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## Article

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## Gender wage gap in hospitality management: The evidence in Europe

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### ABSTRACT

Hospitality employs many women, offering a chance to promote gender equality. However, wage disparities and unequal working conditions persist for women. This study examines the gender wage gap in managerial positions within hospitality across fourteen European countries, using data from the 2018 European Structure of Earnings Survey. We compute adjusted gender wage gaps and use decomposition methods to analyse wage disparities. Results show a significant wage gap in eight countries, from 5.1 % to 23.8 %, suggesting unobserved factors indicative of discrimination. Furthermore, we observe that in most countries, this gender wage gap is lower compared to other sectors of the economy. Additionally, much of the gap is due to female managers being concentrated in lower-paying establishments.

### 1. Introduction

The tourism sector holds significant global importance, driving employment-rich economic growth and creating opportunities for individuals across diverse age groups and skill levels (Organisation for Economic Co-operation and Development, 2018; Organisation for Economic Co-operation and Development, 2020). Within this context, the European Union (EU) stands out as a key player, hosting nearly 37 % of global travel and generating 28.9 % of the sector's worldwide income. In 2019, European tourism contributed 9.9 % to GDP and accounted for 11.6 % of total employment in the EU (European Court of Auditors, 2021). However, this potential is undermined by persistent gender inequalities. Women in tourism frequently face lower wages, reduced job specialisation, and overrepresentation in low- and medium-skilled roles (Baum, 2013). Gender segregation—both horizontal and vertical—further entrenches disparities, with women disproportionately employed in precarious jobs characterised by low wages and limited social protections (Bianchi & de Man, 2021; Costa et al., 2017; Mooney & Ryan, 2009; World Tourism Organization, 2019).

Recent political developments have intensified debates surrounding gender equality and workplace inclusion. For example, the former government in the United States has been challenging diversity, equity, and inclusion (DEI) initiatives, reflecting a broader global backlash against policies designed to promote workplace equity. This political climate underscores the timeliness of examining gender disparities in the tourism sector, particularly in leadership roles, where progress

toward gender parity remains uneven. As organisations and policy-makers grapple with these challenges, understanding the underlying factors contributing to gender wage gaps and barriers to female advancement becomes increasingly critical.

A pivotal subsector of tourism is hospitality, which substantially supports the European economy. Despite the challenges posed by the COVID-19 pandemic, such as a 42 % decline in revenue and a 15 % drop in employment in 2020 compared to 2019, the sector remains essential, employing approximately 9.3 million individuals (Eurostat, 2023b). Beyond its economic impact, hospitality contributes to social development, fostering rural and regional economic growth (Blake et al., 2008).

Notably, in the accommodation segment, a core part of hospitality, 59 % of the workforce consists of women, slightly higher than the 58 % in the overall tourism sector and significantly above the 36 % observed across the broader economy (Eurostat, 2023a). Female leadership within the boards of tourism hotel companies also exceeds global averages, with women holding 27 % of key leadership roles in the UK in 2018 (Equality in Tourism, 2018). These figures underscore the sector's potential to advance gender equality and empower women, as demonstrated by its positive correlation with the Global Gender Gap Index in developed nations (Campos-Soria et al., 2011; Jackman, 2022).

However, these findings also highlight that the path to achieving gender equality in hospitality remains an ongoing goal. A clear horizontal segmentation is evident, with the majority of female employment concentrated in seasonal, part-time, low-paid, and low-skilled positions, especially within hospitality, underscoring the relevance of examining

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gender issues in this sector, since such patterns perpetuate gender inequalities (World Tourism Organization, 2019).

International and regional policies, including the Sustainable Development Goals (SDG 5), the European Strategy for Gender Equality 2020–2025, and initiatives by the European Committee of Social Rights, emphasise the importance of addressing gender disparities in the labour market. Yet, issues such as the gender wage gap and the glass ceiling, which refers to the obstacles women face in gaining access to more senior and responsible positions within organisations, remain pressing concerns.

Research on the gender wage gap highlights that while it is smaller in hospitality compared to the broader economy, this is largely attributed to the sector's overall lower wages (Campos-Soria et al., 2011; Casado-Díaz et al., 2020), while other researches find that the gender wage gap is particularly pronounced in hospitality (Fleming, 2015; García-Pozo et al., 2012). However, existing studies rarely explore wage disparities at the managerial level, leaving a gap in understanding.

This article addresses this gap by examining the gender wage differential among managerial positions in the European hospitality industry using the European Structure of Earnings Survey 2018. It offers two key contributions: first, it is the first study to focus specifically on managerial roles within this sector across Europe; second, by leveraging employer-employee matched data, it incorporates establishment fixed effects, enhancing the robustness of its estimates by accounting for workplace heterogeneity.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature on gender wage gaps in hospitality, providing context for the current study. Section 3 describes the data source, and the econometric methodology employed. Section 4 presents the results, highlighting the key findings and their implications. Finally, Section 5 concludes with the discussion and conclusions of the significance of the results, their practical implications for the industry, and directions for future research.

## 2. Literature review

The literature suggests that observable factors can explain at least part of the gender wage gap. Becker's (1985) human capital theory suggests women's lower productivity might stem from differences in education and experience, but current data shows women have comparable education and experience to men (Blau & Kahn, 2017; Ponthieux & Meurs, 2015). Furthermore, the causes of the gender wage gap are multidimensional and include not only individual but also socio-logical and institutional factors (Altonji & Blank, 1999).

Relying solely on observable factors to explain the gender wage gap is insufficient; social context and job characteristics better explain labour market disparities and discriminatory processes (Lips, 2013; Rubery & Grimshaw, 2014). Gender roles and stereotypes shape hiring and salary decisions, with theories like discrimination taste theory (Becker, 1957) and statistical discrimination theory (Phelps, 1972) highlighting these biases. The gender wage gap correlates with both horizontal segregations, where women are overrepresented in low-paying sectors, and vertical segregation, where women face barriers to higher positions.

Research in the tourism sector, particularly in its hospitality sub-sector, consistently highlights the existence of a gender wage gap, though its magnitude and specifics vary across studies due to differences in data and methodologies. Some analyses focus specifically on hospitality as a representative subset of the tourism sector. This includes works by Kortt et al. (2018) for Australia, Campos-Soria et al. (2011) for Andalusia in Spain, García-Pozo et al. (2012) and Ons-Cappa et al. (2017) for Spain. In contrast, other research adopts a broader view of the tourism sector, encompassing additional activities such as transportation or travel agencies, as seen in studies by Guimarães and Silva (2016) for Brazil, Thrane (2008) for Norway, Muñoz-Bullón (2009) for Spain, and Santos and Varejão (2007) for Portugal. Additionally, women face an increased risk of discrimination when their male directors and

managers hold stereotypical views about their abilities, skills, and productivity based on gender (Carvalho et al., 2019; Flabbi et al., 2019) or exhibit a dislike for working with women (Becker, 1957).

Bakas et al. (2018) demonstrate that the discourses of managers in the tourism sector, which includes hospitality, obtained from different focus groups, reproduce social gender roles that influence the gender wage gap: they perceive women as less productive because they have care responsibilities, even if they do not. Additionally, Segovia-Pérez et al. (2019) found that self-imposed barriers, gender roles, and issues with work-life balance were the primary obstacles to achieving gender equality in hospitality's management positions.

High female representation in leadership can challenge discriminatory workplace norms and improve job opportunities, working conditions, and fair compensation for women. Several studies show a positive relationship between a reduced gender wage gap and gender diversity in higher positions in Portugal (Cardoso & Winter-Ebmer, 2010), the USA (Cohen & Huffman, 2007; Matsa & Miller's, 2011; Tate & Yang, 2015), Sweden (Hensvik, 2014), Germany (Hirsch, 2013; Zimmermann, 2022), the United Kingdom (Theodoropoulos et al., 2022), Norway (Bertrand et al., 2019), and Spain (Santero-Sánchez & Castro, 2022; Vega et al., 2016). Thus, increasing female representation in leadership and management positions is currently considered a potential positive factor in reducing the gender wage gap (European Commission, 2021).

In this sense, it is worth posing the question as to whether women in positions of power are able, in some way, to end this form of discrimination against themselves, as a first step toward closing the wage gap for all other occupations. However, research on the gender wage gap in hospitality managerial positions, even in tourism, is limited. According to a thorough search in three of the most relevant and reputable academic databases (Web of Science, Scopus, and Google Scholar) where we used the keywords "hospitality," "gender," and "management" to capture studies related to the gender gap in hospitality, the only study that specifically analyses the gender wage gap for CEOs in hospitality versus the manufacturing sector is Skalpe (2007), focusing on Norway (1999–2001). It shows women hold more management positions in hospitality (21.4 % vs. 5.8 % in manufacturing industry), but the wage gap is wider due to smaller company sizes. Fleming (2015) examined the US in 2010, following Sparrowe and Iverson (1999), and found the gender wage gap in hospitality management decreased from 27.4 % in 1989 to 21.6 % in 2010 but remains higher than the average gender wage gap (10.7 % vs. 5.3 %). This may be due to men in top positions reserving the best jobs for their own group of men.

Finally, we have identified studies conducted by Oliver and Sard (2021), Marfil and Campos (2021), Casado-Díaz et al. (2020) and Marfil-Cotilla et al. (2023), which analyse the evolution of the gender wage gap in hospitality across the wage distribution in the Spanish context. They show that wage disparities increase at higher percentiles as the explained component (differences in observed characteristics such as occupation, seniority or supervisory tasks) declines, while the unexplained component (differences in the returns to observed characteristics for men and women, which may result from discriminatory practices or biases in the labour market and differences in non-observable characteristics), grows. These findings, combined with the discrepancies in gender-based promotion patterns, provide further proof of the presence of the glass ceiling (Marfil & Campos, 2021).

In conclusion, there is evidence of the gender wage gap at the highest levels of responsibility, but it is still limited. Disaggregating evidence and data by sex in hospitality -considered both as an independent sector and as a partial representation of the tourism sector, given its significant and dominant role within it - can enhance targeted interventions for gender equality, thereby empowering women in the sector (UNWTO, 2019)

### 3. Methodology and data description

#### 3.1. Database

This investigation uses microdata from the European Structure of Earnings Survey (*E-SES*) for 2018. Administered every four years by Eurostat and the European national statistical institutes, this survey follows a standardised methodology and a two-phase random sampling process. First, a stratified random sample of businesses is selected, followed by a random sampling of employees. Conducted in October, it minimises disruptions from holiday absences. It includes businesses from 27 countries (EU, EFTA, and candidate countries) with at least 10 employees in economic activities classified under the following sections of the NACE Rev. 2 classification system: from section B, related to mineral extraction, to section S, related to service activities, including industries such as trade, transport, construction, finance, health, education, arts and entertainment, among others, but excluding section O, which refers to public administration and defence. The survey provides data on wages, worker characteristics, job attributes, and establishment characteristics.

The *E-SES* is suitable for analysing wage differences between sex in Europe and is a key source for Eurostat's gender wage gap statistics and various reports (Leythienne & Pérez-Julian, 2022; Leythienne & Ronkowski, 2018) and scientific papers (Boll & Lagemann, 2019; Henning & Stadler, 2023; Nikulin & Wolszczak-Derlacz, 2022). Its advantage lies in providing matched employer-employee data, allowing control of local unit fixed effects for more accurate econometric estimates. However, it has limitations: it excludes certain important worker characteristics like marital status and number of children and lacks a longitudinal design to track changes over time.

#### 3.2. Sample selection and variable creation

In our analysis, we implemented several sample restrictions. Initially, we limited our sample to individuals employed within the hospitality subsector of tourism (section I - Accommodation and food service activities, as per NACE Rev. 2), specifically within the Managerial occupation group. Managers are identified as individuals categorised under "Group A" in the National Classification of Occupations for 2011, encompassing directors and managers. Secondly, we restricted the sample of local units to those that provided data on at least two managerial workers. This constraint ensures the accurate identification of establishment fixed effects in the econometric estimations (Casado-Díaz et al., 2020). Additionally, we excluded individuals and

establishments with missing data on any primary variable of interest, as well as countries with fewer than 120 observations.

To ensure cross-country comparability, we transformed certain survey variables. The key variable, hourly wage, was logarithmically transformed and converted to euros using 2018 average exchange rates from the European Central Bank. We retained information on sex, age (as a proxy for work experience), and education level. Age was grouped into three categories: below 29, 30–49, and above 49. Education levels were divided into four categories: basic, secondary, tertiary (up to 4 years), and tertiary (more than 4 years). For job characteristics, we included contract type (permanent or fixed-term), workday type (full-time or part-time), and job seniority in years (logarithmically transformed). Local unit characteristics included size (number of workers) and geographical location (NUTS 1 level). Establishment size was categorised into less than 50 workers, 50–249 workers, and 250 or more workers, using enterprise size data.

#### 3.3. Sample description

Our final sample contains data from 14 countries, all EU members except Norway. Table 1 shows selected summary statistics, emphasising the significant variation in sample sizes across countries. Norway, Poland, Denmark, and Czechia have the largest sample sizes. The overall sample includes 11,033 managers from 2270 hospitality establishments. There are fewer women in management than men in six of the fourteen countries: Czechia (38.9 %), Germany (39.6 %), Denmark (41.1 %), Norway (42.1 %), and France (43.4 %). Conversely, Poland (65 %) and Sweden (61.5 %) have a relatively high share of female managers.

To verify these percentages, Fig. 1 compares the share of female managers in hospitality from the Labour Force Survey (LFS) by Eurostat (y-axis) against *E-SES* data (x-axis). The *E-SES* tends to overestimate the share of female managers, except in Latvia, Norway, and Poland. According to LFS data, except for Poland and Latvia, there are fewer women in management than men in every country. The data also show a low presence of women in management in Hungary (27.6 %), Czechia (28.6 %), Denmark (30 %), France (33.7 %), the Netherlands (35.2 %), and Germany (37.5 %).

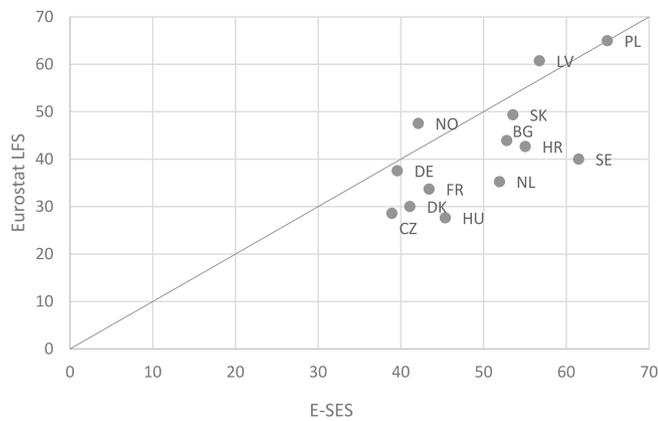
Except for Bulgaria, Czechia, Latvia, and Romania, the mean hourly wages of female managers are lower than those of their male counterparts in every country. The largest raw gender wage gap (difference between mean hourly wages of males and females, divided by the mean hourly wage of males) is in the Netherlands (26 % lower for females), Poland (24.2 % lower), and France (24.1 % lower).

**Table 1**  
Sample statistics.

Country	N° workers	N° establishments	Female (%)	Mean hourly wage		Gender Wage Gap
				male	female	
All	11,033	2720	51.9	19.2	13.7	28.6
Bulgaria	215	69	52.8	5.4	5.6	−4.0
Czechia	1005	57	38.9	8.6	8.7	−1.1
Germany	222	86	39.6	26.6	22.6	15.1
Denmark	1063	286	41.1	42.6	36.0	15.6
France	759	140	43.4	27.1	20.5	24.1
Croatia	148	37	55.0	9.8	8.7	11.3
Hungary	340	80	45.4	8.0	7.2	11.0
Latvia	224	74	56.8	6.6	6.9	−4.3
Netherlands	143	36	51.9	23.9	17.8	25.7
Norway	4450	1407	42.1	32.0	29.4	8.1
Poland	1310	204	65.0	8.5	6.4	24.2
Romania	330	127	56.3	5.3	5.5	−4.5
Sweden	181	27	61.5	24.5	21.7	11.5
Slovakia	643	90	53.6	8.9	8.1	8.6

Notes: The share of female managers, mean hourly wage, and raw gender wage gap were computed using grossing-up factors. The gender wage gap represents the difference between the mean hourly wages of males and females, divided by the mean hourly wage of males.

Source: own elaboration based on *E-SES* 2018.



**Fig. 1.** Share of female managers in hospitality: LFS data against E-SES sample. Notes: data for Romania is not available in the LFS. LFS data for Denmark is from 2019.

Source: own elaboration based on E-SES 2018 and LFS 2018.

### 3.4. Analysing the presence of female managers in hospitality

In order to analyse the presence of female managers in hospitality and to study whether there are barriers to the promotion of women into management positions, we specify a logit model using the following equation,

$$Manager_{ij} = \alpha + \beta female_{ij} + \sum_k \gamma_k X_{kij} + \sum_k \delta_k Y_{kij} + \sum_k \theta_k Z_{kij} + \varepsilon_{ij} \quad (1)$$

where the binary dependent variable takes value 1 if worker *i* in establishment *j* has a management occupation, and 0 otherwise. Among the dependent variables we included the female dummy variable, which takes value 1 if worker *i* is a woman, and 0 otherwise, a set of individual characteristics ( $X_{kij}$ ), a set of job characteristics ( $Y_{kij}$ ) and a set of local unit characteristics ( $Z_{kij}$ ). A negative and statistically significant  $\beta$  coefficient indicates the presence of promotion barriers for women, since it indicates that women workers have a lower probability to be a manager in a hospitality establishment than their counterpart male workers.

To account for establishment unobserved heterogeneity, we specify a linear probability model expressed by

$$Manager_{ij} = \alpha + \beta female_{ij} + \sum_k \gamma_k X_{kij} + \sum_k \delta_k Y_{kij} + \mu_j + \varepsilon_{ij} \quad (2)$$

where  $\mu_j$  represents the establishment fixed effect. A negative and statistically significant  $\beta$  coefficient indicates the presence of promotion barriers for women.

Although the econometric literature highlights the well-documented limitations of the Linear Probability Model (LPM) when applied to binary dependent variables (such as the non-normality of the error term, heteroscedasticity, and the possibility of generating implausible predictions), alternative nonlinear models like probit and logit are not without their own significant challenges. Specifically, when a model includes a large number of dummy variables as explanatory variables, as in the present case (establishment fixed effects), nonlinear approaches can produce biased and inconsistent coefficient estimates (Greene, 2008). Additionally, the computational complexity of estimating probit or logit models increases substantially with large datasets and numerous control variables, making these methods both resource-intensive and time-consuming. To account for possible heteroscedasticity, the estimated standard errors in the linear probability model are robust to heteroscedasticity.

### 3.5. Estimating the adjusted gender wage gap

In line with the typical approach for estimating adjusted gender wage gap, we employ an enhanced version of Mincer's widely used wage

function (Mincer, 1974). This model is founded on the premise that an individual's wage is influenced by their productivity, which, in turn, is influenced by their education level and work experience. The Mincer wage equation, despite originating in the 1970s, remains the workhorse model for analysing wage differentials due to its robustness, simplicity, and adaptability. In this study, we employ an enhanced version that incorporates individual, job, and establishment characteristics, aligning it with the unique context of hospitality. Its compatibility with matched employer-employee data and decomposition methods, such as Oaxaca-Blinder and Juhn-Murphy-Pierce, allows for precise estimation of the gender wage gap and its components. While more recent models exist, they often require additional data or involve complexities that limit their practical applicability for this analysis. Specifically, we suggest the following equation:

$$LnW_{ij} = \alpha + \beta female_{ij} + \sum_k \gamma_k X_{kij} + \sum_k \delta_k Y_{kij} + \sum_k \theta_k Z_{kij} + \varepsilon_{ij} \quad (3)$$

where *i* indexes the individual worker and *j* indexes the local unit. The dependent variable is the log hourly wage ( $LnW_{ij}$ ) regressed against a dummy variable ( $female_{ij}$ ), which takes value 1 if worker *i* is a woman and 0 otherwise; a set of individual characteristics ( $X_{kij}$ ); a set of job characteristics ( $Y_{kij}$ ); and a set of local unit characteristics ( $Z_{kij}$ ). The coefficient of interest, represented by  $\beta$ , signifies the disparity in log points between the wages of females and males with comparable individual characteristics and job attributes while working in similar establishments. From the estimated  $\beta$  coefficient it is possible to determine an estimation of the adjusted gender wage gap (GWG) given that  $GWG = (e^\beta - 1) \times 100$ .

Incorporating establishment fixed effects in the estimation of the gender wage gap can enhance accuracy by accounting not only for observed differences between establishments, but also for unobserved heterogeneity. This approach enables the adjustment for establishment characteristics not captured in the sample data. The proposed wage equation is now,

$$LnW_{ij} = \alpha + \beta female_{ij} + \sum_k \gamma_k X_{kij} + \sum_k \delta_k Y_{kij} + \mu_j + \varepsilon_{ij} \quad (4)$$

where  $\mu_j$  is the establishment fixed effect. With this inclusion, the coefficient  $\beta$  now reflects the disparity in log wages between females and males possessing comparable individual and job characteristics while working within the same local unit/establishment. Again, the estimated coefficient allows us to obtain an estimation of the gender wage gap.

### 3.6. Gender wage gap decomposition

To study the gender wage gap among managers in hospitality in greater depth, we employ two econometric methodologies to dissect wage disparities between men and women. The first method is the Oaxaca-Blinder decomposition (Blinder, 1973; Oaxaca, 1973). The second method is an extension of the Juhn-Murphy-Pierce approach (Juhn et al., 1991), as proposed by Blau and Kahn (1992), adapted for use with employer-employee matched data (Casado-Díaz et al., 2020; Murillo Huertas et al., 2017).

#### 3.6.1. Oaxaca-Blinder decomposition

The Oaxaca-Blinder decomposition is based on the economic theory of wage determination, which links wages to workers' productivity, reflected in observable characteristics like education and experience. This model is widely used because it provides a structured and simple way to analyse wage gaps, especially in studies of wage discrimination.

The Oaxaca-Blinder procedure decomposes the wage gap between men and women into two components: (i) the explained component, due to differences in observable characteristics, and (ii) the unexplained component, which reflects differences in returns to these characteristics and is often attributed to discrimination. However, this unexplained component also includes effects of unobserved variables not accounted

for in the model.

Formally, a wage equation in matrix form is specified separately for men (m) and women (w),

$$\text{Ln}W_G = X_G\beta_G + \varepsilon_G, \quad G \in \{m, w\} \tag{5}$$

where  $\text{Ln}W_G$  is a vector of log hourly wages for group G,  $X_G$  is a set of explanatory variables (individual, job and local unit characteristics),  $\beta_G$  is a vector of coefficients or returns for group G and  $\varepsilon_G$  is the error term. The difference in the expected value of log wages between males and females is expressed as,

$$E(\text{Ln}W_m) - E(\text{Ln}W_w) = E(X_m\beta_m) - E(X_w\beta_w) \tag{6}$$

If we replace the expected value of wages and explanatory variables by their mean value, and using the Ordinary Least Squares (OLS) estimator of vector  $\beta_G$  as a predictor ( $\hat{\beta}_G$ ), we can express the previous equation as,

$$\bar{W}_m - \bar{W}_w = \bar{X}_m\hat{\beta}_m - \bar{X}_w\hat{\beta}_w \tag{7}$$

where  $\bar{W}_G$  represents the mean log hourly wage of group G, and  $\bar{X}_G$  is a vector denoting the mean value of the set of explanatory variables for group G. Rearranging terms yields the fundamental expression for the Oaxaca-Blinder twofold decomposition,

$$\bar{W}_m - \bar{W}_w = \underbrace{(\bar{X}_m - \bar{X}_w)\hat{\beta}_m}_{\text{explained component}} + \underbrace{\bar{X}_w(\hat{\beta}_m - \hat{\beta}_w)}_{\text{unexplained component}} \tag{8}$$

### 3.6.2. Juhn–Murphy–Pierce decomposition

The extension of the Juhn–Murphy–Pierce decomposition suggested by [Blau and Kahn \(1992\)](#) can be used to decompose the difference in mean wages between men and women into three different components: (i) a first component attributable to differences in observed characteristics, (ii) a second component which estimates the effect of establishment-related factors (establishment fixed effects), and (iii) a third component which measures the effect of unobserved factors (residuals). This more detailed decomposition allows capturing not only individual differences, but also the impact of organisational policies and other unmeasured factors, providing a more comprehensive and accurate analysis of wage disparities.

The procedure requires the estimation of a wage equation with establishment fixed effects for the pool of workers,

$$\text{Ln}W_{ij} = X_i\beta + \mu_j + \varepsilon_{ij} \tag{9}$$

where  $\text{Ln}W_{ij}$  is the log hourly wage of worker i in establishment j,  $X_i$  is a set of explanatory variables (individual and job characteristics) including a constant term,  $\beta$  is a vector of coefficients to be estimated,  $\mu_j$  is the establishment fixed effect and  $\varepsilon_{ij}$  is the error term. The mean wage for the group of workers G can be expressed as,

$$\bar{W}_G = \bar{X}_G\hat{\beta} + \eta\bar{\lambda}_G + \sigma\bar{\theta}_G, \quad \bar{\lambda} \sim (0, 1) \quad \bar{\theta} \sim (0, 1) \tag{10}$$

where  $\bar{W}_G$  is the mean log hourly wage of group G,  $\bar{X}_G$  is a vector of the mean value of the set of explanatory variables for group G,  $\hat{\beta}$  is the vector of estimated coefficients for the wage equation for the pool of workers (Eq. (9)),  $\eta$  is the standard deviation of the establishment fixed effects estimated in the wage equation for the pool of workers,  $\bar{\lambda}_G$  is the mean of the standardised establishment effects of group G,  $\sigma$  is the standard deviation of the residuals of the wage equation for the pool of workers, and  $\bar{\theta}_G$  is the mean of the standardised residuals of group G from the wage equation.

The difference in the mean of log hourly wages between men (m) and women (w) can be written as follows,

$$\bar{W}_m - \bar{W}_w = \underbrace{(\bar{X}_m - \bar{X}_w)\hat{\beta}}_{\text{observed characteristics}} + \underbrace{(\bar{\lambda}_m - \bar{\lambda}_w)\eta}_{\text{establishment effect}} + \underbrace{(\bar{\theta}_m - \bar{\theta}_w)\sigma}_{\text{unobserved factors}} \tag{11}$$

As explained by [Murillo Huertas et al. \(2017\)](#) and [Casado-Díaz et al. \(2020\)](#), the establishment effects component is the result of the relative segregation of each group across establishments given by the difference in the mean of standardised establishment effects ( $\bar{\lambda}_m - \bar{\lambda}_w$ ) and the dispersion of wage differentials across establishments ( $\eta$ ).

The summation of the observed characteristics and the establishment effects component corresponds to the explained component derived from the Oaxaca-Blinder decomposition, while the unobserved factors component is indicative of the unexplained component.

## 4. Econometric results

### 4.1. The presence of female managers in hospitality

To analyse promotion barriers for women in management positions, we used data from E-SES for both management and other hospitality occupations. We restricted the sample to local units with data on at least two workers, regardless of occupation.

[Table 2](#) presents the estimation results: the estimated coefficients for the binary female variable, robust standard errors, number of observations, and  $R^2$  values. For the logit model, marginal effects evaluated at the mean of other explanatory variables are shown.

The marginal effect of being female is negative and statistically significant at conventional levels in eight out of fourteen countries: Bulgaria, Czechia, Germany, Denmark, Hungary, Latvia, Norway, and Romania. The largest effects are in Latvia, Hungary, and Norway, where the probability of a female worker being in management is 1.9, 1.5, and 1.1 percentage points lower than a male worker with similar characteristics.

When accounting for establishment effects, the number of countries with a statistically significant negative female coefficient increases to ten, including Croatia and Slovakia. In Latvia, Hungary, and Norway, the probability of a female worker being in management is reduced by 4.2, 3.2, and 2.6 percentage points compared to a male worker in the same establishment. In some countries, like Denmark and Germany, the probability difference is less than 1 percentage point.

Overall, these results indicate that, except for France, the Netherlands, Poland, and Sweden, female workers face more barriers to promotion into management positions compared to their male counterparts, even after controlling for individual and job characteristics. This suggests the presence of promotion barriers for women in hospitality management.

### 4.2. Gender wage gap estimations

The estimation results of the augmented Mincer's wage equation without and with establishment fixed effects are shown in [Table 3](#).

The results of the OLS estimations without establishment fixed effects indicate a significant gender wage gap in hospitality management, with female managers earning approximately 13 % (0.136 log points) less than their male counterparts, controlling for individual, job, and establishment characteristics. The negative and statistically significant coefficient for the female variable appears in eight countries: Czechia, Germany, Denmark, France, Croatia, the Netherlands, Norway, and Poland. In seven of these countries, the gender wage gap exceeds 10 %, with France (19.8 %), the Netherlands (18.1 %), and Croatia (17.7 %) showing the largest gaps. Norway has the smallest gap, with female managers earning 6.1 % (0.063 log points) less than their male peers.

When including establishment effects, the gender wage gap in hospitality management rises to 16 %, two percentage points higher than without establishment effects. The negative and statistically significant coefficient appears in the same eight countries plus Slovakia. The gender wage gap ranges from 5.1 % to 23.8 %, with most countries (except Norway and Slovakia) showing a gender wage gap above 10 %. The largest gaps are in the Netherlands (23.8 %), France (19.2 %), Croatia

**Table 2**  
Probability of a female worker being employed as manager.

Country	Logit				LPM (OLS with establishment effects)			
	marginal effect	s.e.	N	R <sup>2</sup>	coefficient	s.e.	N	R2
All	-0.0036***	(0.0008)	278,887	0.24	-0.0094***	(0.0018)	278,887	0.23
Bulgaria	-0.0084***	(0.0024)	7804	0.27	-0.0111*	(0.0059)	8157	0.26
Czechia	-0.0040**	(0.0017)	23,737	0.19	-0.0211***	(0.0059)	23,737	0.14
Germany	-0.0009***	(0.0003)	35,670	0.28	-0.0061***	(0.0018)	35,670	0.16
Denmark	-0.0011***	(0.0004)	62,221	0.26	-0.0053***	(0.0017)	62,221	0.22
France	-0.0046	(0.0032)	2427	0.25	-0.0095	(0.0088)	2427	0.32
Croatia	-0.0047	(0.0034)	3725	0.19	-0.0136*	(0.0074)	3725	0.16
Hungary	-0.0147***	(0.0047)	5990	0.20	-0.0320***	(0.0088)	5990	0.29
Latvia	-0.0186*	(0.0095)	4731	0.26	-0.0422***	(0.0162)	4731	0.33
Netherlands	0.0072	(0.0050)	3448	0.22	-0.0009	(0.0114)	3448	0.33
Norway	-0.0105***	(0.0008)	95,164	0.22	-0.0257***	(0.0019)	95,164	0.23
Poland	-0.0007	(0.0062)	11,134	0.13	0.0004	(0.0069)	11,992	0.24
Romania	-0.0038**	(0.0017)	6439	0.56	-0.0228***	(0.0065)	6823	0.48
Sweden	0.0045	(0.0082)	3263	0.13	0.0054	(0.0130)	3271	0.12
Slovakia	-0.0029	(0.0020)	11,531	0.32	-0.0212*	(0.0120)	11,531	0.27

Notes: sampling weights are used in all estimations. Robust standard errors (s.e.) are reported in parentheses. Statistically significance is denoted by: \*\*\* 1 % level, \*\* 5 % level and \* 10 % level.

Source: own elaboration based on E-SES 2018.

**Table 3**  
Estimation results for gender wage gap in Hospitality management.

Country	OLS				OLS with establishment effects			
	coefficient	s.e.	N	R <sup>2</sup>	coefficient	s.e.	N	R2
All	-0.1358***	(0.0193)	11,033	0.74	-0.1600***	(0.0186)	11,033	0.88
Bulgaria	0.0643	(0.0807)	215	0.15	-0.0254	(0.0740)	215	0.72
Czechia	-0.1063*	(0.0547)	1005	0.56	-0.1376***	(0.0367)	1005	0.80
Germany	-0.1275**	(0.0608)	222	0.31	-0.1609**	(0.0811)	222	0.62
Denmark	-0.1533***	(0.0326)	1063	0.27	-0.1644***	(0.0267)	1063	0.65
France	-0.2211***	(0.0574)	759	0.36	-0.2129***	(0.0517)	759	0.63
Croatia	-0.1948**	(0.0798)	148	0.56	-0.1674**	(0.0733)	148	0.82
Hungary	-0.0618	(0.0591)	340	0.32	-0.0764	(0.0568)	340	0.67
Latvia	0.0533	(0.0952)	224	0.33	0.1472*	(0.0813)	224	0.81
Netherlands	-0.1995***	(0.0736)	143	0.58	-0.2712***	(0.0703)	143	0.76
Norway	-0.0634***	(0.0106)	4450	0.21	-0.0521***	(0.0120)	4450	0.57
Poland	-0.1649***	(0.0295)	1310	0.33	-0.1553***	(0.0278)	1310	0.59
Romania	0.1099	(0.0772)	330	0.35	-0.0929	(0.0578)	330	0.84
Sweden	-0.0781	(0.0627)	181	0.35	-0.0673	(0.0506)	181	0.57
Slovakia	-0.1217	(0.0750)	643	0.27	-0.0940**	(0.0453)	643	0.75

Notes: sampling weights are used in all estimations. Robust standard errors (s.e.) are reported in parentheses. Statistically significance is denoted by: \*\*\* 1 % level, \*\* 5 % level and \* 10 % level.

Source: own elaboration based on E-SES 2018.

(15.4 %), Denmark (15.2 %), and Germany (14.9 %). Norway shows the smallest gap at 5.1 %. Notably, Latvia has a positive and statistically significant coefficient (at the 10 % level), suggesting female managers earn 15.9 % (0.147 log points) more than male managers, possibly due to the high percentage of women in managerial positions (60.7 %).

These findings align with previous studies, which find larger gender wage differences in higher-wage occupations of the upper wage distribution (Casado-Díaz et al., 2020; Marfil & Campos, 2021; Marfil-Cotilla et al., 2023; Oliver & Sard, 2021).

In order to compare differences in gender wages in managerial positions between hospitality and the rest of the economy, Figs. 2 and 3 present the estimated  $\beta$  coefficients and their corresponding confidence intervals (ci) at the 95 % confidence level, using data for both hospitality and the rest of the economy. The results obtained by OLS without and with establishment effects are shown in Figs. 2 and 3, respectively. Note that the gender wage differences in managerial positions are in most cases lower in hospitality than in the other economic sectors. Basically, the main exception is the Netherlands: 0.199 log points in hospitality versus 0.062 log points in the rest of the economy in the OLS estimation, and 0.271 log points in hospitality versus 0.053 log points in the rest of the economy in the OLS estimation with establishment effects. In France, Germany and Poland, the estimated coefficient (OLS with establishment

effect) in the rest of the economy is also below that for hospitality, but the difference is rather small.

Similar results are found in García-Pozo et al. (2012), Fleming (2015) and Casado-Díaz et al. (2020), which reveal that the gender wage gap is lower in hospitality as compared to that for the rest of economic sectors.

### 4.3. Gender wage gap decomposition

#### 4.3.1. Oaxaca-Blinder decomposition

Table 4 shows the Oaxaca-Blinder decomposition of the raw gender wage gap in hospitality management into explained and unexplained components. Fig. 4 illustrates the relative share of these components of the raw gender wage gap.

For the pooled sample of countries, the explained component is 0.018 log points (1.8 %), meaning that only 5.8 % of the raw gender wage gap is due to differences in individual, job, and establishment characteristics. In contrast, the unexplained component is 0.292 log points (34 %), accounting for 94.2 % of the raw gender wage gap.

The decomposition results show considerable variation, but generally, most of the gender wage gap is attributed to the unexplained component. The explained component is larger in Czechia (-218 %), Croatia (-90.6 %), Romania (-51.5 %), and Slovakia (-42.5 %), and to

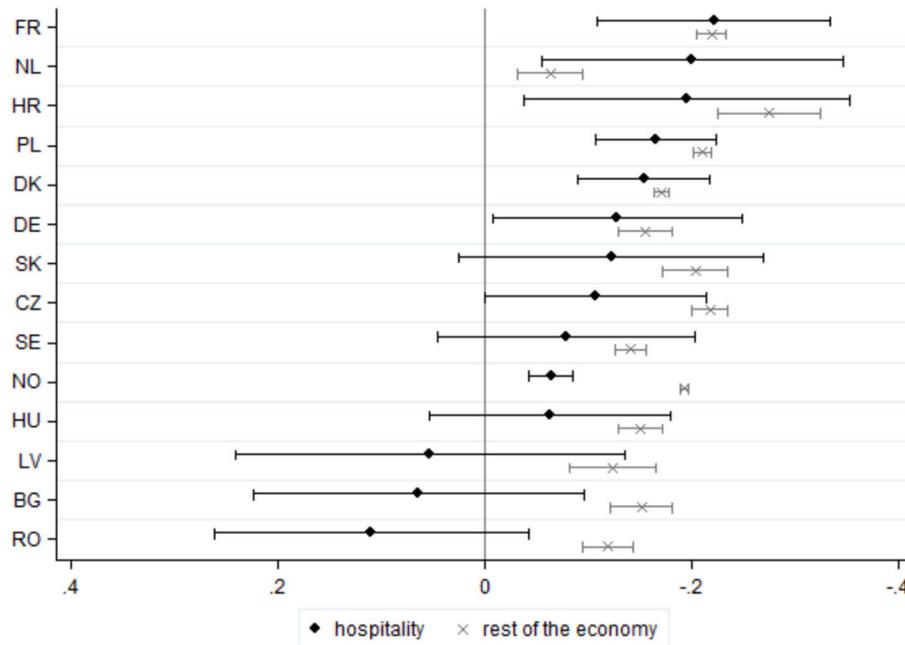


Fig. 2. OLS estimates and ci (95 %) of the gender wage gap in management: hospitality and the rest of the economy. Source: own elaboration based on E-SES 2018.

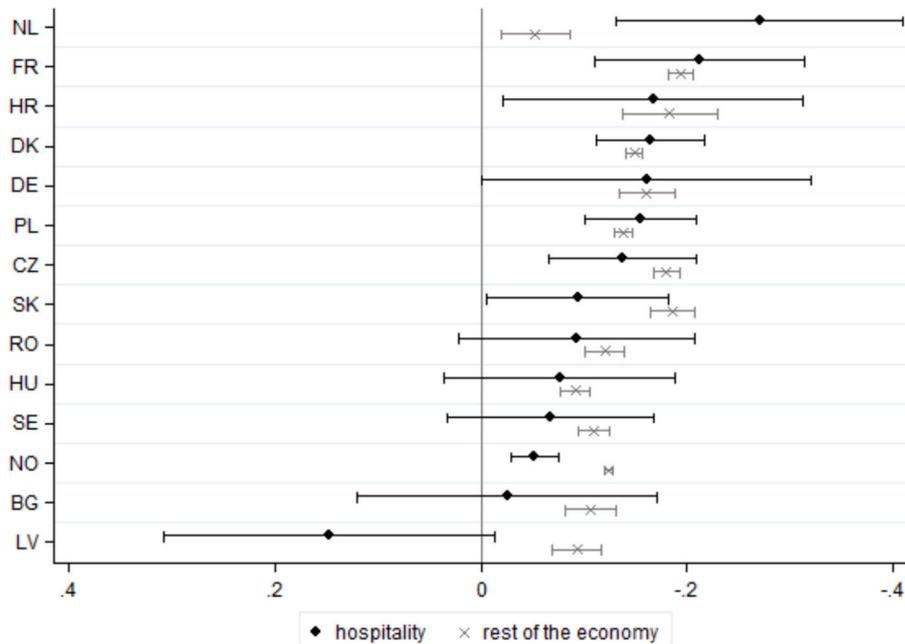


Fig. 3. OLS with establishments effects estimates and ci (95 %) of the gender wage gap in management: hospitality and the rest of the economy. Source: own elaboration based on E-SES 2018.

a lesser extent in France (25.8 %) and the Netherlands (25.3 %). The explained component is positive in seven countries and negative in eight. A positive explained component suggests that female managers typically have characteristics linked to lower wages, while a negative explained component implies that their characteristics are associated with higher wages.

Regarding the explanatory factors within the explained component, age, education level, and firm size are significant. Age, a proxy for experience, shows a positive and large effect in Bulgaria, Germany, Poland, Sweden, and Slovakia, indicating that female managers in these countries have less experience than their male counterparts,

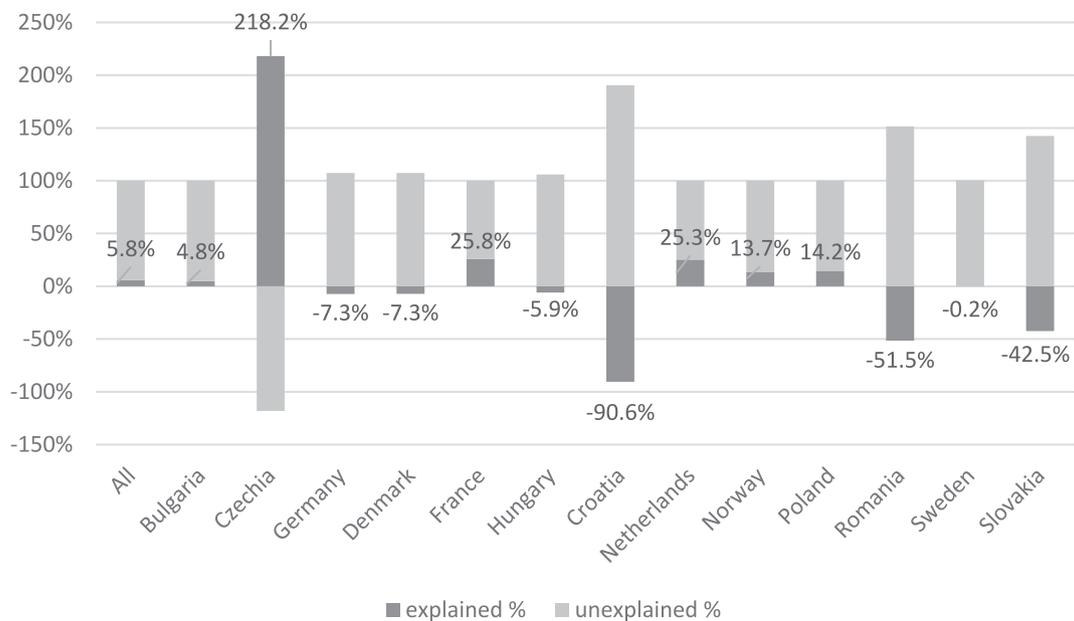
contributing to the gender wage difference. Conversely, age has a negative effect in Czechia and the Netherlands. The educational level significantly impacts the explained component in Czechia, Germany, France, Hungary, the Netherlands, and Norway, suggesting that improving educational levels among female managers could reduce the wage gap. In Croatia, Poland, and Slovakia, higher educational levels among female managers help reduce gender wage differences. Firm size has a large positive effect in the Netherlands and Sweden, indicating that female managers are often in smaller, lower-paying firms, whereas in Germany, Hungary, and Croatia, female managers are more commonly found in larger firms.

**Table 4**  
Oaxaca-Blinder decomposition of differences in average wages by gender in hospitality management.

	Mean log wage		Difference (raw gender wage gap)		Explained component		Unexplained component	
	male	female	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
All	2.61	2.30	0.3104***	(0.0430)	0.0179	(0.0187)	0.2925***	(0.0395)
Bulgaria	1.51	1.58	-0.0693	(0.0844)	-0.0033	(0.0360)	-0.0660	(0.0786)
Czechia	1.91	2.01	-0.0953	(0.1581)	-0.2080	(0.1484)	0.1126*	(0.0564)
Germany	3.17	3.06	0.1124*	(0.0608)	-0.0082	(0.0430)	0.1206*	(0.0559)
Denmark	3.63	3.50	0.1373***	(0.0354)	-0.0100	(0.0178)	0.1472***	(0.0309)
France	3.21	2.91	0.2990***	(0.1005)	0.0772	(0.0872)	0.2219***	(0.0515)
Croatia	1.86	1.80	0.0578	(0.0703)	-0.0034	(0.0438)	0.0612	(0.0578)
Hungary	2.06	1.96	0.1015	(0.1172)	-0.0919	(0.0929)	0.1933*	(0.0773)
Latvia	1.72	1.72	0.0017	(0.1071)	0.0482	(0.0721)	-0.0465	(0.0919)
Netherlands	3.05	2.78	0.2630***	(0.0723)	0.0666	(0.0609)	0.1965***	(0.0667)
Norway	3.38	3.31	0.0733***	(0.0118)	0.0100*	(0.0060)	0.0633***	(0.0105)
Poland	1.91	1.70	0.2059***	(0.0357)	0.0293	(0.0204)	0.1766***	(0.0293)
Romania	1.42	1.50	-0.0817	(0.0894)	0.0421	(0.0531)	-0.1238*	(0.0737)
Sweden	3.12	3.02	0.0996	(0.0735)	-0.0002	(0.0558)	0.0998*	(0.0581)
Slovakia	1.98	1.90	0.0829	(0.1096)	-0.0352	(0.0707)	0.1181	(0.0735)

Notes: sampling weights are used in all estimations. Robust standard errors (s.e.) are reported in parentheses. Statistical significance is denoted by: \*\*\* 1 % level, \*\* 5 % level and \* 10 % level.

Source: own elaboration based on E-SES 2018.



**Fig. 4.** Oaxaca-Blinder decomposition: explained and unexplained components (%).

Notes: the displayed percentages correspond to the explained component. Latvia is not included in the graph due to its large values (explained = 2864 %; unexplained = -2764 %).

Source: own elaboration based on E-SES 2018.

#### 4.3.2. Juhn–Murphy–Pierce decomposition

The results for the Juhn–Murphy–Pierce decomposition are provided in Table 5. The share of each of these three components of the raw gender wage gap is plotted in Fig. 5. It is important to note that the Juhn–Murphy–Pierce decomposition is obtained using a more complete specification of the wage equation with the inclusion of establishment fixed effects, than the Oaxaca-Blinder decomposition. This fact is reflected in an increased share of the explained component, which is now the sum of differences in observable characteristics and unequal distribution by establishment.

For the pooled sample, the explained component is 0.124 log points: 0.010 log points from differences in characteristics and 0.114 log points from workplace premia, accounting for 40 % of the raw gender wage gap. Specifically, differences in individual and job characteristics account for 3.4 % of the raw gender wage gap, while segregation in low-paying establishments explains 36.6 %. The remaining 60 % of the

gender wage gap is attributed to unobservable factors. The coefficient for unobservable factors (0.186 log points) indicates that female managers earn, on average, 20.5 % less than their male counterparts with similar characteristics within the same workplace, suggesting potential direct discrimination. However, further analysis would be needed in order to account for omitted important individual characteristics like marital status and the number of children.

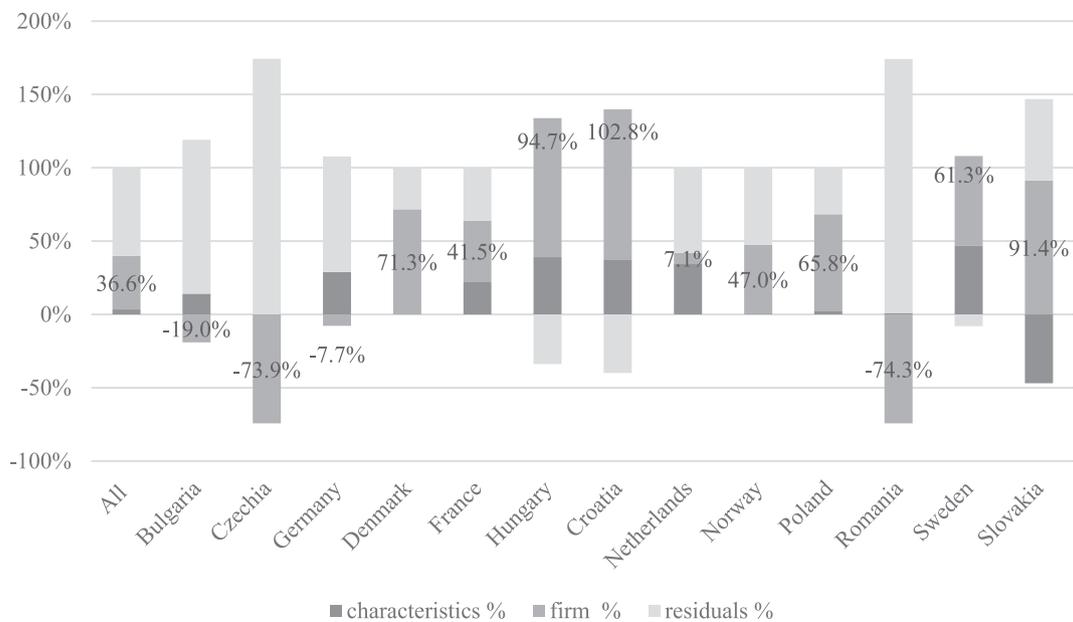
The coefficient for the component which accounts for difference in individual and job characteristics is positive in all countries, except for Bulgaria, Latvia, Romania and Slovakia. This implies that female managers often have characteristics linked to lower wages. The largest shares of this component relative to the raw gender wage gap are in Sweden (46.7 %), Hungary (39.1 %), Croatia (37 %), the Netherlands (34.8 %), Germany (28.9 %), and France (22.4 %).

Considering the sign of the estimated coefficient associated to differences in distribution by workplace, the results suggest that in every

**Table 5**  
Juhn-Murphy-Pierce decomposition of differences in average wages by gender.

	Mean log wage		Difference (gender wage gap)	Differences in		
	male	female		observed characteristics	establishment effect	unobserved factors
All	2.61	2.30	0.3106	0.0106	0.1136	0.1864
Bulgaria	1.51	1.58	-0.0700	-0.0099	0.0133	-0.0734
Czechia	1.86	1.98	-0.1180	0.0005	0.0872	-0.2057
Germany	3.17	3.06	0.1123	0.0325	-0.0087	0.0885
Denmark	3.64	3.50	0.1348	0.0006	0.0961	0.0381
France	3.21	2.91	0.2993	0.0671	0.1243	0.1079
Croatia	1.86	1.80	0.0584	0.0229	0.0554	-0.0198
Hungary	2.05	1.95	0.1030	0.0381	0.1059	-0.0410
Latvia	1.72	1.72	0.0020	-0.0050	0.0762	-0.0692
Netherlands	3.05	2.78	0.2636	0.0917	0.0187	0.1532
Norway	3.38	3.31	0.0733	0.0004	0.0345	0.0385
Poland	1.91	1.70	0.2063	0.0052	0.1357	0.0654
Romania	1.42	1.50	-0.0833	-0.0008	0.0618	-0.1443
Sweden	3.12	3.02	0.0999	0.0467	0.0612	-0.0080
Slovakia	1.99	1.91	0.0812	-0.0381	0.0743	0.0451

Notes: robust standard errors (s.e.) between parentheses.  
Source: own elaboration based on E-SES 2018.



**Fig. 5.** Juhn-Murphy-Pierce decomposition: characteristics, firm and residuals (%).

Notes: the displayed percentages correspond to differences in firm premia. Latvia is not included in the graph due to its large values (characteristics = -254 %; firm = 3858 %; residuals = -3504 %).

Source: own elaboration based on E-SES 2018.

country but Germany, female managers are segregated in low-paying establishments. Apart from the Netherlands, the establishment component explains a relatively large part of the raw gender wage gap, especially in Croatia, Hungary and Slovakia, followed by Romania, Czechia, Denmark, Poland and Sweden.

Lastly, the unobserved factor component has a positive sign, which suggests the possible presence of gender discrimination within establishments in seven countries: Germany, Denmark, France, the Netherlands, Norway, Poland and Slovakia.

### 5. Discussion and conclusions

The hospitality subsector of tourism represents a significant and rapidly expanding service industry, with an average female participation rate of over 50 % globally and up to 70 % regionally (Baum, 2013). The female workforce is employed in a wide variety of roles across a range of establishments, resulting in a disparity in the levels of the wage

distribution, including those in senior management. The main aim of this article is to analyse the factors determining the gender gaps in management jobs (participation and wage) in a sample of northern, eastern and western European countries.

When we estimate the presence of female managers in hospitality, without and with establishment effects, we find that in every country, apart from France, the Netherlands, Poland and Sweden (with a female presence in management positions that is balanced or overrepresented), it is more difficult for female than for male workers employed in the same local unit to be promoted to management positions. This result suggests evidence of the presence of promotion barriers for women within hospitality firms, that is, a “glass ceiling”. In this sense, the legal framework of the European Union serves as a fundamental element in the effort to eliminate the gender gap, identify potential gender bias, and contribute to the reduction of vertical segregation, also known as the glass ceiling, through actions of family-friendly, mentoring and others business policies necessary to recruit, retain and promote talented

women for managerial positions (Leythienne & Pérez-Julian, 2022).

Considering the results for the estimation of the adjusted gender wage gap, we find that statistically significant gender differences in wages exist in nine out of the fourteen countries. More specifically the estimated gender wage gap in those countries ranges from 5.1 % to 23.8 %. The countries which show the highest gender wage gap in hospitality management are the Netherlands (23.8 %), France (19.2 %) and Croatia (15.4 %), while the lowest value is found in Norway, where the wage of female managers is 5.1 % lower than that of male managers with similar individual and job characteristics within the same establishment. Moreover, the significant gender wage gap observed in the Netherlands, at 23.8 %, contrasts sharply with its progressive reputation and overall strong performance in global gender equality rankings, such as the World Economic Forum's Global Gender Gap Index. This unexpected result suggests that sector-specific dynamics in hospitality management diverge from national trends. Potential factors include the concentration of women in lower-paying establishments, differences in wage-setting practices, and structural barriers within hospitality that perpetuate disparities. This finding underscores the importance of industry-specific analyses, as national-level surveys may overlook critical nuances at the sectoral level.

The gender pay gap within a company, otherwise known as the 'intra-company' pay gap, can be reduced through the implementation of centralised pay bargaining or, at the national level, through the enactment of anti-discrimination policies (Henning & Stadler, 2023). Norway is a benchmark case. Hoen et al. (2024) show that Norway has become a signatory to several international agreements (International Labour Organization and the United Nations), which affirm the right to equal pay for work of equal value. In accordance with Norway's Equality and Anti-Discrimination Act (2018), this right is to be observed regardless of whether the work in question is of a different nature or subject to the stipulations of disparate collective agreements. Part of the Act's requirements is the publication of an annual gender equality statement by applicable employers. Public and private employers with more than 50 employees are required to comply, and private sector organisations with 20–49 employees may also report if asked to do so by employee or union representatives. The political and social obligation to report on gender pay gaps creates public pressure to improve gender equality (De Castro Romero et al., 2023).

The results from the Oaxaca-Blinder decomposition indicate that in most cases, the bulk of the gender wage gap is mainly due to the unexplained component and just a minor part is explained by differences in the endowment of individual, job and establishment characteristics. In seven countries, the explained component is positive, indicating that female managers have average characteristics (individual, job and establishment) which are more associated with lower wages. Turning to the explanatory factors inside the explained part, those with a relevant presence are mainly age and level of education (in line with the results of (Cotilla & Campos-Soria, 2021) and the firm size (Muñoz-Bullón, 2009). In accordance with the findings of Segovia-Pérez et al. (2019), our results indicate that the educational level of women does not constitute an obstacle to their promotion to senior management positions within hospitality. The range in the size of firms implies substantial differences in the human resources policies, social dialogue and legislative regimes within which they operate (Baum, 2013). For example, "big chains have significant HRD resources, including in-house and on the job-training whereas SMEs lack the capacity to do so and rely more on the Vocational Education and Training (VET) system to meet their training requirements" (Baum, 2013:7).

The results from the Juhn-Murphy-Pierce decomposition imply that in most cases, the establishment component explains a relatively large part of the raw gender wage gap. Furthermore, the results suggest that female managers are segregated in low-paying hospitality establishments in European countries, in line with the findings for intra-company pay gaps in general (Henning & Stadler, 2023). In this sense, a qualitative analysis could explore whether women attain leadership positions

mainly in low-paying companies that men tend to avoid, providing valuable insights to address the problem. However, also found evidence for the possible presence of gender-based wage discrimination within establishments in seven countries: Germany, Denmark, France, the Netherlands, Norway, Poland and Slovakia. The variation in gender gaps across Europe may reflect cross-country differences in policies that influence the capacity of women to reconcile work and family responsibilities (Baum, 2013).

Lastly, our work has several methodological limitations that should be acknowledged. First, the Mincer wage equations rely on assumptions about the linear relationship between wages, education, and experience, which may not fully capture the complexity of wage determination processes in the tourism sector. Second, the Oaxaca-Blinder decomposition assumes that the wage structure of one group serves as the non-discriminatory benchmark, a premise that may not hold if both groups face discrimination or if unobserved factors influence wages. Third, the Juhn-Murphy-Pierce decomposition, is sensitive to the choice of reference group and may not account for unobserved heterogeneity or selection bias. These limitations are further compounded by the drawbacks of our database, which lacks key wage determinants such as marital status, number of children, and parental leave, potentially introducing omitted variable bias. Moreover, the absence of a longitudinal design prevents us from properly accounting for time-invariant individual and firm characteristics through a panel data approach, limiting our ability to capture long-term wage dynamics. These limitations highlight the need for cautious interpretation of the results and suggest that future research could benefit from incorporating qualitative or mixed methods approaches to provide a more comprehensive understanding of the gender wage gap.

#### CRedit authorship contribution statement

**Lidia de Castro Romero:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Investigation, Conceptualization. **Víctor Martín Barroso:** Writing – original draft, Validation, Software, Resources, Methodology, Formal analysis, Conceptualization. **Rosa Santero-Sánchez:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

#### Declaration of competing interest

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

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