Distr.: General
04 April 2023

English

Economic Commission for Europe

Conference of European Statisticians

Group of Experts on Gender Statistics
Geneva, Switzerland, 10-12 May 2023
Item A of the provisional agenda
Gender pay gap and income inequality

Gender Pay Gaps in the European Union

Note by EUROSTAT*

Abstract

The gender pay gap is a simple indicator, which is widely used to monitor gender inequalities in earnings. In unadjusted form, it measures the differences between the average earnings of men versus women. However, this indicator measures a concept broader than mere discrimination in the sense of "equal pay for work of equal value". Eurostat developed a methodology to decompose the gender pay gap into the part, which is caused by different characteristics of male and female employees, and the other component that stems from differences in financial returns for the same characteristics.

After deducting the first part caused by men and women specializing in different jobs ('segregation'), we obtain the "unexplained gender pay gap", which measures the remaining gap after adjusting for the average characteristics of male and female employees. With this decomposition, we could better identify the drivers of the gap, which would help policy makers addressing the reasons behind gender differences in pay.

We also studied how the Gender Pay Gap adjustment affects the ranking of EU countries. Finally, we extended the analysis to other segregation effects in the labour market, in terms of employment rate and full/part time work, and propose to capture all of them through another complementary and synthetic indicator: the Gender Overall Earnings Gap.

*Drafted by Marina Pérez Julián and Denis Leythienne

I. Introduction

1. The principle of 'equal pay for male and female workers for equal work or work of equal value' has been enshrined in the European treaties since 1957. It is currently laid down in Article 157 of the Treaty on the Functioning of the European Union. This well-stablished legal framework is a prerequisite for achieving the broader objective of gender equality in the European Union (EU).
2. The European Commission has confirmed that 'reducing the gender pay, earnings and pension gaps and thus fighting poverty among women' is among its top priorities. Hence, it has undertaken a number of initiatives in this field as a part of the Gender equality strategy 2020–2025.
3. The right of women and men to equal pay for work of equal value belongs to the European Pillar of Social Rights, which was endorsed at the Social Summit for Fair Jobs and Growth, Gothenburg, Sweden, November 2017. At the Porto Social Summit of May 2021, EU leaders reaffirmed their commitment to the implementation of the European Pillar of Social Rights according to the action plan set up by the Commission in March 2021. The unadjusted gender pay gap ("unadjusted GPG" for short) belongs to the scoreboard of indicators used for the monitoring of the European Pillar of Social Rights' action plan.
4. It is defined as the relative difference between the average earnings of women and men and is widely used as the key indicator to monitor progress in this area.

$$\frac{Mean\ (gross) hourly\ earnings\ of\ men - Mean\ (gross) hourly\ earnings\ of\ women}{Mean\ (gross)\ hourly\ earnings\ of\ men}$$

5. The unadjusted GPG is usually viewed as a tool to measure possible gender discrimination on the labour market, 'unequal pay for equal work, among male and female workers', although this is just one of the possible causes of it.
6. Indeed, it combines two possible differences: (1) possible differences in the average characteristics of men and women in the labour market (e.g. different occupations, economic activities, average age, etc.) and (2) gender gaps for the same average characteristics, that is, differences in the returns for male and female employees with same profiles.
7. In countries with a lower employment rate of women, the unadjusted gender pay gaps may partly come from segregation effects, including 'self-selection': women who decide to engage in the labour market are those with higher education levels or skills levels. In such cases, the unadjusted GPG may be null or even turn negative just because the subpopulations of male and female employees have different profiles.
8. To analyse the GPG, Eurostat has used microdata from the Structure of Earnings Survey (SES) 2018 for all Member States and EFTA countries. These microdata cover two broad areas: the earnings of individual employees and the observed characteristics of the same individual employees. Among the observed characteristics there are characteristics of individual employees (age, education and job experience …), the types of job they do and also the types of companies or enterprises in which they are employed.

9. Eurostat used the same scope and coverage as for the unadjusted GPG:

   - economic activity NACE Revision 2 sections B to S except section O [1];

   - enterprises with 10 employees or more;

   - employees with no restrictions for age and hours worked and including full- and part-timers.

10. Then, using these microdata from SES, Eurostat applied the Blinder-Oaxaca methodology to single out the contribution of each observed characteristic to the unadjusted GPG.

11. In a first edition of this study, the analysis was limited to the part of the unadjusted GPG explained by the different characteristics and was based on the Structure of Earnings Survey 2014 (SES 2014) data (link to the publication on the Eurostat website).

12. In the new edition, based on the latest Structure of Earnings Survey data (SES 2018), we also examine the second category of GPG determinants, namely differences in the financial returns received by men versus women with the same average characteristics. We also included the major socio-economic regions at the first level of the 'Nomenclature of territorial units for statistics' as an explanatory variable, improved the methodology and have focused on other segregation effects that cannot be addressed with the Gender Pay Gap, such as the lower number of hours worked between men and women and the gender employment gap between them.

II. Methodology

13. In the first stage of Eurostat methodology, we ran a regression to estimate the earnings equations for men (M) and women (W) separately, with explanatory variables, as detailed in the following equations:

$$\ln y_i^M = \beta_0^M + \sum_{k=1}^{K} x_{ki}^M \beta_k^M + \varepsilon_i^M$$

$$\ln y_i^W = \beta_0^W + \sum_{k=1}^{K} x_{ki}^W \beta_k^W + \varepsilon_i^W$$

14. where:

   $ln\, y_i$ represents the natural log of hourly earnings for observation i;

   x_{ki}, from k=1 to k=K, are explanatory variables covering the observed personal, job and enterprise characteristics that may impact on the log hourly earnings of individual i;

   β_0 is a constant and β_k, from k=1 to k=K, are the parameters for the corresponding variables covering the observed characteristics;

   ε_i is a disturbance term for observation i, independent from each other and normally distributed with average zero and same variance (i.e "white noise").

([1]) The unadjusted GPG covers all economic activities except agriculture, forestry and fishing (section A), public administration, defence and compulsory social security (section O), and activities of households as employers, undifferentiated goods and services producing activities of households for own use (section T). OJ L 393, 30.12.2006, p. 1–39.

Table 1 - Explanatory variables

Age	Years / years²
Education	Level of education according to the ISCED classification* in the four groups: Group 1 (ISCED 0+1+2), Group 2 (ISCED 3+4), Group 3 (ISCED 5+6), Group 4 (ISCED 7+8)
Occupation	Occupation according to the ISCO-08** classification at 2-digit level. Apprentices and employees working in occupations classified under the International Standard Classification of Occupations (ISCO); ISCO 0 (Armed Forces) and ISCO 6 (Skilled Agricultural, Forestry and Fishery Workers) have been excluded from the sample.
Job experience in the current enterprise	Years / $years^2$
Employment contract	Indefinite / temporary duration
Working time	Full time or part-time
Enterprise characteristics	
Principal economic activity	Economic activity according to the NACE Revision 2 classification*** at section level
Enterprise size	Enterprise with 10–49 employees, 50–249 employees, 250–499 employees, 500–999 employees or 1 000+ employees
Enterprise control	Public or private
Geographical location of the enterprise	NUTS 1 region where the enterprise is located

* ISCED: International Standard Classification of Education
** ISCO-08: International Standard Classification of Occupations
*** NACE Revision 2: Statistical classification of economic activities in the European Community

15. After fitting the two regression models for men and women, a decomposition analysis of the difference between the means of log hourly earnings of men and women is carried out:

$$\Delta = \overline{\ln y}^M - \overline{\ln y}^W$$

16. The differences between the logarithms of the earnings of men and women can thus be decomposed as follows:

$$\overline{\ln y}^M - \overline{\ln y}^W = \underbrace{\sum_{k=1}^{K} \hat{\beta}_k^M \left(\bar{x}_k^M - \bar{x}_k^W\right)}_{\text{Different characteristics (E)}} + \underbrace{\sum_{k=1}^{K} \bar{x}_k^W \left(\hat{\beta}_k^M - \hat{\beta}_k^W\right)}_{\text{Different financial returns (U1)}} + \underbrace{\left(\hat{\beta}_0^M - \hat{\beta}_0^W\right)}_{\text{Residual (U2)}}$$

17. Where k=1 to k=K refers to the corresponding variables covering the observed characteristics

18. In a latter step, an exact formula is applied to do the derivation of the adjusted GPG (based on average earnings) from the results of the Mincer equation (expressed in logarithms).

19. The adjustment of the Gender Pay Gap (GPG adjusted) can be calculated as:

$$\text{GPG adjustment} = [\text{Exp}(\text{E}) - 1](1 - \text{GPG not adjusted}) \quad \text{(I)}$$

20. This equation (I) may be applied to E as a whole or to each component: $\hat{\beta}_k^M(\bar{x}_k^M - \bar{x}_k^W)$ separately. This way, it is possible to measure how differences in the average profile of male versus female employees contribute to the gender pay gap, for each variable (age, occupation, education, etc.).

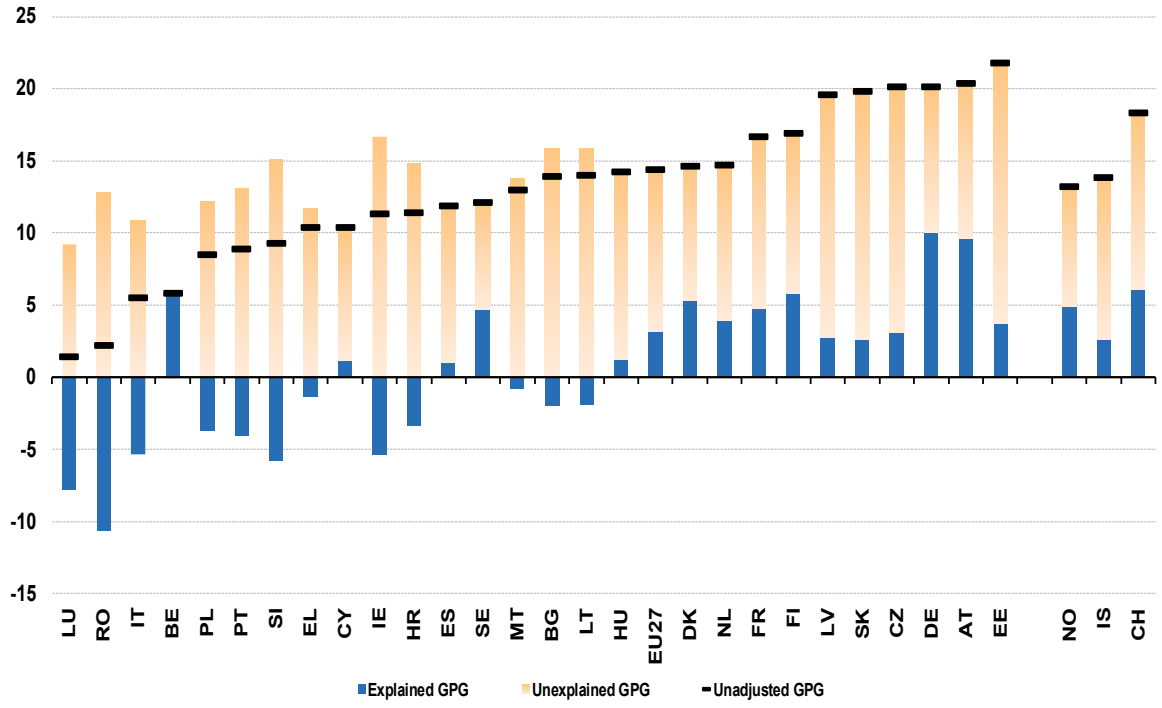
III. Results of the decomposition

21. At the EU level, the explained part represents 3.1 percentage points. This means that women are expected to earn 3.1 % less than men, according to their average characteristics on the labour market (which are less remunerative than those of males). This rather limited adjustment is due to the fact that countries record positive or negative adjustments that partly cancel each other out at the EU level.

22. As a result, the adjusted (or unexplained) GPG is 11.2 % against 14.4 % for the unadjusted GPG, that is, women still earn 11.2 % less than men, on average, after correcting for their different average characteristics.

23. For some countries, the explained GPG constitutes more than half of the unadjusted GPG (see Figure 1). While, at the other extreme, some record a negative explained GPG, which means that female employees present average characteristics on the labour market that are more remunerative than those of men. This is usually happening for countries with "self-selection" effect, where women with lower education and skills refrain from engaging in the labour market, especially when there are few job opportunities.

Figure 1: Gender pay gap adjustments for characteristics, 2018



24. When the explained GPG is negative, this results in the unexplained GPG being higher than the unadjusted GPG. Consequently (see Figure 2a and Figure 2b), the ranking of countries based on the size of the unexplained GPG differs greatly from the one based on the size of the unadjusted GPG. This confirms that the unadjusted GPG on its own is not suitable for ranking countries according to possible gender inequalities in the labour market.

Figure 2a: Unadjusted gender pay gap (%), 2018

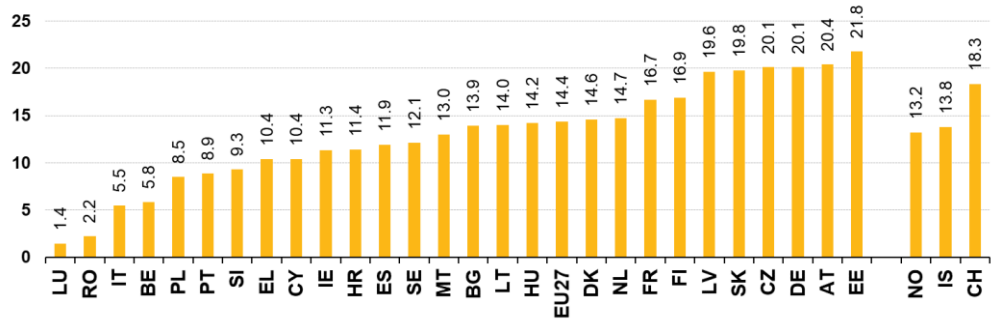
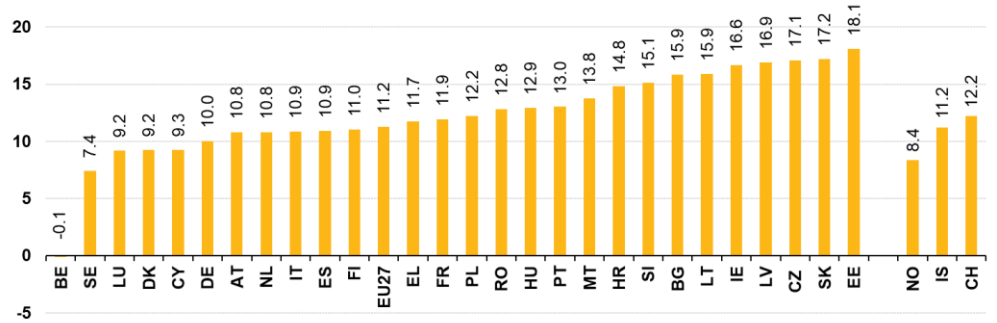
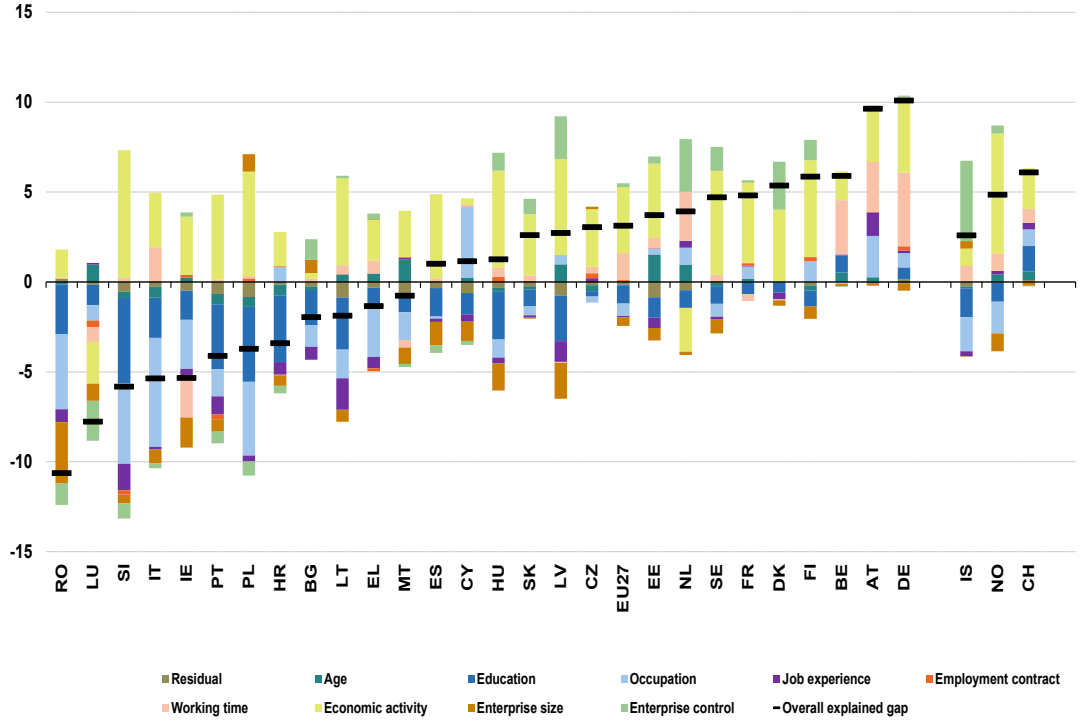


Figure 2b: Unexplained gender pay gap (%), 2018



25. The decomposition also enabled to single out the main drivers behind the explained GPG, in particular three: economic activity, occupation and education. However, these factors have different explanatory effects (see Figure 3).

Figure 3: Decomposition of the explained gender pay gap, 2018



26. The explained GPG for economic activity is positive for most countries, as men tend to work in better-paid economic activities than women (sectoral segregation). For example, women tend to work in education and health domains whereas men tend to work in the finance and IT sectors.

27. A mixed picture is observed for occupation: in the countries with a positive gap, men work on average in better-paid occupations than women, and vice versa for those with a negative gap. Occupational gender segregation thus has a more uneven effect across countries than sectoral gender segregation.

28. As regards education, the explained GPG is negative in the vast majority of countries. This means that employed women have, on average, a higher level of education than men do in most EU labour markets.

29. The level of detail of SES data could be a limit in the analysis. If we had more detailed data, we could better identify segregation. For example, for the same ISCO level we may have detailed occupations where there is a clear concentration of men or women that is not visible without more granularity.

30. All the comparisons in the coefficients of the regression are always done with a category of reference, so they should be interpreted as relative gaps in that category. For occupations, we took ISCO 23 (teaching professionals) as a reference category. This implies that for example, a difference between the returns of men and women on occupation ISCO 12 (corporate managers) refers to the difference between (1) the earnings gap between male managers and male teachers and (2) the earnings gap between female managers and female teachers.

IV. Analysis of the financial returns

31. We also analysed the unexplained part of the difference in the logarithm of earnings obtained from the Mincer equation (U1), which is written as follows:

$$U1 = \sum_{k=1}^{K} \bar{x}_k^W (\hat{\beta}_k^M - \hat{\beta}_k^W)$$

where k=1 to k=K refers to the corresponding variables covering the observed characteristics

32. To detect whether the returns are significantly higher for men, we computed the differences between the upper bound (for women) and the lower bound (for men) of the confidence intervals at 10 %.

33. Examining the rows, we saw that returns are significantly higher for men than for women in a majority of countries as regards age, and in several countries for experience. This could point to the impact of career breaks, which are more frequent among women than among men. Should we have information about this in the data it would be very likely explaining part of the gap and be included as an explanatory variable in the model.

34. It is worth noting too that the financial penalties for working part-time rather than full-time are not larger for women than for men, in any EU Member State or EFTA state. Likewise, working under a temporary contract does not penalise women more than men, except in two countries, Romania and Sweden.

35. Similarly, to detect if the returns are significantly higher for women, we computed the differences between the upper bound (for men) and the lower bound (for women) of the confidence intervals at 10 %.

36. Many countries record lower returns on age[2] or job experience[2] for men than for women. This is expected, as women on average receive higher returns at the end of their careers (and lower returns at the beginning) compared with men (see the publication on Wage determinants in the EU).[2]

37. Working part-time is generally more penalising for men than for women, as was observed in Bulgaria, Czechia, Denmark, Germany, Estonia, Greece, Italy, Lithuania, Hungary, Austria, Portugal and Slovenia (plus Norway and Switzerland).

38. This part of the analysis of the financial returns has to be taken with certain caution. SES data do not cover all explanatory variables of gross earnings. If we had information about household composition, care responsibilities for children or the elderly the coefficients associated with the explanatory factors of the gap could significantly change. Secondly, the level of detail of SES data could be a limit in the analysis. If we had more detailed data, we could better identify segregation. For example, for the same ISCO position, we may have detailed occupations where there is a clear concentration of men or women that is not visible at this level of aggregation (2 digits).

39. Finally, all the comparisons in the coefficients of the regression are always done with a category of reference, so they should be interpreted as relative gaps in that category. For occupations, we took ISCO 23 (teaching professionals) as a reference category. This implies that for example, a difference between the returns of men and women on occupation

[2] Wage determinants in the EU - 2021 edition (europa.eu)

ISCO 12 (corporate managers) refers to the difference between (1) the earnings gap between male managers and male teachers and (2) the earnings gap between female managers and female teachers.

V. Other segregation effects

40. The decomposition of the unadjusted GPG does not capture all segregation effects between men and women in the labour market.

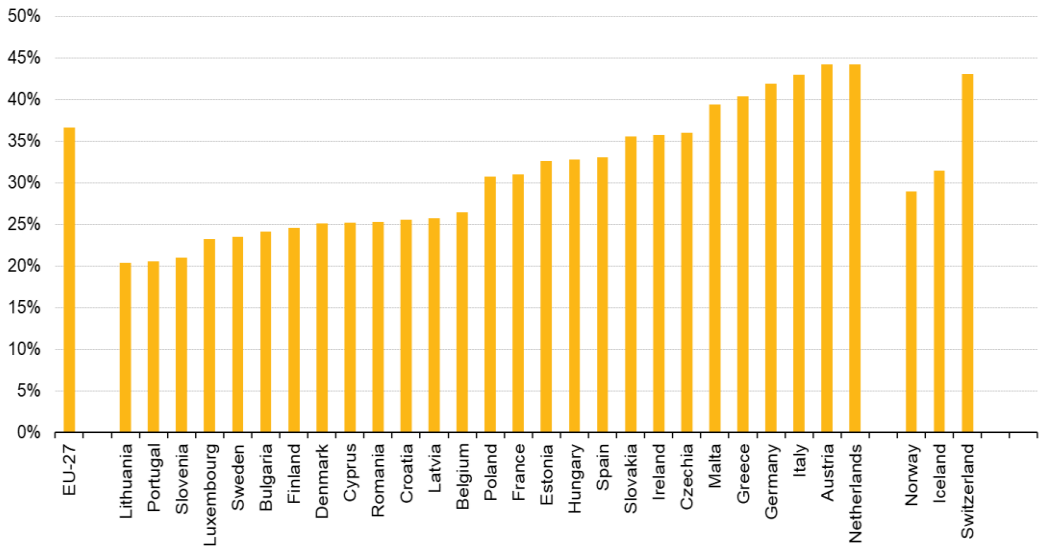
41. For instance, women work, on average, fewer hours per month than men in the labour market. In 2018, they were paid for, on average, 12 % fewer hours per month than men. The gap between the number of hours paid to men and the number of hours paid to women varies substantially across EU Member States. At one end of the scale, in the Netherlands, women were paid for 27 % fewer hours per month than men were. At the other end of the scale, this difference was only 1 % in Bulgaria and Romania, and 2 % in Croatia.

42. Moreover, a lower proportion of women than men participate in the labour market. In 2018, at the EU level, the employment rate of men was 15 percentage points higher than that of women. Across the Member States, the difference between the employment rate of men and women varied from 2 percentage points in Lithuania to 30 percentage points in Greece.

43. Eurostat developed a synthetic indicator, the 'gender overall earnings gap', which measures the impact of three combined factors on the difference in the average earnings of all women of working age – whether employed or not employed – compared to men. Those factors are: the average hourly earnings, the monthly average of the number of hours paid and the employment rate for men and women.

44. In 2018, the gender overall earnings gap was 37 % in the EU-27. This means that the average earnings of all women of working age, whether they were employed or not, were 37 % lower than the corresponding average earnings of men. (see Figure 4)

Figure 4: Gender overall earnings gap, 2018



Source: Eurostat (online data code: teqges01)

VI. Conclusions

45. ‘Unequal pay for male and female workers for equal work’ is just one of the possible causes of the unadjusted gender pay gap, and understanding all its causes is therefore very important.

46. There are clear policy and statistical reasons to decompose the unadjusted GPG into the explained and unexplained parts.

47. The unadjusted GPG indicator, together with the explained gap and its explanatory factors, allow for a better identification and interpretation of some of the causes of the gender pay gap. Consequently, policy actions can be better targeted.

48. However, there are other segregation effects that do not affect hourly earnings, therefore the decomposition of the unadjusted GPG still does not capture all segregation effects between men and women in the labour market In particular, women work on average fewer hours per month than men and this is not captured by the unadjusted GPG which is calculated on an hourly basis. Moreover, a lower proportion of women than men participate in the labour market.

49. We have measured the combined effects of the gender gap in hourly earnings (i.e. the unadjusted GPG), in monthly hours paid and in employment rates. This was done through the so-called ‘gender overall earnings gap’ which estimates the difference between the expected earnings of all women versus all men of working age. We see this indicator as a useful complement of the GPG. On the policy side, it can also contribute to a better understanding of the main drivers behind the gender pension gap.