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**ARE CHILDREN DRIVING THE GENDER  
WAGE GAP? COMPARATIVE EVIDENCE  
FROM POLAND AND HUNGARY**

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## **Are children driving the gender wage gap? Comparative evidence from Poland and Hungary**

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### **Abstract**

The paper examines how much children and responsibilities related with them contribute towards the divergence of men's and women's wages, and consequently, to the formation of the gender wage gap. To derive the relative contribution of gender specific wage inequalities caused by the parenthood to the overall gender wage gap, we provide a modification of standard Oaxaca-Blinder decomposition method. Contrary to our expectations, the findings show that most of the gender wage inequality is due to the positive wage gap between men who do and do not have children and not due to the wage penalty incurred by mothers.

### **Keywords:**

Gender Wage Gap, Family Gap, Motherhood Penalty, Wage Gap Decomposition

### **JEL:**

J13, J22

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## 1. Introduction

Existing literature has documented that having children may contribute towards lower wages for women and a slight wage premium for men compared to childless individuals. Although child and marriage controls were originally primarily used to control for unmeasured human capital misspecification and unmeasured productivity (Hill, 1979), the investigation of the effects of these two factors on the wage level has recently gained researcher's greater attention. The growing research on these topics has led to the appearance of such terms as a 'motherhood penalty' or a 'family gap' and a 'fatherhood premium' (Waldfogel, 1997, Waldfogel, 1998, Budig and England, 2001, Anderson et al., 2002, Datta Gupta and Smith, 2002, Lundberg and Rose, 2002).

Despite the growing empirical research on the wage gaps between parents and childless individuals, no clear link between the parenthood effects on wages and the gender wage gap has been established. However, there are strong reasons to expect that - given the positive effect of children on the men's wages and the negative effect on the wages of women - parenthood is likely to contribute significantly to the divergence of the wages of men and women and consequently to the evolution of the gender wage gap.

In this paper, we combine the two fields of the research on the wage effects of parenthood and gender wage inequality, by proposing a gender wage gap decomposition that directly accounts for an existence of the wage differences between male and female parents and childless individuals. We carry out the analysis for Hungary and Poland, examining the magnitudes of the gaps in wages due to gender and parenthood, and the contribution of the family gaps to the gender wage differential. Poland and Hungary represent transition economies, for which the wage inequalities caused by the parenthood have not been studied so far as most of the research has concentrated on Western countries, especially the US, UK, Germany, as well as Denmark and the Netherlands.<sup>1,2</sup> The two countries also differ in the policies and benefits provided to families with children, which are likely to influence individual's, and especially women's, labor market activity (Fodor et al., 2002).<sup>3</sup>

Our empirical strategy aimed at deriving the contribution of the family gaps among men and women to the overall gender wage gap is based on several stages. First, we estimate wage equations for men and women as well as parents and nonparents. We recognize that in most of the existing literature, estimates of the parenthood effect may be biased due to the multiple selection processes that are present: 1) selection into being employed and 2) the choice of the parenthood status. We address these methodological problems using Dubin's and McFadden's selection correction model (Dubin and McFadden, 1984). In the second step, we use the estimated wage equations and concentrate on the gender wage gap decomposition. In order to directly assess the relative contribution of the family gaps among men and women to the overall gender wage gap, we propose a modification of Oaxaca-Blinder mean decomposition (1973).

Our findings suggest that the existence of the gender wage gap is largely due to the positive wage gap between men who do and do not have children. In Hungary, the family gap among women is entirely explained by women's selection into employment and motherhood, and it is not found to

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<sup>1</sup> On the other hand, transition economies were throughout investigated with regards to the changing gender disaggregated wage structure following the collapse of communism (see for example: Brainerd, 2000; Pailhé, 2002).

<sup>2</sup> A comprehensive cross-country analysis of the family gaps in Europe includes eleven European countries but all of them represent Western European economies (Davies and Pierre, 2005).

<sup>3</sup> Hungary provides universal benefits for women, whereas Poland follows very strict means-tested eligibility criteria for the benefits. Also the maternity leave varies in these two countries. While in Poland over the years 2004-2009 the maternity leave was around 14-18 weeks, in Hungary it was 24 weeks. Consequently, Hungary is recognized as a country that provides better chances for women to combine their work and family obligations. In Poland, where the share of children in the state child centers is among the lowest across the European countries, the child care is mainly delivered by women, lowering their participation rates at the labor market and involvement in the paid employment.

constitute a significant portion of the gender wage inequality. In Poland, accounting for the selections results in a higher estimated cost of motherhood, so that the wage inequality between mothers and non-mothers to a higher extent contributes to the gender wage differential.

The remainder of the paper is structured as follows. In the next section, we summarize theories on the link between family gaps and the gender wage gap, along with the existing literature that is relevant for the discussion. Section three describes the datasets used in the empirical research. In section four we present the empirical methodology that is used in the analysis. This section is divided into two parts. First part discusses the methodology and the problems involved in the estimation of the wage equations; the second part concentrates on the proposition of a gender wage gap decomposition that accounts for the family gaps in wages. In section five, we present the main results along with their interpretation, discussing the impact of the selection correction methodology as well. In section six we give concluding remarks.

## **2. The family and gender wage gaps – how do children and family responsibilities contribute to gender wage gap formation?**

There exist several theories that aim to explain the existence of a wage premium caused by the parenthood. In the case of women, existing research distinguishes at least five possible sources of mother's lower wages if compared with childless women: 1) loss in the human capital and its depreciation during the maternity leave and time out of the labor market due to childrearing (Buligescu et al., 2009, Waldfogel, 1998); 2) compensating wage differential theory – choosing "mother friendly" jobs and sectors; 3) unobserved heterogeneity of mothers and childless women; 4) Becker's work effort theory stating that lower wages of mother result from their lower productivity caused by the presence of children; 5) discrimination based theories. Recently, more in-depth explanations have been tested, such as the differences in the labor market behavior measured by the intensity of the on-the-job search of mothers and childless women (Zhang, 2012) and changes in the non-wage aspects of the job around the motherhood (Felfe, 2012). Higher wages of fathers compared with non-fathers are in turn mainly explained by the theory of specialization. According to this theory women following the childbirth tend to specialize in the home production whereas men in the production delivered at the labor market (Lundberg and Rose, 2002, Killewald and Gough, 2013). Higher wages of fathers are also associated with unobserved gains in their productivity induced by fatherhood or their positive discrimination by the employers caused by a higher valuation of father's social status (Glauber, 2008).

On the other hand, there are a large number of studies on the gender wage gap in general, and some surveys on the topic (international reviews include Weichselbaumer and Winter-Ebmer (2005), and Hersch (2006)). However, previous estimates do not aim to measure the contribution of the family gap to the overall gender gap, despite the fact that biological and cultural differences between the genders related to childbearing are clearly an important factor (Hersch, 2006).

To the best of our knowledge, there are only few studies, which aim to link the wage effects of marital status, children, and thus, family commitments and the gender wage gap. First, Dolton and Makepeace (1986) argued that wage equations as well as the selection equations that pre-determine wages may differ based on the family status.<sup>4</sup> Their findings indicate that single and married women have different selection specifications, and childless and child rearing women have different selection as well as earning equations. Based on the estimated earning equations, Dolton and Makepeace (1986) further decompose the gender wage gap according to Oaxaca-Blinder methodology. They estimate the unexplained components of the wage gaps between different subgroups of married/single and child rearing/childless men and women. Second, Waldfogel (1998) also argues that there exists a relation between the family gap and gender wage gap. She writes: 'The family gap may be another reason why the gender gap is larger in the United States than in other countries'.

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<sup>4</sup> They test their hypothesis by investigating the significance of the dummy variables indicating parenthood and relationship status as well as the interaction terms both in earning and selection equations.

According to Waldfogel (1998) the prevalence of a gender wage gap in the U.S. may be caused by the relatively low provision of family policies such as maternity leave and child care (especially until 1993, when the U.S. did not have a national maternity leave policy). Based on the OLS wage equations, she decomposes the gender wage gap in 1980 and 1991 to find out that while the gender wage gap has declined, the relative contribution of the marital and parental characteristics and returns has increased.

This evidence shows that although some attempts have been undertaken to combine the findings on the family and gender wage gaps, they are rather weak and suffer from methodological problems. Dolton and Makepeace (1986) do not provide estimates of the contribution of the family gap to the gender wage gap and investigate several gaps between male/female and marital and parenthood combinations. Waldfogel (1998) in turn uses standard OLS estimation, which estimates – especially for women – are likely to be biased due to the employment selection and endogeneity of children variables in the earning equation. In consequence, based on the existing literature, no strong evidence may be found on the role of parenthood in the formation of the gender wage gap and the extent children contribute to general gender wage gap inequality.

### **3. Data description**

For the empirical analysis we use the data from the Household Budget Surveys (HBS) for Poland and Hungary. The databases contain the information on the demographic characteristics as well as the labor market activity and housing and living conditions. The design of the databases allows deriving the information on the family situation and parenthood status. The datasets have however certain drawbacks regarding the reported earnings that are further discussed below. Despite that, we still decide to use these datasets as they contain information that is crucial for the identification of our empirical models.<sup>5</sup> Given the structure of other national datasets that could be used (for example Labor Force Survey) the HBSs seem to better meet the requirements regarding the collected information.<sup>6</sup>

For Poland we use recent data of 1999-2009 that are collected based on the same statistical methodology, which is a monthly rotation of the household. Each year approximately 37,000 households take part in the survey but the total number of individuals varies across the years. The data on the labor market activity is collected only for individuals, who at the time of the interview were at least 15 years old. In Hungary, the household data is available for the years 2006-2009. Household income, spending, and characteristics are collected in March-April of each year. Labor market data is collected for individuals aged 16 or above, and this data refers to the current status (overall activity variable), or to the previous year (monthly activity variables).<sup>7</sup> The data is also collected based on a rotational panel. About 1800 households are included in the survey.

We consider only employed individuals who are not in self-employment, not working in agriculture and are of working age (16-64 for men and 16-59 for women). We further restrict the sample to individuals, who are 25 to 60 years old. We do so because in the analyzed counties individuals aged 16-25 are very likely to be still in education, which makes the mechanism of selection into employment less clear.

The dependent variable in our analysis is the natural logarithm of an hourly wage. For the Polish HBS, the data on earnings are collected based on monthly information meaning that only the average nominal monthly earnings are provided. Usually, the hourly wage could be derived using the

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<sup>5</sup> That is the datasets contain unique variables that are essential for the identification of the model. These variables are listed in section 4.1., in which the exclusion restrictions are discussed.

<sup>6</sup> For Poland the LFS does contain more precise wage information. It does not however provide the information on housing condition that we use for the identification.

<sup>7</sup> For our sample dataset, we use the past year's status, since this is the time period for which the wage information is available.

information on the exact hours worked. However, for Polish HBS there is no information on the hours worked and only an indicator of part time employment is available. Given the data structure, we decide to concentrate only on full time employees, whose average hours worked are likely to be less diverged than part-time workers.<sup>8</sup> We recalculate the hourly wage assuming that the average number of hours worked per week is 40.<sup>9</sup> Due to the limited data on some other variables, we additionally restrict the sample to most recent years 2005-2009.

On the other hand, for the Hungarian dataset the information on the wages is collected based on a yearly basis. In order to make the data comparable, we therefore recalculate the statistic as the average monthly wage and also consider only full time workers. The Hungarian dataset does contain information on hours worked, thus it is possible to calculate hourly wages more accurately than in the case of Poland. However, due to our restriction of the sample to full time workers, this correction for actual hours worked does not make a significant difference, as most are reported as working the standard 40 hours per week.

The principal variable in our analysis is a variable that indicates the presence of a child. The datasets do not contain precise information whether an individual has a child. We thus derive the variable indicating whether an individual is a child, and then calculate total number of children a mother or father has based on the indicators assigning the relation to the head of the family, as well as the variables indicating the id of a mother and a father. We define a child as an individual that is living in the household with his parents and is below 25 years old.

On overall, the final sample for Poland consists of 105,183 individuals, out of which 61,326 are men, and 43,857 are women. Around 65 percent of individuals that are included in the sample have children. Women are found to be better educated than men, as the share of women with tertiary education is around 30 percent, whereas of men around 17 percent. Average hourly wage of women is around 8 PLN and of men around 10 PLN.<sup>10</sup> For Hungary, the final sample is smaller and consists of 10,821 out of which 6,045 are men and 4,776 are women. Similarly to Poland, around 60 percent of individuals have children. The hourly wage for men is around 890 HUF, and for women 766 HUF. Detailed summary statistics are presented in Table A. 1 and Table A. 2 in the Appendix.

#### **4. Econometric framework – Methodology**

##### **4.1. Modeling the wage equations**

The estimation of the gap in wages caused by the parenthood is a methodologically complex problem as the decision whether to have a child may be related to the unobservable factors influencing the wages. These may include commitment and devotion to work and individual career orientation. Moreover, only selected individuals are observed working, which means that additionally there is a problem of the labor market (employment) selection. Most often in the previous literature on the family gaps, the above mentioned selection methodological concerns are investigated separately, with the consequence that the estimates corrected for employment selection are still likely to be biased if parenthood selection takes place, and the estimates that account for the heterogeneity of parents and non-parents are still biased due to employment selection. Since both selection processes are likely to be present simultaneously, truly unbiased estimators can be obtained only if both of them are accounted for. This can be achieved by applying a double selection model (Tunali 1986; Lee

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<sup>8</sup> This is not such a significant restriction in the case of these two countries, as the share of part-time workers is low. In Hungary, about 4.7% of workers report working part-time, while in Poland, this is 9%.

<sup>9</sup> This transformation does not impact the results, which means that the same results would be obtained if the wage rate was not recalculated.

<sup>10</sup> Wages are expressed in constant prices from 2005. The wages for Poland are reported in Polish *zlotys* (PLN), whereas for Hungary in Hungarian *forints* (HUF).

1979; Ham 1982; Fisher et al. 1981) or the multinomial correction models (Lee, 1983; Dubin and McFadden, 1984; Dahl, 2002).<sup>11</sup>

In this paper to report unbiased estimates of the wage equations for female and male parents and non-parents we apply multinomial correction model proposed by Dubin and McFadden (1984). As shown by Bourguignon et al. (2007) Dubin's and McFadden's model performs well and it is preferred to other selection models that involve several alternatives, such as Lee's (1983) or Dahl's models (2002). Below we outline Dubin's and McFadden's model, hereafter DMF, adapted to our conceptual framework.

Individuals may choose particular employment-parenthood status out of four possible alternatives: (1) being working parent, (2) being working non-parent, (3) being not working parent and (4) being not working non-parent. The choice of the employment-parenthood status for men and women is modeled by the multinomial logit model of a form: <sup>12</sup>

$$Y_{s,j}^* = X_{s,j} \vartheta_{s,j} + \omega_{s,j}, \quad (1)$$

Where  $j = \{f, m\}$  refers to females ( $f$ ) and males ( $m$ ) and  $s = \{1, 2, 3, 4\}$  denotes four possible alternatives. The wage equation for each possible combination of employment-parenthood decision is given by:

$$Y_{s,j} = X_{s,j} \beta_{s,j} + U_{s,j}. \quad (2)$$

The bias of the estimates occurs because the error terms  $U_{s,j}$  and  $\omega_{s,j}$  may be correlated as there may exist some unobservable characteristics that affect both the choice of employment-parenthood status and wage rate. Assuming that the error terms are linearly related so that  $E(u_{1,j} | \omega_{1,j}, \dots, \omega_{s,j}) = \sigma \frac{\sqrt{6}}{\pi} \sum_{s=1}^S r_{s,j} (\omega_{s,j} - E(\omega_{s,j}))$ , where  $r_{s,j}$  denotes correlation coefficient between  $\omega_{s,j}$  and  $U_{s,j}$  as in equations (1) and (2) and selection equation is modeled with the use of multinomial logit, it can be shown that:

$$E(\omega_{1,j} - E(\omega_{1,j}) | Y_{1,j} > \max_{t \neq s} (Y_{t,j})) = -\ln(P_{1,j}); \quad (3)$$

$$E(\omega_{s,j} - E(\omega_{s,j}) | Y_{1,j} > \max_{t \neq s} (Y_{t,j})) = \frac{P_{s,j} \ln(P_{s,j})}{1 - P_{s,j}}; \quad (4)$$

Where  $P_{s,j}$  is a probability that the alternative  $s$  is preferred. Given the linearity assumption and model's initial restriction of  $\sum_{s=1}^4 r_s = 0$ , this implies that the outcome equation conditional on choosing  $s=1$  is given by:

$$Y_{1,j} = x_{1,j} \beta_{1,j} + \sigma \frac{\sqrt{6}}{\pi} \sum_{s=2}^S r_{s,j} \left[ \frac{P_{s,j} \ln(P_{s,j})}{1 - P_{s,j}} + \ln(P_{1,j}) \right] + v_{1,j}. \quad (5)$$

In the wage equations we include several control variables. Firstly, in accordance with Becker's human capital theory (Becker, 1964) we apply a Mincerian form wage equation and control for the level of education and age of individuals.<sup>13</sup> The decision to marry may also impact the labor market outcomes of men and women, which we account for via the inclusion of a dummy variable for a

<sup>11</sup> For a review of selection correction methods based on the multinomial logit model, see Bourguignon et al. (2007).

<sup>12</sup> The first step of the model, that is the multinomial logit, requires that the assumption of the independence of irrelevant alternatives (IIA) is met. This restriction means that the evaluation of an alternative to another alternative does not change if other (irrelevant) alternative is added to the set of choice. Bourguignon et al. (2007) however show that DMF correction method performs well even if the IIA hypothesis is violated. Still, in order to test whether the IIA hypothesis holds we additionally perform diagnostic tests due to Hausman and Small Hsiao. The tests provide mixed results. The results are available from the authors upon the request.

<sup>13</sup> The datasets we use do not provide the measure of labor market experience. Given that we decide to include both the age and education and not potential experience that could be also calculated. As shown by Anderson et al. (2003) potential experience overestimates women's actual experience if women who have children take time off to raise the children.

marital status with single individuals left as the reference group.<sup>14</sup> The parenthood effect we measure is therefore separated from the marriage effect. In line with existing literature that reports higher wages for individuals working in the private sector (Heitmueller, 2006), we also control for the sector of work.<sup>15</sup> We do not account for the occupations, as the choice of occupation may be endogenous in the wage equation and correlated with the decision on the parenthood. It is also not clear whether occupational outcomes are already a result of discriminatory practices of the employers or pure gender-specific occupational choices.<sup>16</sup> Finally, we control for regional disparities by accounting for the size of the place of living in terms of the total number of inhabitants, region of the country, and whether an individual is living in the capital, since these factors are likely to differentiate average wages.

The identification of a model requires valid exclusion restrictions that are included in the estimation of the choice of employment-parenthood status and excluded from the wage regression. We use a set of exclusion restrictions that have been previously adapted in a similar research and are also available in our datasets (Joshi et al., 1999). These variables include: an indicator whether an individual has a spouse that is employed, the age of a spouse, total non-labor income available to the household, total number of individuals living in the household and housing conditions, which are total number of rooms and housing tenure.

We report both the estimates from DMF model and OLS regressions to assess the bias. As the DMF estimation is based on two stage approach and standard errors from the second stage are not efficient, in the DMF estimations we provide bootstrapped standard errors. Given that the estimation of the family gap is usually carried out via the inclusion of a dummy variable indicating the presence of children in the wage equation (for example: Waldfogel, 1997, Waldfogel, 1998), we additionally complement our analysis with this approach and compare the estimates for Poland and Hungary with previously obtained ones for other economies.

#### 4.2. Decomposing the gender wage gap that accounts for the parenthood

The primary goal of this paper is to assess to what extent the existence of the family wage gap may contribute to the gender wage gap. To do so - based on the wage equations estimated using both the selection correction model and OLS - we propose an extension of standard gender wage gap decomposition commonly referred to Oaxaca-Blinder mean decomposition (1973).

In the present setting, we have four different wage equations: for childless women, for mothers, for childless men, and for fathers. Denoting the separate wage equation for parents and non-parents as:

$$\ln w_j^c = X_j^c \beta_j^c + u_j^c \quad (6)$$

Where  $c = \{CH, NCH\}$  refers to two observed states of employment and parenthood status (CH - being working parent and NCH - being working non-parent) and  $j = \{f, m\}$  for female and male, we can write the mean wage levels for men and women as:

$$\overline{\ln w_m} = p_m \overline{\ln w_m^{CH}} + (1 - p_m) \overline{\ln w_m^{NCH}} \quad (7)$$

$$\overline{\ln w_f} = p_f \overline{\ln w_f^{CH}} + (1 - p_f) \overline{\ln w_f^{NCH}} \quad (8)$$

<sup>14</sup> We restrict the sample to individuals who are either married or single. We do not consider divorced or widowed individuals as for these individuals the parenthood status may be incorrectly specified. Parenthood is defined as having a child that is still living in the household and is at most 25 years old. For divorced individuals we are therefore unable to identify correctly whether he or she has a child as the child is living only with one of the parents.

<sup>15</sup> This is true only for Poland because for Hungary in the database there is no information on the sector of work.

<sup>16</sup> As it is questionable whether to account for the occupational choices, we do however additionally run the analysis controlling for occupations. The results are comparable to the findings obtained when the occupational controls are excluded.



where  $p_f$  and  $p_m$  are the shares of women and men who have children. After very simple algebraic manipulation these can be rewritten as:

$$\overline{\ln w_m} = p_m(\overline{\ln w_m^{CH}} - \overline{\ln w_m^{NCH}}) + \overline{\ln w_m^{NCH}} \quad (9)$$

$$\overline{\ln w_f} = p_f(\overline{\ln w_f^{CH}} - \overline{\ln w_f^{NCH}}) + \overline{\ln w_f^{NCH}} \quad (10)$$

where the terms in parentheses are the family gaps in wages by gender. Incorporating the above equations to the standard mean gender wage gap decomposition, defined as a mean difference in log wages of men and women, we have:

$$\overline{\ln(w_m)} - \overline{\ln(w_f)} = p_m(\overline{\ln w_m^{CH}} - \overline{\ln w_m^{NCH}}) - p_f(\overline{\ln w_f^{CH}} - \overline{\ln w_f^{NCH}}) + (\overline{\ln w_m^{NCH}} - \overline{\ln w_f^{NCH}}) \quad (11)$$

The gender wage gap can be thus separated into three components that represent the family gap among men and women, and the gap in wages among non-parents. Note that because of the negative sign in front of the measure of the family gap among women, when the gap exists - that is when women with children earn lower wages - then it contributes positively towards the formation of the overall gender wage gap. Each of the three components may be additionally decomposed into explained (endowment) and unexplained (remuneration) components using Oaxaca and Blinder decomposition method.

In the case of the wage equations corrected for the selection, on the right hand side of the estimated equations we will additionally have expressions that represent the correction terms. Usually the selection terms are treated in two manners. The first approach treats the selection terms as a separate component of the decomposition and portions the gap into explained, unexplained and selection parts. The second set of the studies subtracts the selection correction terms from both sides of the estimated equation and reports the gap in 'potential' (or offered) wages (Neuman and Oaxaca, 2004). Given that, we decide to interpret the selection terms as an additional selection component representing the part of the gap that is due to the difference in the selection patterns.

## 5. Results

### 5.1. Wage equations

Detailed results from OLS and DMF estimations of the wage equations are presented in Appendix in Table A. 3 for Poland and Table A. 4 for Hungary. The OLS results for Poland show that full time female workers rather than a motherhood penalty receive a positive premium of 1.5 percent from their motherhood. For Hungary the respective estimate is around negative 1.9 percent but the result is not statistically significant. In line with the expectation, positive premium is present for fathers: in Poland full time male workers receive by 7.8 percent higher wages than men who do not have children, whereas in Hungary the respective premium is lower and equals to positive 1 percent. For Hungary the result is again not statistically significant.

The estimated coefficients related to the variable indicating the individual marital status show that both in Poland and Hungary marriage has a positive impact on the wages of men. In Hungary, the effect is around 14 percent and in Poland around 17 percent. The effect of marriage for women in the case of Hungary is negative and equals to 4.6 percent and in the case of Poland to positive 1 percent.

The results are interesting when compared with the OLS estimates found for Western economies, especially the US (Budig and England, 2001; Korenman and Nuemark, 1992, Lundberg and Rose, 2002). The estimates of the motherhood penalty for Poland and Hungary are much smaller, whereas the estimates of the effect of marriage are much higher, than the ones found for other economies. On the other hand, the effects of marriage present for men are much higher than the ones reported by Lundberg and Rose (2002) for the US. The results thus show that for Poland and Hungary it is mostly the marital not the parental status that is influencing the earnings of men and women. This

means that the specialization of men and women in the labor and household production is likely to be observed following the marriage itself and not the presence of children.

The estimation output for the subsamples of individuals who do and do not have children shows that the returns from the observable characteristics, such as age and education, are different for parents and nonparents. The wage-age profiles are much steeper for nonparent – both men and women – than parents, which may reflect parents lower human capital accumulation due to the career interruptions caused by the parenthood. The returns from education are slightly higher for nonparents.

The estimates corrected for the selection bias are presented in columns 7-10 in Table A. 3 (for Poland) and Table A. 4 (for Hungary). Both for Poland and Hungary, the correction terms are found to be significant showing that the selection is critical for a proper analysis of the family gaps among men and women. For both countries, in all the wage equations the F-tests of a joint significance of correction terms results in the rejection of a null hypothesis stating that the corrections have no effect on wages.<sup>17</sup>

The estimates of mother's wage equation for Poland and Hungary show that there is a negative correlation between the unobservable factors influencing the wages of mothers and the unobservable determinants of the choice of being working and not having children. Such factors may include for example an ability to handle multi tasks and workload. This may be interpreted as a positive selection of women into the motherhood. The effect is highly statistically significant for Poland but weakly significant for Hungary. On the other hand, the positive coefficient related to the choice of being a not working mother shows that the unobservable factors related to the choice of this state are positively correlated with unobservable factors influencing wages of mothers. This finding shows that among mothers there is a negative selection into the employment. For Poland we additionally observe a negative selection into employment among working non-mothers (column 7 Table A. 3); this effect is not found for Hungary.

The estimates of wage equations for men for Poland and Hungary show mixed results. In Poland, it is the employment selection that is mostly important. In the case of working fathers in Poland we observe a positive correlation between unobservable factors that influence father's wages and unobservable determinants of being a not working father. There is also a negative relation between unobservable factors that are influencing the choice of being a not working non-father and unobservable determinants of father's wage. The findings thus show that working fathers in Poland are negatively selected into employment out of all fathers and positively selected into the family-employment status if compared to not working childless men. In the case of wage equation of childless working men the selection coefficients show that unobservable factors influencing their wages are negatively related to unobservable factors related to the choice of being a working parent. Such unobservable factors may include for example devotion and attachment to the workplace and employment. The same effect is found for Hungary but it is not statistically significant.

The estimates of the returns from the human capital in the wage equations corrected for the selections are in general higher than the ones obtained from the uncorrected estimations. Both the returns from the education and age are thus overestimated if the selections are not accounted for.

## **5.2. Decomposition of the gender wage gap that accounts for the family gaps in wages**

The results of the gender wage gap decomposition that shows the relative contribution of the family gaps are presented in Table 1. Detailed results that involve the family gaps decompositions are presented in the Appendix. We report both the decomposition based on OLS and DMF and compare the role of selection processes.

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<sup>17</sup> In the case of Hungary the F-test of a joint significance of selection terms results in the value of 7.7 ( $p=0.0$ ) for mothers, 2.39 ( $p=0.067$ ) for non-mothers, 3.94 ( $p=0.008$ ) for fathers and 6.28 ( $p=0.0$ ) for non-fathers. In the case of Poland the respective values are 15.56 ( $p=0.0$ ), 3.34 ( $p=0.0$ ), 176.95 ( $p=0.0$ ), 80.22 ( $p=0.0$ ).

**Table 1. Contribution of the family gaps among men and women to total gender wage differential for Poland and Hungary**

	Poland				Hungary			
<b>Gender wage gap (GWG)</b>	<b>0.187</b>				<b>0.104</b>			
	OLS		DMF		OLS		DMF	
	Estimate	% of GWG	Estimate	% of GWG	Estimate	% of GWG	Estimate	% of GWG
<b>Family gap women</b>	<b>-0.027</b>	<b>9%</b>	<b>-0.027</b>	<b>9%</b>	<b>-0.081</b>	<b>49%</b>	<b>-0.081</b>	<b>49%</b>
Explained	-0.040	14%	-0.025	9%	-0.082	50%	-0.064	38%
Unexplained	0.014	-5%	-0.029	10%	0.000	0%	0.054	-33%
Selection	NO	NO	0.027	-9%	NO	NO	-0.072	44%
<b>Family gap men</b>	<b>0.127</b>	<b>45%</b>	<b>0.127</b>	<b>45%</b>	<b>0.090</b>	<b>51%</b>	<b>0.090</b>	<b>51%</b>
Explained	0.047	16%	0.031	11%	0.080	46%	0.058	33%
Unexplained	0.080	28%	0.141	50%	0.010	6%	0.015	9%
Selection	NO	NO	-0.046	-16%	NO	NO	0.016	9%
<b>GWG childless individuals</b>	<b>0.087</b>	<b>46%</b>	<b>0.087</b>	<b>46%</b>	<b>-0.001</b>	<b>-1%</b>	<b>-0.001</b>	<b>-1%</b>
Explained	-0.106	-50%	-0.084	-45%	-0.123	-117%	-0.114	-109%
Unexplained	0.192	97%	0.125	67%	0.121	116%	0.193	185%
Selection	NO	NO	0.046	25%	NO	NO	-0.080	-77%

Note: Detailed estimation results are included in the Appendix.

For Poland, the gender wage gap that shows the difference in the wages of men and women expressed as a percentage of the average men's wage, accounts for 18.7 percent.<sup>18</sup> In Hungary, the respective gap is lower than in the case of Poland, and accounts for around 10.4 percent.<sup>19</sup> Both in Poland and Hungary, the decomposition that uses OLS wage estimation results shows that roughly half of the gender wage gap is due to fathers' relatively higher wages (family gap among men). For Poland, the family gap among men is around 13% and it constitutes 45% of the total gender wage gap. The respective family gap among women is around 3 percent. This fact contributes to the overall gender wage gap in only 9 percent. The rest of the gender wage gap (46 percent) is due to the gender wage inequality among childless individuals. In Hungary, the family gap among men is smaller than in Poland and it is equal to 9%. The gap makes up 51% of the total gender gap. On contrary, the family gap in wages of women in Hungary is higher than in Poland and is equal to negative 8 percent. This fact accounts for the remaining 50 percent of the total gender wage gap. The results thus show that while in Poland, parenthood-based wage inequalities contribute to the gender wage gap mostly because of men's wage premium from being a father, in Hungary the gender wage gap may be attributed to unequal wage distribution of fathers and non-fathers as well as mothers and non-mothers. Detailed decomposition results (Table A. 5 and Table A. 6 in the Appendix) show that these parenthood-based inequalities in Hungary are mostly explained by the distribution of observable characteristics. In Poland men's higher wages are only partly explained by father's higher human capital endowments.

<sup>18</sup> Detailed decomposition results shows that the gap is found to be not explained by the differences in the distribution of the characteristics. This means that if men in Poland followed the distribution of women's education than their wage would be actually higher and the average gender wage gap would increase.

<sup>19</sup> Similarly to the gender wage gap in Poland, the explained portion of the gender wage gap is negative (mostly due to educational differences, since female employees are relatively highly qualified).

Once we account for the selections of individuals into the employment and parenthood status, the findings related to the parenthood based sources of the gender wage inequality significantly change. For Hungary, we observe that the gap in wages that is due to parenthood is overestimated because of the differences in the selection patterns between mothers and non-mothers. The decomposition results show that women's selection nearly entirely explains the existence of the female family gap in wages. For men we observe that the differences in the selection processes among fathers and non-fathers account for less than one fifth of the family gap among men (18 percent, see Table A. 8) and only 9 percent of total gender wage gap. This means that if the selections are accounted for, we find slightly lower family gap among men. On the other hand, the raw gap among childless men and women in Hungary is small and insignificant (-1 percent) but the differences in selection process lead to its high increase.

For Poland we observe somehow different results when the selections are controlled. For women, differences in the selection processes cause the true family gap to be higher than the observed one. The differences in the selection processes among mothers and childless women, and especially mother's positive selection into working and having kids, thus contribute towards the widening of the gap in their average wages. Consequently the gap in mother's and non-mother's wages constitutes a significant part of the gender wage differential. For men we observe similar results. The difference in the selection processes among fathers and non-fathers is not explaining the gap in their wages, but contributes towards its increase. The same argument thus follows, that the gap in father's and non-father's wages to a higher extent contributes towards the persistence of the gender wage gap. In consequence of the selections, the true gender wage gap among childless individuals in Poland is likely to be smaller than the observed one.

To conclude, the decomposition results show that accounting for the selections is critical for the analysis of gender and family based inequalities. Wage inequalities due to parenthood explain the gender wage gaps in Poland and Hungary in a different manner. In Hungary, women's selection into employment and parenthood entirely explains the gap in their wages, and the gender wage gap is mostly due to the high difference in the wages of males and females who do not have children and the family gap among men. In Poland, however, the female's family gap is underestimated and accounting for the selection leads to its increase. In consequence, higher part of the gender wage gap is attributable to mother's lower earnings compared to women who do not raise kids. Men's selection also causes the family gap among men to increase, so that it also constitutes a significant source of gender wage inequality. This means that while in Hungary the parenthood based inequalities explain the gender wage gap mostly via father's wage premium, in Poland the gender wage gap is largely due to the prevalence of both mother's labor market disadvantage and father's positive wage premium. When looking at the detailed decomposition results of the family gaps among men and women (Table A. 7 and Table A. 8) it is clear that the existence of the family gap among men is largely unexplained by the differences in the distribution of their characteristics suggesting that unobservable factors, that may include father's longer working hours, which we do not fully control for, as well as employer's positive discrimination, may lead to their wage premiums.

## **6. Conclusion**

This paper analyzes family gaps among men and women and their relative contribution to the overall gender wage inequality. The analysis is carried out for two transition countries: Poland and Hungary that differ in the prevailing family models and policies available to women and families with children.

In the paper we present and discuss two main methodological problems that cause OLS estimation of the wage inequality by parenthood and gender to provide bias results. We address these problems simultaneously by adopting the multiple selection model due to Dubin and McFadden (1984). The results of this paper show that indeed the selection processes are critical for an identification of the relation between parenthood and men's and women's wages. While the selection into employment

is found to be important for wage estimates of both men and women, the selection into parenthood is mostly relevant for women.

The results of this paper bring new insights regarding the sources of the wage inequality by gender. Based on the modification of standard Oaxaca-Blinder decomposition we show that wage inequalities due to parenthood, both among women and men, constitute a significant part of the gender wage gap. This is true both for Poland and Hungary. In Hungary mothers are found to pay a high penalty for their motherhood in a form of lower wages. The gap is however entirely explained by women's selection into employment and parenthood. The existence of the gender wage gap is thus largely attributable to the gender wage gap that prevails among childless individuals and the fact that men who have children receive substantially higher wages. For Poland when selections are considered, we find much higher parenthood based wage inequality among women. The cost of motherhood in Poland is therefore much higher than in Hungary that offers women better chances to combine work and family related responsibilities. The divergence of men's and women's wages in Poland is thus predominately caused by women's higher cost of motherhood and men's fatherhood wage premiums.

## References

- Anderson, D.J., Binder M., Krause K., 2002. The Motherhood Penalty: Which Mothers Pay It and Why? *The American Economic Review* 92(2): 354-358.
- Becker, G.S. (1964) Human capital. New York: Columbia University Press.
- Blinder, A.S. (1973) Wage Discrimination: Reduced Form and Structural Estimates. *Journal of Human Resources* 8: 436-455.
- Bourguignon, F., Fournier M. and Gurgand M. (2007) Selection Bias Corrections Based On The Multinomial Logit Model: Monte Carlo Comparisons. *Journal of Economic Surveys* 21(1): 174-205.
- Brainerd, E. (2000) Women in transition: changes in gender wage differentials in Eastern Europe and the Former Soviet Union. *Industrial and Labor Relations Review* 54(1): 138-162.
- Budig, M. J. and England P. (2001) The Wage Penalty for Motherhood. *American Sociological Review* 66: 204-225.
- Buligescu, B., Crombrughe, D., Menteşoğlu, G. and Montizaan, R. (2009) Panel estimates of the wage penalty for maternal leave. *Oxford Economic Papers* 61(1): i35-i55.
- Cotton, J. (1988) On the Decomposition of Wage Differentials. *The Review of Economics and Statistics* 70: 236-243.
- Datta Gupta, N. and Smith N. (2002) Children and Career Interruptions: The Family Gap in Denmark, *Economica*, New Series 69(276): 609-629.
- Davies R., Pierre G. (2005) The family gap in pay in Europe: A cross-country study, *Labour Economics* 12: 469-486.
- Dolton, P. J. and Makepeace G. H. (1986) Sample Selection and Male-Female Earnings in the Graduate Labour Market. *Oxford Economic Papers* 38: 317-341.
- Dubin, J. A. and McFadden, D. L. (1984) An econometric analysis of residential electronic appliance holdings and consumption. *Econometrica* 52: 345-362.
- Felfe, Ch. (2012) The motherhood wage gap what about job amenities? *Labour Economics* 19(1): 59-67.

- Fisher, R., Robert, P.H., Trost, P. and Lurie, P. M. (1981) Labour force earnings and college choice of young women: An examination of selectivity bias and comparative advantage. *Economics of Education Review* 1: 169-191.
- Fodor, E., Glass Ch., Kawachi J., Popescu L., (2002). Family Policies and Gender in Hungary, Poland, and Romania. *Communist and Post-Communist Studies* 35 (December): 475-490.
- Fortin, N., Lemieux T., Firpo S. (2011) Chapter 1 - Decomposition Methods in Economics. In: Ashenfelter O, Card D (eds.) *Handbook of Labor Economics*: Elsevier. Volume 4. Part A, 1-102.
- Glauber, R. (2008) Race and Gender in Families and at Work: The Fatherhood Wage Premium. *Gender & Society* 22: 8-30.
- Ham, J. C. (1982) Estimation of a labour supply model with censoring due to unemployment and underemployment. *Review of Economic Studies* 49: 335-345.
- Heckman, J (1979) Sample selection bias as a specification error. *Econometrica* 47 (1): 153 - 161.
- Heitmueller, A. (2006) Public-private sector pay differentials in a devolved Scotland. *Journal of Applied Economics*: 295-323.
- Hersch, J. (2006) Sex Discrimination in the Labor Market. *Foundation and Trends in Microeconomics* 2 (4): 281-361.
- Hill, M. (1979) The Wage Effects of Marital Status and Children. *The Journal of Human Resources* 14(4): 282-307.
- Joshi, H., Paci, P. and Waldfogel, J. (1999) The wages of motherhood: better or worse? *Cambridge Journal of Economics* 23: 543-564.
- Killewald A. and Gough M. (2013) Does Specialization Explain Marriage and Parenthood Penalties and Premiums? *American Sociological Review* 78:477-502.
- Korenman, S. Neumark D. (1992) Marriage, Motherhood and Wages. *The Journal of Human Resources* 27(2): 233-255.
- Lee L.F. (1983) Generalized Econometric Models with Selectivity. *Econometrica* 51: 507-512
- Lee, L. F (1979) Identification and estimation in binary choice models with limited (censored) dependent variables. *Econometrica* 47: 977-996.
- Lundberg, S. and Rose E. (2002) The Effects of Sons and Daughters on Men's Labor Supply and Wage, *The Review of Economics and Statistics* 84(2): 251-268.
- McFadden, D. L. (1973) Conditional logit analysis of qualitative choice behavior. In P. Zarembka (ed.), *Frontiers of Econometrics*. New York: Academic Press.
- Neuman, S. and Oaxaca R.L. (2004) Wage Decompositions with Selectivity-Corrected Wage Equations: A Methodological Note, *Journal of Economic Inequality* 2(1): 3-10.
- Oaxaca, R.L. (1973) Male-Female Wage Differentials in Urban Labor Markets. *International Economic Review* 14: 693-709.
- Pailhé, A. (2000) Gender Discrimination in Central Europe During the Systemic Transition. *Economics of Transition* 8(2): 505-535.
- Tunali, I. (1986) A general structure for models of double-selection and an application to a joint migration/earnings process with remigration. *Research in Labor Economics* 8 B: 235-283.
- Waldfogel, J. (1997) The effect of children on women's wages. *American Sociological Review* 62: 209-217.

Waldfogel, J. (1998) Understanding the "family gap" in pay for Women with Children. *Journal of Economic Perspectives* 12 (1): 137-156.

Weichselbaumer, D. and Winter-Ebmer, R. (2005) A Meta-Analysis of the International Gender Wage Gap. *Journal of Economic Surveys* 19: 479–511.

Zhang, Y. (2012) A Search Interpretation of the Family Gap. *Labour Economics* 19(2): 186-197.

## APPENDIX

Table A. 1. Summary statistics for Poland, sample of full time working individuals aged 25-60.

Variables	Poland					
	Men	Women	Women parent	Women non-parent	Men parent	Men non-parent
	Mean	Mean	Mean	Mean	Mean	Mean
Age	40.58	40.526	40.623	40.351	41.035	39.704
No education and less than primary	0.002	0.001	0.001	0.001	0.001	0.003
Primary education	0.071	0.048	0.048	0.047	0.068	0.077
Vocational education	0.717	0.54	0.578	0.472	0.743	0.667
High school	0.045	0.093	0.092	0.095	0.043	0.048
Tertiary education	0.167	0.319	0.282	0.386	0.145	0.208
Married	0.855	0.847	0.974	0.618	0.986	0.603
Parent	0.658	0.643				
Private sector	0.694	0.515	0.51	0.525	0.682	0.717
City 500+ th.	0.11	0.141	0.123	0.175	0.098	0.133
City 200-500 th.	0.091	0.104	0.1	0.11	0.087	0.097
City 100-200 th.	0.075	0.08	0.081	0.08	0.077	0.072
City 20-100 th.	0.192	0.2	0.201	0.199	0.195	0.186
City less 20 th.	0.116	0.125	0.129	0.117	0.119	0.11
Village	0.416	0.35	0.366	0.32	0.423	0.401
Region Central	0.199	0.225	0.22	0.236	0.194	0.207
Region North	0.148	0.14	0.141	0.139	0.151	0.142
Region East	0.158	0.156	0.158	0.15	0.161	0.153
Region North-West	0.167	0.159	0.159	0.159	0.165	0.172
Region South-West	0.107	0.103	0.1	0.108	0.102	0.116
Region South	0.222	0.217	0.222	0.208	0.227	0.211
Warsaw region	0.135	0.156	0.15	0.165	0.133	0.138
Hourly wage	10.244	8.341	8.232	8.538	10.698	9.372
Ln of hourly wage	2.2	2.013	2.004	2.03	2.244	2.117
Number of kids			1.745		1.859	
Household's financial income	2.323	2.456	2.427	2.508	2.146	2.661
Household's benefits	3.795	3.853	2.632	6.055	2.476	6.328
Spouse that is employed	0.532	0.695	0.823	0.463	0.618	0.367
Total number of people living in the HH	3.779	3.543	3.929	2.847	4.077	3.205
Parent living in the household	0.089	0.083	0.08	0.089	0.085	0.096
Housing tenure	19.276	19.21	17.378	22.512	16.792	24.051
Partner's age	2.976	3.053	3.108	2.955	2.973	2.982
Total number of rooms	39.473	43.791	42.925	46.183	38.693	41.813
No observations	61326	43857	28207	15650	40336	20990



**Table A. 2.** Summary statistics for Hungary, sample of full time working individuals, aged 25-60.

Variables	Hungary					
	Men	Women	Women parent	Women non-parent	Men parent	Men non-parent
	Mean	Mean	Mean	Mean	Mean	Mean
Age	40.299	41.791	43.248	39.256	42.487	37.024
No education and less than primary	0.006	0.005	0.005	0.006	0.005	0.008
Primary education	0.086	0.091	0.1	0.075	0.091	0.077
Vocational education	0.644	0.528	0.57	0.454	0.662	0.618
High school	0.058	0.058	0.053	0.067	0.05	0.069
Tertiary education	0.206	0.318	0.272	0.398	0.192	0.229
Married	0.681	0.761	0.941	0.449	0.937	0.297
Parent	0.6	0.635				
Urbanization high density	0.312	0.326	0.277	0.411	0.272	0.371
Urbanization medium density	0.204	0.211	0.208	0.217	0.206	0.202
Urbanization rare density	0.484	0.463	0.515	0.372	0.522	0.428
Region Central	0.251	0.265	0.224	0.337	0.214	0.306
Region Central Transdanubia	0.111	0.103	0.104	0.101	0.111	0.112
Region Western Transdanubia	0.122	0.114	0.126	0.094	0.127	0.113
Region South Transdanubia	0.088	0.094	0.098	0.085	0.092	0.081
Region Northern Hungary	0.132	0.125	0.131	0.114	0.138	0.124
Region Northern Plains	0.155	0.156	0.183	0.11	0.182	0.115
Region Southern Plains	0.141	0.143	0.134	0.159	0.135	0.148
Hourly wage	887.476	766.216	737.301	816.53	925.682	830.286
Ln of hourly wage	6.6	6.495	6.465	6.547	6.636	6.546
Number of kids			1.668		1.812	
Household's financial income	0.222	0.239	0.309	0.117	0.305	0.097
Household's benefits	1.937	1.061	1.573	0.171	3.012	0.327
Spouse that is employed	0.485	0.567	0.675	0.378	0.611	0.296
Total number of people living in the HH	3.489	3.323	3.856	2.396	4.01	2.707
Parent living in the household	0.065	0.07	0.081	0.052	0.076	0.047
Housing tenure	17.494	18.698	18.421	19.179	15.268	20.825
Partner's age	2.842	2.883	3.033	2.621	2.965	2.658
Total number of rooms	40.208	46.69	46.623	46.89	39.935	41.201
No of observations	6045	4776	3033	1743	3624	2421

Table A. 3. OLS and DMF regression results for Poland – sample of full time non-agricultural and not self-employed workers aged 25-60; dependent variables logarithm of an hourly wage.

Variables	OLS						DMF correction			
	women coef/se	men coef/se	women parent coef/se	women nonparent coef/se	men parent coef/se	men nonparent coef/se	women parent coef/se	women nonparent coef/se	men parent coef/se	men nonparent coef/se
Parent	0.015*** (0.005)	0.078*** (0.004)								
Married	0.010* (0.006)	0.174*** (0.006)	-0.015 (0.014)	0.001 (0.007)	0.053*** (0.018)	0.166*** (0.006)	0.047*** (0.021)	0.036*** (0.010)	0.080*** (0.022)	0.123*** (0.011)
Age 31 to 36	0.121*** (0.006)	0.083*** (0.006)	0.097*** (0.008)	0.127*** (0.010)	0.070*** (0.008)	0.072*** (0.008)	0.102*** (0.009)	0.136*** (0.009)	0.083*** (0.008)	0.084*** (0.009)
Age 37 to 42	0.160*** (0.006)	0.095*** (0.006)	0.134*** (0.008)	0.176*** (0.012)	0.079*** (0.008)	0.085*** (0.011)	0.130*** (0.011)	0.184*** (0.013)	0.115*** (0.010)	0.115*** (0.010)
Age 43 to 48	0.182*** (0.006)	0.069*** (0.006)	0.151*** (0.008)	0.220*** (0.010)	0.049*** (0.008)	0.097*** (0.011)	0.133*** (0.010)	0.202*** (0.011)	0.110*** (0.010)	0.125*** (0.011)
Age 49 to 54	0.218*** (0.006)	0.049*** (0.006)	0.178*** (0.009)	0.250*** (0.009)	0.014* (0.008)	0.093*** (0.009)	0.145*** (0.011)	0.234*** (0.011)	0.078*** (0.010)	0.126*** (0.009)
Age 55 to 60	0.270*** (0.012)	0.043*** (0.007)	0.228*** (0.021)	0.296*** (0.014)	-0.010 (0.012)	0.077*** (0.010)	0.211*** (0.026)	0.363*** (0.022)	0.053*** (0.017)	0.164*** (0.013)
Primary education	0.093 (0.073)	-0.035 (0.103)	0.168*** (0.048)	-0.101 (0.194)	-0.175 (0.166)	0.112 (0.107)	0.127 (0.083)	-0.300 (0.191)	-0.091 (0.147)	0.000 (0.104)
Vocational education	0.281*** (0.073)	0.142 (0.103)	0.334*** (0.047)	0.129 (0.194)	0.006 (0.166)	0.288*** (0.107)	0.258** (0.083)	-0.123 (0.191)	0.056 (0.147)	0.141 (0.105)
High school	0.334*** (0.073)	0.184* (0.104)	0.385*** (0.048)	0.184 (0.194)	0.054 (0.167)	0.317*** (0.108)	0.306*** (0.083)	-0.073 (0.190)	0.102 (0.150)	0.168 (0.104)
Tertiary education	0.682*** (0.073)	0.533*** (0.104)	0.750*** (0.047)	0.511*** (0.194)	0.437*** (0.166)	0.629*** (0.107)	0.641*** (0.084)	0.217 (0.191)	0.466*** (0.148)	0.456*** (0.107)
Private sector	-0.005 (0.004)	-0.036*** (0.004)	-0.013*** (0.005)	0.012* (0.007)	-0.036*** (0.005)	-0.034*** (0.007)	-0.012*** (0.005)	0.012* (0.007)	-0.032*** (0.005)	-0.035*** (0.007)
<b>CORRECTIONS</b>										
Working parent								-0.033* (0.021)		-0.126*** (0.012)
Working							-0.072***		-0.038	

nonparent							(0.029)		(0.024)	
Not working parent							0.166***	-0.001	0.436***	0.069***
							(0.026)	(0.030)	(0.029)	(0.021)
Not working nonparent							-0.077*	0.088***	-0.330***	0.099***
							(0.043)	(0.021)	(0.042)	(0.018)
Number of observations	43 853	61 317	28 204	15 649	40 332	20 985	28 204	15 649	40 332	20 985
R2	0.313	0.248	0.319	0.307	0.231	0.257	0.321	0.311	0.241	0.264

Notes: 1) \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

2) Control variables: size of the place of residence, regional dummies, and year fixed effects.

3) Standard errors in parenthesis. Standard errors in OLS: White robust standard errors; Standard errors in DMF: bootstrapped at 100 replications.

Table A. 4. OLS and DMF regression results for Hungary – sample of full time non-agricultural and not self-employed workers aged 25-60; dependent variables logarithm of an hourly wage.

Variables	OLS						DMF correction			
	women coef/se	men coef/se	women parent coef/se	women nonparent coef/se	men parent coef/se	men nonparent coef/se	women parent coef/se	women nonparent coef/se	men parent coef/se	men nonparent coef/se
Parent	-0.019 (0.017)	0.010 (0.019)								
Married	-0.046** (0.021)	0.140*** (0.023)	0.049 (0.037)	-0.078*** (0.025)	0.111** (0.046)	0.139*** (0.029)	0.018 (0.058)	-0.045 (0.037)	0.049 (0.062)	0.073* (0.040)
Age 31 to 36	0.102*** (0.023)	0.116*** (0.021)	0.092** (0.045)	0.118*** (0.031)	0.132*** (0.034)	0.091*** (0.028)	0.057 (0.064)	0.127*** (0.027)	0.096** (0.037)	0.086*** (0.028)
Age 37 to 42	0.191*** (0.025)	0.140*** (0.024)	0.185*** (0.043)	0.232*** (0.056)	0.149*** (0.036)	0.106*** (0.037)	0.129** (0.064)	0.242*** (0.058)	0.108*** (0.036)	0.136*** (0.037)
Age 43 to 48	0.207*** (0.024)	0.109*** (0.024)	0.203*** (0.043)	0.215*** (0.042)	0.104*** (0.035)	0.140*** (0.046)	0.138** (0.066)	0.215*** (0.047)	0.069** (0.033)	0.184*** (0.048)
Age 49 to 54	0.216*** (0.024)	0.083*** (0.025)	0.236*** (0.045)	0.186*** (0.032)	0.102*** (0.036)	0.033 (0.041)	0.173*** (0.059)	0.166*** (0.044)	0.091** (0.034)	0.097** (0.049)
Age 55 to 60	0.233*** (0.026)	0.044 (0.030)	0.234*** (0.048)	0.252*** (0.037)	-0.018 (0.042)	0.118** (0.046)	0.227*** (0.053)	0.211*** (0.054)	-0.001 (0.051)	0.211*** (0.059)
Primary	0.478**	0.134	0.575*	0.290	0.154	0.115	0.501*	0.306	0.110	0.055

education	(0.241)	(0.098)	(0.341)	(0.308)	(0.169)	(0.100)	(0.290)	(0.322)	(0.17)	(0.101)
Vocational education	0.717***	0.309***	0.812**	0.529*	0.338**	0.292***	0.681**	0.561*	0.273	0.170*
High school	(0.240)	(0.095)	(0.340)	(0.306)	(0.167)	(0.094)	(0.282)	(0.312)	(0.18)	(0.103)
	0.859***	0.499***	0.910***	0.739**	0.562***	0.431***	0.760***	0.781**	0.489**	0.279**
Tertiary education	(0.241)	(0.099)	(0.341)	(0.308)	(0.171)	(0.102)	(0.284)	(0.315)	(0.187)	(0.12)
	1.262***	0.970***	1.338***	1.094***	1.064***	0.867***	1.181***	1.133***	0.990***	0.717***
	(0.240)	(0.096)	(0.340)	(0.306)	(0.168)	(0.097)	(0.283)	(0.310)	(0.187)	(0.107)
<b>CORRECTIONS</b>										
Working parent								0.061		-0.155
								(0.108)		(0.094)
Working nonparent							-0.105		0.160*	
							(0.075)		(0.093)	
Not working parent							0.112**	0.044	0.061	0.039
							(0.050)	(0.147)	(0.107)	(0.134)
Not working nonparent							0.045	-0.099	-0.162	0.174**
							(0.094)	(0.081)	(0.158)	(0.079)
Number of observations	4 776	6 045	3 033	1 743	3 624	2 421	3 033	1 743	3 624	2 421
R2	0.357	0.291	0.341	0.392	0.312	0.265	0.341	0.386	0.310	0.264

Notes: 1) \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

2) Control variables: size of the place of residence, regional dummies, and year fixed effects.

3) Standard errors in parenthesis. Standard errors in OLS: White robust standard errors; Standard errors in DMF: bootstrapped at 100 replications.

**Table A. 5. Contribution of the family gaps into the gender wage gap for Poland – based on the uncorrected estimates**

Gender wage gap	0.187			
Family gap among women				
	Estimates	Family gap decomposition	contribution to GWG	%contribution to GWG
<b>Family gap</b>	<b>-0.027</b>	100%	<b>0.017</b>	<b>9%</b>
<b>Explained total</b>	-0.040	152%	0.026	14%
<i>by</i>				
<i>Age</i>	0.011	-39%	-0.007	-4%
<i>Education</i>	-0.040	148%	0.026	14%
<i>Marriage</i>	0.011	-41%	-0.007	-4%
<i>Rest</i>	-0.022	82%	0.014	8%
<b>Unexplained total</b>	0.014	-52%	-0.009	-5%
<i>by</i>				
<i>Age</i>	-0.028	103%	0.018	10%
<i>Education</i>	0.191	-709%	-0.123	-66%
<i>Marriage</i>	-0.022	80%	0.014	7%
<i>Rest</i>	-0.128	474%	0.082	44%
Family gap among men				
	Estimates	Family gap decomposition	contribution to GWG	%contribution to GWG
<b>Family gap</b>	<b>0.127</b>	<b>100%</b>	<b>0.083</b>	<b>45%</b>
<b>Explained total</b>	0.047	37%	0.031	16%
<i>by</i>				
<i>Age</i>	0.017	13%	0.011	6%
<i>Education</i>	-0.017	-14%	-0.011	-6%
<i>Marriage</i>	0.068	54%	0.045	24%
<i>Rest</i>	-0.021	-16%	-0.014	-7%
<b>Unexplained total</b>	0.080	63%	0.053	28%
<i>by</i>			0.000	
<i>Age</i>	-0.049	-39%	-0.032	-17%
<i>Education</i>	-0.250	-197%	-0.165	-88%
<i>Marriage</i>	-0.112	-88%	-0.074	-40%
<i>Rest</i>	0.492	387%	0.323	173%
Gender wage gap among nonparents				
	Estimates	GWG decomposition	contribution to GWG	%contribution to GWG
<b>GWG</b>	<b>0.087</b>	<b>100%</b>	<b>0.087</b>	<b>46%</b>
<b>Explained total</b>	-0.094	-108%	-0.094	-50%
<i>by</i>				
<i>Age</i>	-0.004	-4%	-0.004	-2%
<i>Education</i>	-0.077	-89%	-0.077	-41%
<i>Marriage</i>	-0.001	-1%	-0.001	0%
<i>Rest</i>	-0.012	-14%	-0.012	-6%
<b>Unexplained total</b>	0.181	208%	0.181	97%
<i>by</i>				
<i>Age</i>	-0.074	-85%	-0.074	-39%
<i>Education</i>	0.109	126%	0.109	58%
<i>Marriage</i>	0.095	109%	0.095	51%
<i>Rest</i>	0.050	57%	0.050	27%

Notes:

- 1) Column 1 presents the estimates of the family gap decompositions for men and women and gender wage gap decomposition among childless individuals;
- 2) Column 2 presents the decomposition of the family gap decompositions for men and women and gender wage gap decomposition among childless individuals showing the percentage of the gap that is due to the certain components
- 3) Column 3 represents the contribution of the family gaps among men and women and gender wage gap among childless individuals and their components
- 4) Column 4 represents percentage contribution of the family gaps among men and women and gender wage gap among childless individuals and their components to the overall gender wage gap

**Table A. 6. Contribution of the family gaps into the gender wage gap for Hungary – based on the uncorrected estimates**

Gender wage gap	0.104			
Family gap among women				
	Estimates	Family gap decomposition	contribution to GWG	%contribution to GWG
<b>Family gap</b>	<b>-0.081</b>	<b>100%</b>	<b>0.051</b>	<b>49.3%</b>
<b>Explained total</b>	-0.082	101%	0.052	49.5%
by				
<i>Age</i>	0.078	-96%	-0.049	-47.2%
<i>Education</i>	-0.086	105%	0.054	51.9%
<i>Marriage</i>	-0.038	47%	0.024	23.0%
<i>Rest</i>	-0.036	44%	0.023	21.9%
<b>Unexplained total</b>	0.000	-1%	0.000	-0.3%
by				
<i>Age</i>	0.021	-26%	-0.014	-13.0%
<i>Education</i>	0.258	-317%	-0.163	-156.1%
<i>Marriage</i>	0.115	-141%	-0.073	-69.6%
<i>Rest</i>	-0.394	484%	0.249	238.5%
Family gap among men				
	Estimates	Family gap decomposition	contribution to GWG	%contribution to GWG
<b>Family gap</b>	<b>0.090</b>	<b>100%</b>	<b>0.054</b>	<b>51.4%</b>
<b>Explained total</b>	0.080	89%	0.048	45.8%
by				
<i>Age</i>	0.038	42%	0.023	21.7%
<i>Education</i>	-0.028	-31%	-0.017	-15.9%
<i>Marriage</i>	0.088	98%	0.053	50.3%
<i>Rest</i>	-0.018	-20%	-0.011	-10.4%
<b>Unexplained total</b>	0.010	11%	0.006	5.6%
by				
<i>Age</i>	0.006	7%	0.004	3.5%
<i>Education</i>	0.099	110%	0.059	56.6%
<i>Marriage</i>	-0.018	-20%	-0.011	-10.3%
<i>Rest</i>	-0.077	-86%	-0.046	-44.2%
Gender wage gap among nonparents				
	Estimates	GWG decomposition	contribution to GWG	%contribution to GWG
<b>GWG</b>	<b>-0.001</b>	<b>100%</b>	<b>-0.001</b>	<b>-1.0%</b>
<b>Explained total</b>	-0.123	11586%	-0.123	-117.3%
by				
<i>Age</i>	-0.003	316%	-0.003	-3.2%
<i>Education</i>	-0.097	9173%	-0.097	-92.9%
<i>Marriage</i>	-0.015	1464%	-0.015	-14.8%
<i>Rest</i>	-0.007	633%	-0.007	-6.4%
<b>Unexplained total</b>	0.121	-11486%	0.121	116.3%
by				
<i>Age</i>	-0.074	7009%	-0.074	-71.0%
<i>Education</i>	-0.214	20244%	-0.214	-205.0%
<i>Marriage</i>	0.093	-8783%	0.093	88.9%
<i>Rest</i>	0.317	-29956%	0.317	303.3%

Notes: Columns description as in Table A. 5.

Table A. 7. Contribution of the family gaps into the gender wage gap for Poland – based on the corrected estimates

GWG	0.187			
Family gap among women				
	Estimates	Family gap decomposition	contribution to GWG	%contribution to GWG
<b>Family gap women</b>	<b>-0.027</b>	<b>100%</b>	<b>0.017</b>	<b>9%</b>
<b>Explained</b>	-0.025	92%	0.016	9%
by				
<i>Marriage</i>	0.013	-48%	-0.008	-4%
<i>Age</i>	0.019	-69%	-0.012	-6%
<i>Education</i>	-0.036	132%	0.023	12%
<i>Rest</i>	-0.021	78%	0.013	7%
<b>Unexplained</b>	-0.029	107%	0.019	10%
by				
<i>Marriage</i>	0.011	-40%	-0.007	-4%
<i>Age</i>	-0.055	204%	0.035	19%
<i>Education</i>	0.395	-1463%	-0.254	-136%
<i>Rest</i>	-0.380	1407%	0.244	131%
<b>Selection</b>	0.027	-102%	-0.018	-9%
Family gap among men				
	Estimates	Family gap decomposition	contribution to GWG	%contribution to GWG
<b>Family gap men</b>	<b>0.127</b>	<b>100%</b>	<b>0.083</b>	<b>45%</b>
<b>Explained</b>	0.031	25%	0.021	11%
by				
<i>Marriage</i>	0.047	37%	0.031	17%
<i>Age</i>	0.022	17%	0.014	8%
<i>Education</i>	-0.018	-14%	-0.012	-6%
<i>Rest</i>	-0.019	-15%	-0.012	-7%
<b>Unexplained</b>	0.141	111%	0.093	50%
by				
<i>Marriage</i>	-0.042	-33%	-0.028	-15%
<i>Age</i>	-0.017	-13%	-0.011	-6%
<i>Education</i>	-0.071	-56%	-0.046	-25%
<i>Rest</i>	0.271	213%	0.178	95%
<b>Selection</b>	-0.046	-36%	-0.030	-16%
Gender wage gap among nonparents				
	Estimates	GWG decomposition	contribution to GWG	%contribution to GWG
<b>GWG childless individuals</b>	<b>0.087</b>	<b>100%</b>	<b>0.087</b>	<b>46%</b>
<b>Explained</b>	-0.084	-97%	-0.084	-45%
by				
<i>Marriage</i>	-0.002	-2%	-0.002	-1%
<i>Age</i>	-0.003	-3%	-0.003	-2%
<i>Education</i>	-0.062	-71%	-0.062	-33%
<i>Rest</i>	-0.018	-21%	-0.018	-10%
<b>Unexplained</b>	0.125	144%	0.125	67%
by				
<i>Marriage</i>	0.053	61%	0.053	29%
<i>Age</i>	-0.068	-78%	-0.068	-36%
<i>Education</i>	0.254	292%	0.254	136%
<i>Rest</i>	-0.114	-132%	-0.114	-61%
<b>Selection</b>	0.046	53%	0.046	25%

Notes: Columns description as in Table A. 5.

**Table A. 8. Contribution of the family gaps into the gender wage gap for Hungary – based on the corrected estimates**

GWG	0.104			
Family gap among women				
	Estimates	Family gap decomposition	contribution to GWG	%contribution to GWG
<b>Family gap women</b>	<b>-0.081</b>	<b>100%</b>	<b>0.051</b>	<b>49%</b>
Explained by	-0.064	78%	0.040	38%
Marriage	-0.022	27%	0.014	13%
Age	0.076	-93%	-0.048	-46%
Education	-0.081	99%	0.051	49%
Rest	-0.037	45%	0.023	22%
Unexplained by	0.054	-67%	-0.034	-33%
Marriage	0.060	-73%	-0.038	-36%
Age	-0.059	73%	0.037	36%
Education	0.100	-123%	-0.063	-60%
Rest	-0.046	57%	0.029	28%
Selection	-0.072	89%	0.046	44%
Family gap among men				
	Estimates	Family gap decomposition	contribution to GWG	%contribution to GWG
<b>Family gap men</b>	<b>0.090</b>	<b>100%</b>	<b>0.054</b>	<b>51%</b>
Explained by	0.058	65%	0.035	33%
Marriage	0.047	52%	0.028	27%
Age	0.048	54%	0.029	28%
Education	-0.024	-26%	-0.014	-14%
Rest	-0.013	-15%	-0.008	-8%
Unexplained by	0.015	17%	0.009	9%
Marriage	-0.023	-26%	-0.014	-13%
Age	-0.049	-55%	-0.030	-28%
Education	0.136	152%	0.081	78%
Rest	-0.048	-54%	-0.029	-28%
Selection	0.016	18%	0.010	9%
Gender wage gap among nonparents				
	Estimates	GWG decomposition	contribution to GWG	%contribution to GWG
<b>GWG childless individuals</b>	<b>-0.001</b>	<b>100%</b>	<b>-0.001</b>	<b>-1%</b>
Explained by	-0.114	10804%	-0.114	-109%
Marriage	-0.011	1051%	-0.011	-11%
Age	-0.006	546%	-0.006	-6%
Education	-0.093	8782%	-0.093	-89%
Rest	-0.004	425%	-0.004	-4%
Unexplained by	0.193	-18271%	0.193	185%
Marriage	0.053	-5032%	0.053	51%
Age	-0.028	2680%	-0.028	-27%
Education	-0.396	37422%	-0.396	-379%
Rest	0.564	-53340%	0.564	540%
Selection	-0.080	7567%	-0.080	-77%

Notes: Columns description as in Table A. 5.





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