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Why are women paid less than men? An investigation into gender wage gap in Poland

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An investigation into gender wage gap in Poland

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Abstract

Despite decades of anti-discriminatory legislation, wage discrimination against women is believed to be a major source of social inequality in the developed economies. In the present study we investigate the issue of gender wage gap in Poland. The analysis is carried out both with regard to the labour market as a whole and in different occupational groups. We control for potential occupational segregation by including only groups with nearly balanced males-to-females ratio (0.4-0.6). The raw wage data suggest that in the case of most occupations women in Poland earn less than men. What is more, when controlling for individual and job characteristics relevant from the perspective of the labour market, the gender pay gap increases. Lower wages received by females cannot be, therefore, justified by lower productivity potential. On the contrary, despite better qualifications than in the case of men, women earn on average less, which points to the existence of gender discrimination in the Polish labour market.

Keywords:
wage inequality, Mincer wage equation, Oaxaca-Blinder Decomposition, gender wage gap, Poland

JEL:
C21, J31, J71

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1. Introduction

Statistical data show that in Poland women are paid on average several per cent less than men. According to the Eurostat, as of 2012, the unadjusted gender pay gap[1] amounted to 6.4%. In the public debate the differences in average wages between men and women are largely ascribed to gender discrimination.

The problem of gender discrimination in the Polish labour market has been undertaken in some previous studies (e.g. Grajek, 2003; Rokicka and Ruzik, 2010; Van der Velde et al., 2013). The results obtained thus far depend heavily on the data and methodology used, but some general conclusions can be drawn. Firstly, the differences in average monthly wages between men and women are much higher than in the case of hourly wages, indicating lower labour supply of females compared to males. Secondly, the unexplained component of gender wage gap is much higher than the explained one, suggesting the existence of discrimination against women in the Polish labour market.

In the present study we investigate the extent to which these differences can be explained by different characteristics relevant from the perspective of the labour market, hence justified by differential productivity potential of men and women. The aim of the paper is to answer the question of why women in Poland are paid less than men and whether and to what extent this wage gap can be attributed to gender discrimination in the Polish labour market. We particularly focus on the sectoral dimension of this phenomenon. For this purpose we estimate the adjusted gender wage gap in different occupational groups.

In the majority of the previous studies of the Polish labour market the gender wage gap has been estimated for the whole economy with occupation and/or industry as explanatory variables. In the presence of labour market segregation of women into less-paid occupations/industries this may result in the underestimation of the discrimination effect. Most of the analyses thus far have concentrated on gender differences in average wages, including premiums and bonuses. This approach may, in turn, lead to the overestimation of the discrimination effect since on average men work longer hours than women and specifically take more overtime. We aim to contribute to the existing empirical literature by correcting for these biases. Firstly, we use the base salary, which does not include premiums and bonuses, as the dependent variable. Secondly, we restrict the analysis to occupational groups with nearly balanced gender ratio and, hence, control for potential gender segregation in the labour market.

As far as the methodology is concerned we follow the standard approach in the literature. The adjusted wage gap is obtained on the basis of extended Mincer equation estimates. To answer the question of to what extent the gender pay gap can be explained by different characteristics of males and females we use the Oaxaca-Blinder (1973) decomposition.

The structure of the paper is as follows. In section two some methodological aspects of gender wage gap estimation are discussed. In section three the hitherto research on gender wage gap in Poland is presented. Section four contains description of the data used in the paper. Section five outlines our empirical strategy and the empirical results. Section six concludes.

[1] The terms “gender pay gap” and “gender wage gap” are used thoughout the paper interchangeably.

2. The gender wage gap– definition and methodological issues

According to the Eurostat definition the unadjusted gender pay gap represents the difference between the average gross hourly earnings of male and female paid employees expressed as a percentage of the average gross hourly earnings of male paid employees[2].

However, not all the differences in earnings between men and women are due to discrimination. Article 2 of ILO Equal Remuneration Convention (No. 100)[3] states that: *Each Member shall, by means appropriate to the methods in operation for determining rates of remuneration, promote and, in so far as is consistent with such methods, ensure the application to all workers of the principle of equal remuneration for men and women workers for work of equal value.* However, Article 3 of the Convention[4] adds that: *Differential rates between workers which correspond, without regard to sex, to differences, as determined by such objective appraisal, in the work to be performed shall not be considered as being contrary to the principle of equal remuneration for men and women workers for work of equal value.*

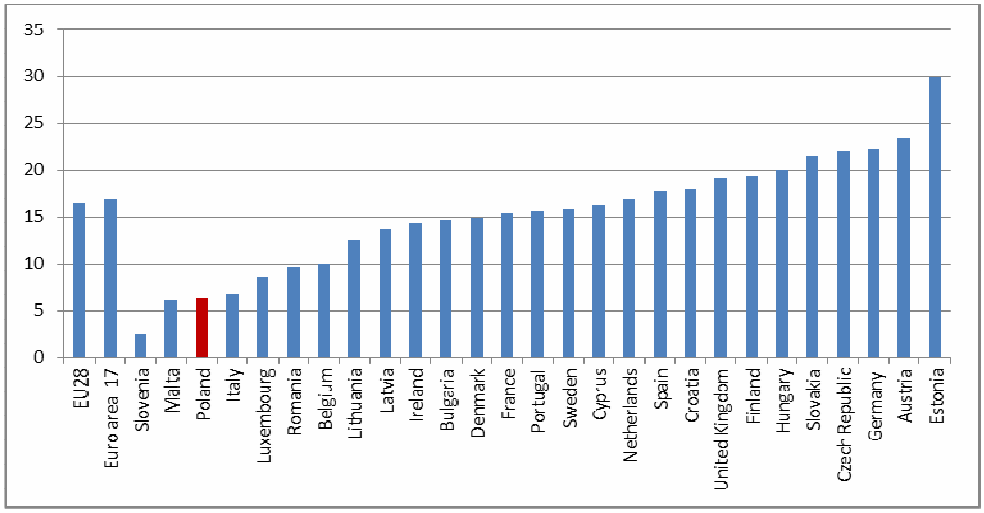
The Polish Labour Code (Art. 183a §1) also specifies: *Work of equal value means work that requires from workers both comparable qualifications, certified by documents specified in relevant regulations or by appropriate apprenticeship and professional experience, as well as comparable scope of responsibility and effort.*

Hence, both the Equal Remuneration Convention and the Polish Labour Code state that not all the differences in pay between men and women are due to discrimination. The differences can result from both differences in personal (education, work experience, professional carrier, etc.) and job characteristics (different occupation, sector, branch, type and size of the firm, etc.). In the case of women lower average earnings may also be the result of career breaks or part-time work due to childbearing.

The differences in average wages between men and women among the EU Member States are very diversified. In 2012 the highest gender wage gap was noted in Estonia (30%), the lowest in Slovenia (2.5%, see Figure 1). There are various reasons for this diversification – apart from different size of the discrepancy between males and females in human capital endowments, the differential female labour force participation rates may also play a role. The rates are, in turn, affected by different institutional and cultural factors, e.g. the attitudes towards the division of labour in the family.

[2] http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/earn_grgpg2_esms.htm
[3] http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C100 (30.11.2014).
[4] http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C100 (30.11.2014).

Figure 1. The unadjusted gender wage gap in the EU countries** in 2012 (%)



Notes: NACE Rev. 2 - Industry, construction and services (except for public administration, defence, compulsory social security)
Source: Eurostat.
** data for Greece were not available

Compared to other EU member states, the gender pay gap in Poland is relatively low (Figure 1). In 2012 the average difference in hourly pay between men and women amounted to 6.4%. Lower differences among the EU countries were noted only in Slovenia (2.5%) and Malta (6.1%). Moreover, the gap has decreased significantly over time. Between 2007 and 2012 the unadjusted gender wage gap in Poland (according to the Eurostat data) fell from 14.9% to 6.4%.

The raw wage gap is, however, a misleading indicator of gender inequality in the labour market, as it does not take into account the existing differences of male and female employees in productivity potential. It may either overestimate the extent of discrimination if women are systematically less qualified than men, or underestimate it.

Therefore, both for scientific and policy-making purposes in numerous studies since the early 1970s the raw gender differentials have been decomposed into a part that can be explained by differences in human capital endowments and an unexplained part (or a part explained by the difference in the value attached by the labour market to equal endowments of males and females). The latter part constitutes an estimate for gender discrimination in the labour market. The decomposition was pioneered by Blinder (1973) and Oaxaca (1973) and it is usually based on the Mincer equation (Mincer, 1974; Mincer and Polachek, 1974), in which logarithmic wages are regressed against individual characteristics relevant from the perspective of the labour market (such as years of education, work experience or time-out-of-work). In line with the underlying human capital model (Becker, 1964) the coefficients in the wage regression are interpreted as returns to investment (or loss from disinvestment). It is also customary to include among explanatory variables job characteristics such as profession or industry.

Despite its simplicity, this approach poses several econometric problems. First of all, the estimates of discrimination effect are conditional upon the control variables included in the wage equation. If the gender differences in potential productivity are not fully accounted for by the control variables, the unexplained residual is likely to be biased upwards. On the other hand, if the explanatory variables in the wage equation are themselves the result of discrimination, the unexplained residual will be underestimated. This may be the case with job characteristics if occupational gender segregation leads to the overrepresentation of women in less-paid professions. Another potential source of estimation bias is the unobserved heterogeneity problem resulting in endogeneity of regressors in

the wage equation. Some unobserved individual characteristics, e.g. mental abilities, affect both wages and some of the explanatory variables, e.g. educational attainment, which may lead to inconsistency of the ordinary least squares estimates. The estimates may also be inconsistent due to sample selection bias (the decision to supply labour - especially in the case of women - may be conditional on several factors such as expected wage, income of the partner, number of children) or measurement errors.

These identification problems are widely recognized in the literature but there is no consensus on how to handle them (Kunze, 2008). There is no agreement in the literature regarding the choice of controls and it is often restricted by the dataset available to the researcher. The endogeneity of regressors may be corrected for using instrumental variables estimator, but finding valid instruments – especially given data constraints – often poses major problems. If panel data are available, the unobserved individual effect may be captured by means of fixed effects estimator and some transformations of endogenous variables may be used as instruments by applying Hausman and Taylor (1981), Arellano and Bond (1991) or Arellano and Bover (1995) estimators. Despite potential inconsistency of the estimates most studies based on cross-sectional datasets apply, however, the OLS estimator (Kunze, 2008).

The results of cross-country studies suggest that gender wage discrimination is a well-established feature of labour markets in most developed economies (Blau and Kahn, 2003), i.e. only a fraction of raw wage gap between men and women can be explained by their differential productivity potential. It is also a persistent phenomenon. Although over time, raw wage gaps have fallen (from around 65% to 30% from the 1960s to the 1990s), most of this decrease was the result of improving labour market endowments of females as compared to males (Weichselbaumer and Winter-Ebmer, 2005). The extent of wage discrimination and its evolution over time varies substantially across countries (e.g. Johnes and Tanaka, 2008), income quantiles (in many countries the gender wage gap is wider at the top and/or at the bottom of the wage distribution, suggesting the existence of 'glass ceilings' and/or 'sticky floors', e.g. Christofides et al., 2013) or experience levels (the gender wage gap seems to be present from the beginning of working careers and constant or even increasing over time, e.g. Kunze, 2005). There exist also substantial gender differences in professions and industries and wages are negatively related to the percentage of women in the occupation (Grönlund and Magnusson, 2013). To some extent this is the result of discrimination, but it also reflects women's tendency to choose occupations where flexibility of work hours is higher or penalties for time-out-of-work are smaller. Consequently, not only occupational segregation but also traditional division of labour in the family disadvantages women in the labour market (Blau and Kahn, 1996).

3. Literature overview of gender wage gap in Poland

The amount of hitherto analyses of gender wage gap in Poland is rather scarce. The short description of the papers and their results is presented below.

Goraus and Tyrowicz (2014) used the Polish Labour Force Survey (PLFS) quarterly data from 1995q1 to 2012q4 to explain the differences in wages by gender. They used both Oaxaca-Blinder (1973) decomposition with two components and Nõpo (2008) decomposition with four components. Their explained variable was hourly wages. Among explanatory variables they used education level, marital status, occupation, industry, place of residence (rural/town), region, sector ownership and the size of the firm. Firstly, they estimated the average wage gap in the analysed period using different specifications. The results however were similar and indicated that the adjusted gender wage gap (around 20%) was much higher than the unadjusted one (9%). The unexplained component in the case of Nõpo decomposition it was around 19-21%, in the case of Oaxaca-Blinder – around 21-23%. Secondly, they estimated the adjusted wage gap for all the quarters separately and investigated the cyclical properties of wage gap using the Hodrick and Prescott (1997) filter. The results showed that

there was no trend in the evolution of gender gap and that the gender gap in Poland was rather stable over time.

Van der Velde, Tyrowicz and Goraus (2013) used data from the Polish Labour Force Survey in 2012 taking hourly wage as an explained variable. The control variables included age, marital status, place of residence, region (capital, large cities etc.), level of education, field of education, experience, tenure, occupation, size of the firm, industry, ownership, presence of children, presence of other sources of income available. The raw gender pay gap amounted to about 25% in the case of monthly wages and about 9% in the case of hourly wages and was higher at the top of the distribution. The adjusted gender wage gap was higher than the raw gap across the whole distribution. In general the authors concluded that the problem of sample selection had significant impact on the estimated gender wage gap. Moreover there were significant differences in wage gap between quartiles of the distribution.

Interesting results are presented in Słoczyński (2012). He estimated the gender wage gap in Poland for each of the 16 Polish regions separately. He used data from the Structure of Wages and Salaries by occupations in October 2008. The explained variable was logarithm of monthly wages. As the explanatory variables he used level of education, work experience, size of the enterprise, ownership sector, age, occupation and NACE sections. Two specifications were analysed: without and with working time used as an explanatory variable. The Oaxaca-Blinder decomposition was used. Firstly, the pooled model (for all the regions) was analysed. Secondly, parameters of separate models for each region were estimated. The results indicate that the gender wage gap was very diversified between regions of Poland. The highest differences were observed in Śląskie (Silesian) region (25.4%). The lowest was in the Warmińsko-Mazurskie region (5.9%) and other south-eastern, rural regions of Poland[5].

Mysiková (2012) estimated gender wage gap in Poland, the Czech Republic, Slovakia and Hungary using data from the Statistics of Income and Living Conditions (EU-SILC) in 2008. Hourly gross wage were used as the explained variable and several personal characteristics as the explanatory variables. First Heckman (1979) regression method for women was used to deal with the selection problem. Second the Oaxaca-Blinder decomposition to analyse the wage gap. Due to correction for the selection bias the third component (the "selection effect") was added to the decomposition. The results indicate that the difference between wages of men and women was the highest in the Czech Republic (0.26 log points) and Slovakia (0.20). It was much lower in Poland and Hungary (in both cases about 0.09). Negative selection effects were found in the Czech Republic and in Hungary, when in Poland and Slovakia it was positive. It means that in Poland and in Slovakia the selection-corrected gender wage gap would be lower than the observed one. The endowment effects were positive for the Czech Republic and for Slovakia and negative for Poland and Hungary. The differences in characteristics of men and women were responsible for 10% in the Czech Republic and 4.2% in Slovakia of observed gender wage gap. On the other hand, in Poland and Hungary, on average working women had better characteristics than working men. Detailed analysis of the endowment effect revealed that women in all countries had better characteristics, but the job characteristics were responsible for positive endowment effect in the Czech Republic and Slovakia. Discrimination effect was high for all four countries. In Poland and in Hungary it was exceeding 100% of the observed gender wage gap.

Rokicka and Ruzik (2010) aimed to estimate gender pay gap in informal employment in Poland. They used data from Polish Ministry of Labour and Social Affairs from 2007, hourly income. Among

[5] However while interpreting the results we have to remember about differences in the industry density which is relatively low in Warmińsko-Mazurskie and relatively high in Śląskie. As more observation are from Śląskie so it is expected that the variance of the wages also would be higher. The spatial distribution of the firm among regions may explain those results.

explanatory variables were age, age squared, family size, level of education, marriage, full time job, dummies for sectors, cities and towns. First the authors measured the earnings inequality between formal and informal economies using deciles ratios, Gini coefficients and entropy indices. Second, the authors calculated the gender wage gap with OLS and quantile regression on a pooled sample (women and men together) with gender as an explanatory variable[6], separately for formal and informal workers. The results indicate that differences in wages by gender existed both in formal and informal economy in Poland. In informal market wage differences were higher for low wage earners, in formal market – it was the opposite. The raw gender wage gap in informal market varied from 24% (for 25th percentile of wages) to 15% (for 75th percentile) and was equal to 19% for the whole sample. In formal market the raw gender wage gap varied from 17% (for 25th percentile) to almost 23% (for 75th percentile) and was about 21% for the whole sample. The adjusted gender wage gap was significant at 1% level only in formal employment and varied between 15% and 18%. In the informal market the adjusted gender wage gap was significant (at 10% level) only for 25th percentile of wages and was equal to 25%.

Matysiak, Baranowska and Słoczyński (2010) used both the Polish Labour Force Survey and the Structure of Wages and Salaries by occupations data from the period 1996-2008. Monthly and hourly wages were taken as explained variable. Among explanatory variables - age, region, sector and section of employment, occupation and size of the place of the employment. Juhn, Murphy, Price (1991) and Oaxaca-Blinder decomposition were used. The authors showed that the gender wage gap was by almost 10 pp. lower for hourly than monthly data. It means that part of the differences might be explained by the differences in working time. The results indicate that the gender wage gap in Poland was pro-cyclical. The difference in wages were decreasing during the downturn and growing during the economic recovery. The gender wage gap in Poland was the highest for the individuals at the age of 35-44. Oaxaca-Blinder decomposition revealed that the unexplained component was higher than the raw gender wage gap. The authors conclude that the differences in human capital and other observable characteristics were not able to explain the gender wage gap and differences in wages between men and women in Poland are due to discrimination.

Łatuszyński and Woźny (2008) used data collected by the private company (Hay Group) about wages of 183 666 individuals from 221 enterprises (only private sector) in 2004. As an explained variable they used hourly wages. Among other variables they had tenure at the company and at the current position, occupational group, region, size of the town of the workplace. They used Oaxaca-Blinder decomposition. The results indicate that the variables used in the model explained about 67% of the difference in base salary and 61% of difference in total remuneration. Moreover the difference in the feminization ratio explains about 42% of differences of the base salary and 35% in the case of the total remuneration. Differences in the feminization ratio of the occupational groups and employment structure enabled to explain about 86% of the difference in case of the base salary and 71% in case of the total remuneration. The gender wage gap was higher the higher the position of individuals in the company. It was the highest in case of specialists and managers. The gender wage differences varied also between regions. The lowest differences were observed in Dolnośląskie (Lower Silesian), Śląskie (Silesian), Zachodniopomorskie and Warmińsko-mazurskie regions. The highest in Kujawsko-pomorskie, Lubelskie and Łódzkie regions. The wage gap varied also between the occupations. The highest differences were among engineers, sales workers and workers in the customer service and the lowest for the R&D and IT workers. The gender wage differences were also much higher in large cities than in the rural areas.

Magda and Szydłowski (2008) used data from the Polish Labour Force Survey and Structure of Wages and Salaries by occupations in 1995-2006. Their explained variable was hourly wages. Among explanatory variables they had level of education, experience, occupation, type of contract, working

[6] Elder et al. (2010) showed that decomposition on pooled data systematically overstates the contribution of observable characteristics to mean outcome differences.

time, number of employees in the enterprise, sector, section, the wage bargaining level and the unemployment rate in the region. They excluded education sector because of the strong domination of women in employment. They used the Ordinary Least Squares (OLS), the Quantile Regression and Oaxaca-Blinder decomposition. The results indicate that raw gender gap was about 16% in case of the SWS data and about 13% for the PLFS data. Only small part of the gap was due to differences in observable characteristics (about 0.8% in case of SWS data and about 13% in case of PLFS data). Monthly wages at the bottom of the distribution were similar for men and women (probably because of the existence of minimum wage) but at the top of the distribution the difference was significant (above 20%). For the hourly wages the difference between males and females wages was twice smaller than for monthly data (about 7.5% in case of average wages and 6.6% for median wages). Also for hourly wages the gender wage gap have widened at the top of the distribution.

To the best of our knowledge the literature described above contains most of the latest analyses of the gender wage gap in Poland[7]. The magnitude of gender wage gap differs due to differences in data and methodology used. However, the hitherto research confirms that firstly, the differences in average monthly wages between men and women are much higher than in case of hourly wages. It means that part of the wage differences might be explained by the differences in working time. Secondly, part of the wage differences can be explained by differences in personal and employment characteristics. However majority of the research indicate that the unexplained component of gender wage gap is much higher than the explained one. It indicates the existence of discrimination of women in the labour market in Poland.

However some of the hitherto estimates of wage gap can be overestimated as most of the hitherto research analyse the gender differences between average wages (including premiums and bonuses[8]). As the share of premiums and bonuses differs between men and women, the better measure of workers' remuneration is the base (flat) salary. In our further research we then follow the approach by Łatuszyński and Woźny (2008) and use the base salary of men and women as the explained variable.

On the other hand, in some of the hitherto research, where gender wage gap is estimated for the whole economy, the differences in wages can be underestimated. This may be due to overrepresentation of women in less-paid professions. To eliminate this problem we adjusted our sample only to occupational groups with masculinization ratio between 0.4 and 0.6.

As the methodology is concerned most of the hitherto research use the Oaxaca-Blinder (two components) decomposition. In some papers the analyses were extended by introducing other techniques, however the differences in results were rather small. Therefore Oaxaca-Blinder decomposition is also the method used in our further analyses.

[7] Among the earlier papers we should also mention Grajek (2003) and Adamchik and Bedi (2003). However, as they used data from the early transition period, their results cannot be directly compared with the latter ones.

[8] The exception is Łatuszyński and Woźny (2008) where both average and base salaries were taken into account.

4. The data

The data on wages and individual characteristics of employees come from the Structure of Wages and Salaries by occupations (SWS) database for 2012. The survey is carried out with biennial frequency. It covers entities of the national economy with the number of employees exceeding 9 persons. The database includes both full– and part–time employees who worked for the whole month in October[9].

The advantage of the SWS survey is high reliability of the data on wages. Contrary to the Labour Force Survey or the Household Budget Survey the wages in the SWS are not declared by the respondents (and, hence, often downward biased, especially in the case of high-income workers), but reported by the accounting departments along with the number of hours worked.

Another advantage of the SWS data is the quantitative nature of the sample. As of 2012, the SWS survey covers 12.8% of the population of enterprises with the number of employees exceeding 9 persons. The total number of observations in the sample is 725.2 thousands. The disadvantage of the database is its representativeness only for entities employing more than 9 employees[10].

The database contains information on wages and several personal characteristics such as gender, age, level of education, work tenure, occupation, as well as some employer's characteristics: ownership sector, size of the enterprise and its location as well as the NACE section. These variables were used as controls in the Mincer equation.

According to the data from the SWS survey for 2012, the average monthly wage of men (3790 PLN) was 17% higher than the average wage of women (3133 PLN, see Figure 2). However after controlling for the differences in the number of hours worked the difference decreases significantly. The average hourly wage of men (21.4 PLN in October 2014) was only 7% higher than in the case of women (19.9 PLN). It confirms the results obtained in previous studies (see e.g. Słoczyński, 2010). Hence, the majority of differences in average monthly wages between men and women can be explained by differences in working time.

Apart from working time, on average male and female employees differ also with respect to the wage structure. In the case of men the share of statutory and optional prizes and bonuses is higher than in the case of women. Therefore, in the present study we use not the average level of earnings but the base (flat) salary divided by the nominal number of hours. When excluding prizes and bonuses the magnitude of the raw gender pay gap decreases further to 6.7%.

[9] Source: Structure of wages and salaries by occupations in October 2012, CSO.

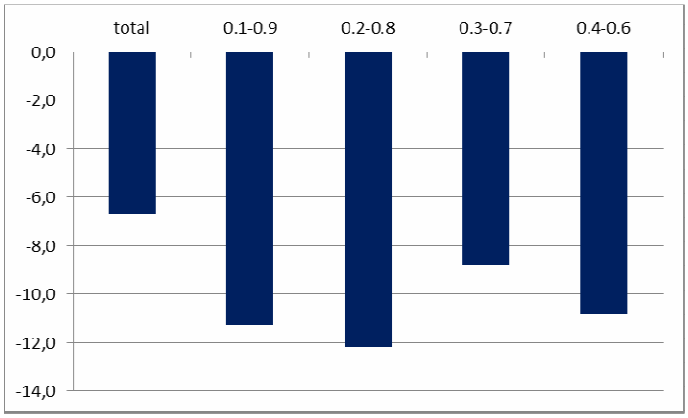
[10] The survey does not include: apprentices, persons engaged in outwork (home–workers), students maintaining vacation or diploma practices, members of workers groups organised by other units and appointed to work in the reporting units, e.g. soldiers, labour corps members, convicts; moreover, excluded were: people on maternity or child–care leaves and people appointed to schools or PhD studies, etc., persons employed in intervention and public works, persons on sick leaves. For more information about sample selection scheme see: Structure of wages and salaries by occupations in October 2012, CSO, www.stat.gov.pl

Figure 2. Average monthly (left figure) and hourly (right figure) wages of men and women in October 2012 (PLN)

Source: Structure of wages and salaries by occupations in October 2012, CSO.

In order to capture the pure gender wage gap we want to separate two interacting effects: the potential segregation of women into less-paid occupations and possible wage discrimination against women. For this purpose we restrict our analysis to occupations with nearly balanced male-to-female (or masculinisation) ratio (0.4-0.6). To ensure sufficient number of observations 3-digit occupational groups[11] are used. In total there are 25 (out of 132) 3-digit occupational groups with masculinisation ratio between 0.4 and 0.6[12]. The raw gender wage gap for the restricted sample is higher than in the whole sample and amounts to 10.8% (see Figure 3).

Figure 3. The unadjusted gender wage gap (% difference between men and women base salary) in Poland for the whole sample and after controlling for differences in masculinisation ratio



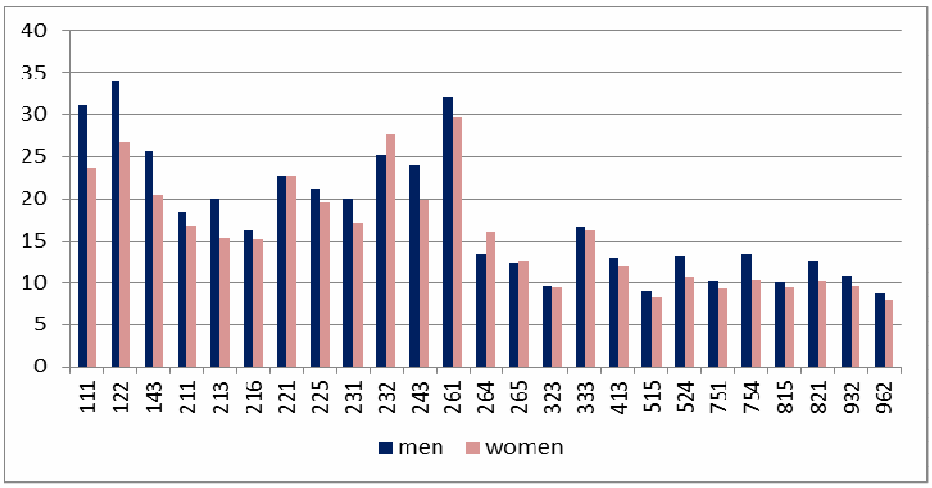
Source: Structure of wages and salaries by occupations in October 2012, CSO, own estimates.

The unadjusted gender wage gap differs significantly across selected occupational groups (see Figure 5). In the majority of occupational groups the hourly base salary of men was on average higher than that of women. Only in four out of 25 selected groups females earned on average more than males. In two cases the differences were considerable – among Authors, journalists and linguists (264) and Vocational education teachers (232) the base salary of women were almost 17% and 9% higher than men. In the other two cases (Medical doctors, 221 and Creative and performing artists, 265) the differences in base salaries were close to zero.

[11] According to International Standard Classification of Occupations, ILO, http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_172572.pdf

[12] The list of the groups is presented in Table A1 in the Appendix.

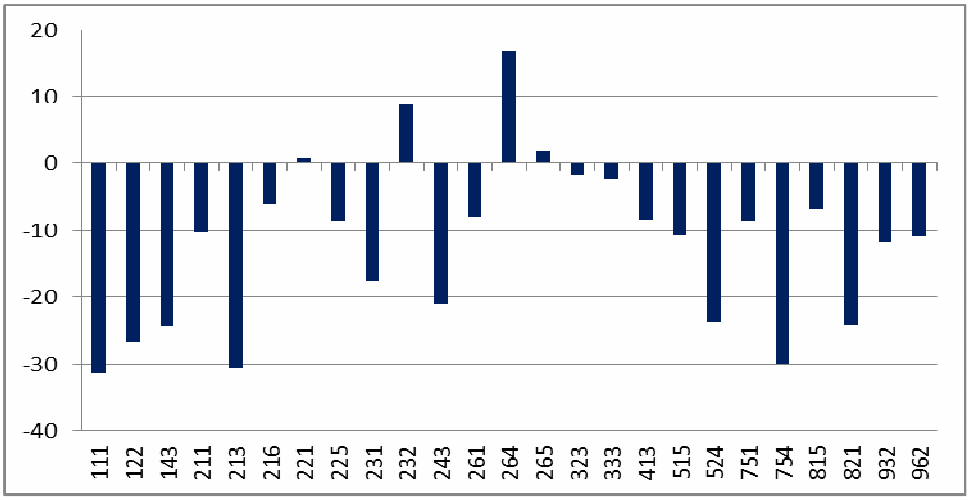
Figure 4. Average hourly base salary of men and women in selected occupational groups* (PLN)



* With masculinisation ratio between 0.4 and 0.6
Source: Structure of wages and salaries by occupations in October 2012, CSO, own estimates.

The highest differences in hourly base salary between men and women were to be observed among Legislators and senior officials (111), Life science professionals (213) and Other craft and related workers (754). In all three groups men earned on average about 30% more than women.

Figure 5. The unadjusted gender wage gap in 3-digit occupational groups with masculinisation ratio between 0.4 and 0.6 (%)



Source: Structure of wages and salaries by occupations in October 2012, CSO, own estimates.

5. The empirical strategy and the results

The empirical strategy consists of two steps. In the first one the so-called extended Mincerian wage equation with female dummy is estimated. The functional form allows for the second-order polynomial interactions whenever it is possible. The empirical equation includes all information available in the SWS data. On top of that, interactions of personal characteristics (level of education and work experience) with characteristics of the entities (size of the firm, ownership sector, NACE section) were included in the equation. As the aim of the study is to estimate the wage equation separately for each occupational group, we do not include occupation indicators among explanatory variables.

The empirical equation used in the first step is given as:

$$\ln(w_i) = \beta_0 + \beta_1 FEM_i + \beta_2 EXP_i^2 + \sum_{k=1}^{K1} \gamma_k SIZ_{ki} + \sum_{k=1}^{K2} \delta_k SIZ_k EDU_i + \sum_{k=1}^{K3} \varphi_k SIZ_k EXP_i +$$
$$+ \sum_{k=1}^{K4} \eta_k SC_{ki} + \sum_{k=1}^{K5} \iota_k SC_k EDU_i + \sum_{k=1}^{K6} \kappa_k SC_k EXP_i + \quad (1)$$
$$+ \sum_{k=1}^{K7} \lambda_k NC_{ki} + \sum_{k=1}^{K8} \nu_k NC_k EDU_i + \sum_{k=1}^{K9} \mu_k NC_k EXP_i + \varepsilon_i$$

where:

w_i – base salary (in PLN),

FEM_i - dummy variable (1 for female, 0 for male),

EXP_i – number of years of work experience and its square (EXP^2),

EDU_i – number of years in education,

SIZ_k – size of the firm (small, medium, big, huge),

SC_k - ownership sector (1 for public, 0 for private),

NC_k - NACE section (set of dummy variables for each section).

Inclusion of interactions of squared experience with other variable was not possible due to exact colinearity problems.

The results indicate that the adjusted gender wage gap, i.e. the percentage difference in hourly base wages between men and women after controlling for different personal and job characteristics, amounted in 2012 to 13.6%[13] for the whole sample. Hence, the adjusted wage gap was much higher than the unadjusted one (6.7%[14]). This result indicates that despite better qualifications than in the case of men, women earn on average less, which suggests gender discrimination in the Polish labour market. When restricting the sample to occupations with fairly balanced gender ratio (0.4-0.6) the adjusted gender gap decreases to 9.8% (Table 1). It confirms that part of the differences in wages between men and women are due to segregation of women into less-paid but (probably) more stable jobs.

[13] As a robustness check we perform the estimations with average hourly wages as an explained variable. In that case the adjusted wage gap equaled 0.168 i.e. was much higher than in case of base salaries.

[14] It confirms the findings of Goraus, Tyrowicz (2014) and Van der Velde, Tyrowicz, Goraus (2013).

Table 1. Estimated parameters of equation (1) for the whole sample and after controlling for differences in masculinisation ratio

	Total	Masculinisation ratio			
		0.1-0.9	0.2-0.8	0.3-0.7	0.4-0.6
N	725239	543893	360700	201179	109166
R^2	0.28	0.28	0.24	0.28	0.31
Female	-0.136***	-0.138***	-0.125***	-0.094***	-0.098***
EXP	0.012***	0.023***	0.014***	0.009***	0.033***
EXP^2	-0.0004***	-0.0005***	-0.0006***	-0.0005***	-0.0004***

N – size of the sample, R^2 – coefficient of determination.
Female – percentage difference in (log of) base salary of women and men
Source: own estimations.

In the next step we estimated the parameters of equation similar to the equation (1) for each of the 24[15] occupational groups. The equation (1) cannot be used directly as it is not possible to control for interactions of NACE section with personal characteristics. The reason is insufficient variability of personal characteristics in specific occupational groups. For that purpose simpler specification was used, namely equation (2):

$$\ln(w_i) = \beta_0 + \beta_1 FEM_i + \beta_2 EXP_i + \beta_3 EXP_i^2 + \sum_{k=1}^{K1} \gamma_k SIZ_k * EDU_i + \\ + \sum_{k=1}^{K2} \delta_k SC_k + \sum_{k=1}^{K3} \phi_k SC_k * EDU_i + \sum_{k=1}^{K4} \varphi_k SC_k * EXP_i + \sum_{k=1}^{K5} \eta_k * NC_k + \varepsilon_i \quad (2)$$

where:

w_i – base salary (in PLN),

FEM_i - dummy variable (1 for female, 0 for male),

EXP_i – number of years of work experience and its square (EXP^2),

EDU_i – number of years in education,

SIZ_k – size of the firm (small, medium, big, huge),

SC_k - ownership sector (1 for public, 0 for private),

NC_k - NACE section (set of dummy variables for each section).

Not all possible interactions are directly included due to collinearity. For instance, it is not possible to separately include in equation (2) number of years in education (EDU) and at the same time number of years in education interacted with the size of the firm (SIZ, set of dummy variables). In cases with interaction of continuous variable with dummy variable we omit separate continuous variable in equation specification. For analogous reason there are no interactions of size of the form with working experience.

[15] One group (323 - Traditional and complementary medicine associate professionals) was omitted because of insufficient number of observations in the sample (only 24 workers).

The results (see Table 2) indicate that the adjusted gender wage gap differ from 33% among Legislators and senior officials (111) to 4% among Other craft and related workers (754).

Table 2. Estimated parameters of equation (1) for each of the selected occupational groups

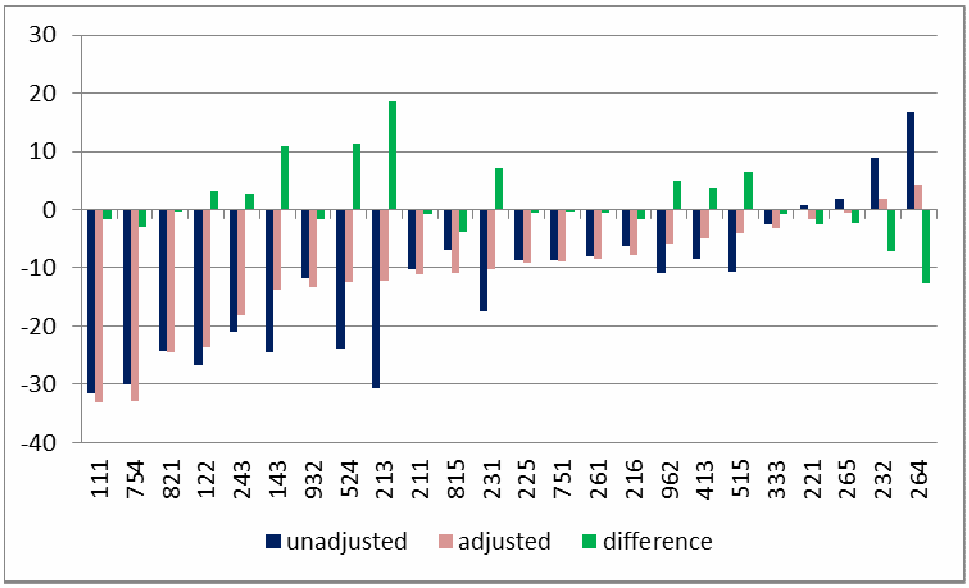
Code	N	R^2	Female	EXP	EXP^2
111	1458	0.45	-0.332***	0.034***	-0.0005***
122	4871	0.30	-0.237***	0.032***	-0.0008***
143	2798	0.28	-0.137***	0.022***	-0.0004***
211	1109	0.39	-0.110***	0.028***	-0.0004***
213	3701	0.38	-0.121***	0.030***	-0.0006***
216	1642	0.17	-0.078***	0.019***	-0.0004***
221	7646	0.31	-0.017	0.049***	-0.001***
225	217	0.42	-0.092**	0.041***	-0.0006***
231	10970	0.31	-0.103***	0.017***	-0.0002***
232	3264	0.54	0.018*	0.027***	-0.0004***
243	13686	0.21	-0.182***	0.042***	-0.001***
261	4209	0.37	-0.085***	0.053***	-0.001***
264	1309	0.12	0.043	0.017*	-0.0003
265	876	0.24	-0.005	0.020**	-0.0003**
333	2196	0.20	-0.031	0.023***	-0.0004***
413	889	0.50	-0.049**	0.012***	-0.0002***
515	6403	0.23	-0.041***	0.005***	-0.00004
524	5137	0.30	-0.125***	0.027***	-0.0006***
751	7137	0.20	-0.090***	0.006***	-0.00002
754	458	0.78	-0.329***	0.020***	-0.0003**
815	1769	0.24	-0.108***	0.007***	-0.0002***
821	12198	0.34	-0.245***	0.016***	-0.0002***
932	9608	0.19	-0.133***	0.007***	-0.00006**
962	9800	0.20	-0.059***	0.006***	-0.0001***

N – size of the sample, R^2 – coefficient of determination.
Female – percentage difference in (log of) base salary of women and men controlling for individual and job characteristics
Source: own estimations.

In the case of 15 (out of 24) occupational groups the adjusted gap in base hourly wages is higher than the unadjusted one[16]. This result indicates that despite better qualifications than in the case of men, women earn on average less, which confirms the existence of gender discrimination in the Polish labour market.

On the other hand in nine occupational groups the adjusted wage gap was smaller than the unadjusted one. The adjusted part was the highest for Life science professionals (213) where the wage gap decreased from over 30 to 12%, Other sales workers (524) – wage gap decreased from 24 to 12% and Other services managers (143) – wage gap decreased from 24 to 14%. In these occupational groups significant part of the raw differences in base wages between men and women can be explained by differences in individual and employment characteristics.

Figure 6. The unadjusted and adjusted gender wage gap in Poland in selected occupational groups



Source: own estimates.

In the second step we try to answer the question how much of the differences of wages can be attributed to wage discrimination. The most popular and well established in the literature approach to examine gender wage gap is to pursuit the Oaxaca-Blinder (1973) decomposition. The decomposition relies on the combination of separate regressions for men and women. The gap is decomposed into the part that is due to group differences in the magnitudes of the determinants of the outcome in question and group differences in the effects of these determinants. In decomposition, the interest is not just the difference in the mean of outcome variable between groups, but whether the difference is caused by the difference in coefficients or characteristics. In the case of gender wage differences, the former is often regarded as wage discrimination, and the latter is treated as difference in endowments. The Oaxaca-Blinder two-component decomposition used to explain wage differences can be presented as:

$$D = (X_F - X_M)\beta_M + (\beta_F - \beta_M)X_F \qquad (3)$$

where

$(X_F - X_M)\beta_M$ - is the part of the gap between men's (M) and women's (F) wages which can be explained by differences in characteristics, the so-called explained part and

[16] The results are in line with the estimates of gender wage gap from previous research (see eg. Goraus, Tyrowicz, 2014 or Van Der Velde, Tyrowicz and Goraus, 2013).

$(\beta_F - \beta_M)X_F$ - is the part of the gap which cannot be explained by the differences in characteristics and is treated as a discrimination effect, the unexplained part.

The decomposition is not unique as the group of men can be interchanged with the group of women. Nevertheless, as stated by Elder et al. (2010) many papers acknowledge this ambiguity by simply reporting both decompositions. However, the resulting differences are negligible.

In what follows the Oaxaca-Blinder two-component decomposition is used to answer the question of how much of the wage gap between men and women can be attributed to the differences in characteristics of individuals and how much remains unexplained.

The estimated values of the Oaxaca-Blinder decomposition for the whole sample and the subsamples restricted to occupations with particular masculinisation ratio are presented in Table 3 and Figure 7. The total difference in log wages between group of men and group of women in the whole sample is 0.05. The explained part of the wage gap is negative and amounts to -0.054. It indicates that due to better characteristics of women the gap between wages of men and women should be much smaller, close to zero. The unexplained part is positive and twice higher than the observed wage gap which points to significant wage discrimination of women in Poland.

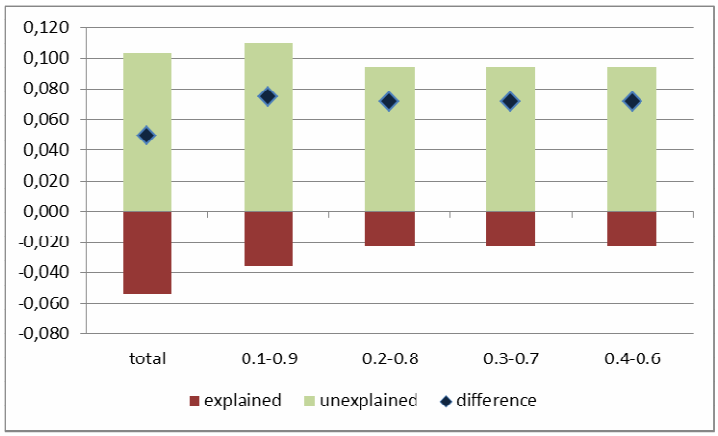
When we restrict the sample to occupations with masculinization ratio between 0.4 and 0.6, the total difference in log wages increases to 0.07. The explained component is still negative however it decreases to -0.02. The unexplained part of the wage gap in the adjusted sample also decreases and amounts to 130% of the total wage gap (comparing to 200% in the whole sample). It suggests that in the whole sample (including less-paid occupations with overrepresentation of women) the discrimination effect is overestimated.

Table 3. Estimated parameters of Oaxaca-Blinder two-components decomposition in the whole sample and in subsamples with different masculinisation ratios

Total		Masculinisation ratio			
		0.1-0.9	0.2-0.8	0.3-0.7	0.4-0.6
Men	2.595	2.678	2.718	2.718	2.718
Women	2.546	2.603	2.647	2.647	2.647
Difference	0.050	0.075	0.072	0.072	0.072
Explained	-0.054	-0.036	-0.022	-0.022	-0.022
Unexplained	0.103	0.110	0.094	0.094	0.094
N Total	725239	543893	360700	201179	109166
N Men	359704	245802	169835	91882	53967
N Women	365535	298091	190865	109297	55199

N – size of the sample
Source: own estimates.

Figure 7. Oaxaca-Blinder two components decomposition in the whole sample and in subsamples with different masculinisation ratios



Source: own estimates.

Even more interesting results are obtained when decomposing the differences in base wages separately for each of the 24 selected occupational groups (see Table 4 and Figure 8).

The results of the decomposition indicate that in the case of most occupations the explained part is much smaller than the unexplained one. Only among Other elementary workers (962) the gap in wages was totally explained by different characteristics of the workers. The explained part in this group equalled to 107% of the gap. The slightly negative unexplained component (-6%) suggests discrimination of men.

High share of explained components are noted also in Life science professionals (213) and Veterinarians (225) groups where more than the half of the gap (57%) is explained by differences in characteristics. Relatively high share of the gap is also explained for University and higher education teachers (231) – 47%. These are the occupation where significant part of the wage differences by gender is due to "worse" personal and job characteristics of the women.

On the other hand in some of the groups the explained component is negative which means that women in these groups have "better" labour market characteristics. It concerns two types of workers. The one contains groups with specific higher qualifications needed (Architects, planners, surveyors and designers – 216, Vocational education teachers – 221, Authors, journalists and linguists – 264 and Creative and performing artists – 265). The second type are the groups in which specific vocational skills are required (Food processing and related trades workers – 751, Textile, fur and leather products machine operators - 815 and Assemblers – 821).

The unexplained component of the gap was positive in 19 groups indicating that at least part of the differences in wages between men and women cannot be explained by differences in their characteristics. This part is treated therefore as the effect of wage discrimination of women (or the effect of other factors, not included in the model).

The highest share of the unexplained part was observed in the group of Architects, planners, surveyors and designers – 216, Keyboard operators – 413, Food processing and related trades workers – 751, Textile, fur and leather products machine operators - 815 and Assemblers, 821. In all of these groups the unexplained part was higher than the total wage gap.

On the other hand in five groups (Medical doctors – 221, Vocational education teachers – 232, Authors, journalists and linguists – 264, Business services agents – 333 and Other elementary workers – 962) the unexplained component of Oaxaca-Blinder decomposition was negative. In two groups (232, 264) the base salary of women was on average higher than the base salary of men. Part of this difference is due to "better" characteristics of women but most of the gap in these groups is unexplained which indicates the discrimination of men.

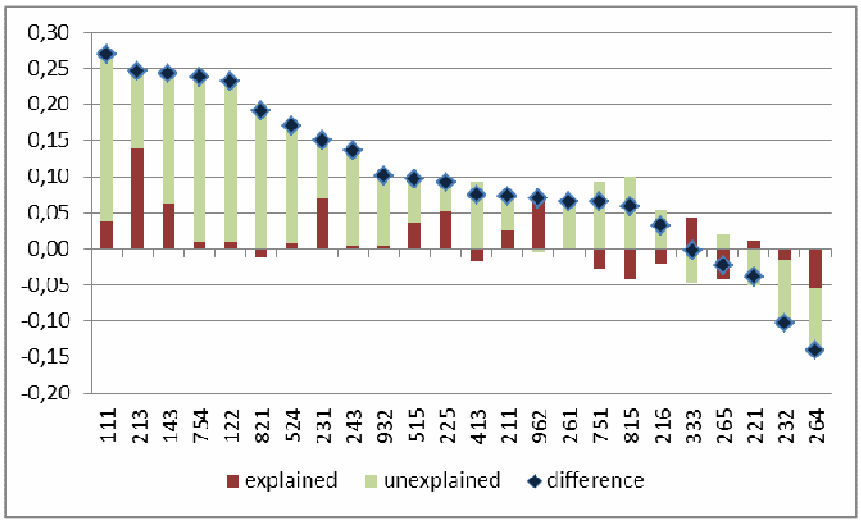
Table 4. Estimated parameters of Oaxaca-Blinder two-components decomposition in each of the selected occupational groups

	Men	Women	Difference	Explained	Unexplained	N Total	N Men	N Women
111	3,362	3,092	0.270	0.038	0.232	1458	849	609
122	3,269	3,036	0.232	0.010	0.222	4871	2888	1983
143	3,101	2,859	0.242	0.063	0.180	2798	1488	1310
211	2,784	2,711	0.073	0.025	0.048	1109	549	560
213	2,892	2,645	0.246	0.139	0.107	3701	1743	1958
216	2,666	2,634	0.033	-0.020	0.053	1642	907	735
221	2,977	3,016	-0.039	0.011	-0.050	7646	3257	4389
225	2,998	2,907	0.092	0.052	0.040	217	90	127
231	2,857	2,706	0.150	0.071	0.079	10970	6105	4865
232	3,092	3,195	-0.103	-0.016	-0.087	3264	1470	1794
243	2,953	2,817	0.136	0.006	0.131	13686	5970	7716
261	3,278	3,212	0.066	0.001	0.065	4209	1678	2531
264	2,402	2,542	-0.140	-0.054	-0.086	1309	589	720
265	2,428	2,451	-0.022	-0.042	0.020	876	489	387
333	2,693	2,696	-0.003	0.044	-0.046	2196	964	1232
413	2,472	2,397	0.075	-0.017	0.092	889	381	508
515	2,136	2,039	0.097	0.036	0.061	6403	3309	3094
524	2,398	2,228	0.170	0.008	0.162	5137	2274	2863
751	2,259	2,194	0.065	-0.028	0.093	7137	3723	3414
754	2,541	2,303	0.238	0.009	0.229	458	242	216
815	2,266	2,207	0.059	-0.042	0.101	1769	741	1028
821	2,478	2,287	0.190	-0.011	0.202	12198	6572	5626
932	2,315	2,214	0.101	0.005	0.096	9608	3980	5628
962	2,098	2,029	0.069	0.074	-0.004	9800	5376	4424

N – size of the sample

Source: own estimates.

Figure 8. Oaxaca-Blinder two components decomposition for each of the selected occupational groups



Source: own estimates.

6. Conclusions

The aim of the paper was to answer the question of why women in Poland are paid less than men and whether women are wage-discriminated in the Polish labour market. To answer these questions we analysed the gender wage gap in Poland in different occupational groups. We took data from the Structure of Wages and Salaries in October 2012 survey. To separate the potential segregation of women into less-paid occupations and possible wage discrimination against women we restrict our sample to occupations with nearly balanced male-to-female (or masculinisation) ratio (0.4-0.6). To eliminate the impact of premiums and bonuses on average wages we decide to analyse the differences in base salaries.

The analyses of statistical data showed that average hourly base wage of men in the whole sample was 6.7% higher than in the case of women. When we restricted our sample to occupations with similar share of men and women employed (masculinization ratio between 0.4 and 0.6) the unadjusted gender wage gap increases to 10.8%. The differences in wages varied significantly across selected occupational groups. In most of the groups the average base salary of men was higher than the one of women. The highest negative raw differences in October 2012 were observed among Legislators and senior officials (111), Life science professionals (213) and Other craft and related workers (754). In all three groups the base salaries of men were about 30% higher than the ones of women. Only in four groups out of 25 selected women earned on average more than men.

The results of the estimated parameters of the extended Mincer equation indicate that the adjusted wage gap in the whole sample (13.6%) is higher than the unadjusted one (6.7%). In the restricted sample the adjusted gender wage gap decreases and equals 9.8% (comparing to 10.8% of unadjusted wage gap). The comparison of unadjusted and adjusted for individual and job characteristics gender base wage gap shows that in 15 out of 24 occupational groups the adjusted base wage gap is higher than the unadjusted one. It indicates that different job characteristics do not explain the existing wage differences between men and women. Moreover despite better characteristics women are less paid than men what confirms the existence of wage discrimination.

The results of the Oaxaca-Blinder two components decomposition for the whole sample indicate that due to better characteristics of women the gap between wages of men and women should be much smaller, close to zero. The unexplained part of the gap is positive and twice higher than the observed

wage gap which points to significant wage discrimination of women in Poland. However, our results show that in the whole sample the discrimination effect is overestimated. After adjusting the sample to groups with masculinisation ratio between 0.4 and 0.6 the unexplained part of the wage gap amounts to 130% of the total differences in wages (comparing to 200% in the whole sample).

The decomposition of the wage differences in selected occupational groups shows that in most cases the explained part is much smaller than the unexplained one. The unexplained component of the gap was positive in 19 out of 24 groups indicating that at least part of the differences in wages between men and women in these groups cannot be explained by differences in their characteristics. This points to wage discrimination of women in these groups. The highest share of the unexplained part was observed in the group of Architects, planners, surveyors and designers – 216, Keyboard operators – 413, Food processing and related trades workers – 751, Textile, fur and leather products machine operators - 815 and Assemblers, 821.

On the other hand in two groups (Vocational education teachers – 232 and Authors, journalists and linguists – 264) the base salary of women was on average higher than the base salary of men but only part of the difference is due to "better" characteristics of women. Most of the gap in these groups is unexplained which indicates the discrimination of men.

While interpreting the results of the wage gap presented above we have to remember that they are strictly linked with the set of control variables in the empirical specification. In our analyses most of the control variables concern employment characteristics (size of the firm, ownership sector, NACE section). The database used in the analyses lacks some relevant personal characteristics (e.g. marital status, number of children, first/second earner etc.) which would potentially have an impact on wages. Moreover, due to data limitation, our results are valid only for the employees working in the enterprises with more than 9 employees.

Our general results confirm the findings of previous studies. Only a fraction of the gender wage gap in Poland can be explained by different characteristics of men and women. Moreover the wage gap is generally higher at the top of the wage distribution. However the magnitude of the adjusted wage gap and the decomposition of differences in wages cannot be directly compared with previous studies as instead of using the average wages, we used base salaries.

However, our results show that some of the previous estimates of wage discrimination of women (the unexplained part) can be overestimated. We showed that when we separate the effect of segregation of women into less-paid occupations the discrimination effect is much smaller. Moreover, we showed that looking at the average effects may give the imprecise results as among occupational groups there are the ones where wage discrimination of women appears and the ones with wage discrimination of men.

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Appendix

Table 1. List of 3-digt level occupational groups with masculinisation ratio between 0.4 and 0.6

Code	Name of the occupational group	Masculinisation ratio	No of employees in the sample		No of employees - total economy	
			men	women	Men	women
111	Legislators and senior officials	0.58	849	609	7920	5707
122	Sales, marketing and development managers	0.59	2888	35410	1983	26013
143	Other services managers	0.53	1488	1310	16395	12934
211	Physical and earth science professionals	0.50	549	560	5154	5002
213	Life science professionals	0.47	1743	1958	15845	17138
216	Architects, planners, surveyors and designers	0.55	907	735	12325	8873
221	Medical doctors	0.43	3257	4389	32849	46578
225	Veterinarians	0.41	90	127	930	1343
231	University and higher education teachers	0.56	6105	4865	47887	37360
232	Vocational education teachers	0.45	1470	1794	15122	18179
243	Sales, marketing and public relations professionals	0.44	5970	7716	72190	91694
261	Legal professionals	0.40	1678	2531	16647	25235
264	Authors, journalists and linguists	0.45	589	720	9043	9163
265	Creative and performing artists	0.56	489	387	4182	3351
323	Traditional and complementary medicine associate professionals	0.46	11	13	101	231
333	Business services agents	0.44	964	13148	1232	14782
413	Keyboard operators	0.43	381	508	4263	5220
515	Building and housekeeping supervisors	0.52	3309	3094	35870	33102
524	Other sales workers	0.44	2274	2863	31273	34905
751	Food processing and related	0.52	3723	3414	59404	47951

	trades workers					
754	Other craft and related workers	0.53	242	216	2440	2117
815	Textile, fur and leather products machine operators	0.42	741	8005	1028	9851
821	Assemblers	0.54	6572	5626	65420	53012
932	Manufacturing labourers	0.41	3980	5628	51509	67378
962	Other elementary workers	0.55	5376	4424	65278	48387

Source: Structure of wages and salaries by occupations in October 2012, CSO and International Standard Classification of Occupations, ILO, http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_172572.pdf, own elaboration

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