, it does not allow the same individual or firm to be followed over time and therefore the analysis is based on a repeated cross-section, meaning that the estimates are affected by unobserved firm and individual heterogeneity. To overcome these limitations, we implement an alternative econometric strategy decomposing wage distributions using Recentred Influence Function Regressions (Firpo et al., 2009, 2018; Fortin et al. 2021).[20] Under the assumption that unobserved individual and firm heterogeneity do not change between two close time periods within each wage quantile, the parameters of interest (the gender dummy and the interaction term) allow correlations to be identified. We select two recent years in the SES survey (2010 and 2014) and

[20] We thank a referee for pointing this out and recommending that we use the RIF function. This function has been recently used by, among others, Bloise, Brunetti & Cirillo (2021) and Magda, Gromadzki & Moriconi (2020).

decompose wage changes along the wage distribution. The results are presented in Table S1 in the supplementary materials and are illustrated in Figure 5, where the predicted wages due to changes in GVCs for male and female workers are shown. There are some interesting differences along the wage distribution. Indeed, the negative effect of GVCs is strongest for the 25th wage quantile with a significant drop in the wages of female workers. For the higher wage levels, female workers are not significantly affected by FVA. In contrast GVCs seem to impact male workers positively – but the high confidence levels and non-significant coefficients should be noted. As a result male wages, e.g. for the 75th wage quantile, at low and at high GVC intensity are similar. These results are in line with the previous ones presenting the estimation for workers of different education (Table 2) and skill levels (Table A3). Obviously, workers with low and medium education levels (lower skill levels) are those who obtain relatively lower remuneration and are more hit by negative impact from GVC.

Fig. 5 Predicted wages due to changes in FVA/EXP in different wage quantiles



Source: own elaboration based on data from EU-SES and WIOD

Additionally, we perform the RIF decomposition of GWG into explained and unexplained part (results presented in Table 4). Within the unexplained part, GVC is positively correlated with GWG for 25th and 50th percentile of wage distribution.

Table 4. RIF decomposition of GWG into explained and unexplained part

	25th wage quantile	50 wage quantile	75the wage quantile

	(1)	(2)	(3)
Prediction log of male wage	1.667***	2.191***	3.673***
	[0.035]	[0.034]	[0.133]
Prediction log of female wage	1.217***	1.659***	2.338***
	[0.082]	[0.075]	[0.125]
Difference	0.450***	0.532***	1.335***
	[0.068]	[0.062]	[0.111]
Explained			
FVA/Exp$_{jt-1}$	0.002	0.00	-0.008
	[0.002]	[0.001]	[0.006]
Total	0.197***	0.205***	0.687***
	[0.069]	[0.061]	[0.123]
Unexplained			
FVA/Exp$_{jt-1}$	0.097*	0.112***	-0.081
	[0.050]	[0.037]	[0.156]
Total	0.253***	0.327***	0.647***
	[0.010]	[0.008]	[0.068]
N	3223813	3223813	3223813

Notes: Personal, job, sector and country controls included – not reported. Sample restricted to SES 2020 and 2014. Other notes as under Table 1.
Source: own elaboration based on data from SES and WIOD

Next, we divide country-sectors according to their GVC intensity (based on GVC quantiles) and as a further extension we conduct analyses for the country-sectors with relatively low GVC intensity (FVA/Exp lower than or equal to the median value) and higher GVC intensity (FVA/Exp higher than the median value). The results (in Table S2 in the supplementary materials) indicate that in a regression without firm controls for country-sectors with low GVC intensity the association with the gender gap seems to be more significant (GVCs being associated with male wage increases) than for high GVC intensive country-sectors. When the full set of controls is included, this differentiation is blurred.

Finally, we run regressions separately for low- and high-tech manufacturing industries[21] (Table S3). Bramucci et al. (2021) conduct a very interesting study considering the impact of offshoring on employment and find differences between high- and low-technology industries

[21] The classification of sectors into low- and high-tech follows the division made by Eurostat, available at https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf. Specifically, high-tech industries are: C19_C20_C21_C22, C21, C21_C26_C27_C33, C21_C29_C30, C26_C27_C33, C27, C28, C29_C30, C29_C30_C31_C32, C30 (according to NACE rev. 2, see https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF)

which are associated with the types of labour tasks that are offshored and the types of domestic jobs that are affected. Our results reveal that the wage gap is bigger for low-tech manufacturing, but the association between GVC intensity and the male premium acts mainly through high-tech industries.

In order to check the results, we perform a number of robustness checks.[22] First, we employ an alternative measure of GVC, this time using the traditional index of offshoring (OFF)[23] calculated as the ratio of the value of imports of intermediate inputs to the industry's added value (Feenstra & Hanson, 1999). The correlation between FVA/Exp and OFF is high and the main results from the regression analysis indicating a negative association between the intensity of offshoring and how much female wages are affected are maintained. The patterns in the background regressions are also confirmed for specific groups of workers classified on the basis of their education and skill levels and occupations.

Next, we use average gross hourly wages as the dependent variable, this time expressed in a common currency and using the PPP as the conversion rate. The change in the method of wage conversion does not change our main conclusions: the estimates are very similar to the benchmark ones.

Finally, we augment the specifications with additional measures of national labour market arrangements in order to control for their potential influence on the relationship between GVCs and wages. We take into account the level at which wage bargaining predominantly takes place (company level, industry-wide or centralised bargaining) by considering whether both collective agreement opening clauses and enterprise-level bargaining are present.[24] When these further

[22] Due to space constraints, the detailed results for this section are available in the supplementary materials. See Table S4-S12.

[23] Calculation of offshoring (tier 1) is based on Szymczak et al. (2022).

[24] These are derived from the ICTWSS database. Specifically, the variable *Clauses in collective agreement* distinguishes countries in which agreements contain no opening clauses (BG, CY, CZ, EE, HU, LT, LU, LV, PL RO, SK and UK for 2014, and additionally PT for 2010, FI and ES for 2006 and NO for 2002) and countries with agreements containing general opening clauses (BE, ES, FI, FR, NO and PT for 2014, BE, ES, FI, FR and NO for

measures of labour arrangements are added as independent variables, the results on the relationship between GVCs and wages remain stable with respect to the benchmark ones.

5. Conclusions

In this paper we have examined linkages between involvement in GVCs and gender wage inequalities. We have used a merged wide-ranging SES-WIOD dataset for the years 2002, 2006, 2010 and 2014 covering 18 European countries. We have employed a wealth of information on employees' personal characteristics (sex, age, education level, tenure, type of employment contract and occupation), company characteristics (size, form of economic and financial control and bargaining scheme coverage) derived from SES together with the sectoral variable reflecting the foreign added value embodied in exports (FVA/Exp) proposed by Feenstra (2017) based on WIOD (release 2016). Using OLS regressions with robust standard errors clustered at the industry level we have estimated the impact of individual-, company-, sector- and country-level determinants of the wage level. We have found female wage penalty among European employees regardless of the model specification. Additionally, we have found that lower wages are typical for younger people, those with low and medium levels of education, those in temporary employment, those with shorter tenure and those in lower skilled occupations. Moreover, employees in small and medium-sized enterprises and those with industry-level collective pay agreement schemes are also subject to lower wages. Additionally, in countries with centralised wage coordination and greater openness, wages turn out to be higher. When analysing the

2010, BE, FR and NO for 2006 and BE and FR for 2002). The variable *Wage bargaining* takes value 1 if in the country wage bargaining takes place predominantly at the industry and country levels (BE, ES, FI, FR, NO and PT for 2010 and additionally RO for 2010 and BG for 2002) and 0 if wage bargaining is at the company level (BG, CY, CZ, EE, HU, LT, LU, LV, PL, RO, SK and UK for 2014 and without RO for 2010 and without BG for 2002). The variable *Articulation of enterprise bargaining* takes value 0 if no additional wage bargaining not under union control takes place in the country (CZ, EE, FR, HU, LT, LV, PL, PT, RO and UK for 2014 and without PT and RO for 2010, 2006 and 2002) and 1 if additional wage bargaining is restricted by law or a sectoral agreement or is under the control of unions (BE, BG, CY, ES, FI, LU, NO and SK for 2014, and additionally RO and PT for 2010, 2006, 2002).

influence of GVC involvement, significant patterns have been found. First, the impact of FVA/Exp on wages is negative and statistically significant in our baseline estimations based on a pooled sample and this negative effect of GVCs on wages is lower for male workers. In view of this, we can conclude that involvement in GVCs can indeed lead to higher gender wage differences. However, when splitting the sample into workers with different education and/or skill levels, it is notable that involvement in production sharing mostly negatively affects workers in the middle of the distribution and in specific occupation groups. Next, we have tried to assess whether involvement in GVCs causes similar effects on female/male wages in concentrated and non-concentrated sectors. We have tested the assumption of a positive impact of rising international trade competition narrowing the GWG. When we expanded our baseline estimation with measures of sector concentration, we found that greater involvement in GVCs only results in a higher GWG in less competitive sectors, which is in line with the labour market discrimination theory proposed by Becker (1957). An alternative modelling technique based on decomposing wage distributions using Recentred Influence Function Regressions, in turn, reveals that the negative impact of GVCs is strongest in the 25th wage quantile and more visible for women.

In short, this study has tried to fill a research gap on the trade and GWG nexus in an international setting. We have added to the literature with evidence of the impacts on females of trade expansion in developed countries, showing its complicated and mixed consequences, taking into account gender, skill, education and occupation diversity together with sector heterogeneity. Our results reveal that the increasing international competition pressure does not lead to the reduction in the wage inequalities. Although firms from sectors more involved in the GVC should benefit in terms of productivity it does not materialised by higher wages of their workers. Additionally gender differences may result from the lower woman bargaining power or gender composition of sectors more involved in GVC. As Bøler et al. (2015) report, in sectors

exposed to higher international competition, women may be also penalised due to lower flexibility and commitment, related to households responsibilities. Importantly, potential drivers of the gender wage differences in the GVC involved sectors may remain as open question which need to be investigated in the future studies e.g. taking into account within and between firms pay inequalities.

As far as the most recent labour trends are concerned, it is already clear that the Covid-19 pandemic affects female and male workers differently, potentially spurring gender inequalities in many dimensions (Oreffice & Quintana-Domeque, 2021). Consequently, focusing on the impacts of GVCs on the employment and wages of women and men will become even more important, taking into account possible labour insecurity and uneven development due to possible disintegration of some international linkages and GVCs, e.g. in the form of reshoring previously offshored production.

CRediT authorship contribution statement

Dagmara Nikulin: Conceptualization, Methodology, Software, Writing – original draft, Writing – review & editing. **Joanna Wolszczak- Derlacz:** Project administration, Investigation, Data curation, Formal analysis, Visualization, Writing – original draft, Writing – review & editing

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.strueco.2022.10.002

Appendix

Table A1. Male/female mean wage differences

country	2002	2006	2010	2014
BE	1.19	1.16	1.12	1.07
BG	1.28	1.27	1.32	1.31
CY	1.62	1.61	1.53	1.33
CZ	1.37	1.33	1.33	1.33
EE	1.31	1.44	1.44	1.41
ES	1.33	1.31	1.26	1.22
FI	1.20	1.19	1.17	1.14
FR	1.31	1.25	1.16	1.16
HU	1.27	1.29	1.27	1.22
LT	1.23	1.34	1.43	1.33
LU	1.18	1.23	1.18	1.22
LV	1.11	1.22	1.24	1.25
NO	1.16	1.15	1.15	1.13
PL	1.23	1.27	1.25	1.24
PT	1.49	1.45	1.40	1.38
RO	1.34	1.24	1.19	1.19
SK	1.51	1.50	1.37	1.38
UK	1.30	1.27	1.28	1.22

Notes: The ratio of mean male/female wages is weighted based on the grossing-up factor for employees (from SES).

Source: own elaboration based on SES 2002, 2006, 2010, 2014.

Table A2. Descriptive statistics of variables

Summary statistics – Males

	N	Mean	Std. Dev.	p25	Median	p75
Gross hourly wage (USD)	4120291	15.127	13.622	4.801	10.871	21.931
Age						

ageyoung	4120291	0.189	0.392	0	0	0
ageaverage	4120291	0.543	0.498	0	1	1
ageold	4120291	0.268	0.443	0	0	1
Education level						
loweduc	4120133	0.234	0.424	0	0	0
mededuc	4120133	0.589	0.492	0	1	1
higheduc	4120133	0.177	0.381	0	0	0
Type of employment contrac						
indefinite	4006520	0.919	0.273	1	1	1
temporary	4006520	0.076	0.265	0	0	0
apprentice	4006520	0.005	0.069	0	0	0
Tenure						
shortdur	4120291	0.118	0.323	0	0	0
meddur	4120291	0.308	0.462	0	0	1
logdur	4120291	0.347	0.476	0	0	1
vlongdur	4120291	0.227	0.419	0	0	0
FT	4120291	0.960	0.195	1	1	1
Skill level						
skill 1	4091521	0.086	0.281	0	0	0
skill 2	4091521	0.632	0.482	0	1	1
skill 3	4091521	0.121	0.326	0	0	0
skill 4	4091521	0.161	0.368	0	0	0
Company size						
small	4083261	0.196	0.397	0	0	0
medium	4083261	0.304	0.460	0	0	1
large	4083261	0.500	0.500	0	0	1
Type of financial control						
public	4100502	0.030	0.171	0	0	0
private	4100502	0.968	0.176	1	1	1
Collective pay agreement						
nationagr	3896324	0.130	0.336	0	0	0
industagr	3896324	0.234	0.424	0	0	0
enterpagr	3896324	0.339	0.474	0	0	1
noagr	3896324	0.296	0.457	0	0	1
Coordination of wage setting	4120291	0.343	0.475	0	0	1
Export (share of GDP)	4120291	0.473	0.287	0.269	0.342	0.657
Import (share of GDP)	4120291	0.566	0.298	0.340	0.461	0.748
GDP per capita	4120291	30832.10	15813.12	19919.57	25994.99	37017.27
Price cost margin (PCM)	4120291	0.692	0.074	0.645	0.698	0.744
FVA/Exp	4120291	0.258	0.076	0.197	0.256	0.314
OFF	4120291	0.260	0.121	0.165	0.239	0.335

Summary statistics – Females

	N	Mean	Std. Dev.	p25	Median	p75
Gross hourly wage (USD)	2310726	9.021	9.990	2.747	4.865	12.176
Age						
ageyoung	2310726	0.171	0.377	0	0	0
ageaverage	2310726	0.583	0.493	0	1	1
ageold	2310726	0.246	0.431	0	0	0
Education level						
loweduc	2310707	0.229	0.420	0	0	0
mededuc	2310707	0.603	0.489	0	1	1
higheduc	2310707	0.168	0.374	0	0	0
Type of employment contrac						
indefinite	2249668	0.908	0.288	1	1	1

temporary	2249668	0.088	0.283	0	0	0
apprentice	2249668	0.004	0.062	0	0	0
Tenure						
shortdur	2310726	0.130	0.337	0	0	0
meddur	2310726	0.342	0.474	0	0	1
logdur	2310726	0.347	0.476	0	0	1
vlongdur	2310726	0.180	0.385	0	0	0
FT	2310726	0.906	0.292	1	1	1
Skill level						
skill 1	2303893	0.132	0.339	0	0	0
skill 2	2303893	0.620	0.485	0	1	1
skill 3	2303893	0.126	0.332	0	0	0
skill 4	2303893	0.121	0.327	0	0	0
Company size						
small	2293094	0.186	0.389	0	0	0
medium	2293094	0.331	0.470	0	0	1
large	2293094	0.483	0.500	0	0	1
Type of financial control						
public	2301600	0.022	0.148	0	0	0
private	2301600	0.976	0.153	1	1	1
Collective pay agreement						
nationagr	2212276	0.112	0.316	0	0	0
industagr	2212276	0.184	0.388	0	0	0
enterpagr	2212276	0.323	0.468	0	0	1
noagr	2212276	0.381	0.486	0	0	1
Coordination of wage setting	2310726	0.275	0.447	0	0	1
Export (share of GDP)	2310726	0.440	0.263	0.257	0.331	0.648
Import (share of GDP)	2310726	0.542	0.254	0.349	0.462	0.734
GDP per capita	2310726	25576.5	13366.3	16444.3	22539.6	31370.8
Price cost margin (PCM)	2310726	0.672	0.087	0.623	0.678	0.738
FVA/Exp	2310726	0.266	0.076	0.212	0.264	0.315
OFF	2310726	0.247	0.115	0.160	0.224	0.324

Notes: weights are applied based on the grossing-up factor for employees (from SES). The Age variable is divided into cohorts: 14-19, 20-29, 30-39, 40-49, 50-59 and 60+ recoded as *ageyoun*g (below 30), *ageaverage* (30-49) and *ageold* (50 and above). The education variable represents the highest completed level of education according to ISCED-1997 (for the years 2002, 2006 and 2010) and ISCED-2011 (for the year 2014). We recode this variable into three binary variables: *loweduc, mededuc and higheduc*, using the 'Correspondence between ISCED 2011 and ISCED 1997 levels' tables available at https://ec.europa.eu/eurostat/documents/1978984/6037342/Comparability_ISCED_2011_ISCED_1997.pdf. The type of employment contract is represented by 3 variables: *indefinite*, *temporary*, and *apprentice*. Tenure in the enterprise is recoded into 4 variables: *shortdur* for less than 1 year, *meddur* for 1 to 4 years, *longdur* for 5 to 14 years and *vlongdur* for 15 years or more. The variable *FT* takes value 1 for full-time employees and 0 otherwise. The skill level is divided into 4 groups derived from the occupation variable (b23) and transformed according to the mapping of ISCO major groups to skill levels available in ILO (2012). Company size is recoded into 3 variables: *small*, *medium* and *large*, for enterprises with respectively 1-49, 50-249, and 250 or more employees. Type of financial

control means a public or a private enterprise. Collective pay agreement level is divided into *nationagr* 'National level or interconfederal agreement,' *industagr* 'Industry agreement or agreement for individual industries in individual regions' and *enterpagr* 'Enterprise or single employer agreement; agreement applying only to workers in the local unit; any other type of agreement.'

Source: Own elaboration based on SES data.

Table A3. Estimation results – wage regression: workers with different skill levels

	Skill_1		Skill_2		Skill_3		Skill_4	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sex_i	0.107***	0.112***	0.142***	0.143***	0.130***	0.116***	0.119***	0.140***
	[0.020]	[0.020]	[0.013]	[0.010]	[0.018]	[0.015]	[0.029]	[0.024]
FVA/Exp_{jt-1}	0.158	-0.061	-0.425**	-0.405**	-0.124	-0.274	-0.312*	-0.163
	[0.226]	[0.148]	[0.186]	[0.178]	[0.183]	[0.161]	[0.163]	[0.164]
$Sex_i \times FVA/Exp_{jt-1}$	0.09	0.004	0.145***	0.141***	0.141*	0.198***	0.129	0.051
	[0.062]	[0.076]	[0.042]	[0.048]	[0.073]	[0.056]	[0.097]	[0.090]
Personal and job controls	yes	yes	yes	yes	yes	yes	yes	yes
Firm controls	no	yes	no	yes	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.898	0.895	0.876	0.876	0.832	0.84	0.788	0.799
N	460475	443230	4162028	4018923	871006	841657	726899	702068

Notes: Personal controls: ageyoung, ageaverage, loweduc, mededuc, indefinite, shortdur, meddur, full time. Other notes as under Table 1.

Source: own elaboration based on data from SES and WIOD

Table A4. Estimation results – wage regression: workers in different occupations

	Occupations: 1 – digit ISCO-08 classification								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Sex_i	0.098**	0.149***	0.116***	0.142***	0.251***	0.129	0.184***	0.152***	0.112***
	[0.038]	[0.024]	[0.015]	[0.015]	[0.031]	[0.091]	[0.022]	[0.025]	[0.020]
FVA/Exp_{jt-1}	-0.313	0.015	-0.274	-0.023	-0.013	-2.004**	-0.319*	-0.470**	-0.061
	[0.221]	[0.156]	[0.161]	[0.112]	[0.090]	[0.820]	[0.159]	[0.220]	[0.148]
$Sex_i \times FVA/Exp_{jt-1}$	0.191	-0.101	0.198***	-0.112*	-0.332**	-0.204	0.091	0.137	0.004
	[0.146]	[0.085]	[0.056]	[0.055]	[0.145]	[0.279]	[0.072]	[0.086]	[0.076]
R^2	0.781	0.839	0.84	0.866	0.907	0.859	0.863	0.889	0.895
N	300105	401963	841657	288188	106207	5111	1754360	1865057	443230

Notes: Personal, job, sector and country controls included, but not reported. Other notes as under Table 1.

Occupation: 1 digit ISCO-08 classification: (1) – Managers, (2) – Professionals, (3) – Technicians and associate professionals, (4) – Clerical support workers, (5) – Service and sales workers, (6) Skilled agricultural, forestry and fishery workers, (7) – Craft and related trade workers, (8) – Plant and machine operators, and assemblers, (9) – Elementary occupations.

Source: own elaboration based on data from SES and WIOD

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Supplementary materials to the paper:

"GVC involvement and the gender wage gap: micro - evidence on European countries" [Not to be included in the main text, can be provided as online appendix]

Table S1. Estimation results – RIF wage regression 2010 and 2014 year

	25th wage quantile	50th wage quantile	75th wage quantile
	(1)	(2)	(3)
Sex_i	-0.042	0.052	0.084
	[0.074]	[0.091]	[0.070]
FVA/Exp_{jt-1}	-1.252***	0.104	-0.099
	[0.234]	[0.544]	[0.230]
$Sex_i \times FVA/Exp_{jt-1}$	1.023***	0.832**	0.188
	[0.321]	[0.302]	[0.284]
R^2	0.524	0.707	0.616
N	3222295	3222295	3222295

Notes: Personal, job, sector and country controls included – not reported. Other notes as under Table 1. Calculations conducted in STATA based on *rifhdreg* function (Rios-Avila, 2020).
Source: own elaboration based on data from SES and WIOD

Table S2. Estimation results – wage regression for countries-sector with low/high GVC intensity

	Low GVC intensity		High GVC intensity	
	(1)	(2)	(3)	(4)
Sex_i	0.067	0.111***	0.139**	0.088***
	[0.040]	[0.023]	[0.050]	[0.030]
FVA/Exp_{jt-1}	-0.684**	-0.558**	-0.418	-0.555**
	[0.279]	[0.245]	[0.256]	[0.206]
$Sex_i \times FVA/Exp_{jt-1}$	0.548**	0.317**	0.208	0.364***
	[0.242]	[0.130]	[0.143]	[0.084]

Personal and job controls	yes	yes	yes	yes
Firm controls	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes
R^2	0.861	0.87	0.844	0.834
N	3058257	2895501	3197754	3133958

Notes: Other notes as under Table 1. Low GVC intensity: countries-sectors with FVA/Exp< =median, High GVC intensity: countries-sectors with FVA/Exp>median
Source: own elaboration based on data from SES and WIOD

Table S3. Estimation results – wage regression for low and high tech industries

	Low tech industry		High tech industry	
	(1)	(2)	(3)	(4)
Sex_i	0.142***	0.147***	0.101***	0.096***
	[0.013]	[0.013]	[0.019]	[0.022]
FVA/Exp_{jt-1}	-0.071	-0.114	-0.447	-0.624***
	[0.157]	[0.158]	[0.268]	[0.185]
$Sex_i \times FVA/Exp_{jt-1}$	0.129*	0.092	0.279***	0.322***
	[0.060]	[0.064]	[0.074]	[0.074]
Personal and job controls	yes	yes	yes	yes
Firm controls	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes
R^2	0.868	0.87	0.872	0.874
N	3858609	3698302	2361799	2307576

Notes: as under Table 1.
Low tech industries: C10-C12, C10_C13, C13-C15, C16_C17, C16_C17_C18, C18, C19_C20_C22, C19_C20_C22_C23, C23, C24_C25, C24_C25_C28, C31_C32.
High tech industries: C19_C20_C21_C22, C21, C21_C26_C27_C33, C21_C29_C30, C26_C27_C33, C27, C28, C29_C30, C29_C30_C31_C32, C30; (according to the NACE rev. 2, see https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF)

Source: own elaboration based on data from SES and WIOD

Table S4. Estimation results – wage regression, including the interaction between *Sex* and *OFF* (eq.1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

Sex_i	0.174***	0.185***	0.176***	0.169***	0.151***	0.155***	0.148***	0.148***
	[0.028]	[0.022]	[0.020]	[0.018]	[0.011]	[0.011]	[0.011]	[0.011]
OFF_{jt-1}	-0.112	-0.074	-0.057	-0.061	-0.218**	-0.220**	-0.133	-0.145
	[0.151]	[0.119]	[0.111]	[0.100]	[0.079]	[0.079]	[0.095]	[0.094]
$Sex_i \times OFF_{jt-1}$	0.074	0.052	0.061	0.029	0.095**	0.080*	0.112***	0.111***
	[0.103]	[0.071]	[0.066]	[0.056]	[0.037]	[0.039]	[0.037]	[0.038]
$ageyoung_{it}$		-0.220***	-0.090***	-0.069***	-0.069***	-0.068***	-0.064***	-0.064***
		[0.014]	[0.009]	[0.008]	[0.010]	[0.010]	[0.009]	[0.009]
$ageaverage_{it}$		-0.044***	0	0.004	0.004	0.005	0.010**	0.010**
		[0.006]	[0.004]	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]
$loweduc_{it}$		-0.537***	-0.534***	-0.227***	-0.210***	-0.208***	-0.208***	-0.209***
		[0.018]	[0.017]	[0.011]	[0.009]	[0.008]	[0.009]	[0.009]
$mededuc_{it}$		-0.403***	-0.406***	-0.151***	-0.138***	-0.137***	-0.139***	-0.139***
		[0.015]	[0.015]	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]
$indefinite_{it}$			0.078***	0.060***	0.078***	0.076***	0.072***	0.072***
			[0.012]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]
$shortdur_{it}$			-0.300***	-0.264***	-0.193***	-0.196***	-0.204***	-0.204***
			[0.020]	[0.019]	[0.013]	[0.013]	[0.013]	[0.013]
$meddur_{it}$			-0.215***	-0.189***	-0.126***	-0.128***	-0.133***	-0.133***
			[0.021]	[0.020]	[0.014]	[0.014]	[0.014]	[0.014]
$longdur_{it}$			-0.112***	-0.096***	-0.054***	-0.055***	-0.062***	-0.062***
			[0.013]	[0.013]	[0.010]	[0.010]	[0.009]	[0.009]
$full\ time_{it}$			0.062***	0.050***	0.011	0.013*	0.015*	0.014*

			[0.009]	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]
skill_1$_{it}$				-0.582***	-0.586***	-0.589***	-0.595***	-0.595***
				[0.010]	[0.010]	[0.010]	[0.008]	[0.008]
skill_2$_{it}$				-0.454***	-0.450***	-0.452***	-0.454***	-0.454***
				[0.012]	[0.012]	[0.013]	[0.012]	[0.012]
skill_3$_{it}$				-0.242***	-0.248***	-0.248***	-0.248***	-0.248***
				[0.006]	[0.005]	[0.006]	[0.006]	[0.006]
size_small$_{it}$					-0.298***	-0.301***	-0.308***	-0.308***
					[0.023]	[0.023]	[0.021]	[0.021]
size_medium$_{it}$					-0.123***	-0.125***	-0.128***	-0.128***
					[0.013]	[0.013]	[0.012]	[0.012]
public$_{it}$					0.009	0.013	0.03	0.03
					[0.023]	[0.023]	[0.022]	[0.022]
nationagr$_{it}$						0.048**	0.005	0.003
						[0.020]	[0.017]	[0.017]
industagr$_{it}$						-0.032***	-0.031***	-0.031***
						[0.009]	[0.008]	[0.008]
ln_H_EMPE$_{jt}$							-0.027**	-0.027**
							[0.012]	[0.012]
PCM$_{jt}$							0.016	0.019
							[0.126]	[0.123]
Coordination of wage-setting$_{ct}$							-0.061***	-0.066***

							[0.009]	[0.011]
ln_GDPpc$_{ct}$							0.796***	0.792***
							[0.028]	[0.032]
Exp/GDP$_{ct}$							0.113**	
							[0.040]	
Imp/GDP$_{ct}$								0.181***
								[0.052]
R^2	0.808	0.839	0.848	0.865	0.871	0.868	0.874	0.874
N	6431017	6430840	6256011	6220408	6146698	6005878	6005878	6005878

Notes: as under Table 1

Source: own elaboration based on data from SES and WIOD

Table S5. Estimation results– wage regression, including the interaction between Sex and OFF, workers with different education levels

	Low education		Medium education		High education	
	(1)	(2)	(3)	(4)	(5)	(6)
Sex$_i$	0.164***	0.175***	0.166***	0.139***	0.169***	0.151***
	[0.016]	[0.014]	[0.022]	[0.012]	[0.017]	[0.017]
OFF$_{jt-1}$	-0.114	-0.062	-0.145	-0.252**	0.187**	0.154
	[0.143]	[0.152]	[0.112]	[0.103]	[0.085]	[0.092]
Sex$_i$×OFF$_{jt-1}$	0.086	-0.008	0.055	0.161***	-0.076	-0.018
	[0.058]	[0.053]	[0.066]	[0.036]	[0.057]	[0.055]
Personal and job controls	yes	yes	yes	yes	yes	yes
Firm controls	no	yes	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes	yes	yes
R^2	0.879	0.885	0.878	0.879	0.803	0.811
N	1074434	1024347	4313027	4184004	832947	797527

Notes: as under Table 1

Source: own elaboration based on data from SES and WIOD

Table S6. Estimation results– wage regression, including the interaction between *Sex* and *OFF*, workers with different skills levels

	Skill_1		Skill_2		Skill_3		Skill_4	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sex_i	0.124***	0.100***	0.167***	0.151***	0.157***	0.136***	0.157***	0.163***
	[0.017]	[0.010]	[0.018]	[0.010]	[0.017]	[0.012]	[0.024]	[0.023]
OFF_{jt-1}	-0.009	-0.071	-0.153	-0.209*	0.124	-0.02	0.135	0.13
	[0.157]	[0.120]	[0.118]	[0.119]	[0.098]	[0.102]	[0.125]	[0.124]
$Sex_i \times OFF_{jt-1}$	0.025	0.057*	0.056	0.122***	0.038	0.124***	-0.018	-0.041
	[0.035]	[0.030]	[0.053]	[0.034]	[0.068]	[0.040]	[0.074]	[0.074]
Personal and job controls	yes	yes	yes	yes	yes	yes	yes	yes
Firm controls	no	yes	no	yes	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.898	0.895	0.876	0.876	0.832	0.84	0.788	0.799
N	460475	443230	4162028	4018923	871006	841657	726899	702068

Notes: as under Table A3
Source: own elaboration based on data from SES and WIOD

Table S7. Estimation results– wage regression, including the interaction between *Sex* and *OFF*, workers from different occupations

	Occupations: 1 – digit ISCO-08 classification								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sex_i	0.153***	0.135***	0.136***	0.134***	0.206***	0.057	0.177***	0.139***	0.100***
	[0.034]	[0.017]	[0.012]	[0.012]	[0.015]	[0.042]	[0.020]	[0.015]	[0.010]
OFF_{jt-1}	0.054	0.164	-0.02	0.14	-0.11	-0.796	-0.13	-0.326*	-0.071
	[0.163]	[0.140]	[0.102]	[0.090]	[0.089]	[0.738]	[0.135]	[0.157]	[0.120]
$Sex_i \times OFF_{jt-1}$	-0.024	-0.046	0.124***	-0.084*	-0.175**	0.183	0.133**	0.191***	0.057*
	[0.131]	[0.051]	[0.040]	[0.040]	[0.077]	[0.264]	[0.062]	[0.054]	[0.030]

R^2	0.781	0.839	0.84	0.866	0.907	0.856	0.863	0.889	0.895
N	300105	401963	841657	288188	106207	5111	1754360	1865057	443230

Notes: as under Table A4
Source: own elaboration based on data from SES and WIOD

Table S8. Estimation results – wage regression, wages expressed in USD PPP (eq.1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sex_i	0.136***	0.160***	0.144***	0.148***	0.148***	0.155***	0.139***	0.139***
	[0.027]	[0.019]	[0.017]	[0.016]	[0.013]	[0.014]	[0.011]	[0.011]
FVA/Exp_{jt-1}	-0.430*	-0.376*	-0.365*	-0.346*	-0.501***	-0.489***	-0.346**	-0.359**
	[0.222]	[0.193]	[0.177]	[0.174]	[0.141]	[0.143]	[0.154]	[0.154]
$Sex_i \times FVA/Exp_{jt-1}$	0.216**	0.143**	0.176***	0.105*	0.101*	0.075	0.143***	0.142***
	[0.086]	[0.060]	[0.053]	[0.051]	[0.055]	[0.057]	[0.047]	[0.047]
$ageyoung_{it}$		-0.220***	-0.090***	-0.069***	-0.069***	-0.068***	-0.064***	-0.064***
		[0.014]	[0.008]	[0.008]	[0.009]	[0.010]	[0.009]	[0.009]
$ageaverage_{it}$		-0.044***	0	0.004	0.004	0.005	0.009**	0.010**
		[0.006]	[0.004]	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]
$loweduc_{it}$		-0.537***	-0.533***	-0.226***	-0.210***	-0.208***	-0.209***	-0.209***
		[0.018]	[0.017]	[0.011]	[0.008]	[0.008]	[0.009]	[0.009]
$mededuc_{it}$		-0.403***	-0.406***	-0.151***	-0.138***	-0.137***	-0.139***	-0.139***
		[0.015]	[0.015]	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]
$indefinite_{it}$			0.078***	0.060***	0.078***	0.076***	0.072***	0.072***
			[0.012]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]
$shortdur_{it}$			-0.300***	-0.264***	-0.192***	-0.196***	-0.204***	-0.204***

			[0.021]	[0.019]	[0.013]	[0.013]	[0.013]	[0.013]
meddur$_{it}$			-0.215***	-0.189***	-0.126***	-0.127***	-0.133***	-0.133***
			[0.021]	[0.020]	[0.014]	[0.014]	[0.014]	[0.014]
longdur$_{it}$			-0.112***	-0.096***	-0.054***	-0.055***	-0.061***	-0.062***
			[0.013]	[0.013]	[0.010]	[0.010]	[0.009]	[0.009]
full time$_{it}$			0.063***	0.051***	0.012	0.014*	0.015*	0.014*
			[0.009]	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]
skill_1$_{it}$				-0.582***	-0.586***	-0.589***	-0.595***	-0.595***
				[0.010]	[0.010]	[0.010]	[0.008]	[0.008]
skill_2$_{it}$				-0.453***	-0.450***	-0.452***	-0.454***	-0.454***
				[0.012]	[0.012]	[0.012]	[0.012]	[0.012]
skill_3$_{it}$				-0.242***	-0.248***	-0.248***	-0.248***	-0.248***
				[0.006]	[0.005]	[0.005]	[0.006]	[0.006]
size_small$_{it}$					-0.298***	-0.301***	-0.308***	-0.308***
					[0.023]	[0.023]	[0.021]	[0.021]
size_medium$_{it}$					-0.123***	-0.125***	-0.128***	-0.128***
					[0.013]	[0.013]	[0.012]	[0.012]
public$_{it}$					0.009	0.013	0.03	0.03
					[0.023]	[0.023]	[0.022]	[0.022]
nationagr$_{it}$						0.048**	0.005	0.003
						[0.021]	[0.018]	[0.018]
industagr$_{it}$						-0.031***	-0.030***	-

								0.031***
						[0.009]	[0.008]	[0.008]
ln_H_EMPE$_{jt}$							-0.026*	-0.026**
							[0.012]	[0.012]
PCM$_{jt}$							0.099	0.101
							[0.115]	[0.112]
Coordination of wage-setting$_{ct}$							-0.059***	-0.064***
							[0.009]	[0.011]
ln_GDPpc$_{ct}$							0.790***	0.785***
							[0.029]	[0.032]
Exp/GDP$_{ct}$							0.118***	
							[0.040]	
Imp/GDP$_{ct}$								0.190***
								[0.049]
R^2	0.644	0.702	0.719	0.75	0.764	0.761	0.771	0.772
N	6431017	6430840	6256011	6220408	6146698	6005878	6005878	6005878

Notes: as under Table 1

Source: own elaboration based on data from SES and WIOD

Table S9. Estimation results– wage regression: workers with different education levels, wages expressed in USD PPP

	Low education		Medium education		High education	
	(1)	(2)	(3)	(4)	(5)	(6)
Sex$_i$	0.145***	0.180***	0.138***	0.129***	0.147***	0.142***
	[0.020]	[0.016]	[0.014]	[0.011]	[0.022]	[0.020]
FVA/Exp$_{jt-1}$	-0.089	-0.047	-0.431**	-0.483***	-0.113	-0.048
	[0.199]	[0.197]	[0.182]	[0.160]	[0.147]	[0.125]
Sex$_i$×FVA/Exp$_{jt-1}$	0.154**	-0.026	0.156***	0.188***	0.006	0.018

	[0.071]	[0.064]	[0.047]	[0.048]	[0.077]	[0.070]
Personal and job controls	yes	yes	yes	yes	yes	yes
Firm controls	no	yes	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes	yes	yes
R^2	0.769	0.784	0.765	0.774	0.651	0.669
N	1074434	1024347	4313027	4184004	832947	797527

Notes: as under Table 1

Source: own elaboration based on data from SES and WIOD

Table S10. Estimation results– wage regression: workers with different skills levels, wages expressed in USD PPP

	Skill_1		Skill_2		Skill_3		Skill_4	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sex_i	0.107***	0.112***	0.142***	0.143***	0.130***	0.116***	0.119***	0.140***
	[0.020]	[0.020]	[0.013]	[0.010]	[0.018]	[0.015]	[0.029]	[0.024]
FVA/Exp_{jt-1}	0.158	-0.061	-0.425**	-0.405**	-0.124	-0.274	-0.312*	-0.163
	[0.226]	[0.148]	[0.186]	[0.178]	[0.183]	[0.161]	[0.163]	[0.164]
$Sex_i \times FVA/Exp_{jt-1}$	0.09	0.004	0.145***	0.141***	0.141*	0.198***	0.129	0.051
	[0.062]	[0.076]	[0.042]	[0.048]	[0.073]	[0.056]	[0.097]	[0.090]
Personal and job controls	yes	yes	yes	yes	yes	yes	yes	yes
Firm controls	no	yes	no	yes	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.796	0.794	0.751	0.759	0.664	0.683	0.622	0.645
N	460475	443230	4162028	4018923	871006	841657	726899	702068

Notes: as under Table 1

Source: own elaboration based on data from SES and WIOD

Table S11. Estimation results– wage regression: workers from different occupations, wages expressed in USD PPP

	Occupations: 1 – digit ISCO-08 classification								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sex_i	0.098**	0.149***	0.116***	0.142***	0.251***	0.129	0.184***	0.152***	0.112***
	[0.038]	[0.024]	[0.015]	[0.015]	[0.031]	[0.091]	[0.022]	[0.025]	[0.020]
FVA/Exp_{jt-1}	-0.313	0.015	-0.274	-0.023	-0.013	-2.004**	-0.319*	-0.470**	-0.061
	[0.221]	[0.156]	[0.161]	[0.112]	[0.090]	[0.820]	[0.159]	[0.220]	[0.148]
$Sex_i \times FVA/Exp_{jt-1}$	0.191	-0.101	0.198***	-0.112*	-0.332**	-0.204	0.091	0.137	0.004
	[0.146]	[0.085]	[0.056]	[0.055]	[0.145]	[0.279]	[0.072]	[0.086]	[0.076]
R^2	0.636	0.699	0.683	0.734	0.82	0.743	0.747	0.775	0.794
N	300105	401963	841657	288188	106207	5111	1754360	1865057	443230

Notes: as under Table 1

Source: own elaboration based on data from SES and WIOD

Table S12. Estimation results – wage regression, with additional country variable describing labour market arrangements

	(1)	(2)	(3)	(4)	(5)	(6)
Sex_i	0.135***	0.138***	0.136***	0.138***	0.135***	0.137***
	[0.014]	[0.010]	[0.014]	[0.010]	[0.014]	[0.010]
FVA/Exp_{jt-1}	-0.370**	-0.418***	-0.374**	-0.422***	-0.381**	-0.447***
	[0.163]	[0.143]	[0.162]	[0.143]	[0.165]	[0.143]
$Sex_i \times FVA/Exp_{jt-1}$	0.217***	0.203***	0.217***	0.202***	0.218***	0.203***
	[0.042]	[0.049]	[0.042]	[0.049]	[0.042]	[0.049]
Clauses in collective agreement	0.005	-0.006				
	[0.009]	[0.013]				
Wage bargaining			0.028	0.029		
			[0.019]	[0.020]		

Articulation of enterprise bargaining					0.025	0.056***
					[0.015]	[0.012]
Personal and job controls	yes	yes	yes	yes	yes	yes
Firm controls	no	yes	no	yes	no	yes
Sector and country controls	yes	yes	yes	yes	yes	yes
R^2	0.853	0.856	0.853	0.856	0.853	0.856
N	6256011	6029459	6256011	6029459	6256011	6029459

Notes: as under Table 1. *Clauses in collective agreement: 1* - agreements contain general opening clauses, defined as renegotiation of contractual provisions at lower levels, under specified conditions 0 - agreements contain no opening clauses. *Wage bargaining: 1* - wage bargaining at company level 0 - predominantly industry-wide and centralised bargaining). *Articulation of enterprise bargaining:* 1- supplementary enterprise wage bargaining is informal and prohibited or restricted by law or sectoral agreement, or where it is recognized but under trade union control; 0 - additional enterprise wage bargaining, when it occurs, is formally or informally conducted also by non-union bodies or where the articulation does not apply.

Source: own elaboration based on data from SES and WIOD