

4 March 2014

Original: English

Economic Commission for Europe

Conference of European Statisticians

Group of Experts on Gender Statistics

Work Session on Gender Statistics

Geneva, 19-21 March 2014

Item 4 of the provisional agenda

Gender segregation in education and employment and its relationship with the gender pay gap

Data on gender pay gap by education level collected by UNECE

Note by the Secretariat

Summary

In 2012, UNECE collected data on gender pay gap by education level for the first time for its Gender Statistics Database. This paper describes the findings and discusses the relationship of men's and women's distribution by education level and the overall gender pay gap. The paper also outlines the relevant definitions. It concludes that the breakdown of the gender pay gap by education level brings an important additional insight to gender differences in the labour market and can be useful for policymaking.

I. Introduction

A. Background

1. The gender pay gap is one of the most widely used indicators of gender equality in the labour market. The European Union uses the gender pay gap in hourly earnings as an important indicator to monitor gender differences in income from work (European Commission, 2006, 2013). The Organization for Economic Cooperation and Development (OECD) uses a similar approach. This indicator measures the overall gap. Other measures are needed for understanding the situation in different segments of the labour market and in

different population groups. Recent UNECE Work Sessions on Gender Statistics have recommended including the pay gap in monthly earnings alongside with the pay gap in hourly wage rates in the UNECE Gender Statistics Database (UNECE 2008). The 2010 Work Session recommended data collection on the gender pay gap in hourly wage rates by education level. These data are not readily available in other international databases.

2. Several studies applying different methods have aimed to identify factors explaining the gender pay gap. Using household surveys from many countries around the world, Nopo and colleagues (2012) decomposed the gender pay gap by matching males and female earnings across labour force segments formed by combinations of socio-demographic and job variables. Another method, commonly used for analysing the contribution of individual and job-related factors was developed by Blinder (1973) and Oaxaca (1973). It uses an econometric model for estimating the male-female differential returns of employees' characteristics. Jingyo Suh (2010) adapted this method when investigating the determinants and characteristics of changes in the gender wage gap between 1989 and 2005 in the United States and showed how investments in women's human capital, namely education and work experience, contributed to narrowing gender pay gap. In a study decomposing the gender pay gap at the time of market reforms in Eastern Europe and the former Soviet Union, Brainerd (2000) observed that the increase in the gender pay gap was linked to the widening of wage distribution.

3. England and colleagues (2012) found that among women married or in partnership aged 25-54, those with higher education have the largest pay gap against their male peers. Likewise, OECD (2011, 2012) observed that the pay gap between men and women is wider among the most skilled population group. In her study of the reasons for narrowing gender wage gap in Canada between 1988 and 2008, Drolet (2011) looked at the changes in the wage gap among employees with selected characteristics. She found that higher increases of young women's real wages earnings compared to men were due to changes in educational attainment and choice of occupation, among others. Grey-Bowen and McFarlane (2010) reported consistent pay gap in favour of men among highly skilled professionals in the United States.

4. In its Strategy for equality between women and men, the European Commission (2010) reported the existing gap between the women's educational attainment and professional development and underlined the special attention to pay to the transition between education and labour market. In this line, gender pay gap by education level will contribute to monitoring the impact of related policies and may help identify priority areas for policy action.

5. To date, Eurostat publishes disaggregated gender pay gap data by enterprise ownership, industry and working time. In spite of the shown interest, data on the gender pay gap by education level has not been reported systematically at the international level until UNECE included it in its 2012 update of the Gender Statistics Database. The required wage and earnings statistics were collected from national statistical offices and from Eurostat for the countries covered in its databases. The gap by education level is calculated with the same methodology as for the overall gender pay gap.

6. The UNECE Gender Statistics Database includes the pay gap in hourly wage rates as well as in monthly earnings. The latter are influenced by the number of hours worked and by irregular payments and bonuses, which vary by sex and education level. In this paper, we focus on the gender pay gap in hourly wage rates.

7. We compare the gender pay gap among the different educational categories and against the gap in the total work force. We also explore the effects of the difference between employed men's and employed women's distribution by education level on the overall gender pay gap and its evolution over time. Section II discusses the definitions and data coverage in the UNECE Gender Statistics Database, followed by the analysis in section III and conclusions in section IV.

II. Definitions and data coverage

A. Wage rates

8. The International Labour Organization (ILO) Resolution concerning an integrated system of wages statistics (ILO, 1973) defines the measurement of wage rates as follows:

- The data on time rates of wages should relate to an appropriate time unit such as the hour, day, week, month or other customary period used for purposes of determining the wage rates concerned.
- Wage rates should include basic wages, cost-of-living allowances and other guaranteed and regularly paid allowances, but exclude overtime payments, bonuses and gratuities, family allowances and other social security payments made by employers. Ex gratia payments in kind, supplementary to normal wage rates, are also excluded.
- Statistics of wage rates fixed by or in pursuance of laws or regulations, collective agreements or arbitral awards (which are generally minimum or standard rates) should be clearly distinguished from statistics referring to wage rates actually paid to individual workers. Each of these types of wage rates is useful for particular purposes.

9. In the UNECE Statistical Database, the time unit for the wage rate data is the hour and data pertain to actually paid wages.

B. Target population

10. The target population is composed of employed persons, further specified according to type of economic activity, status in employment, hours worked and size of enterprise.

1. Types of economic activity

11. Wage statistics are relevant, among others, for monitoring how wages are set up through recruitment bargaining. This is more often the case in the private sector and in companies where no collective remuneration schemes are set. For this reason, the economic activities covered exclude the public sector and the activities of international organizations. Most data sources for earnings and wage statistics do not cover the sector of agriculture, forestry and fishing (ISIC Rev. 4 category A).

2. Status in employment

12. The target population includes employees and excludes employers, own-account workers, contributing family workers, and members of producers' cooperatives.

3. Hours worked

13. Average earnings data utilised to compute the gender pay gap should represent all employees under work contract either on part-time or full time basis.

4. Size of enterprise

14. In principle, the size of enterprise does not matter. However, for statistical survey design, some limitations may apply, such as covering employees in enterprises with personnel size above certain threshold, as is the case with the European Structure of Earnings Surveys.

C. Data for calculating the gender pay gap in hourly wage rates

15. For calculating the gender pay gap in hourly wage rates, UNECE considers establishment surveys as the most appropriate source, because they produce least deviations from the definition described above. The second priority is to use other sources with a definition close to the one described above, such as administrative records of income tax and household surveys. The country-specific discrepancies from the definition are listed in the individual country footnotes to the extent that the information is available.

16. For European Union member countries, Norway and Switzerland, UNECE publishes the unadjusted hourly gender pay gap based on hourly earnings figures from the EU Structure of Earnings Surveys, which are available from the Eurostat online database. Eurostat's methodological notes provide further explanation¹.

D. Level of education attained

17. The employed population is classified into three levels of educational attainment defined on the basis of the 1997 International Standard Classification of Education (ISCED97) as follows:

- Lower education level, composed of ISCED categories 0 to 2: pre-primary education, primary education or first stage of basic education, and lower secondary or second stage of basic education;
- Medium education level, composed of ISCED categories 3 and 4: upper secondary education and post-secondary non-tertiary education;
- Higher education level composed of ISCED categories 5 and 6: first stage of tertiary education and second (and upper) stage of tertiary education.

18. This grouping corresponds to those used in other tables of the UNECE Statistical Database.

19. The breakdown of the gender pay gap by level of education is based on the earnings data provided by national statistical offices² in response to the UNECE questionnaire, and on earnings data of the EU Structure of Earnings Surveys of 2006 and 2010 provided by Eurostat.

III. Analysis

A. Gender pay gap: overall and by education level

20. In all countries with available data, men earn more than women at all levels of education and the gap tends to be largest among the highly educated (figure 1). In some countries (e.g. Austria, Denmark, Germany) the gender pay gap has a clear pattern of

¹http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/earn_grgpg2_esms.htm

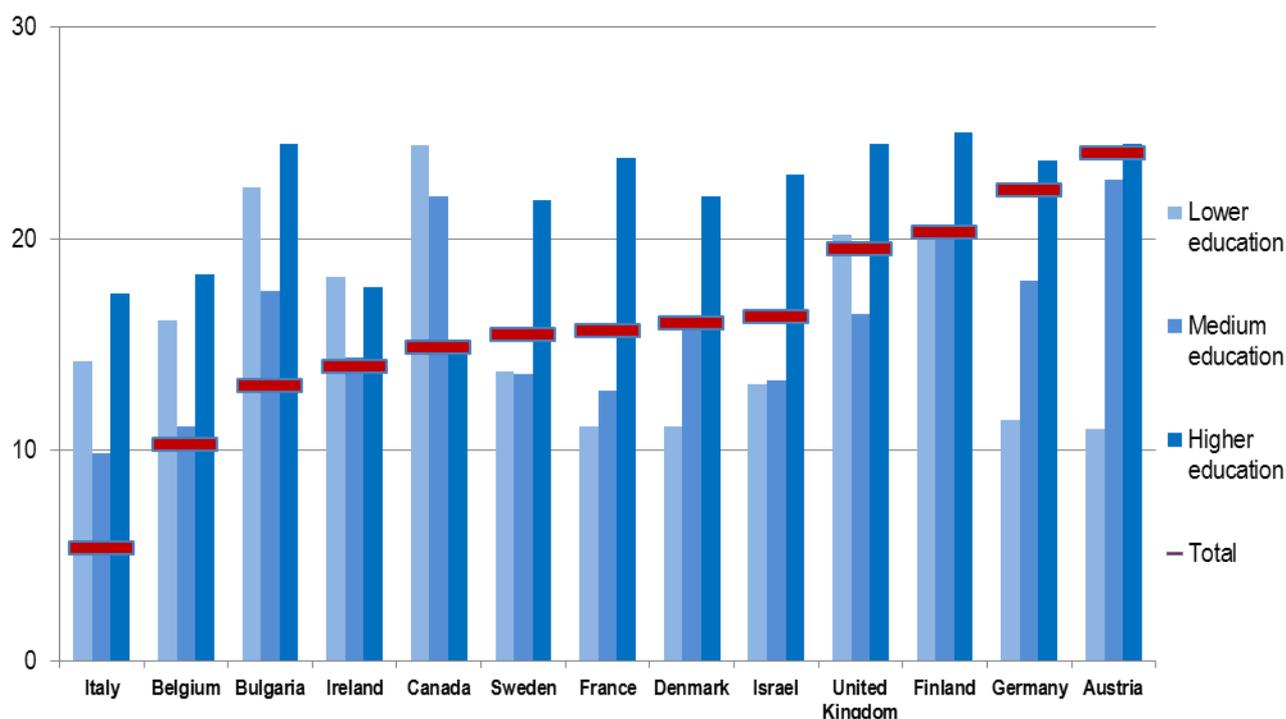
² The following countries provided the basic data for breakdown of hourly and monthly GPG by level of education: Austria, Belgium, Canada, Cyprus, Czech Republic, Finland, Germany, Hungary, Israel, Latvia, Lithuania, Malta, Portugal, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, The fYR of Macedonia, Turkey.

Albania, Estonia, Croatia, Italy, Kyrgyzstan, Norway, Russian Federation and Slovenia provided data for breakdown of monthly GPG only. Data by the following countries enabled the calculation of overall GPG in monthly earnings or in wage rates or both: Armenia, Azerbaijan, Belarus, Bulgaria, Georgia, Kazakhstan, Netherlands, Republic of Moldova, Tajikistan, Ukraine, United States.

increasing by level of education. In others, such as Finland, France, Israel and Sweden, the gaps in lower and middle educational groups are similar, but noticeably narrower than for tertiary educated workers. In contrast, for some countries the gap for lower educated workers is higher than for the middle educated workers (e.g., Belgium, Bulgaria, Italy, Ireland, United Kingdom).

Figure 1

Gender pay gap in hourly wage rates by level of education, per cent, 2010, selected UNECE countries



Source: UNECE Gender Statistics Database, December 2013

21. The size of the overall gender pay gap depends, among others, on the distribution of working women and men by education level. For example, in countries where the education level of female employees is on average higher than that of male employees, the overall gender pay gap is lower than the gap within any education category (Belgium, Bulgaria, Ireland, Italy). Limiting the analysis to the overall pay gap would thus underestimate inequality in pay in those countries. The opposite situation would have an increasing effect on the overall gender pay gap (Austria, Germany).

22. These findings on the relative position of the overall gender pay gap among the gaps estimated by education level warrant a closer look at the connection between the overall and sub-group level gaps.

B. Decomposition of the overall gender pay gap by education level

23. In the following, we look at the way the wage rates of men and women in the education level categories interact with the sex distribution of employees in those categories.

24. The overall gender pay gap GPG_T in the population composed of n sub-populations can be expressed as follows:

$$GPG_T = \left(\frac{\sum_{i=1}^n p_i(m) \times \bar{E}_i(m) - \sum_{i=1}^n p_i(w) \times \bar{E}_i(w)}{\sum_{i=1}^n p_i(m) \times \bar{E}_i(m)} \right) \times 100$$

where $\bar{E}_i(m)$ and $\bar{E}_i(w)$ denote the average hourly wage rate of men and women, respectively, within the education level group i , and $p_i(m)$ and $p_i(w)$ the share of those with education level i among men and women, respectively.

25. For an educational level i , the formula is the standard one:

$$GPG_i = \left(\frac{\bar{E}_i(m) - \bar{E}_i(w)}{\bar{E}_i(m)} \right) \times 100$$

26. In the total population, we can think of the contribution of each sub-group to the total average wage for men and women as depending not only on the average wage of men and women within the sub-groups, but also on the relative weight of each sub-group among men and women, respectively – $p_i(m)$ and $p_i(w)$. Therefore, the distribution of men and women by education level ($p_i(m)$ and $p_i(w)$) affects the way the gaps in the sub-groups contribute to the overall gap.

27. Hence, in countries where the education level of working women is on average higher than that of working men, the overall gender pay gap is lower than the gap within the education categories (see Belgium and Italy in figure 1). The opposite would also hold (see Austria and Germany in figure 1). Indeed, table 1 shows that in Italy and Belgium, the proportion of employees with higher education is larger among women than among men, and in Austria and Germany, the situation is the opposite.

Table 1
Distribution of male and female employees by education level, 2010, selected countries

Educational level	Italy		Belgium		Sweden		France		Germany		Austria	
	F	M	F	M	F	M	F	M	F	M	F	M
Lower education	28.0	41.0	17.4	23.4	15.1	17.1	21.9	23.2	14.3	13.1	18.5	14.1
Medium education	49.6	44.8	36.4	40.7	45.0	54.4	41.7	46.9	60.6	56.8	63.5	65.1
Higher education	22.4	14.2	46.2	35.8	39.8	28.3	36.4	29.9	24.9	29.9	18.0	20.8
All education levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : UNECE Gender Statistics database

C. Change in gender pay gap by education level over time

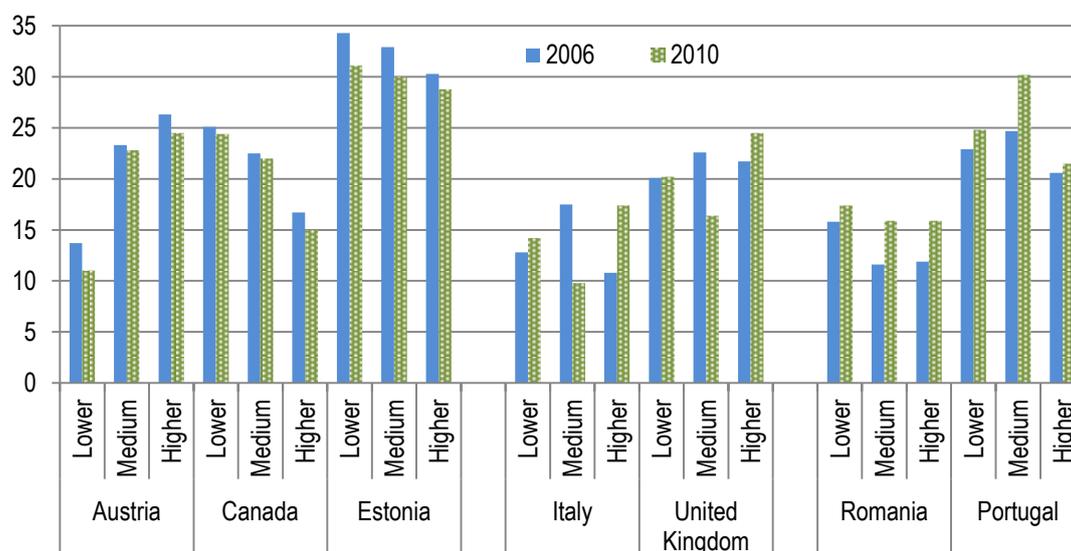
28. Computing the gender pay gap by education level can also improve understanding of trends. For instance, the overall gender pay gap in hourly wage rate has fallen from 24.3 per cent in 2006 to 19.5 per cent in 2010 in the United Kingdom while the gap remained unchanged among employees with lower education level, decreased among those with medium education level, and increased among those with higher education (figure 2). It appears that the trend is mainly driven by the narrowing gender gap in the medium education category while inequality has increased among those with higher education level.

29. In Italy, the overall gender pay gap increased from 4.4 per cent to 5.3 per cent, with large decrease among employees in the medium education category and large increase

among those with higher education. In countries such as Austria, Canada and Estonia the overall gender pay gap reduced between 2006 and 2010 as it did in every education category. In Romania and Portugal, on the contrary, upward trends were recorded at all levels. These changes can be to a varying extent related to the changes in the wage rates as well as to the changes in the sex and education level distribution of the labour force.

Figure 2

Gender pay gap in hourly wage by level of education, per cent, 2006 and 2010



Source: UNECE Gender Statistics Database

30. The estimated gender pay gap in a category depends on the average wages of men and women in that category. The change over time of the gender pay gap is, by this fact, a reflection of the simultaneous changes occurring in men and women's average wages. The gap narrows when the relative increase in women's average wage is larger than that of men's average wage and, correspondingly, when both wages shrink, the relative decrease in women's wage is lower than that of men's.

31. Similarly to the compositional effect of education level, the change of the education structure of the work force may influence the trend of the gender gap within the sub-groups and in the total employed population. Let us consider here the two main processes that shape the education structure of the labour force – labour market entry of graduates and retirement. Wages towards the end of the work career are typically higher than those of the newcomers. In that case, a relatively high number of entries to the labour market in a certain sex and education group, say, higher educated women, would decrease the average wage of that group.

32. In many countries, women outnumber men among university graduates whereas among older employees with higher education, men outnumber women. Such change, and the resulting age-sex composition of the group of employees with higher education, would widen the pay gap in that group.

IV. Conclusion

33. The gender pay gap broken down by education level brings an important additional insight to gender differences in the labour market, which can be useful for policymaking.

With few exceptions, we observed an increase of the gender pay gap with education level. The wider gap among the highly educated is consistent with the findings on the so-called glass ceiling for women's careers. Even though there are currently more women graduating from tertiary educations than men, it is also clear that the policies that have led to the empowerment of women through education by themselves cannot tackle the inequalities in the labour market.

34. Analysing the pay gap in different population groups and the related compositional effects can bring us closer to designing targeted policy action to reduce gender inequality.

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