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# The gender gap in earnings: an international comparison with European matched employer–employee data

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This article examines the origin of the cross-country heterogeneity of the gender wage gap in nine European countries using a unique harmonized international matched employer–employee dataset. Our novel findings suggest that cross-country differences in the intensity of female segregation into low-paying workplaces is a relevant source of international differences in the size of the gap and that international disparities in the characteristics of wage structures are not very influential. On the other hand, the evidence is not fully conclusive with respect to the influence on the variations of the gap of different macroeconomic, social and institutional country-specific features considered previously in the literature.

**Keywords:** gender wage gap; matched employer–employee data; Juhn–Murphy–Pierce decomposition; segregation

**JEL Classification:** J16; J30; J70

## I. Introduction

The existence of a significant and persistent gap in earnings between males and females is a well-documented stylized fact of modern labour markets. Provided that identifying the sources of gender differences in wages is crucial in implementing effective policy decisions so as to reduce them, the origin of the gap has received considerable attention in economic literature (for authoritative reviews, see Altonji and Blank, 1999; Blau and Kahn, 2000).

Most studies on the origin of the gender wage gap apply to individual countries. Although there is a wide variation in results across studies, some general

regularities emerge in them. First, differences by gender in productivity-related individual characteristics such as education and experience play only a minor role in explaining the gap, and their influence tends to diminish over time alongside the general improvement of the educational situation and participation rates of females (Weichselbaumer and Winter-Ebmer, 2005). Second, a larger share of the gap is typically explained by the female segregation into low-paid structures. On this subject, whereas earlier studies highlighted the detrimental effect on female wages arising from female segregation into low-paid occupations and industries (e.g. Groshen, 1991; Macpherson and Hirsch, 1995), more recent studies

that draw on broad samples of matched employer–employee data reveal that female segregation into low-wage workplaces has a particularly significant negative impact on their relative wages and also, that a high presence of women tends to depress workplace’s wages (e.g. Bayard *et al.*, 2003; Amuedo-Dorantes and De la Rica, 2006). Finally, the size of the gender pay gap seems to be related to the extent of wage inequality, since a more compressed wage structure is likely to diminish the gender pay gap. Therefore, the evolution of wage dispersion over time is a significant determinant of the changes of the gap (Blau and Kahn, 1997, 2006; Edin and Richardson, 2002).

A relevant branch of the gender-related literature consists of cross-country comparative analyses of the origin of international differences in the size of the gender wage gap. Studies with a cross-country perspective are motivated by the striking variation across countries of the gap (for detailed descriptive evidence, see OECD, 2008) and although they are rather scarce, due plausibly to data limitations, they have complemented traditional within-country examinations of gender pay differentials and have led to additional significant progress. In particular, they have emphasized the influence of certain macroeconomic and institutional factors on shaping cross-country differences in the gap. In this vein, the seminal cross-country comparative studies of Blau and Kahn (1992, 1996, 2003) suggest that the size of the gap is related to wage dispersion and accordingly, that wage-setting institutions which are relevant in shaping wage dispersion, such as collective bargaining, have an important impact on cross-country variations of the gender wage gap. Moreover, other studies show that differences across countries in the size of the gap could be related to the generosity of family friendly schemes, such as parental leave provisions or state provision of child-care services (Arulampalam *et al.*, 2007; Christofides *et al.*, 2010), gender employment gaps (Olivetti and Petrongolo, 2008) and cultural beliefs concerning gender (Fortin, 2005).

This article examines the gender pay gap across a set of representative European countries based on a unique international matched employer–employee dataset, the European Structure of Earnings Survey. This dataset consists of inter-country harmonized microdata, as the survey is conducted in all the countries according to a common methodology. Moreover, it is the only international database that is currently available with matched employer–employee data. This type of data has enabled fundamental progress to be made in the understanding of wage determination in general and of the origin of the

gender wage gap in particular (Abowd and Kramarz, 1999; Hamermesh, 2008). Thus, cross-country comparisons are developed on a strictly comparable basis with a wealth of harmonized information. This enables to extend and enrich previous international comparative studies. They are based on either different national sources of microdata (i.e. Blau and Kahn, 1992, 1996, 2003) or on international harmonized household-based microdata (Fortin, 2005; Arulampalam *et al.*, 2007; Olivetti and Petrongolo, 2008; Christofides *et al.*, 2010), a sort of data which involve well-known important restrictions to analysing wages, such as a high risk of measurement error in wages and rather limited information on key wage-determining characteristics of individuals and, particularly, of their jobs and workplaces.

An extension of the Juhn *et al.* (1991) wage decomposition methodology is employed in the empirical analysis in order to ascertain the origin of the gender wage gap and of its international differences. This technique distinguishes between the relative impact that gender-specific factors and wage structure characteristics have on the gap. It should be noted that although it has been previously used in cross-country analysis of the gender wage gap (Blau and Kahn, 1992), its adaptation for use with matched employer–employee data allows us to assess the influence on shaping international differences in the magnitude of the gap of certain additional factors such as the intensity of female sorting into low-wage workplaces. Therefore it permits a more in-depth analysis of the relative influence in the gap of potential relevant sources referred to in the literature, such as female segregation into low-wage structures and the global characteristics of wage structures.

The outline of this article is as follows. Sections II and III describe the dataset and the methodology used in the decomposition of the gender wage gap. Section IV examines the sources of the gap and of international differences in its size, along with the impact that several country-specific macroeconomic, social and institutional factors have on them. Finally, the conclusions are presented in Section V.

In a nutshell, important differences across European countries in the size of the gap and its determinants are observed. Consistent with previous studies, differences in productivity-related individual characteristics explain just a minor part of the gap in most countries. Conversely, female segregation into low-paying structures usually explains a larger share of the gap, with a marked impact of female segregation into low-wage workplaces in comparison to occupational segregation. Moreover, a substantial part of the gap remains systematically unexplained, which implies that in every European country a

significant average wage differential exists between observationally similar men and women doing the same type of jobs in the same workplaces. On the other hand, cross-country comparative analyses suggest that international disparities in wage structure characteristics are not major determinants of inter-country differences in the size of the gender wage gap. On the contrary, they seem to be mainly driven by cross-country differences in gender-specific factors and in particular by differences in the intensity of female workplace segregation. Finally, the evidence is not conclusive in terms of the influence that country-specific factors such as female employment rates, family conciliation policies, cultural beliefs about gender or wage-setting institutions have on the variations of the gap across this set of European economies.

## II. Data

The microdata used in this study are drawn from the 2002 wave of the European Structure of Earnings Survey (hereafter ESES). This dataset is a collection of national surveys conducted in all member states of the EU (as well as in Iceland, Liechtenstein and Norway) according to a standard methodology under the auspices of the Statistical Office of the European Communities. This study draws on the national data samples for Italy, Spain, Portugal, the Netherlands, Norway, the Czech Republic, Latvia, Slovakia and Lithuania.<sup>1</sup>

The ESES provides detailed and comparable information regarding the level and structure of the remuneration of employees, their individual characteristics and the enterprise or local unit to which they belong. It covers workplaces with more than nine employees in sections C to O of the Statistical Classification of Economic Activities in the European Community (commonly referred to as NACE), except for Norway, Latvia, Italy and Portugal where sectors L, M, N and O (respectively, public administration, defence and compulsory social security; education; health and social work and other community, social and personal service activities) are not covered and Spain, where sector L is not covered.<sup>2</sup> Given that industry coverage in these latter countries does not fully comprise the public sector and that wage differentials in European labour

markets tend to be lower in the public sector than in the private sector (Arulampalam *et al.*, 2007), excluding the public sector is likely to inflate the size of the raw gender pay gap in these countries.

The ESES consists of cross-section matched employer–employee data with a sample of workers at each workplace. It collects information, usually provided by the management of firms, on demographic information corresponding to workers (earnings, hours worked, sex, age, level of education, tenure in the firm, occupation, type of contract and full-time/part-time indicators) along with detailed information regarding each respondent's workplace (including industry, size and type of financial control, whereas additional features of workplace's labour force composition can be derived from the observations of each workplace). The analysis is restricted to individuals aged 18–64 and to workplaces with at least two observations in the samples. After applying these filters, the national samples are seen to range between 58 049 and 972 729 workers and between 472 and 21 615 workplaces and the number of workers per firm ranges between 8.8 and 831.2 (detailed descriptive statistics are available from the author on request).

The earnings measure used in the empirical analysis is the gross hourly wage. This implies that the aim of the research is to explain international differences in the gender gap of the price of labour rather than in terms of labour incomes. Wages cover remuneration in cash paid by the employer before deductions for tax and employee social security contributions. They comprise all payments different from overtime pay, including commissions, travelling expenses, premium payments for shift, night and weekend work and all bonuses and allowances, regardless of whether or not they are paid regularly in each monthly pay period (thus, they also cover annual bonuses as holiday bonuses, 13th and 14th monthly salaries, profit sharing and allowances for leave not taken) and its definition is exactly the same across countries.

## III. Methods

In evaluating the sources of the gender wage gap and its international differences, the extension of the Juhn *et al.* (1991) decomposition suggested by Blau and Kahn (1992) is used. It should be noted that it has

<sup>1</sup> These are the countries whose national statistics offices allowed researchers to access the data of their national samples of the ESES in the framework of a European research project (*European Labour Market Analysis using Firm-level Panel Data and Linked Employer–Employee Data*) financed by the European Union under the VI Framework Programme.

<sup>2</sup> The national samples of Norway, Latvia, Lithuania, the Netherlands and Slovakia cover workplaces with less than 10 employees. In order to work with similar types of workplaces in all the countries, they have been dropped from the samples.

been specifically adapted to be used with matched employer–employee data, following the hints of Gartner and Stephan (2004).

The empirical analysis departs from the separate estimation for each country of the following wage function:

$$w_{ij} = X_i\beta + \varepsilon_{ij} + a_j \quad (1)$$

where  $w_{ij}$  is the natural log of hourly wage of individual  $i$  in workplace  $j$ ;  $X_i$  is a vector of controls;  $\beta$  is a vector of parameters to be estimated (including an intercept);  $\varepsilon_{ij}$  is a stochastic error term and  $a_j$  is an error component corresponding to workplace  $j$  and invariant for all the individuals working in the same workplace.<sup>3</sup>

Controls include individual and job characteristics (the highest level of education reached by the individual, age and its squared term, the time spent with the current employer and its squared term, dummies for 27 major occupational groups and indicators for a permanent contract and a full-time job) and, in an alternative specification of the equation, also workplace characteristics (indicators for industry – 55 dummies –; the type of financial control – a dummy for fully publicly owned firms –; size – five dummies – and a set of characteristics of the workplace workforce – namely, the ratio to all employees in the workplace of women, low- and high-educated workers, defined as those workers with lower than upper-secondary and with tertiary education, respectively, and the average age and tenure). In order to ensure cross-country comparability of the results, the specification of the wage equation is exactly the same for all countries.

Equation 1 is estimated for the pool of workers (i.e. males and females) in each country. Although choosing the wage structure of the majority group as the reference structure with which to develop wage decompositions is largely standard practice in the literature, there are several advantages to using a pooled approach obtained from a matrix combination of both the female and the male prices as the estimate of the wage structure that would exist in the absence of discrimination. First, pooling the wage structures for all workers allows all the available information to be used in order to estimate market wage returns and constitutes a more natural approximation to the labour market's nondiscriminatory

wage structure than simply adopting the structure of the main group or using other alternatives (Neumark, 1988; Oaxaca and Ransom, 1994). Second, there are some methodological and computational advantages, since it renders the use of percentile ranks in the Juhn *et al.* (1991) decomposition unnecessary, which can lead to problems of identification in the decomposition (Suen, 1997).<sup>4</sup>

Identification of the workplace effects is guaranteed, given that there is more than one observation per workplace in the dataset. Since the result of the Hausman's contrast for all the countries indicates that workplace-specific effects are correlated with the rest of the explanatory variables in Equation 1, it is estimated by fixed effects (which is equivalent to estimating by ordinary least squares with a set of workplace dummies). Relying on the properties of the ordinary least squares estimator, after the estimation of Equation 1 with the pooled data of country A and having obtained the values of  $\hat{\beta}^A$ ,  $\sigma^A$  and  $\eta^A$ , the average wage of the subgroup of workers  $s$  ( $s$  = males or females) in country A can be expressed as

$$\bar{w}_s^A = \bar{X}_s^A \hat{\beta}^A + \sigma^A \bar{\theta}_s^A + \eta^A \bar{\lambda}_s^A$$

where  $\bar{\theta}^A \sim (0, 1)$ ,  $\bar{\lambda}^A \sim (0, 1)$       (2)

where the superscript  $A$  is for country A (note that subscripts  $i$  and  $j$  have been omitted in the equation for ease of presentation);  $\bar{w}_s^A$  stands for the mean natural log of the hourly wage of given group  $s$ ;  $\bar{X}_s^A$  is a vector of the average of the set of explanatory variables for group  $s$ ;  $\hat{\beta}_s^A$  is the vector of coefficients estimated with Equation 1 and the pooled data of country A;  $\sigma^A$  is the SD of wage residuals of the pool of workers;  $\bar{\theta}_s^A$  is the average standardized residual of group  $s$ ;  $\eta^A$  is the SD of workplace effects of the pool of males and females and  $\bar{\lambda}_s^A$  is the average standardized workplace effect of group  $s$ .

Using the pooled wage structure as the market price references in the decomposition, the wage gap between males and females in country A can be written as follows:

$$D^A = w_m^A - w_f^A = (X_m^A - X_f^A)\beta^A + (\theta_m^A - \theta_f^A)\sigma^A$$

$$+ (\lambda_m^A - \lambda_f^A)\eta^A = \Delta X^A \beta^A + \Delta \theta^A \sigma^A + \Delta \lambda^A \eta^A \quad (3)$$

where the subscript 'm' is for males and 'f' for females and a prefix 'Δ' denotes the average

<sup>3</sup> Given that workplace specific effects also capture unobserved individual effects common to all employees in a workplace and that it is not possible to identify this effect in ESES cross-section microdata, they are relegated to the residual. Existing evidence for several countries suggests that unobserved individual effects tend in general to be weakly correlated with workplace specific effects (Abowd *et al.*, 2001; Lane, 2009).

<sup>4</sup> A recent assessment of the merits and shortcomings of the Juhn *et al.* (1991) decomposition can be found in Yun (2009). According to this author, the decomposition relies on a few bold assumptions that are difficult to verify.



difference between males and females in the subsequent variable.

In brief, Equation 3 provides a within-country decomposition of the gender wage gap. It quantifies the extent to which average wage differences between males and females in a country are related to (1) differences in observed characteristics, (2) the influence of unobserved elements and (3) the influence of workplace-related factors. More specifically, the first term on the right-hand side of the equation corresponds to the portion of the wage differential attributable to differences between the observed characteristics of the two groups ( $\bar{X}_m^A - \bar{X}_f^A$ ), valued at market prices ( $\hat{\beta}^A$ ), which coincides with the 'explained' component of the standard Oaxaca–Blinder decomposition. The second term measures the influence of the unobserved factors in the model. This component comprises the effect of unobserved ability, motivation and discrimination, and corresponds to the impact of differences by gender on the average standardized residual ( $\bar{\theta}_m^A - \bar{\theta}_f^A$ ) multiplied by the money value per unit difference in the standardized residual ( $\sigma^A$ ), which determines the specific wage penalty suffered by the disadvantaged group. Finally, the third term estimates the influence of workplace-related factors. This term is taken as a product of the difference in the average standardized workplace effect of males and females ( $\bar{\gamma}_m^A - \bar{\gamma}_f^A$ ), which measures the intensity of female segregation into comparatively low-wage workplaces, and the dispersion of wage differentials across workplaces ( $\eta^A$ ), which determines the extent of the wage penalty of females resulting from this segregation.

On the other hand, the difference in the magnitude of the gender wage gap between two countries (A and B) may be expressed, after applying the decomposition in Equation 3 twice, as the following decomposition equation:

$$\begin{aligned} D^A - D^B = & (\Delta\bar{X}^A - \Delta\bar{X}^B)\hat{\beta}^A + \Delta\bar{X}^B(\hat{\beta}^A - \hat{\beta}^B) \\ & + (\Delta\bar{\theta}^A - \Delta\bar{\theta}^B)\sigma^A + \Delta\bar{\theta}^B(\sigma^A - \sigma^B) \\ & + (\Delta\bar{\lambda}^A - \Delta\bar{\lambda}^B)\eta^A + \Delta\bar{\lambda}^B(\eta^A - \eta^B) \quad (4) \end{aligned}$$

According to the accounting scheme of cross-country differences in the gender wage gap provided by Equation 4, international discrepancies in the magnitude of the gap can be explained by inter-country differences in six factors. The first term of the decomposition captures the effect in the gap of

cross-country differences in the relative observed characteristics of males and females. The second term reflects the contribution of differences in the market prices of observed characteristics. The third term measures the impact of inter-country differences on the relative positions of males and females within the residual wage distribution (after controlling for measured characteristics and workplace effects). The fourth term isolates the impact of differences in wage residual dispersion with the relative position of the average worker of each group in the residual distribution remaining constant.<sup>5</sup> The fifth term captures the impact of cross-country differences in the extent of female workplace segregation. Finally, the sixth term measures the effect of differences in the dispersion of workplace wage differentials.

Note that the first and second decomposition terms in Equation 4 can be aggregated to assess the overall effect of observed characteristics in generating international differences in the gender wage gap. Similarly, the third and fourth terms capture the overall influence of unobserved factors and the fifth and sixth terms assess the joint effect of workplace-related factors. Alternatively, the components of the decomposition methodology can be further grouped into those terms that capture the role of inter-country deviations attributable to differences in worker-specific factors (the first, third and fifth terms) and those that measure the overall effect of inter-country differences in the underlying wage structure (the second, fourth and sixth terms), respectively.

## IV. Results

### *Descriptive evidence*

The first panel of Table 1 documents the gender wage gap for the nine European countries (the first column reports the unweighted average values). Consistent with previous evidence, a high level of international heterogeneity may be observed in the size of the wage gap, which ranges from 0.067 log points in Lithuania to 0.313 points in Slovakia.<sup>6</sup> Interestingly, the countries embraced by this research cover almost the full range of heterogeneity in the gender wage gap in Europe given that, according to equivalent estimates for the EU members with the 2002 wave of the European Structure of Earnings Survey, the hourly

<sup>5</sup> If inter-country differences in residual inequality were interpreted as differences in the market premium for unobserved skills, this component would represent the effect of differences in the returns to unobservable skills. However, this is quite a strong interpretation of residual inequality as it may also capture, *inter alia*, the effect of measurement error, equation misspecification and heterogeneity in unmeasured characteristics.

<sup>6</sup> These gaps should be exponentiated in order to express the estimates as percentage mark-ups.

**Table 1. Summary statistics**

|   | Average | Lithuania | Latvia | Italy  | Norway | Portugal | Spain  | The Netherlands | Czech Republic | Slovakia |
|---|---------|-----------|--------|--------|--------|----------|--------|-----------------|----------------|----------|
| <i>Gender wage gap</i>                  |         |           |        |        |        |          |        |                 |                |          |
| Log hourly wage gap                     | 0.202   | 0.067     | 0.130  | 0.163  | 0.204  | 0.222    | 0.229  | 0.231           | 0.261          | 0.313    |
| <i>Breakdown of the gap</i>             |         |           |        |        |        |          |        |                 |                |          |
| Mean female residual                    | -0.158  | -0.080    | -0.076 | -0.238 | -0.181 | -0.150   | -0.204 | -0.086          | -0.236         | -0.167   |
| Mean male residual                      | 0.112   | 0.094     | 0.058  | 0.111  | 0.104  | 0.092    | 0.112  | 0.088           | 0.205          | 0.143    |
| Female mean residual percentile         | 44      | 46        | 46     | 41     | 43     | 45       | 42     | 47              | 40             | 43       |
| Male mean residual percentile           | 59      | 56        | 55     | 65     | 59     | 58       | 60     | 57              | 62             | 59       |
| Residual SD                             | 0.276   | 0.341     | 0.349  | 0.212  | 0.216  | 0.266    | 0.242  | 0.281           | 0.244          | 0.331    |
| Mean female workplace effect            | -0.179  | -0.119    | -0.051 | -0.180 | -0.126 | -0.138   | -0.237 | -0.172          | -0.261         | -0.325   |
| Mean male workplace effect              | 0.137   | 0.140     | 0.039  | 0.084  | 0.072  | 0.084    | 0.129  | 0.177           | 0.227          | 0.278    |
| Female mean workplace effect percentile | 47      | 52        | 54     | 44     | 53     | 50       | 43     | 41              | 43             | 42       |
| Male mean workplace effect percentile   | 61      | 62        | 57     | 61     | 61     | 67       | 59     | 58              | 63             | 63       |
| Workplace effects SD                    | 0.294   | 0.374     | 0.568  | 0.250  | 0.126  | 0.340    | 0.309  | 0.169           | 0.240          | 0.266    |

Note: European structure of earnings survey 2002.

gender wage gap varies from 0.052 log points (Slovenia) to 0.329 (Slovakia).<sup>7</sup>

The second panel of Table 1 provides summary results of the within-country decompositions of the gender wage gap according to Equation 3. It comprises the dispersion of residuals and workplace effects and the average position of men and women in both distributions. In short, this evidence reveals that unobserved elements and workplace-related factors are, without exception, unfavourable for female wages in all the economies. Yet, their impact is quite different across countries and, as a consequence, they constitute potential relevant sources of international differences in the size of the gender wage gap. Therefore, the average wage residual is systematically positive for males and negative for females and, consequently, the average female position in the residual distribution is always well below the median (on average, females are in percentile 44 of the distribution) and the average male position is above it (percentile 59). Yet, some international differences can be found with regard to the importance of this phenomenon (the mean female wage residual ranges from  $-0.238$  to  $-0.076$ ) and also the magnitude of residual wage inequality. In the same vein, in all the countries females are systematically segregated into low-paying workplaces (the average male workplace effect is always positive whereas the average female workplace effect is largely negative). Moreover, the intensity of segregation varies significantly across countries (the average female

workplace effect ranges from  $-0.051$  to  $-0.325$ , with an average value of  $-0.179$ ), and international differences in inequality workplace effects, which determine the specific wage penalty on female wages of this type of segregation, are also observed (the average SD of workplace effects ranges between 0.126 and 0.568, with an average of 0.294).

#### *Decomposition results*

Table 2 contains the results of the separate within-country decompositions of the gender wage gap according to the three terms shown in Equation 3. As can be observed, differences in measured characteristics of males and females account in general for a minor part of the gap (on average, 0.046 log points or 22.7% of the total gender wage gap of 0.202 points). The specific impact of gender differences in measured qualifications is not usually very important (overall, differences in education, age and tenure explain only 6.9% of the total gap) whereas, in turn, job characteristics are a more significant source of the gap (16.3%). The bulk of this last effect is explained by differences by gender in occupational distribution (12.4%), which implies that, with respect to the impact of observed characteristics, female occupational segregation is by far the most relevant origin of the gap. It must be noted, nevertheless, that in some cases, average results reveal a remarkable heterogeneity across countries. Thus, for example, the impact on the gap of gender differences in productivity-

<sup>7</sup>This information may be accessed on the website of the European Commission (<http://ec.europa.eu>).

Table 2. Within-country decomposition of the gender wage gap

|                              | Average     | Lithuania      | Latvia      | Italy       | Norway      | Portugal    | Spain       | The Netherlands | Czech Republic | Slovakia    |
|------------------------------|-------------|----------------|-------------|-------------|-------------|-------------|-------------|-----------------|----------------|-------------|
| Gender wage gap              | 0.202       | 0.067          | 0.130       | 0.162       | 0.204       | 0.222       | 0.229       | 0.231           | 0.261          | 0.313       |
| (1) Observed characteristics | 0.046(22.7) | -0.089(-133.3) | 0.033(25.2) | 0.023(14.0) | 0.117(57.5) | 0.082(37.0) | 0.040(17.3) | 0.124(53.7)     | 0.037(14.0)    | 0.050(16.0) |
| Individual characteristics   | 0.014       | -0.036         | -0.012      | 0.017       | 0.023       | 0.017       | 0.026       | 0.061           | 0.016          | 0.011       |
| Education                    | -0.001      | -0.016         | -0.007      | -0.006      | 0.006       | -0.009      | -0.008      | 0.013           | 0.011          | 0.009       |
| Age                          | 0.010       | -0.003         | -0.002      | 0.017       | 0.014       | 0.017       | 0.013       | 0.032           | -0.001         | 0.000       |
| Tenure                       | 0.005       | -0.017         | -0.003      | 0.006       | 0.003       | 0.009       | 0.021       | 0.017           | 0.006          | 0.002       |
| Job characteristics          | 0.033       | -0.053         | 0.045       | 0.006       | 0.094       | 0.065       | 0.014       | 0.063           | 0.020          | 0.039       |
| Type of contract             | 0.001       | -0.001         | 0.000       | 0.001       | 0.001       | 0.001       | 0.003       | 0.007           | 0.003          | -0.003      |
| Full-time/part-time          | 0.006       | 0.003          | -0.001      | 0.000       | 0.023       | -0.008      | -0.003      | 0.034           | 0.000          | 0.008       |
| Occupation                   | 0.025       | -0.055         | 0.046       | 0.005       | 0.070       | 0.072       | 0.014       | 0.022           | 0.017          | 0.034       |
| (2) Wage residuals           | 0.071(35.2) | 0.059(88.7)    | 0.047(35.7) | 0.074(45.5) | 0.062(30.2) | 0.064(28.9) | 0.076(33.3) | 0.049(21.1)     | 0.108(41.2)    | 0.103(32.8) |
| (3) Workplace effects        | 0.085(42.1) | 0.097(144.6)   | 0.051(39.0) | 0.066(40.5) | 0.025(12.3) | 0.076(34.1) | 0.113(49.4) | 0.059(25.5)     | 0.117(44.8)    | 0.160(51.2) |

Notes: Specification with workplace effects. The percentage of each term relative to the wage gap is given in parentheses.

related individual characteristics such as education and age is quite significant in the Netherlands (where they explain 26.4% of the total gap) and is, indeed, beneficial for female wages in Latvia ( $-0.012$ ) and Lithuania ( $-0.036$ ), where females are more highly educated than men and they have longer tenure and total work experience (as proxied by age). In the same vein, females are actually sorted into high-paying occupations in Lithuania. Yet, with these few exceptions, empirical findings by and large confirm previous available evidence that differences by gender in productivity-related characteristics are in general a minor source of the gap in earnings and that occupational segregation is more significant.

Unobserved factors tend to be a relevant source of the gender wage gap. Thus, the second term of the breakdown accounts on average for 35.2% of the total average gap and the within-workplace differential between males and females ranges from 0.047 to 0.108 log points, with an average across countries of 0.071 points. Interestingly, put differently, this result reveals that in all the countries a significant within-workplace wage differential exists between observationally similar men and women doing the same type of jobs.

Overall, gender differences in workplace distribution are comparatively the most important origin of the gender pay gap in all the countries (although a significant cross-country heterogeneity is also observed in this case). Hence, the third term of the breakdown has an average effect of 0.085 log points (42.1% of the total average gap), ranging from 0.025 to 0.16 log points. It should be noted that the negative impact that female sorting into low-wage labour structures has on female wages is still more clean-cut when occupational and workplace segregation are aggregated, since 54.4% of the total average gap is explained by this factor.

In order to ascertain the specific attributes of low-wage workplaces in which European women are over-represented, Table 3 contains the results of the within-country decompositions of the gender wage gap with an alternative specification of the model of wage determination, in which workplace effects have been substituted by a set of workplace characteristics. These attributes account for 0.090 points of the gap, which compares to 0.085 points corresponding to workplace effects with the previous specification of the wage equation. Hence they almost entirely capture the effect on the gap of workplace effects. As can be observed, the factors with the greatest detrimental effect on female relative wages are female sorting into low-paying industries and, especially, into workplaces with a high presence of female employees. The estimated coefficient of the female share is negative

and significant at conventional levels in every country and this factor has an average explanatory power of 0.068 log points (or 33.3% of the total gap) and is highly relevant in every country (it actually ranges from 0.034 to 0.118 points). Therefore, previous findings in the literature indicating that a disproportionate location of females in certain labour structures tends to lower wages are clearly confirmed as regards workplace segregation. The evidence also suggests that the phenomenon is systematic and particularly relevant.

Table 4 displays the summary outcomes of the between-country decompositions of the international differences in the size of the gender wage gap according to Equation 4. Specifically, it contains the average results of all the possible pairwise decompositions of cross-country differences in the gender wage gap. For each pair of countries the comparison where the difference in the magnitude of the wage gap is positive has been considered (the total amount of comparisons is 36 and full results of pairwise country comparisons can be obtained from the author on request). Hence, the aim of the empirical analysis is to examine why comparatively higher gender wage gaps prevail in some countries.

As can be observed in the first line of Table 4, the total average cross-country difference in the magnitude of the gender wage gap is relatively high (0.091 log points). In short, inter-country comparisons reveal, first, that although both differences in endowments and in the market returns of observed characteristics are significant sources that explain international differences in the size of the gap, cross-country differences in relative endowments are clearly more relevant (their explanatory power is of 0.030 points) than differences in returns (0.013 points). The global impact of unobserved factors is relatively low (0.017 points or 18.6% of the average difference in the gap) which implies, interestingly, that the bulk of international differences in the magnitude of the gender wage gap are identified in practice. Moreover, it is mainly due to differences in the female relative position in the residual wage distribution (differences in the residual gap explain 0.015 points), given that cross-country differences in residual wage inequality have an almost negligible influence (0.002 points). In turn, differences in the impact of workplace effects are also important to explain cross-country differences in the size of the gap (0.031). This is due to the effect of differences in the extent of female workplace segregation (0.041), given that international disparities in the dispersion of workplace wage differentials have an opposite influence as inter-firm wage differentials tend to be lower in countries with higher gender gaps ( $-0.010$ ).



Table 3. Within-country decomposition of the gender wage gap

|                                 | Average     | Lithuania   | Latvia      | Italy       | Norway      | Portugal    | Spain       | The Netherlands | Czech Republic | Slovakia    |
|---------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------------|----------------|-------------|
| (1) Gender wage gap             | 0.202       | 0.067       | 0.130       | 0.162       | 0.204       | 0.222       | 0.229       | 0.231           | 0.261          | 0.313       |
| Observed characteristics        | 0.131(64.9) | 0.009(13.4) | 0.082(63.2) | 0.083(51.0) | 0.148(72.5) | 0.157(70.7) | 0.150(65.4) | 0.181(78.4)     | 0.151(57.9)    | 0.219(69.9) |
| Individual characteristics      | 0.014       | -0.036      | -0.011      | 0.017       | 0.022       | 0.017       | 0.028       | 0.061           | 0.017          | 0.010       |
| Education                       | -0.001      | -0.018      | -0.008      | -0.006      | 0.005       | -0.009      | -0.005      | 0.013           | 0.012          | 0.009       |
| Age                             | 0.010       | -0.001      | 0.000       | 0.017       | 0.013       | 0.017       | 0.012       | 0.032           | 0.000          | 0.000       |
| Tenure                          | 0.005       | -0.017      | -0.003      | 0.006       | 0.003       | 0.009       | 0.021       | 0.017           | 0.006          | 0.001       |
| Job characteristics             | 0.027       | -0.055      | 0.052       | 0.002       | 0.068       | 0.064       | 0.010       | 0.061           | 0.024          | 0.015       |
| Type of contract                | 0.002       | 0.000       | 0.000       | 0.001       | 0.001       | 0.001       | 0.003       | 0.008           | 0.003          | -0.001      |
| Full-time/part-time             | 0.006       | 0.006       | 0.006       | -0.004      | 0.018       | -0.008      | -0.002      | 0.032           | 0.000          | 0.006       |
| Occupation                      | 0.019       | -0.061      | 0.045       | 0.005       | 0.049       | 0.071       | 0.010       | 0.021           | 0.021          | 0.009       |
| Workplace characteristics       | 0.090       | 0.100       | 0.041       | 0.063       | 0.058       | 0.076       | 0.112       | 0.059           | 0.111          | 0.194       |
| Industry                        | 0.038       | 0.101       | 0.015       | 0.017       | 0.021       | 0.027       | 0.038       | -0.012          | 0.039          | 0.097       |
| Type of financial control       | -0.001      | -0.032      | -0.001      | 0.001       | 0.000       | 0.000       | 0.000       | 0.017           | -0.003         | 0.010       |
| Size                            | -0.004      | -0.005      | -0.007      | 0.000       | 0.000       | -0.008      | -0.014      | 0.000           | -0.001         | -0.001      |
| Female share of the workforce   | 0.068       | 0.065       | 0.039       | 0.046       | 0.034       | 0.060       | 0.093       | 0.053           | 0.118          | 0.100       |
| Average age of the workforce    | -0.001      | 0.005       | -0.005      | -0.000      | -0.004      | -0.006      | 0.003       | 0.000           | -0.017         | -0.006      |
| Average tenure of the workforce | -0.002      | -0.008      | 0.000       | 0.002       | -0.002      | -0.003      | -0.005      | 0.004           | -0.010         | -0.003      |
| Share of high-educated workers  | -0.006      | -0.026      | -0.004      | -0.001      | 0.000       | -0.001      | -0.006      | 0.000           | -0.015         | -0.005      |
| Share of low-educated workers   | -0.001      | 0.001       | 0.003       | -0.002      | 0.001       | -0.005      | -0.007      | -0.002          | 0.001          | 0.001       |
| (2) Wage residuals              | 0.071(35.1) | 0.058(86.4) | 0.048(36.8) | 0.080(49.0) | 0.056(27.4) | 0.065(29.3) | 0.079(34.7) | 0.051(21.9)     | 0.110(42.1)    | 0.094(30.1) |
| (3) Workplace effects           | -           | -           | -           | -           | -           | -           | -           | -               | -              | -           |

Notes: Specification with workplace characteristics. The percentage of each term relative to the wage gap is given in parentheses.

**Table 4. Between-country decomposition of differences in the gender wage gap**

|  |         |
|--|---------|
| Average between-country gap ( $D_A - D_B$ )                | 0.091   |
| Gap in endowments of observed characteristics (1)          | 0.030   |
| Of which occupation (1a)                                   | (0.005) |
| Market prices for observed characteristics (2)             | 0.013   |
| Wage residual gap (3)                                      | 0.015   |
| Wage residual SD (4)                                       | 0.003   |
| Gap in workplace effects (5)                               | 0.041   |
| Workplace effects SD (6)                                   | -0.010  |
| Characteristics (1) + (2)                                  | 0.042   |
| Wage residuals (3) + (4)                                   | 0.017   |
| Workplace effects (5) + (6)                                | 0.032   |
| Worker-specific components (1) + (3) + (5)                 | 0.086   |
| Of which occupational and workplace segregation (1a) + (5) | (0.046) |
| Wage structure components (2) + (4) + (6)                  | 0.005   |

*Notes:* The table contains average values calculated from all the pairwise comparisons of the countries in the sample where the difference in the gap is positive, with the wage structure of country A and country B weights as the base for the breakdown.

By grouping the components of the inter-country decomposition methodology into those attributable to worker-specific factors and those related to the wage structure, we gain an additional insight into the origin of international differences in the size of the gender wage gap. Gender-specific components play a very important role in explaining differences in the gender wage gap between countries, since they explain 0.086 points (or 94.1%) of a total average difference of 0.091 points. From a disaggregate perspective, this is due to the fact that in countries with higher gender wage gaps the relative endowments of observed characteristics have a comparatively higher detrimental effect on female wages (with an average effect of 0.030), differences by gender in the residual gap are also relatively more disadvantageous for females (0.015) and, particularly, female segregation into low-paying workplaces is considerably more intense (0.041). With respect to the global impact of female segregation into low-paying structures, it is noteworthy that the joint effect of differences in occupational and workplace segregation is considerably large (0.046 points and 50% of the total gap) and that the impact of workplace segregation (0.041) is much higher than that of occupational segregation (0.005).

On the contrary, cross-country differences in wage structures seem to play on the whole a comparatively minor role in shaping international differences in the gender wage gap. Thus, although female wages in countries with higher wage gaps tend to be disfavoured by global wage structure characteristics, this factor explains just 0.005 points (or 5.5%) of the total average difference of 0.091 points. This low impact is due to the fact that the effect of the comparatively more unfavourable returns to observed characteristics (0.013 points) and a higher residual wage

inequality (0.002) are counteracted by usually lower inter-firm wage differentials (-0.010). Nevertheless, overall this evidence suggests that in contrast with the findings of earlier studies that wage structure characteristics are prominent in explaining cross-country differences in the magnitude of the sex wage gap, this conclusion cannot be generalized.

#### *Country-specific features and the size of the gender wage gap*

The final part of the empirical analysis explores the influence of certain country-specific features (namely female employment rates, family conciliation policies, cultural beliefs about gender and wage-setting institutions such as collective bargaining) whose potential influence in cross-country variations in the size of the gender wage gap has been previously referred to in the literature. First, it has been hypothesized that gender wage and employment gaps could be negatively correlated across countries if nonrandomness of female selection into work implies that in countries with lower female labour force participation women with a relatively low return to paid jobs would choose not to participate, thus narrowing the average wage gap in these countries (Olivetti and Petrongolo, 2008). Second, the generosity of family friendly schemes such as parental leave provisions or state provision of child-care services are likely to influence the behaviour of men and women differently and hence affect gender wage gaps. The expected impact of these policies is unclear *a priori* as they could, *inter alia*, not only motivate women to participate in the labour force, but also have unintended effects on the labour market position of women if they imply longer absences of work of women or attract comparatively less productive women into the workforce. Yet, the empirical evidence suggests that countries with more

Table 5. Country-specific macroeconomic, social and institutional features

|   | Lithuania | Latvia | Italy | Norway | Portugal | Spain | The Netherlands | Czech Republic | Slovakia |
|---|-----------|--------|-------|--------|----------|-------|-----------------|----------------|----------|
| A Wage dispersion   | 1.060     | 1.190  | 1.786 | 1.591  | 1.139    | 1.289 | 0.891           | 1.002          | 1.545    |
| B Wage-setting institutions                                   |           |        |       |        |          |       |                 |                |          |
| Collective bargaining coverage rate <sup>a</sup>              | 14        | 20     | 80    | 70     | 80       | 80    | 80              | 25             | 50       |
| Minimum wage/Average gross wage <sup>b</sup>                  | 0.43      | 0.35   | –     | –      | 0.38     | 0.33  | 0.45            | 0.36           | 0.41     |
| C Work-family policies  |           |        |       |        |          |       |                 |                |          |
| Work-family reconciliation index <sup>c</sup>                 | –2.40     | –0.89  | –0.71 | –      | –0.54    | 1.41  | 6.59            | –0.84          | –4.05    |
| D Employment rate   |           |        |       |        |          |       |                 |                |          |
| Employment rate gap <sup>d</sup>                              | 5.5       | 7.5    | 27.1  | 6.2    | 15.1     | 28.2  | 16.2            | 16.9           | 11.0     |
| E Gender role attitudes <sup>e</sup>                          |           |        |       |        |          |       |                 |                |          |
| Agreement with statement ‘Scarce jobs should go to men first’ | 24.4      | 19.8   | 27.0  | 14.4   | 29.5     | 16.6  | 12.4            | 18.4           | 24.1     |
| Agreement with statement ‘Being a housewife is fulfilling’    | 78.5      | 40.0   | 54.9  | 60.5   | 50.7     | 65.5  | 51.5            | 76.4           | 70.8     |

Notes: <sup>a</sup>Eurostat (2005).

<sup>b</sup>European Industrial Relations Observatory (2005); for Portugal, statutory minimum wage/median gross wage. In Norway and Italy, there does not exist a national statutory minimum wage and collective bargaining is the regulatory mechanism of low-wages.

<sup>c</sup>Christofides *et al.* (2010); the composite index is the sum of indicators on policies about work-family issues (such as parental leaves and child-care policies) and is scaled in order to have a zero mean and SD equal to unity.

<sup>d</sup>The employment rate gap is the difference between the employment rate (calculated by dividing the number of persons aged from 15 to 64 in employment by the total population of the same age group) of males and females. The indicator is based on the EU Labour Force Survey.

<sup>e</sup>Agreement (as measured by the proportion of respondents of the total population) to the statement in the 1999–2001 wave of the World Value Survey.

generous work–family policies tend to have a lower gender wage gap (Arulampalam *et al.*, 2007). Third, given that women’s attitudes towards work are important determinants of human capital investment and labour supply (Vella, 1994), the gender wage gap could be in practice lower in countries with more gender-egalitarian cultures (Fortin, 2005). Finally, it has been hypothesized that wage-setting institutions could well have important indirect gender effects through their impact on wage structure given that, as women are usually concentrated in the lower part of the wage structure, the more dispersed the structure prevailing in a country, the greater the penalty for female wages. Hence, collective bargaining and minimum wages could affect the gender wage gap insofar as countries with higher minimum wages and with more centralized or coordinated bargaining tend to have lower wage dispersion and, plausibly, lower gender wage gaps (Blau and Kahn, 1992, 2003).

In order to explore the influence of these factors, Table 5 contains information on a set of country-specific macroeconomic, social and institutional features for each country and Fig. 1 plots their relation with the gender wage gap.<sup>8</sup> Given the relatively low number of countries covered by the research, following Arulampalam *et al.* (2007) and Olivetti and Petrongolo (2008), our aim is not to provide a conclusive test of the impact of the set of factors on the gender pay gap but simply to provide correlations between summary measures of potentially important factors and observed gender pay gaps.

Overall, the empirical evidence for this sample of countries is not fully conclusive with respect to the influence on the international heterogeneity of the gap of cross-country differences in the macroeconomic, social and institutional elements previously highlighted in the literature. Gender wage and employment gaps are, contrary to expectations, positively correlated and their unconditional correlation (0.28) is not statistically significant. In a similar way, the correlation of the gender gap is not statistically significant either with the generosity of

work–family policies (0.08) or with any of the proxies of the social gender beliefs (−0.18 and 0.14, respectively). Finally, the evidence does not corroborate a positive association between wage inequality and the magnitude of the gender gap, given that the bivariate correlation across countries between the size of the gender wage gap and wage dispersion is actually negative (−0.51), although not significant at conventional levels.<sup>9</sup> Consequently, the gender wage gap is not significantly correlated across countries either with the minimum wage or with the collective bargaining coverage rate (with bivariate correlations of −0.09 and 0.40 not being significant in any case at conventional levels).<sup>10</sup>

## V. Conclusions

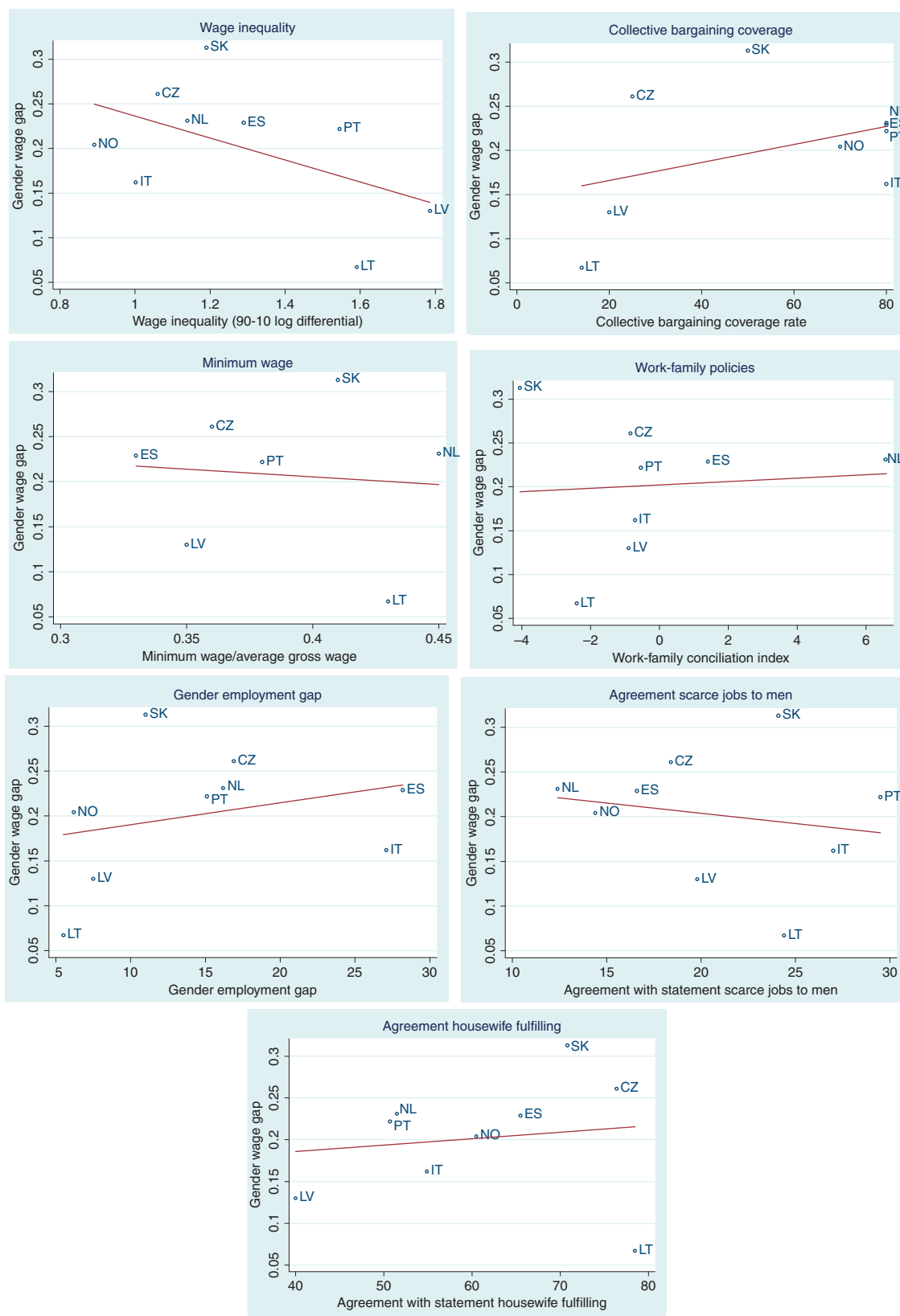
This research examines the origin of international differences in the gender wage gap in a number of representative European economies on the basis of microdata drawn from the European Structure of Earnings Survey. This survey constitutes a unique harmonized international matched employer–employee dataset with linked information on both worker and workplace characteristics. Consequently, its use provides a novel comparative evidence that largely complements previous findings in the gender-related literature and a sound empirical base for assessing the sources of the gender wage gap in earnings and its heterogeneity across countries and consequent policy options. This examination is particularly appealing because, despite long-standing equal pay and equal opportunity legislation, a significant gender gap in pay is generally observed in the EU, with a remarkable heterogeneity across its members (Eurostat, 2005; European Commission, 2006).

The empirical evidence confirms that in general, differences in individual productivity-related characteristics play a minor role in the explanation of the

<sup>8</sup> Although detailed information on its calculation can be found in Table 5, we should note that family conciliation policies are proxied through the recreation of the Organization for Economic Co-operation and Development (OECD) work–family reconciliation index (a summary measure of the policies prevailing in a country on work–family issues) carried out by Christofides *et al.* (2010) for all the EU members. Alternatively, gender role attitudes have been measured, following Fortin (2005), with the information of the 1999 to 2001 wave of the World Value Survey. In particular, perceptions of the man as main breadwinner, as well as anti-egalitarian views or discriminatory attitudes against working women are captured through the agreement to the statement ‘When jobs are scarce, men should have more right to a job than women’ and perceptions with respect to women’s traditional role is measured as agreement to the statement ‘Being a housewife is just as fulfilling as working for pay’.

<sup>9</sup> Interestingly, this same result holds for all the EU countries according to ESES 2002 data (European Commission, 2006).

<sup>10</sup> A thorough analysis of international differences in wage inequality and the influence of wage-setting institutions in European economies using the ESES data can be found in Simón (2010).



**Fig. 1. Relation between the gender wage gap and country-specific features**

Notes: The coefficient and the *p*-value of the bivariate correlation with the gender wage gap are as follows: wage inequality (−0.51 and 0.16); collective bargaining coverage (0.40 and 0.29); minimum wage (−0.09 and 0.84); work–family policies (0.08 and 0.85); gender employment gap (0.28 and 0.46); agreement with statement ‘Scarce jobs should go to men first’ (−0.18 and 0.63) and agreement with statement ‘Being housewife is fulfilling’ (0.14 and 0.73).

LT: Lithuania; LV: Latvia; IT: Italy; NO: Norway; CZ: Czech Republic; NL: The Netherlands; PT: Portugal; SK: Slovakia; ES: Spain.



gender pay gap and reveals that in all European countries significant average within-workplace wage differentials exist between observationally similar men and women doing the same job. From a policy perspective, these findings suggest that policies should partly focus on differential treatment within the labour market rather than addressing issues of differential access to education and other productive endowments (for a thorough review of potential policy responses to the gender pay gap, see European Commission, 2006).

A novel finding is that female segregation into low-wage structures, and in particular into low-wage workplaces, contributes significantly to both the gender pay gap in all European economies and to international differences in its size. Although it should be taken into account that some degree of gender segregation could be plausibly optimal for both men and women if they differ in their preferences regarding nonlabour activities and nonpecuniary job attributes or in their socialization patterns (Blau *et al.*, 1998), this evidence supports potential attempts to enforce an equal distribution of men and women across occupations and workplaces through equal treatment legislation, affirmative action or other means. Furthermore, as segregation of females into workplaces with a high presence of female employees has been identified as a factor with a particularly detrimental effect on their relative wages, particular attention should be given to lower wages in labour structures which tend to be dominated by females and to policy initiatives aimed at improving the remuneration of female-dominated jobs, such as the development and application of gender-neutral systems of job evaluation.

On the other hand, international disparities in wage structures, and in particular in the extent of wage inequality, do not seem to be major determinants of inter-country differences in the size of the gender wage gap in Europe. This result contradicts the findings of previous comparative studies and reveals that the generalization of their conclusions is not straightforward. Moreover, it suggests that policy initiatives adopting a mainstreaming or multi-dimensional approach that includes potential changes of institutional factors such as wage formation systems might not be fundamental to reducing the gender pay gap.

To conclude, the influence of certain country-specific factors previously referred to in the literature as potential sources of cross-country variations in the size of the gap is also explored. Yet, overall the evidence for the countries covered by the research is far from conclusive in terms of the influence on the gap of cross-country differences in factors such as

female employment rates, family conciliation policies, cultural beliefs about gender or wage-setting institutions. Nevertheless, it must be noted that the limited number of countries could significantly hinder the empirical analysis, warranting further research in these issues.

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