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##### Communicating gender statistics

## Communicating on gender differences in earnings: beyond the gender pay gap

Note by Eurostat (European Commission) \*

### *Abstract*

Gender equality is a fundamental right and one of the founding values of the EU (Article 2 of the Treaty on European Union and Article 23 of the Charter of Fundamental Rights of the European Union). In order to identify inequalities between women and men, gender statistics are an indispensable tool in gender policy monitoring development and its implementation at global, European and national levels. A key priority of gender policies at both EU and national levels is to reduce the imbalances in earnings between men and women. One of the classical indicators to monitor this imbalance is the unadjusted gender pay gap: the difference between the average gross hourly earnings of men and women expressed as a percentage of the average gross hourly earnings of men. It presently takes the data from the structure of earnings dataset corresponding to enterprises with 10 or more employees.

The unadjusted gender pay gap (GPG) is simple to understand but is often mistakenly interpreted as an indicator for discrimination (unequal pay for equal work) although many

\*Prepared by Mr. Denis Leythienne, Mr. Piotr Ronkowski, Mr. Javier Alcantara Ortega

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factors play a role such as the different proportions of women versus men working in certain sectors or occupations ('segregation'). Moreover, since the GPG is based on the hourly earnings of employed women, it fails capturing the impact of work/life trade-offs such as women working fewer hours per month than men or being more often left out of the labour market.

To measure the impact of differences in the average characteristics of male and female employees on their average earnings, Eurostat has used microdata from the Structure of Earnings Survey 2014. The document will explain how the Oaxaca decomposition method was used to isolate the contribution of each observed factor to the unadjusted gender pay gap. It will be shown that NACE/ISCO segregation effects are important and differ across EU countries. The document will also illustrate how the ranking of countries is substantially affected by adjusting the Gender Pay Gap.

Besides decomposing the Gender Pay Gap, Eurostat has developed a synthetic indicator that broadens the analysis to the whole population of men and women of working age. This so-called 'overall gender earnings gap' also accounts for the impact of part-time work, as well as the lower employment rates of women, on their expected earnings. The document will explain how this indicator was calculated and compare the resulting ranking of EU countries with those based on the adjusted and unadjusted gender pay gaps. Finally, the paper will make proposals on how to communicate the newly developed indicators to the general public and policymakers.

## **I. Introduction**

### **A. Policy background**

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 (EU) and in Directive 2006/54/EC on the implementation of the principle of equal opportunities and equal treatment of men and women in matters of employment and occupation. This legal framework makes reducing the gender pay gap (GPG) one of the key priorities of EU gender policy. The European Commission confirmed 'reducing the gender pay, earnings and pension gaps and thus fighting poverty among women' as one of the key areas in its document 'Strategic engagement for gender equality 2016-2019'.
2. The right of women and men to equal pay for work of equal value was also reiterated in the European Pillar of Social Rights that was presented by the European Commission and proclaimed by the EU leaders at the Social Summit in Gothenburg in November 2017. The unadjusted gender pay gap (unadjusted GPG) indicator has taken great importance by its inclusion in the social scoreboard of the European Pillar of Social Rights and is widely used in this policy context as the key indicator to monitor and evaluate progress.

### **B. The unadjusted gender pay gap**

3. The unadjusted GPG indicator is published annually by Eurostat in cooperation with the national statistical institutes of the EU Member States and EFTA (European Free Trade Association)

countries. It is based on the data from the Structure of Earnings Survey (SES), which is released every four years. The unadjusted GPG is calculated on the basis of the SES conducted in 2002, 2006, 2010 and 2014, and on the basis of other national sources for the years between the SES years. The scope and coverage of the unadjusted GPG are as follows: (i) economic activity sections B to S without O defined by NACE Rev. 2 (Statistical classification of economic activities in the European Community), (ii) only enterprises with 10 employees or more, (iii) no restrictions for age and hours worked, and (iv) both full-time and part-time employees are included. The definition of the unadjusted GPG, expressed as a percentage, is as follows:

$$\frac{\text{Mean (gross) hourly earnings of men} - \text{Mean (gross) hourly earnings of women}}{\text{Mean (gross) hourly earnings of men}^1}$$

4. As an unadjusted indicator, the GPG gives an overall picture of the differences between men and women in pay. It measures a concept that is broader than the concept of 'equal pay for equal work or work of equal value'. Indeed, a part of the difference in earnings of men and women can be explained by differences in the average characteristics of male and female employees (Eurofound, 2010). The differences in the average characteristics can result from many factors, including the concentration of one sex in certain economic activities or the concentration of one sex in certain occupations. The first phenomenon is called 'sectoral gender segregation' and the second one is called 'occupational gender segregation'.
5. Sectoral gender segregation may explain part of the difference in earnings of men and women, when one sex tends to be concentrated in low-paying economic sectors and the other sex tends to be concentrated in high-paying sectors.
6. Similarly, occupational gender segregation may explain the difference in earnings of men and women, when one sex tends to be concentrated in low-paying occupations and the other sex tends to be concentrated in high-paying occupations. Occupational gender segregation may also be partially caused by men being more often promoted to supervisory and management positions than women, due to discrimination or other factors such as career breaks or reconciliation between work and family life. The term 'glass ceiling' is used as a metaphor to describe an invisible barrier that keeps women from rising beyond a certain level in an enterprise's hierarchy.
7. The unadjusted GPG is therefore a rather complex indicator. Its measurement covers both possible discrimination between men and women through 'unequal pay for equal work' and the differences in the average characteristics of male and female employees. To separate out the different factors at work in the gender pay gap, Eurostat worked on a methodology to 'decompose' the unadjusted GPG.

## II. Data source and methodology

### C. Data source

8. For the decomposition of the unadjusted GPG, Eurostat has used microdata from the Structure of Earnings Survey (SES) from 2014. The microdata cover two broad areas: the earnings of individual employees and the characteristics observed at the level of both employees and employers. Those include: (i) the personal characteristics of individual employees such as age, education and job

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<sup>1</sup> The term 'mean hourly earnings' instead of 'mean gross hourly earnings' will be used further in the document.

experience, (ii) the types of job done by individual employees, and (iii) the types of companies or enterprises that individual employees work for.

## D. Methodology

9. Eurostat applied the Oaxaca (1973) decomposition, also called the Blinder-Oaxaca decomposition, to decompose the unadjusted GPG (Eurostat, 2018). This method is carried out in two stages: a regression analysis and a decomposition analysis of the structure of earnings. In the first stage, a regression analysis is conducted to estimate the earnings equations separately for men (M) and women (W) as detailed in the following equations:

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

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

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  $i$ ;

$\beta_0$  is a constant and  $\beta_k$ , from  $k=1$  to  $k=K$ , are the parameters for the corresponding variables covering the observed characteristics;

$u_i$  is a disturbance term for observation  $i$ , independent from each other and normally distributed.

10. The regression analysis includes the SES variables as explanatory variables covering the observed personal, job and enterprise characteristics. More information on the SES variables can be found in the SES implementing arrangements (Eurostat, 2014).
11. In Eurostat's model, the regression equations relate the log hourly earnings to age and age squared, education, occupation, job experience (in the current enterprise) and job experience squared, employment contract, working time, principal economic activity, enterprise size and enterprise control. The explanatory variables covering education, occupation, employment contract, working time, principal economic activity, enterprise size and enterprise control are categorical.
12. The final decomposition equation for the difference between the means of log hourly earnings of men and women is as follows:

$$\overline{\ln y^M} - \overline{\ln y^W} = (\hat{\beta}_0^M - \hat{\beta}_0^W) + \sum_{k=1}^K \bar{x}_k^W (\hat{\beta}_k^M - \hat{\beta}_k^W) + \sum_{k=1}^K \hat{\beta}_k^M (\bar{x}_k^M - \bar{x}_k^W)$$

Overall Difference ( $\Delta$ ) =                      Unexplained ( $U$ )                      +                      Explained ( $E$ )

13. The part  $U$  shows what a female worker with average characteristics would have earned if she had been treated in the same way as a typical male worker, and compares that with what she actually earns (Bazen, 2011). This represents the 'unexplained' part of the difference in earnings between men and women.
14. The part  $E$  measures the part of  $\Delta$  that is due to differences in the average characteristics of men and women weighted by the male coefficients. This represents the 'explained' part of the difference in earnings between men and women.
15. Each of the components,  $E$  and  $U$ , can be expressed as a proportion of the overall difference  $\Delta$ . Furthermore, each subcomponent of the explained part  $E$ , i.e.  $E_k = \hat{\beta}_k^M (\bar{x}_k^M - \bar{x}_k^W)$ , can be presented as a proportion of the overall difference  $\Delta$  in order to estimate the magnitude of the effects of the

specific personal, job and enterprise characteristics in explaining the difference  $\Delta$ . These effects will be called ‘explanatory factors’.

16. Finally, the explained and unexplained GPGs can be calculated by applying the decomposition results to the unadjusted GPG as follows:

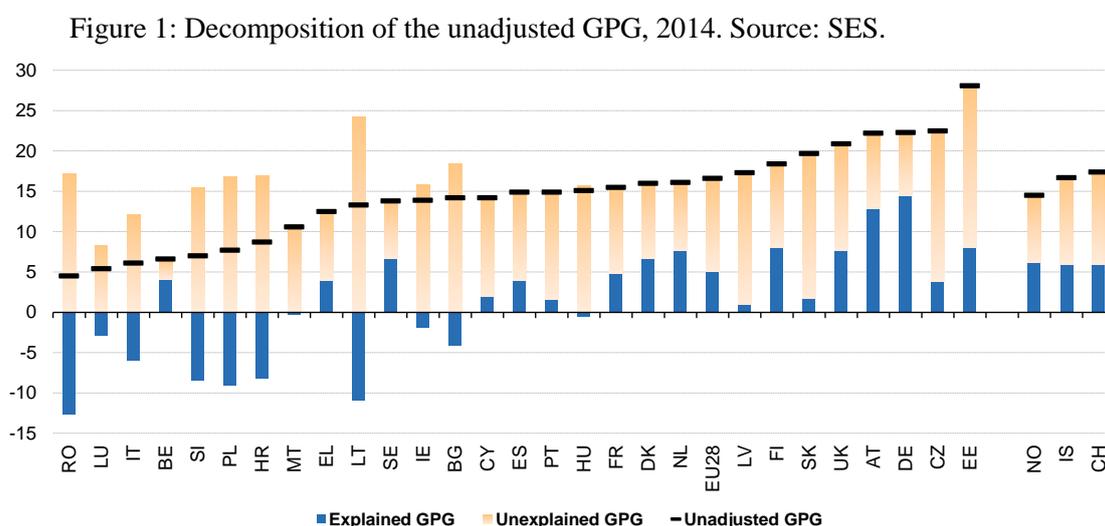
$$GPG_{expl} = GPG_{unadj} * \frac{E}{\Delta} \quad \text{and} \quad GPG_{unexpl} = GPG_{unadj} * \frac{U}{\Delta}$$

We can also calculate the subcomponents of the explained GPG by applying the decomposition results ( $\frac{E_k}{\Delta}$ ) to the unadjusted GPG.

### III. Results and analysis

#### E. Decomposition of the unadjusted gender pay gap

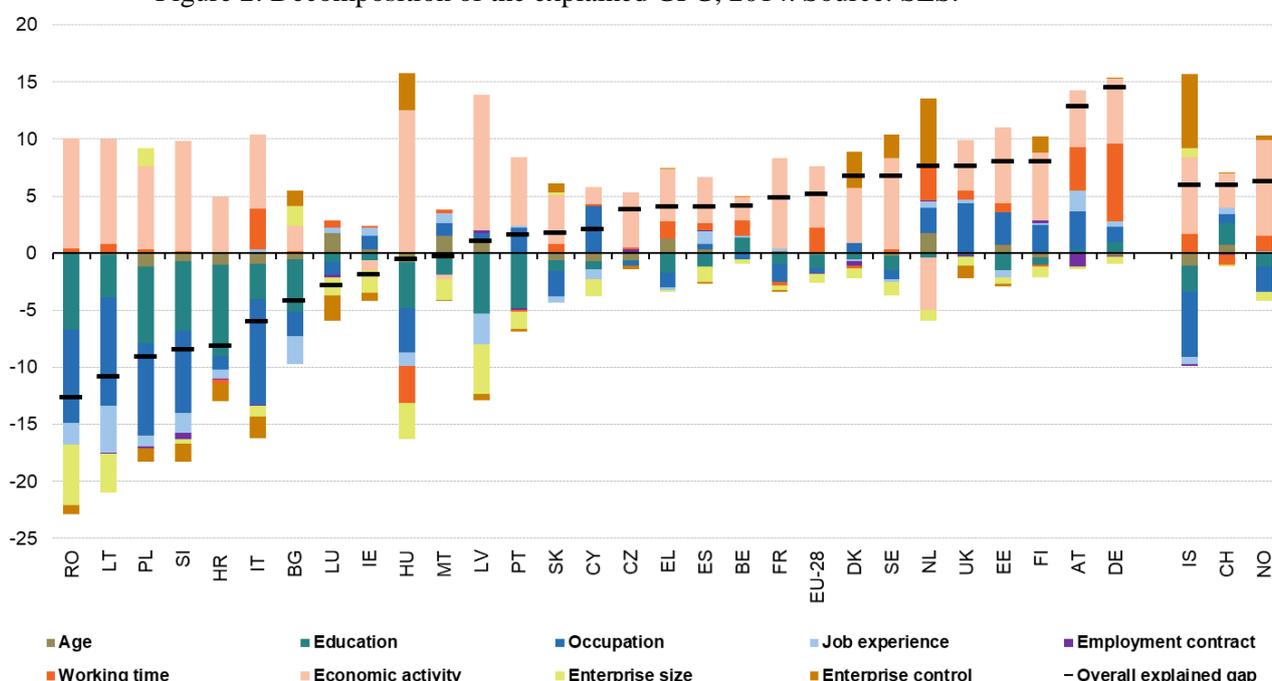
17. Figure 1 presents the results of a decomposition of the unadjusted GPG for 2014 into the explained GPG and the unexplained GPG.



18. For the EU as a whole, the estimated unexplained GPG is 11.5 % against 16.6 % for the unadjusted GPG. This means that women still earn 11.5 % less than men after correcting for the different average characteristics of men and women.
19. The unadjusted GPG varies from 4.5 % in Romania to 28.1 % in Estonia, whereas the unexplained GPG varies from 2.5 % in Belgium to 24.2 % in Lithuania.
20. Turning to the explained part, this component ranges from -12.7 % in Romania to 14.5 % in Germany. A negative gap of 12.7 % in Romania means that women are expected to earn 12.7 % more than men according to their average characteristics on the labour market, which are more favourable than for men.
21. The overall explained gap is negative in 11 Member States: Bulgaria, Ireland, Croatia, Italy, Lithuania, Luxembourg, Hungary, Malta, Poland, Romania and Slovenia, and positive in 17 Member States. For the countries with a negative explained gap, the unexplained GPG is higher than the unadjusted figure.

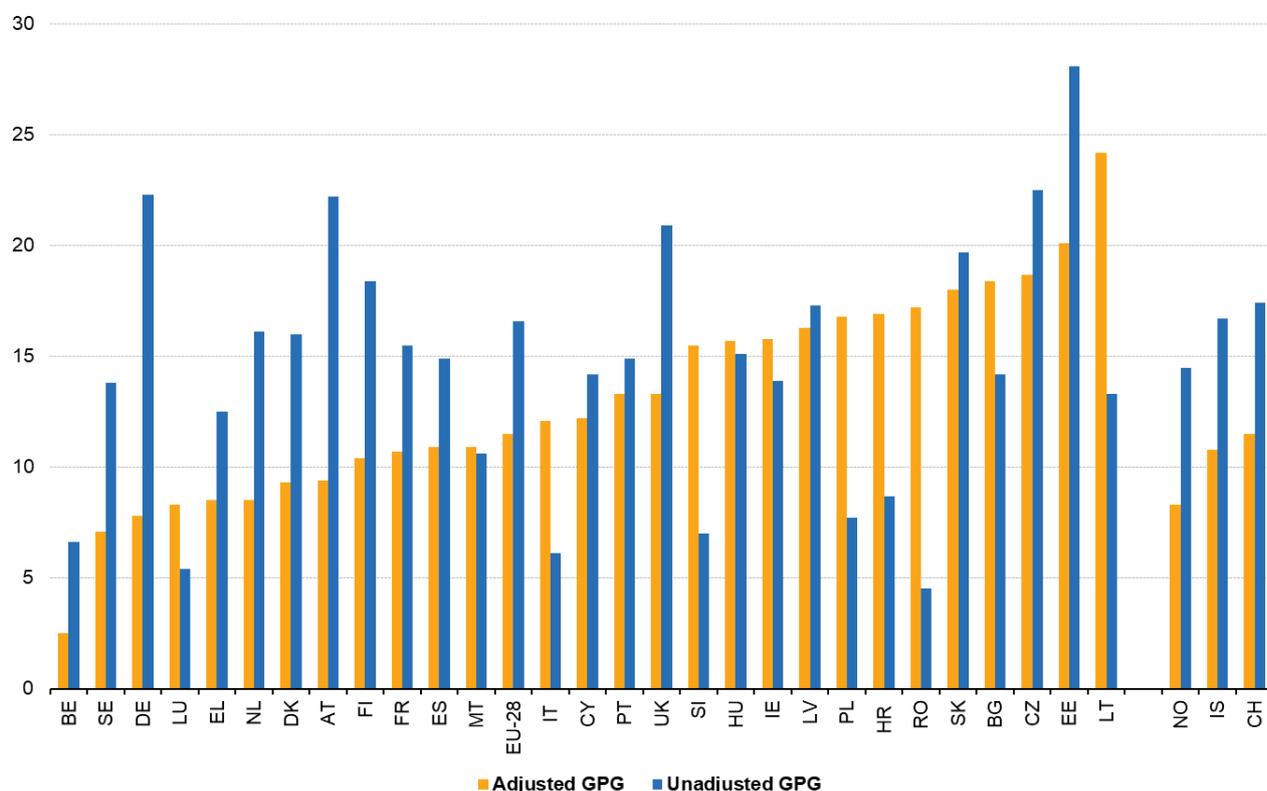
22. However, this does not mean that the unexplained GPG measures discrimination through ‘unequal pay for equal work’. Indeed, SES data miss some important variables such as the total working experience, which, if taken into account, might change the unexplained gap. The unexplained GPG should rather be viewed as a ‘residual gap’ i.e. the part of the unadjusted GPG that remains after correcting for different characteristics of men and women in the labour market as observed in SES data.
23. Having presented the overall explained and unexplained GPGs, it is interesting to look closer at the explanatory factors. As shown in Figure 2, the EU explained GPG is strongly driven by economic activity (5.4 % gap) and working time (2.1 % gap), whereas a small positive value (0.1 %) is recorded for job experience (tenure). The positive explained gaps for those characteristics are partially offset by the negative gaps recorded for education (-1.2 %), enterprise size (-0.8 %) occupation (-0.4 %), age and employment contract (both -0.1 %). For example, the negative gap of 1.2 % for education means that women are expected to earn 1.2 % more than men due to their average education level being higher than for men. Finally, there is no explained gap for enterprise control at the EU level.

Figure 2: Decomposition of the explained GPG, 2014. Source: SES.



24. Across EU Member States, the overall explained GPG is mostly driven by the following three explanatory factors: economic activity, occupation and education. The explained gap of at least 1 % (irrespective of the sign) is recorded for economic activity in 25 Member States, for occupation in 22, and for education in 18. Among those three characteristics, economic activity and education have the most uniform effect across EU Member States.
25. Figure 3 compares the unadjusted GPG with the unexplained (also named 'adjusted') GPG. When comparing the ranking of EU countries (arranged from the smallest to largest gaps) before/after adjustment, we observe that Romania, Lithuania, Croatia, Poland, Slovenia, Bulgaria and Italy increased their gaps, moving by at least 10 positions. At the other extreme, Germany, Austria, the Netherlands, Finland and Denmark decreased their gaps, all those countries moving by at least 10 positions in the other direction.

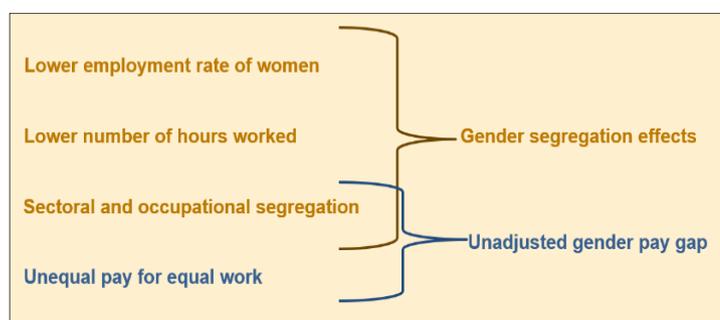
Figure 3: Adjusted and unadjusted GPGs, 2014. Source: SES.



## F. Other gender segregation effects and the 'Gender Overall Earnings Gap'

26. Note that the decomposition of the unadjusted GPG does not capture all segregation effects between men and women in the labour market (see Figure 4). In particular, women work, on average, fewer hours per month than men in the labour market. 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. This is shown by the lower employment rates for women than men across EU Member States.

Figure 4: Gender segregation effects



27. Table 1 presents Eurostat's data on the average hourly earnings, the average number of hours paid per month and the employment rate. In 2014, women were paid on average 14 % fewer hours per month than men at the EU level. The gap between the average number of hours paid to men versus women varies substantially across EU countries. At one end of the scale, women were paid on average 28 % fewer hours than men per month in the Netherlands. At the other end of the scale, this difference was about only 1 % in Bulgaria, Latvia and Romania. In 2014, the employment rate of men was 10.5 percentage points higher than that of women at the EU level. Across EU Member States, the difference between the employment rate of men and women varied from 1.5 percentage points in Finland to 25.4 percentage points in Malta.
28. To give a complete picture of the gender earnings gap, Eurostat developed a new synthetic indicator, the 'gender overall earnings gap' (GOEG), which measures the impact of the three combined factors, namely: the difference in the average hourly earnings, the monthly average of the number of hours paid and the employment rate for men and women. The results are published in a Statistics Explained article on gender statistics (Eurostat, 2013). In 2014, the gender overall earnings gap was 39.6 % in the EU-28 (see Table 1). Across Member States, the gender overall earnings gap varied significantly, from 19.2 % in Lithuania, to 47.5 % in the Netherlands.

Table 1: Gender overall earnings gap (%), 2014. Source: SES and LFS.

	Average hourly earnings (EUR)		Average number of hours paid per month		Employment rate for age group 15-64 (%)		Gender overall earnings gap (%)
	Men	Women	Men	Women	Men	Women	
<b>EU-28</b>	16.60	13.75	162	139	70.1	59.6	39.6
Belgium	20.49	19.15	160	134	65.8	57.9	31.1
Bulgaria	2.52	2.16	179	177	63.9	58.2	22.8
Czechia	5.99	4.64	171	167	77.0	60.7	40.4
Denmark	30.16	25.35	131	125	75.8	69.8	26.1
Germany	19.87	15.44	154	122	78.1	69.5	45.2
Estonia	6.89	4.95	177	167	73.0	66.3	38.4
Ireland	26.20	22.55	149	129	68.3	58.0	36.7
Greece	10.07	8.81	164	155	58.0	41.1	41.4
Spain	12.76	10.86	162	145	60.7	51.2	35.7
France	18.78	15.87	154	140	67.3	60.4	31.1
Croatia	5.98	5.46	183	179	59.1	50.0	24.4
Italy	15.85	14.88	175	145	64.7	46.8	43.7
Cyprus	11.94	10.25	169	162	66.0	58.6	26.9
Latvia	4.89	4.04	159	158	68.4	64.3	22.8
Lithuania	4.20	3.65	170	162	66.5	64.9	19.2
Luxembourg (1)	23.44	22.18	181	155	72.6	60.5	32.5
Hungary	5.00	4.25	171	166	67.8	55.9	32.0
Malta	10.35	9.25	163	150	74.9	49.5	45.6
Netherlands	19.41	16.29	145	104	78.1	68.1	47.5
Austria	17.55	13.65	167	133	75.2	66.9	44.9
Poland	5.87	5.42	180	165	68.2	55.2	31.5
Portugal	8.08	6.88	168	161	65.8	59.6	26.1
Romania	2.85	2.72	183	181	68.7	53.3	26.8
Slovenia	9.14	8.50	179	174	67.5	60.0	19.6
Slovakia	5.90	4.74	173	168	67.6	54.3	37.3
Finland	21.78	17.77	161	153	69.5	68.0	24.1
Sweden	22.22	19.14	165	148	76.5	73.1	26.2
United Kingdom	20.93	16.56	162	129	76.8	67.1	45.0
Iceland	17.73	14.79	168	141	85.4	80.5	34.0
Norway	33.09	28.31	150	126	77.0	73.4	31.5
Switzerland	36.53	30.18	168	127	83.4	74.1	44.5

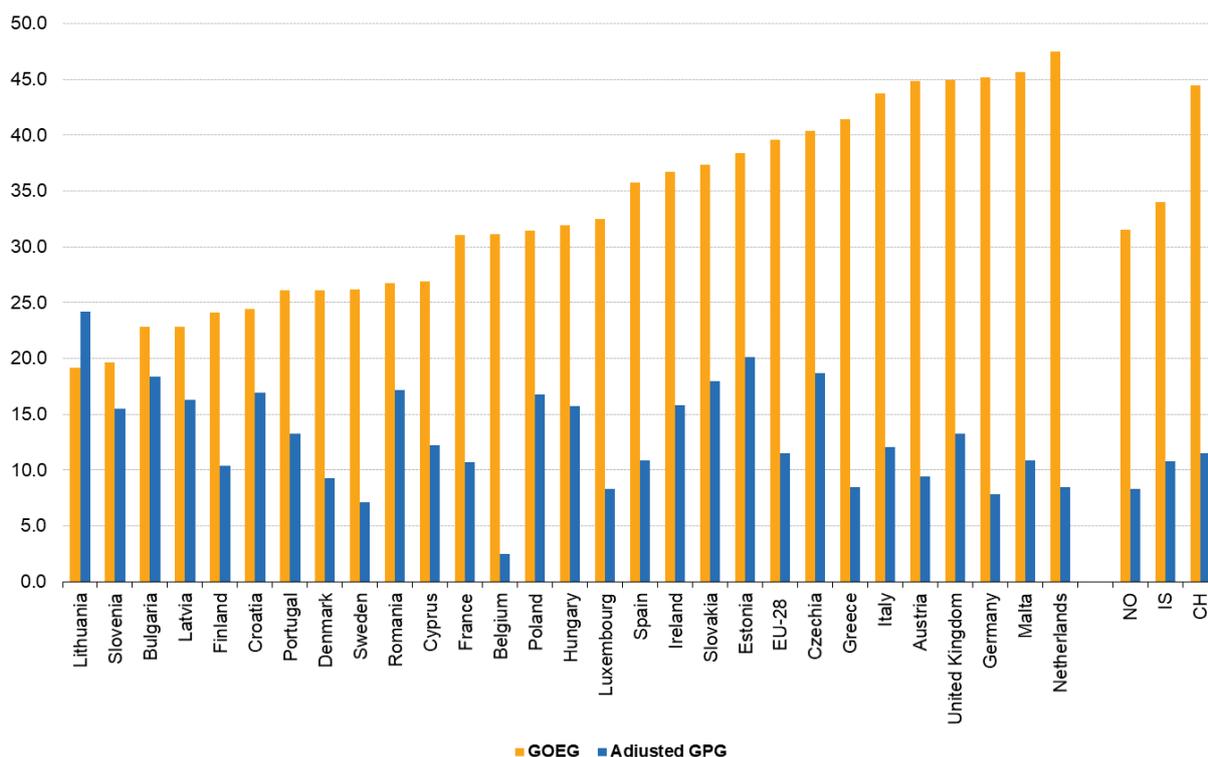
29. Table 2 shows contributions to the gender overall earnings gap. At EU level, the gender pay gap, the gender hour's gap and the gender employment rate gap contributed 37.4 %, 30.4 % and 32.2 %, respectively, to the gender overall earnings gap.

Table 2: Contributions to the GOEG, 2014 (%). Source: SES and LFS.

	Contributions to the gender overall earnings gap		
	Gender pay gap	Gender hours' gap	Gender employment rate gap
<b>EU-28</b>	37.4	30.4	32.2
<b>Belgium</b>	18.1	47.6	34.3
<b>Bulgaria</b>	59.6	4.3	36.1
<b>Czechia</b>	49.4	4.6	46.0
<b>Denmark</b>	57.3	15.5	27.2
<b>Germany</b>	41.9	38.7	19.4
<b>Estonia</b>	68.2	12.0	19.8
<b>Ireland</b>	32.8	31.5	35.7
<b>Greece</b>	25.0	10.6	64.4
<b>Spain</b>	36.5	25.1	38.5
<b>France</b>	45.3	25.6	29.1
<b>Croatia</b>	32.5	7.9	59.7
<b>Italy</b>	11.0	32.7	56.3
<b>Cyprus</b>	48.6	13.5	37.9
<b>Latvia</b>	73.7	2.4	23.9
<b>Lithuania</b>	65.9	22.6	11.4
<b>Luxembourg</b>	14.1	39.5	46.4
<b>Hungary</b>	42.2	7.7	50.1
<b>Malta</b>	18.4	13.6	67.9
<b>Netherlands</b>	27.2	51.6	21.3
<b>Austria</b>	42.2	38.2	19.6
<b>Poland</b>	21.1	23.0	55.9
<b>Portugal</b>	53.2	14.1	32.7
<b>Romania</b>	15.0	3.5	81.5
<b>Slovenia</b>	33.2	13.0	53.9
<b>Slovakia</b>	46.8	6.3	46.9
<b>Finland</b>	73.7	18.4	7.9
<b>Sweden</b>	49.2	35.8	15.0
<b>United Kingdom</b>	39.2	38.2	22.6
<b>Iceland</b>	43.6	42.2	14.2
<b>Norway</b>	41.2	46.1	12.7
<b>Switzerland</b>	32.4	47.5	20.1

30. Figure 5 shows the ranking of EU countries according to their adjusted GPG and overall earnings gaps. The lowest overall earnings gaps are recorded for Lithuania (19.2 %), Slovenia (19.6 %) and Bulgaria (22.8 %); the highest for the Netherlands (47.5 %), Malta (45.6 %) and Germany (45.2 %). The largest differences between the ranking made according to both indicators are observed for Lithuania (the highest for adjusted GPG versus the lowest for GOEG) and Bulgaria (4th highest for adjusted GPG versus 3rd lowest for GOEG) on one side; and for Germany (3<sup>rd</sup> lowest for adjusted GPG versus 3<sup>rd</sup> highest for GOEG) and the Netherlands (6<sup>th</sup> lowest for adjusted GPG versus the highest for GOEG) on the other side.

Figure 5: Gender overall earnings gap and adjusted GPG, 2014, Source: SES



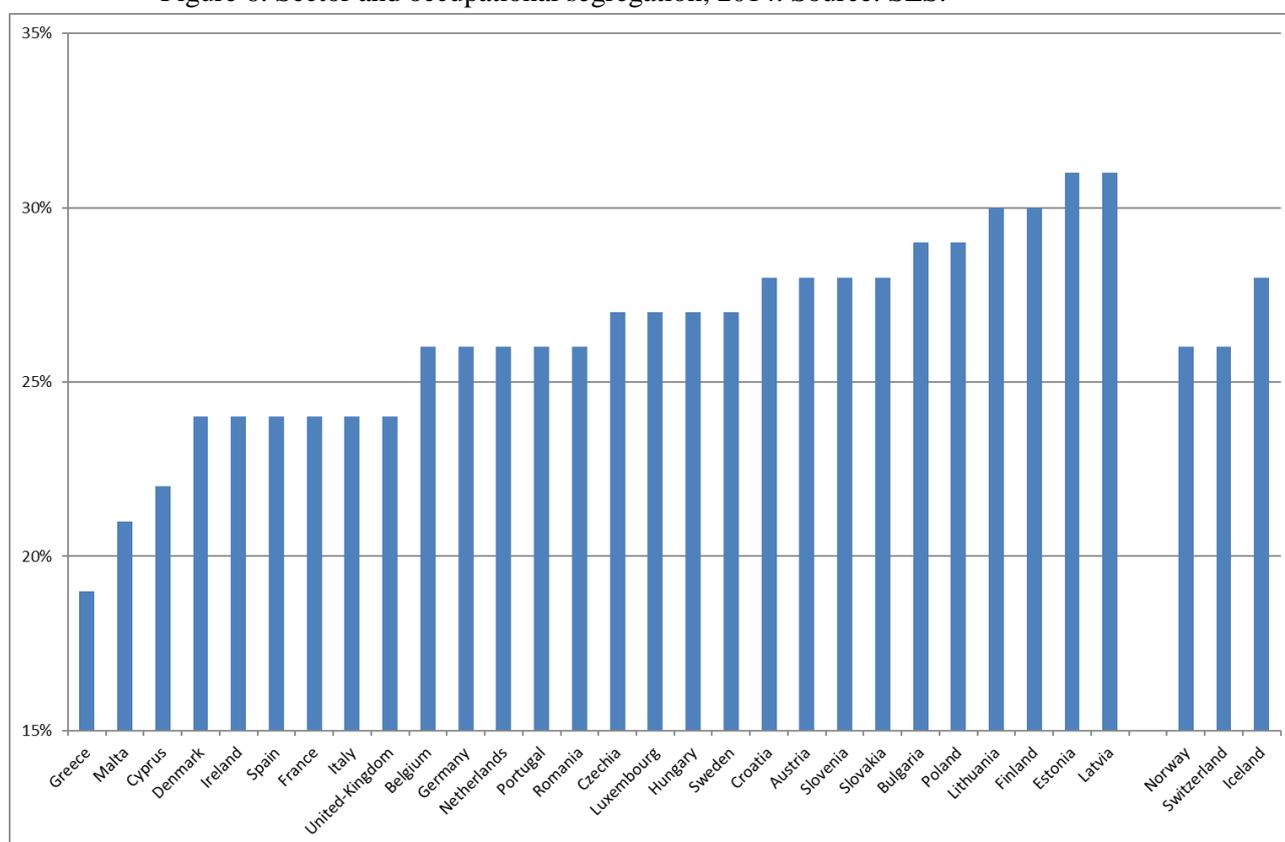
#### IV. How to better communicate on earnings gaps

31. Communicating on the adjusted GPG proved difficult for a number of technical and other reasons. Unlike the unadjusted, the adjusted GPG is obtained from a regression model and therefore influenced by model specifications. It is also complex to communicate to a wide audience. Finally, although a better indicator than the unadjusted, the adjusted GPG cannot pretend to measure potential discrimination between men and women. In particular, the decomposition misses important variables not present in the Structure of Earnings Survey that could further reduce the unadjusted GPG such as career breaks due to maternity leaves or the possible aversion of some female employees to positions requiring unplanned overtime. On the contrary, the adjusted GPG could underestimate discrimination as it corrects for gender and occupational segregation which, in some countries or industries, could include some discriminatory elements.
32. However, the GPG decomposition proved a valuable tool to identify the origin of gender pay gaps such as sector and or occupational segregation. Each of these causes can be separately identified and translated into simple indicators that are easy to communicate to the wide public. For instance, sector

and occupational segregation can be measured as the 'distance to parity', namely the difference between the proportion of women in each combination of sector and occupation, and the par (50%). Those absolute gaps, summed over all occupations and sectors and weighted by the corresponding number of employees (males + females), can provide a simple indicator of segregation which is an important driver of gender pay gaps.

33. As shown in Figure 6, countries with the highest levels of sector and occupational segregation are Latvia and Estonia (both 31 %) whereas Greece (19 %), Malta (21 %) and Cyprus (22%) record the lowest.
34. The above-mentioned indicator on segregation can be further split into its sector and occupational components. For the latter, simple indicators such as the proportion of women occupying managerial positions can be used as well.

Figure 6: Sector and occupational segregation, 2014. Source: SES.



## V. Conclusions

35. '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. The results presented in the paper show that there are clear policy and statistical reasons to decompose the unadjusted GPG into the explained and unexplained parts. The unadjusted GPG indicator, together with the explained gap and its explanatory factors, allow for a better identification and interpretation of the causes of the gender pay gap. As a consequence, policy actions can be better targeted.

36. The GPG decomposition is useful in two aspects. First, the adjusted GPG gives a different ranking of EU countries than unadjusted figures. In particular, countries with low female employment rates record large increases in their gender pay gap figures due to adjustments for the self-selection effect. For policy making, it is important that country rankings are not biased by such effects: a country with a low employment rate of women should not appear as a good performer just because the 'few' employed women have higher profiles and positions than the general population of males.
37. Second, the explanatory factors in the regression allow identifying the main drivers of gender differences in the earnings of men and women. Countries with the same unadjusted gender pay gap may require different policies: increase the employment rate of women in some cases; in others promote professions/course of studies where women are under-represented, or foster working-time arrangements that are more 'family friendly'. It also paves the way for developing specific indicators on segregation that can be more easily communicated to the public such as 'distance to parity' that can be further broken down by occupation and economic sector to better target policy actions.
38. However, the adjusted GPG may not be appropriate as a headline indicator, being complex and model-dependent. Moreover, the decomposition misses important variables that would impact the unadjusted GPG downwards. On the opposite, the adjusted GPG could underestimate possible discrimination related to gender and occupational segregation effects.
39. An interesting candidate for measuring the impact of all forms of gender differences with an impact on earnings, at the level of the society as a whole ('macro-level'), is the gender overall earnings gap. This indicator has the double merits of measuring the contributions of each factor to the final difference between the average earnings of all men and women of working age, and to estimate the future gender pension gap that would result if no corrective actions are taken.
40. To conclude, experiments done by Eurostat show that gender pay gaps are complex phenomena. They could be better communicated to the general public through a set of simple indicators measuring each of the underlying causes that should be identified beforehand through the whole range of statistical techniques.

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