The Gender Wage Gap Experience in the European Union with Special Reference to Cyprus

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Abstract

Gender wage gap has attracted considerable political and legislative attention in the European Union. A number of statistical methodologies have been applied to try to analyse it. We use the leading methodologies used in the literature to consider and attempt to understand the gender wage gap in twenty four EU member states. First, we examine the unconditional wage gap, estimated from country-wide surveys and used by policymakers and politicians when they refer to the wage gap phenomenon. Then we examine the conditional wage gap, both at its mean level and across the wage distribution, using a number of methodologies. Finally, we examine how the unexplained wage gap is related to country-specific characteristics that cannot be evaluated at the member state level. We use the cross-country variation in this large sample of member states to explore the influence of (i) policies concerned with reconciling work and family life and (ii) wage-setting institutions. In this paper, we provide a partial preview the results of an extensive study of these phenomena.

JEL Classification: J16, J31, J50, C21

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1 Introduction
The European Union (EU) has set the reduction of labour market gender disparities as an important aim. Two different directives, the Racial Equality Directive and the Employment Framework Directive, define a set of principles that offer legal protection against discrimination. The EU Employment Guidelines, 2003/58/EC of July 22, 2003, indicate that, through gender mainstreaming and specific policy actions, member states should encourage the labour market participation of women and should reduce gender gaps in employment and unemployment rates and pay.

The gender issues and any cross-member state divergences in experience are an interesting field of study because, in principle at least, EU states share a set of common values. Discussions surrounding wage gaps and differences in these gaps across member states, the determinants of these differences, and the creation of policies to reduce wage gap are frequently based on national aggregate data summarized by the European statistical service, EUROSTAT. The wage gaps presented in these data are referred to as unconditional estimates of the wage gap because they do not take into account the characteristics of the individual men and women whose wages make up the national aggregates. The unconditional wage gaps presented in aggregate data fail to capture the richer information available at the individual level and to sort out the part of country wage gaps that can be attributed to differences in the productive characteristics of the individuals behind the aggregate data. This means that the appropriate wage gaps may be bigger or smaller and it is these that need to be analysed and understood. It is for this reason that our efforts focus on conditional approaches to the gender gap. Below we outline the approach followed in Christofides et al (2010), an extensive study of gender issues in 24 EU countries (excluded due to data problems are Malta and the recent entrants of Romania and Bulgaria), using data from the Euroean Union Statistics on Income and Living Conditions (EU SILC) for 2007.

The benchmark methodology used to examine the gender wage gap is the Oaxaca-Ransom (1994) decomposition. This methodology enables the decomposition of the unconditional (or observed) gender wage gap into a part explained by observed characteristics and a part which cannot be explained by data available in EU SILC and
may be attributed to, among other factors, discrimination. This methodology is further enriched using the Heckman (1974, 1979) corrections. Using this methodology the Oaxaca-Ransom decomposition is adjusted to take into account self-selection into paid employment. This is important because employment rates are very different across the EU. The variation in the gender-wage gap across the wage distribution is examined using quantile regression analysis, following the methodology proposed by Melly (2005). Following Albrecht et al (2003), this allows us to search for possible ‘sticky floor’ and ‘glass ceiling’ effects, that is peculiarities at different points in the wage gap distribution. For example, a larger wage gap for the low-paid may indicate that women get ‘stuck’ in jobs which offer low remuneration relative to that of their male colleagues, more so than women with wages closer to the mean. At the other end of the wage distribution, highly paid women may find it difficult to brake into the top echelons of their professions (a ‘glass ceiling’ may exist), earning significantly lower rewards than their male colleagues and experiencing a larger wage gap than women in the middle of the wage distribution.

With these gaps and effects established on a consistent basis across the 24 EU countries, we consider the extent to which they are related to various country features. In Christofides et al (2010) the OECD (2001) work-family reconciliation index, initially covering 14 EU and OECD countries, is recreated for the EU. We use these data along with the unionisation rate, to examine the relationship between gaps and effects on the one hand and country features on the other.

2 The unconditional wage gap

The unconditional wage gap is derived from surveys conducted by national statistical agencies and is reported in a comparative form by EUROSTAT. Table 1 reports earnings gaps for 2007, the year that we analyse in Christofides et al (2010). The highest male-female earnings gaps are observed in Estonia and Austria and the lowest in Italy and Malta. In a number of Eastern European countries the earnings gap is below the EU average, namely Poland, Slovenia, Bulgaria, Romania, Latvia, and Hungary. Scandinavian countries which are generally considered as role models for the rest of the EU countries have above average earnings gaps in Table 1. Earnings
gaps may be affected by factors such as employment participation or education levels which are not reflected in the unconditional wage gap. Table 1 reports these for the EU 27 and the EU average.

The highest male employment rates are observed in Netherlands and Denmark (82.2% and 81%, respectively) and the lowest male employment rates in Poland and Romania (63.6% and 64.8% respectively). The highest female employment rates are observed in the Denmark and Sweden (73.2% and 71.8%, respectively) while the lowest female employment rates are observed in Malta and Italy (35.7% and 46.6%, respectively). The highest gaps between male and female employment rates are observed in Malta and Greece and the lowest in Denmark and Sweden. The highest female higher education attainment rates for individuals aged 30-34 are observed in Finland, Ireland and Cyprus (55.4%, 48.6% and 48.0%, respectively) and the lowest male employment rates in Czech Republic and Romania (13.7% and 14.3% respectively). Countries with a highly educated population like Cyprus and Slovenia have high earnings gaps and countries with lower educational attainment like Malta have a lower earnings gap. It is, therefore, important to examine gender pay gaps while taking into account other variables that might be related to them. This brings us to the notion of the conditional wage gap to which we now turn.

3 Conditional Wage Gap Analysis

A more complete examination of the relationship between the observed wage gap and its determinants requires a detailed data base at the individual level. Such sources must report some income concept (the hourly/weekly/monthly wage rate or earnings per period) as well as personal characteristics (education, age, experience, etc) at the individual level. A dataset that fulfils these requirements is EU-SILC, which is available since 2004. It is prepared by the statistical services of member states on behalf of Eurostat. Information is available for all EU countries except Malta. The EU-SILC data set reports a wealth of information on the personal characteristics of each individual. These include annual earnings inclusive of overtime, tips, etc), age, education, marital status, number of children, and child care details. Also, it reports information on working status, whether an individual was working full time or part
time, the industry of employment and his or her occupation and years of working experience (not available for all countries).

The overall wage gap is defined as the difference between the male and female average ln-wage earnings. Using this other source of information, Christofides et al (2010) reveal that the countries with the highest gender wage gap are new member states (Cyprus, Estonia, the Czech Republic, Latvia, Lithuania and the Slovak Republic). The lowest gender wage gap is observed in Slovenia and Hungary. Thus, of the nine new member states in the sample, six have the highest and two the lowest unconditional gender wage gaps, with Poland being closer to the middle of the pack. The Scandinavian countries in the sample (Denmark, Finland and Sweden) have middling gender gaps, while Greece, Italy and Spain have relatively low gaps. The average gender wage gap across the EU24 is 0.381 ln-wage points (roughly speaking these can be interpreted as percentage differences) and the average employment gap is 27%. The results, compared to Table 1, are different because the EU-SILC data are based on surveys conducted over a representative sample of the population of each member state.

4 Econometric model

In order to analyse this information with an eye on conditional wage gaps, it is necessary to adopt an econometric methodology. Three different econometric methodologies are summarized in the following sections. In Section 4.1 the Oaxaca-Ransom decomposition is described. The Oaxaca-Ransom approach is based on estimations for each gender using Ordinary Least Squares (OLS) estimation of ln-earnings equations which take account of all relevant characteristics available in the EU-SILC data. The mean difference between the male and female earnings is decomposed into a portion attributable to characteristics and portions attributable to the ‘male advantage’ and the ‘female disadvantage’. These estimations are carried out separately for each member state but can also be conducted on a pooled sample involving data for all countries. Section 4.2 summarizes the correction proposed by Heckman (1974, 1979) which takes into account selection into paid employment. When corrections are implemented in the context of the Probit model, we use additional variables which account for membership in the selected paid-employment sample. In section 4.3, we consider decompositions that can be carried out along the
different points of the wage distribution, not just at the mean. This allows us to establish possible ‘sticky floors’ and ‘glass ceilings’ effects using the methodology proposed by Melly (2005).

4.1 The Oaxaca-Ransom decomposition

The Oaxaca and Ransom (1994) decomposition is given by:

\[ \bar{W}^M - \bar{W}^F = (\bar{X}^M - \bar{X}^F)\hat{\beta}^N + \bar{X}^M (\hat{\beta}^M - \hat{\beta}^N) + \bar{X}^F (\hat{\beta}^N - \hat{\beta}^F) \]  

(1)

where \( \bar{W}^M \) and \( \bar{W}^F \) are the average values of ln earnings for males and females, \( \bar{X}^M \) and \( \bar{X}^F \) are vectors with the average characteristics for the two genders and \( \hat{\beta}^M \) and \( \hat{\beta}^F \) are the OLS estimates of relevant coefficients. \( \hat{\beta}^N \) is a non-discriminatory coefficient structure obtained from the pooled regression of males and females. The first term in equation (1) measures the explained part, the second the male advantage (i.e., the extent to which the male characteristics are valued above the non-discriminatory coefficient structure) and the third the female disadvantage (i.e., the extent to which the female characteristics are valued below the non-discriminatory coefficient structure). The last two terms combined make up what can be described as the unexplained part of the decomposition.

In the above approach, only the earnings of the individuals in paid employment are used and, as a result, the sample may not be random. To deal with this selection problem, the Heckman (1974, 1979) model can be used.

4.1 The Heckman correction to the Oaxaca-Ransom decomposition

The Heckman (1974, 1979) model consists of two steps. First, a Probit estimation deals with the selection of individuals into employment. A selection term is estimated for each individual. In the second stage these selection terms are included in the ln earnings equations for each gender and they are used in the context of the Oaxaca-Ransom decomposition.

The Probit estimation which, for each gender, selects individuals into paid employment is
\[ P_i^* = Z_i \gamma + u_i \]  

where, for each individual indexed by \( i \), \( Z \) is a vector of observable exogenous variables, \( \gamma \) a vector of constant parameters and \( u \) is the residual term. The observed outcome of the selection process, denoted by \( P \), takes the value 1 in the case of paid employment, i.e.

\[ P_i = \begin{cases} 1 & \text{if } P_i^* > 0 \text{ with probability } F(Z_i \gamma) \\ 0 & \text{if } P_i^* < 0 \text{ with probability } 1 - F(Z_i \gamma) \end{cases} \]

where \( F(.) \) is the standard normal distribution function. A correction term, the inverse Mills ratio\(^1\) is estimated from the Probit equation and it is included in the ln earnings equations that we estimate.

Figure 1 reports the results of the Oaxaca-Ransom decompositions that were carried out for each of the twenty four countries in the sample – Table 2 provides the country codes used in the figure. By a property of OLS, the bar height is the actual gap appearing in the sample. Cyprus has the highest average predicted and actual gender pay gap and Slovenia the lowest. The explained gap is the first term in equation (1) and the unexplained part is the sum of the second and third terms in equation (1). It is important to note that, in most countries (e.g. Estonia and Cyprus) a noticeable part of the offered gap can be explained by characteristics. This observation justifies the use of the conditional approach, in that the object of our study should be the unexplained, or residual, wage gap. It is necessary, however, to consider the extent to which the paid employee sample analysed in Figure 1 is randomly selected from the population of each of the countries analysed. If it is not, the breakdowns between explained and unexplained components could be misleading.

Figure 2, reports the pay gap that is predicted to prevail once selection into the paid employee sample is taken into account using the Heckman correction. In these cases, the method takes into account the non-randomness (if any) of the sample of paid employees.

\(^1\) The inverse Mills ratio is defined as \( \lambda_i = \varphi(Z_i \hat{\gamma}) / F(Z_i \hat{\gamma}) \) where \( \varphi(.) \) is the probability density function and \( F(.) \) is the standard normal distribution function.
employees used and produces an offered earnings gap that is then decomposed into
the explained and unexplained parts. Note that, in some countries (again Estonia and
Cyprus), a noticeable part of the offered gap can be explained by characteristics. In
some cases (Austria, Belgium, Estonia, France, Germany, Greece, Ireland, Latvia,
Poland, Portugal, Spain, and the EU) the selection-adjusted gap is even higher,
suggesting that positive selection is at work; that is, in the selected sample the
individuals involved are such that the pay differences between men and women are
even higher than in the population at large. The explained part of the decompositions
is smaller than the unexplained part (male and female disadvantage combined) for
almost all cases, regardless of whether selection corrections have been made. This
suggests that the data available do not fully account for the behaviour of earnings
and/or that a substantial amount of female disadvantage may exist. Interestingly,
Scandinavian countries but also Cyprus have the highest proportion of the gap
explained by characteristics, while Greece, Italy, Hungary, Poland, Portugal, Slovenia
and Spain have very low proportions of the wage gap explained. In some cases, the
explained gap is negative, suggesting that female characteristics are superior to male
ones (e.g. Portugal, Hungary and Slovenia).

4.2 Quantile decompositions of the gender wage gap

In the quantile regression approachy (see Koenker and Bassett (1978) the
characteristics of individuals can have different impacts at different points of the wage
distribution and the implied decompositions can be carried out at each point. This
allows examination of ‘glass ceiling’ and ‘sticky floor’ processes. In the case of the
former, a larger unexplained gender wage gap is observed at the top of the wage
distribution, suggesting that, as women move to the top of the distribution, their pay
may not increase as well. In the case of sticky floors, a larger unexplained earnings
gap at the lower end of the wage distribution may mean that women collect in
occupations and industries with low pay and little possibility of advancement.
Decompositions based on quantile regression have been proposed by Melly (2005),

Melly (2005) decomposes the difference between male and female wages (the left
hand side of equation (2)) into the three factors that appear on the right hand side of
equation (2), namely the effect of differences in residuals, in (median) coefficients, and in covariates:

$$\hat{q}(\hat{\beta}^M, X^M) - \hat{q}(\hat{\beta}^F, X^F) = \left[ \hat{q}(\hat{\beta}^M, X^M) - \hat{q}(\hat{\beta}^{mM, rF}, X^M) \right] + \left[ \hat{q}(\hat{\beta}^{mM, rF}, X^M) - \hat{q}(\hat{\beta}^F, X^M) \right] + \left[ \hat{q}(\hat{\beta}^F, X^M) - \hat{q}(\hat{\beta}^F, X^F) \right]$$

where and $X^M$ and $X^F$ are vectors with male and female characteristics, $\hat{\beta}^M$ and $\hat{\beta}^F$ are the estimated median coefficients on characteristics, $\hat{q}(\hat{\beta}^F, X^M)$ is the counterfactual earnings distribution of individuals with characteristics $X^M$ and coefficients $\hat{\beta}^F$, and $\hat{q}(\hat{\beta}^{mM, rF}, X^M)$ is the distribution that would have prevailed if the median coefficients were the same for males and females but the residuals were distributed as in the female distribution. For personal characteristics we use the same variables as in the Oaxaca-Ransom decomposition. This work is has been carried out for each country and is available in Christofides et al (2010).

Figure 3 reports the quantile decomposition for Cyprus. The solid line plots the actual wage distribution, the dotted line shows the unexplained component and the dashed/dotted line indicates the explained component. The gender earnings gap is higher at the lower end of the wage distribution and this suggests that lower paid women receive significantly lower earnings compared to lower paid male employees. This significant difference at the lower end of the distribution indicates the presence of the ‘sticky floor’ phenomenon. This phenomenon for Cyprus can be partly attributed to the high segregation of women in low-paying industries and occupations. The wage gap at the lower end of the distribution is explained to a large extent by observable characteristics. For the rest of the distribution the wage difference remains constant and it is mainly driven by the unexplained part of the decomposition.

5 The role of institutions and work-family reconciliation policies

The estimation of the conditional wage gap allows the examination of the relationship between the wage gap and labour-market policies which are likely to affect it both at the mean or median and across the whole wage distribution. The trade union
membership rate is used as a proxy for the wage-setting environment in each member state. The OECD (2001) Work-family Reconciliation Index is a convenient summary of the policies prevailing in different countries on work-family issues. Christofides et al (2010) have constructed a variant based on available information. The new summary measure relies on (i) the availability of formal child care for children under 3 for more than 30 hours a week, (ii) maternity pay entitlement (product of length and generosity), (iii) the extent to which part-time employment for family, children and other reasons is possible, (iv) the extent to which working times can be adjusted for family reasons and (v) the extent to which whole days of leave can be obtained without loss of holiday entitlement for family reasons.

There is an inverse relation between the mean gender wage gap, and the family reconciliation index. The correlation coefficient between the two variables is -53.9% (the hypothesis test that this correlation is not significant is rejected with p-value equal to 0.001). That is, countries with generous work-families policies (e.g. Denmark and The Netherlands) tend to have a lower unexplained wage gap compared to countries with less generous policies (e.g. Cyprus, Poland and the Slovak Republic). The relationship between the unexplained wage gap and the union membership rate is also negative with the correlation coefficient being -37.6% (the hypothesis test that this correlation is not significant is marginally accepted with p-value equal to 0.103). The relationship of the unexplained part of the mean wage gap and the union membership rate is statistically significant at the 5% level. Thus, unionism appears to be associated with reductions in the wage gap at the centre of the wage distribution.

6 Conclusion

We have examined the unconditional wage gap provided by national sources and reported in Eurostat. The minimum difference is observed in Italy where the average male average wage is 5.1% higher than the average female wage. The highest difference is observed in Estonia where the average male wage is 30.9% than the female wage rate. Using data from the 2007 EU-SILC, the gender wage gap is examined for twenty four EU countries. The gender wage gap varies considerably between countries, ranging from 0.502 ln wage points in Cyprus to 0.087 ln wage points in Slovenia.
The use of detailed individual level data allows the estimation of the conditional wage gap. The empirical results show that a large part of the wage gap is not explained by characteristics. In some countries the unexplained gap is larger than the total, suggesting that female characteristics are superior to the male ones. The wage gap is wider when non-random selection into work is taken into account. That is, women in the selected samples are more highly qualified than in the population at large.

When the decomposition is performed across the wage distribution using quantile regression, the unexplained gender wage gap widens at the top of the distribution (glass ceiling effect) in most countries and, in some cases, it also widens at the bottom of the distribution (sticky floor effect). In Cyprus, the sticky floor phenomenon seems to be particularly acute.

The conditional wage gap makes possible an examination of the relationship of the unexplained part of the wage gap with country policies and institutions. The trade union membership rate is found to be negatively related to the average and median unexplained wage gaps. Generous policies concerning the reconciliation of work and family life also reduce the mean unexplained wage gaps.
References


### Table 1: Earnings difference, employment rate and higher education attainment rate from EUROSTAT in 2007

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<tr>
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<th>Earnings Difference (%)</th>
<th>Rank</th>
<th>Employment Rate Male (%)</th>
<th>Female (%)</th>
<th>Difference (%)</th>
<th>Rank</th>
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EU-27 Average   17.6   72.5  58.3  14.2  27.3  32.9  -5.6

Sources: ¹Gender pay gap in unadjusted form in %, (Table tsiem040). ²Employment rate by gender (Table tsiem010). ³Tertiary educational attainment, age group 30-34; (Table t2020_41)

### Table 2: Countries included in the estimation and their two-letter code

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Figure 3: Quantile regression decomposition for Cyprus