# Does motherhood explain lower wages for females in Macedonia?

**Blagica Petreski**
Finance Think – The Economic Research & Policy Institute - Skopje
Frederik Shopen 1/2
1000 Skopje
Macedonia
E-mail: blagica.petreski@financethink.mk

## Abstract

The objective of the paper is to estimate the motherhood wage gap, as well its contribution for the gender wage gap in Macedonia, after considering workers' characteristics and selectivity bias onto the labor market, for childbearing-age population. In particular, we aim to disentangle to which extent the natural role of women to have and raise children potentially affects the gender wage gap. Due to the large inactivity of females in Macedonia, we estimate the gap by employing a repeated imputation technique, which imputes the wages of those who are unemployed or inactive. Imputed samples are used to decompose the gaps by weighing (Barsky et al. 2002); and by using recentered influence function (Firpo et al. 2007). The Survey of Income and Living Conditions (2010) is used. Results suggest that motherhood wage gap in Macedonia does not exist as it is fully explained by characteristics, and hence it does not contribute to potential reducing of the gender wage gap. Motherhood wage gap is fully explained by characteristics at any decile along the wage distribution. Selection is irrelevant either, i.e. its consideration does not alter these conclusions.

**Keywords**: gender wage gap, motherhood wage gap, repeated imputations, nonparametric decomposition

**JEL classification:** J16, J31, E24

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## 1. Introduction

A recent study (Petreski et al. 2014) has shown that the gender wage gap in Macedonia – when workers' characteristics and selectivity bias into employment have been taken into account – is about 7.5%. This suggests that 7.5% lower wage for women than men, on average, remains unexplained and could be understood as discrimination against women on the labor market. There are, however, several possible veins to think about this residual gap, one notable being the natural difference between the two genders: female's role as mothers. It could cause lower wage for women from different reasons: i) different productivity of mothers versus childless women or men due to losses of job experiences and career interruptions in the past; ii) different productivity due to tasks related to the child, potentially reducing devotion to work, limiting options to travel and stay overtime, and changing overall working attitude after giving birth; iii) different employer's expectations of the mother's productivity than compared to other workers; iv) different perceptions of employers for the work of mothers; and others.

The objective of the paper is threefold: *first*, to calculate the differences in wages between mothers and childless women (motherhood wage gap); *second* to estimate its contribution for the gender wage gap in Macedonia; after considering workers' characteristics and selectivity bias onto the labor market, for childbearing-age population; and, *third,* to decompose the selection-adjusted gaps at deciles by referring to semi- and non-parametric approaches.

The paper relies on a relatively novel method for estimating gender gaps in wages, imputing missing wages for those who are not in employment and hence have an unobserved wage. This is especially important for cases where the inactivity of females in prevalent. In Macedonia, the gender inactivity gap is above 30 percentage points, while the motherhood inactivity gap is 23 percentage points, suggesting that females in general and mothers in particular face large detachment from the labor market. Their exclusion from the calculation of the wage gaps potentially hides important information. Hence, we rely on the repeated imputations technique which bases on median regressions (Rubin, 1987) and does not require assumptions on the actual level of missing wages, as usually required in the matching approach, nor it requires arbitrary exclusion restrictions and lack of robustness (Manski, 1989) raised in Heckman (1979) models. To assign a person with missing wage below or above the medium, we rely on a human capital specification whereby indicators as education, age and experience play prominent role. Finally, we pursue decomposition of the gaps at deciles: by utilizing weights that equalize the empirical distributions of the explanatory variable (Barsky et al. 2002); and by replacing the log wages with the recentered influence function (Firpo et al. 2007).

The main finding is that once workers' characteristics and selectivity into employment are accounted for, employers in Macedonia commit discrimination against women, penalizing their wage by about 7-8% compared to men. Selection has been found to explain about 60% of the existing gender wage gap. On the other hand, mothers' wage is not penalized, i.e. the motherhood wage gap does not exist and, hence, does not contribute to explaining the gender wage gap. Selection does not alter this conclusion, thus there is no

motherhood-based selection in Macedonia. The analysis by deciles suggests that the gender wage gap exists along the entire wage distribution, with potentially declining size in the right half of it and vanishing for the highest-paid jobs. On the other hand, the existent difference in the wages between mothers and childless women could be entirely, if not overly, explained by characteristics, at any point of the wage distribution.

The rest of the paper is structured as follows. Section 2 offers stylized facts about the issue at hand. Section 3 presents the economics of the motherhood wage gap. Section 4 presents the methodology and the data we use. Section 5 presents the results and offers a discussion. Section 6 concludes.

## 2. Some stylized facts

To start the discussion about the motherhood wage gap and its interference with the gender wage gap, we portray some stylized facts for the gaps in Macedonia. We use the age span 24-45, to reflect the usual childbearing period for women, as in Harkness and Waldfogel (2003); Gash (2009) and Pal and Waldfogel (2014). Although, other spans were used throughout the literature (e.g. Felfe, 2012; Zhang, 2010), but in all cases excluding mothers with grown up children (above the age of 18) who already separated from parents (i.e. became independent).

That mothers could have lower wages than childless women could be observed from Table 1: it contrasts the labor-market status between childbearing-age men and women; and between childbearing-age childless women and mothers.

**Table 1 – Labor-market status of persons in childbearing age (24-45)**

| Labor market status | Men | Women | Childless women | Mothers |
|---|---|---|---|---|
| **Employed** | 59.4 | 40.1 | 49.9 | 36.9 |
| **Unemployed** | 40.4 | 29.3 | 36.8 | 26.7 |
| **Inactive** | 0.3 | 30.6 | 13.4 | 36.4 |

*Source: Author's calculation based on SILC*

There are notable differences. *First,* both employment and unemployment rates of women in childbearing age are lower than of men, due to the pervasive inactivity of this-age females. Reasons for inactivity may be manifold: the increased investment in postgraduate education in the last couple of years against the low higher-pay job creation; females heading or living in female-headed households receiving remittances; females engaged as unpaid family workers in agriculture; and others – all raising the reservation wage. Last but not the least reason, aside those affecting reservation wage, is the childbearing and housewife role of women. Hence, *second,* when childless women are compared with mothers, it is evident that the last reason for inactivity – women as mothers – may be prevalent: the inactivity rate of mothers is almost triple that of childless women.

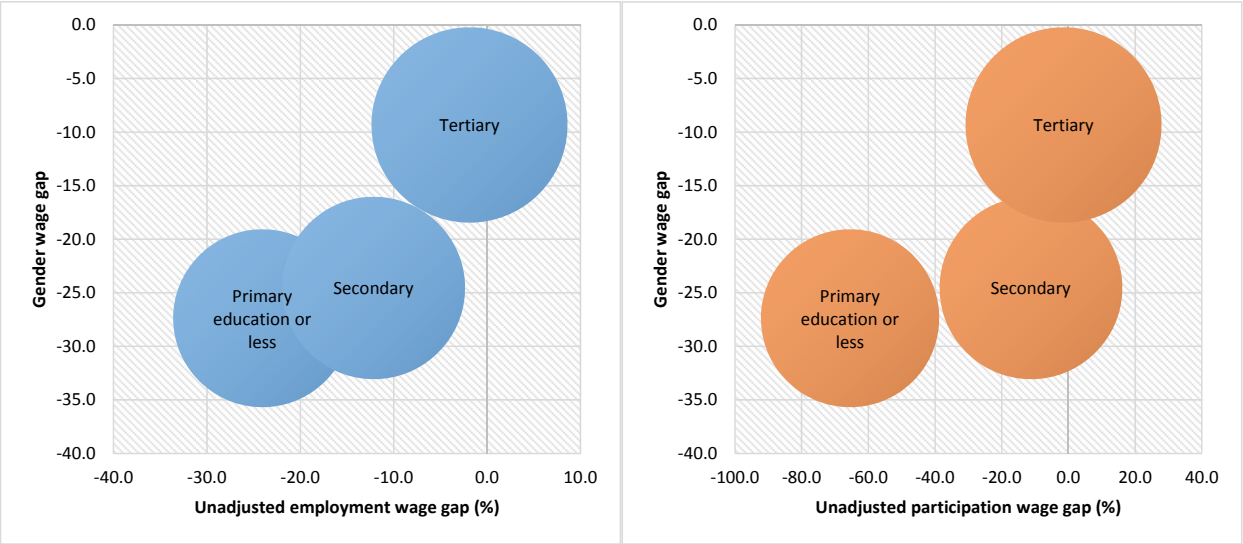
Table 2 also supports our discussion: having a child likely makes a difference - mothers are lower paid than childless women and also compared to men (both with or without children). If looking at the unadjusted gaps pattern may suggest a role for motherhood in explaining (part of) gender wage gap in Macedonia, then we may be able to further explain the adjusted gap in Petreski et al. (2014).

**Table 2 – Unadjusted wage gap**

| | Gender / Motherhood pay gap |
|---|---|
| **All women compared to all men** | -12.5 |
| **Childbearing-age women compared to child-bearing-age men** (gender wage gap) | -14.1 |
| **Mothers compared to childless women** (motherhood wage gap) | -8.7 |
| **Mothers compared to fathers** | -21.9 |
| **Mothers compared to all men** | -16.8 |
| ***Source: Author's calculation based on SILC*** | |

The next two figures cross-analyze the gender and motherhood wage gaps, respectively with the gender/motherhood employment and participation gaps for childbearing-age persons at different levels of education. Figure 1 analyses the gender gaps and suggests that the employment and participation gaps are wider for less educated youth. In addition, Figure 1 reveals a positive correlation between the gender wage gap, on the one hand, and the gender employment and participation gaps on the other: with growing education both gaps close down. Such a positive correlation between the gaps may suggest that childbearing-age women tend on average to be more negatively selected into employment than men (i.e. that women who work have worse characteristics than those who do not), which is likely explained by the high reservation wage.

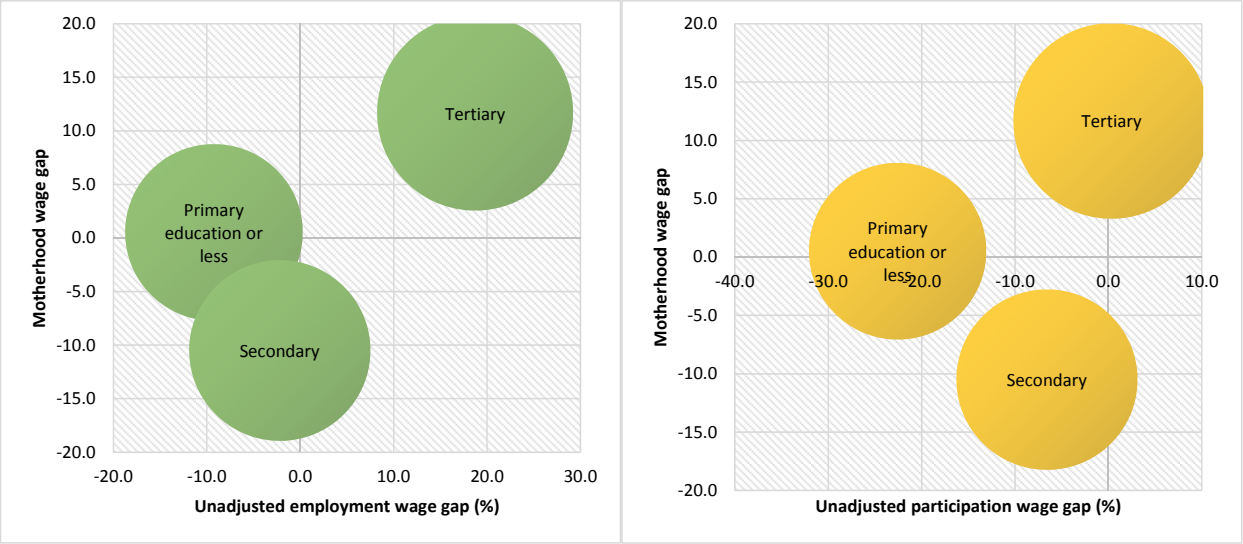
**Figure 1 – Gender wage gap against i) gender employment gap (left) and ii) gender participation gap (right), at different levels of education for childbearing-age individuals (24-45)**




*Source: Authors' calculations based on SILC 2010*
*Note: The size of the circles represents the size of the females' wage.*

But, what about the childbearing role and education? Figure 2 analyses the motherhood wage gap and suggests several interesting insights: motherhood wage gap is large for childbearing-age women with secondary education, and almost non-existent for those with primary education; on the other hand, it is positive for those with tertiary education. Conversely, the employment and participation gaps are considerably larger at the primary-education level and small for secondary-education one. Hence, for these two education groups, the correlation is actually negative: higher education improves the position of mothers on the labor market, but worsens the wage. This may suggest a positive selection of mothers on the labor market. However, the picture reverses when the tertiary education is added. So, overall, selection may actually not play a role for mothers.

**Figure 2 – Motherhood wage gap against i) motherhood employment gap (left) and ii) motherhood participation gap (right), at different levels of education for childbearing-age women (24-45)**




*Source: Authors' calculations based on SILC 2010*
*Note: The size of the circles represents the size of the mothers' wage.*

Given the discussion above, several features of the labor market for childbearing-age women emerge in Macedonia:

1. The unadjusted motherhood wage gap is likely lower than the gender wage gap, but mainly driven by women in a secondary-education group, which are most prone to having too high reservation wages and putting more than usual value for childbearing;
2. Childbearing-age women outside the labor market are likely not those with the worst labor-market characteristics (negative selection), reflecting the high reservation wages;
3. Conversely, childbearing-age mothers outside the labor market are likely with worse labor-market characteristics (positive selection) but the result is likely driven by the secondary-education group and not the entire cohort;
4. Hence, motherhood may explain a part of the gender wage gap, potentially correcting it downwards.

## 3. Theoretical foundations and literature overview

The literature underpinning this paper is two-stranded. The first relevant strand of literature is the one on gender wage gaps and their interferences with the gender employment and participation gaps. Some of the representative papers include: Gronau (1974); Beblo et al. (2003); Blau and Kahn (2003); Albrecht et al. (2004); Azmat et al. (2004); Neal (2004); Fotin (2005); Petrongolo and Olivetti (2008), and others. In general, many studies document a role for the selection into employment or into the labor market; in the

majority of cases the selection is positive, i.e. women outside the labor market are those with worse labor-market characteristics, but in some cases selection is found to be negative, i.e. women outside the labor market are not those with the worst characteristics, since they set high reservation wage and value leisure more than employment not commensurate to their human characteristics. However, a widespread characteristic of studies correcting for selection is that they mainly rely on the Heckman (1979) method of correction with few exceptions (e.g. Petrongolo and Olivetti, 2008; Machado, 2012).

The other strand of literature pertinent to this paper is the one on motherhood wage gap. In particular, the motherhood gap could be an important component of the gender wage gap (Waldfogel, 1998a). This strand of the literature is actually fairly wide and touches upon a variety of wage differentials: i) between full- and part-time workers (Ermisch and Wright, 1993; Joshi and Paci, 1998; Makepeace, 1987; Joshi and Newell, 1989; Jones and Long, 1979; Blank, 1990; Corcoran et al. 1983), given the propensity of childless females to work full-time and to be more career-minded than mothers; ii) between married and single women (Greenhalgh, 1980; Dolton and Makepeace, 1987; Joshi and Newell, 1989; Hill, 1979; Neumark and Korenman, 1994), reflecting the fact that spouse's income may play a role in labor market status and outcome; and iii) between mothers and childless women (Daniel et al. 2013; Gangl and Ziefle, 2009; Amadeo-Dorantes and Kimmel, 2005; Waldfogel, 1995; Joshi and Newell, 1989; Correl et al. 2007; Joshi et al. 1999; Fuchs, 1988; Felfe, 2012; Hill, 1979; Korenman and Neumark, 1992; Neumark and Korenman, 1994; Waldfogel, 1997a,b; Joshi, 1991; Lundberg and Rose, 2000; Harkness and Waldfogel, 2003), reflecting the notion that motherhood may impact labor-market status and outcome. The latter is what we focus on in this paper.

The literature offers a variety of explanations why mothers may have lower wages than childless women (for extensive review of the literature on these explanations, see Budig and England, 2001). *First*, many women spend time at home carrying for children, interrupting their job experience, or at least interrupting full-time employment. This explanation draws on the Becker's (1993) human capital theory. If the market wage reflects individual productivity which is determined by the formal skills (education), experience, and routine, any period of nonmarket activity (i.e. birth-giving and childcare) is likely to generate wage losses due to processes of human capital depreciation and lack of further human capital investment (Becker 1985; Mertens et al. 1995; Mincer and Ofek 1982). Hence, mothers accumulate smaller human capital stock, which then predicts lower wage than women who continuously stayed in human-capital investment.

*Second*, mothers may trade-off higher wages for "mother-friendly" jobs that are easier to combine with parenting. This explanation suggests that motherhood may shape post-birth mother's labor-market choices, i.e. that childbirth may stir the traditional division of labor between spouses (e.g. Becker, 1985). In a traditional view, childbirth may even lead to withdrawal of females from the labor market, i.e. stir inactivity, although nowadays the return of mothers at work is quicker (Goldin, 2006). Still, if mothers may have observed or unobserved characteristics that make them different than childless women, their absence from the wage distribution may impose significant selection bias in the estimation of the

motherhood wage gap. In understanding this process, the role of husband's income may play a role: it may actually rouse mother's decision to stay (longer) detached from the labor market and/or to insist on returning to a job place which is more mother-friendly and likely less paid. In addition, if such job changes result in loss of firm-, occupation-, or industry-specific human capital, then a wage loss is implied (Budig and England 2001; Waldfogel 1998a).

*Third*, mothers may earn less because the needs of their children leave them exhausted or distracted at work, making them less productive, or simply limit options to travel, stay overtime and the like (Gangl and Ziefle, 2009). In addition, wage losses or wage growth stagnation after childbirth may be assumed due to mothers' geographical/mobility restriction, limiting the set of available job opportunities. In such a case, as Manning (2003) argues, mothers' bargaining power is decreased, in relation to both current and prospective employers.

*Fourth*, employers may discriminate against mothers, even though these women may have the same productivity as the childless women on the same workplace. This is pure statistical discrimination against mothers, as the status of a mother may easily infer unobservable worker productivity for employers, when they recruit, train, promote or remunerate mothers (Correll, Benard, and Paik 2007; Petersen and Saporta 2004; Spence 1973). "As with many other traits and behaviors, motherhood or taking time off for childcare may have little real productivity effects in itself but may nevertheless generate significant wage effects whenever employers believe more family-oriented behaviors to be correlated with mothers' lower productivity on the job and consequently decide to stigmatize working mothers." (Gangl and Ziefle, 2009, p.343).

*Fifth*, still some unobserved factors may inflate the motherhood gap, like the career-mindness of some women, which deters them from marriage and/or having children; as well the career ambition or ability at the workplace. We should also note that men's wages are not usually affected by fatherhood (Loh, 1996), or in some cases they even increase after having a child (Lundberg and Rose, 2000).

To our knowledge, there is no literature merging the selectivity effects on the gender wage gap with the motherhood wage gap. Hence, this study will be the first that examines the contribution of the motherhood wage gap to the gender wage gap in Macedonia, by explicit consideration of the selectivity bias into employment and participation.

## 4. Model, methodology and data

To estimate the gender and motherhood wage gaps, we rely on Mincer's (1974) human capital earnings function which relates the log of individual wage to human capital characteristics:

$$ln(y_i) = \alpha + \beta_1 gender_i + \beta_2 mother_i + \Sigma\gamma_j * X'_t + \varepsilon_i \quad (1)$$

Whereby $ln(y_t)$ is the log of the hourly wage; $\text{gender}_i$ is a dummy variable taking a value of 1 for females and zero for males; and $mother_i$ is a dummy variable taking a value of 1 for females with at least one child below the age of 18. The coefficient $\beta_1$ measures the gender wage gap, while the coefficient $\beta_2$ the motherhood wage gap. $X'_t$ is s vector of labor-market characteristics, including, but not limited to those which are usually found in the referent literature: education, age and its square, experience, marriage and the like (Budig and England, 2001; Agüero et al. 2011). In the regression, we do not include variables related to occupation and economic sector, since these are not observed for those who are unemployed or inactive, and hence would not fit into our methodological framework described below. The contract type is also dropped from our imputation-based estimates.

Given the presence of selection into the labor market (Section 2), the non-completeness of the wage distribution will make inferences about the estimated wage gaps false. While this has been addressed in the studies by employing the Heckman (1976, 1979) sample-selection method, we hereby propose an alternative empirical approach: **repeated imputations**. This technique is based on median regressions (Rubin, 1987) and does not require assumptions on the actual level of missing wages, as usually required in the matching approach, nor it requires arbitrary exclusion restrictions and lack of robustness (Manski, 1989) raised in Heckman (1979) models.

One plausible characteristic of the median regressions is that, if missing wage observations fall completely on one or the other side of the median regression line, the results are only affected by the position of wage observations with respect to the median, and not by the precise values of imputed wages. Hence, we can make an assumption referring to the economic theory on whether an individual who is not in work should have a wage observation below or above the median wages for their gender and for the fact she is a mother or not; and we extend the framework of Johnston et al. (2000) and Neal (2004) by using probability models (probit) to assign individuals on either side of the median of the wage distribution. This assumption relates to individual's observable characteristics, in the following manner:

$$Pr(m_t) = \alpha + \Sigma\gamma_j * Z'_t + u_i \qquad (2)$$

Whereby the $Z_t$ vector includes: education, experience, age, its square, marital status, number of children below the age of 3, and between the ages of 3 and 6, and spouse's income (but not gender and motherhood). In particular, we include the last three variables to control for some of the reasons the literature articulates for the potential presence of the motherhood wage gap (e.g. Budig and England, 2001): experience – to control for career breaks and their potentially negative influence on the human capital and hence wage; presence of children and in particular small children – to control for the potentially lower productivity and devotion given the need to raise children; and spouse income – to control for the possibility that mothers' labor-market choices, inter alia, depend on the labor-market status of the husband. What we cannot control within this specification is the type of the workplace, given we do not observe such for the non-working mothers – to account for the fact that mothers may choose more flexible job places; and other unobservable factors, like ability and career-mindness.

Hence, with the repeated imputation technique we allow for, so-called, selection on observables. In doing so, we estimate the probability of each individual belonging above or below their gender-specific/motherhood-specific median. Then, the missing wage values are replaced by simulated versions, and independent simulated datasets are obtained. Despite early suggestions (e.g. Schafer and Olsen, 1998; Schafer, 1999) that 3 to 5 imputations are sufficient to obtain good results, some more recent contributions (Graham et al. 2007) document that increasing the number of imputations increases the efficiency of the estimations. Hence, we use 100 imputations. This method has the advantage of using all available information on the characteristics of the non-employed and of taking into account uncertainty about the reason for missing wage information (Rubin, 1987; Petrongolo and Olivetti, 2008).

The repeated imputation technique is not without its criticisms, though. One apparent critique is the work of unobservables in determining participation (or missingness from the wage distribution) and wages simultaneously. One obvious example is individual values and tastes towards family orientation: a person may be family-oriented and has a partner but not children, and hence does not want to work (or does not want to work long hours). Then, this inclination to devoting time to family values affects both non-participation (and, hence, the motherhood wage gap) and wages. Hence, while repeated imputation has the advantage over Heckman (1979) selection method as it does not require (arbitrary) exclusion restrictions, exactly the latter could be considered its main weakness: it is weak on the selection on unobservables. Hence, in an Appendix, we will compare our results with the ones from a Heckman model. The main challenge with the Heckman (1979) procedure is, though, to find exogenous instrument(s) affecting participation, but not wages directly. Some studies (e.g. Grimshaw and Rubery, 2015; Budig and England, 2001; Davies and Pierre, 2005; Aguero et al. 2011) suggest that the number of children, their age and (mostly in less developed countries) their gender may affect the motherhood wage penalty, i.e. determine the decision of the mother to participate in the labor market or not, but not the wage per se.

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After we have estimated the gender and motherhood wage gaps of the childbearing-age cohort, we will conduct a couple of decompositions. The decomposition literature has seen an evolution: Fortin et al. (2011) review the decomposition methods that have been developed since the seminal work of Oaxaca and Blinder (Blinder, 1973; Oaxaca, 1973)[1]. In that regard, we propose two advancements of the decomposition in this work, which could, inter alia, serve as robustness exercise. First, the research moved to estimating gender and motherhood wage gaps at different percentiles of the wage distribution. Important contributions include: Machado and Mata (2005), Firpo et al. (2007; 2009), Chernozhukov et al. (2013). Second, semi- and non-parametric methods, such as matching or weighting, have been proposed, against the inherently parametric character of Oaxaca-Blinder decomposition. Representative papers in this field include: Barsky et al. (2002), Frölich (2007), Black et al. (2008), Ñopo (2008). Hence, we finally opt to decompose the

[1] We decide here to go beyond the usual Oaxaca-Blinder decomposition, for two reasons: first, decomposition at the mean may actually hide a lot of information about gaps, in particular about the glass ceiling effect; and second, the Oaxaca-Blinder decomposition could not be technically combined with the repeated imputation technique.

gaps at deciles, by referring to the weighting approach (Barsky et al. 2002); and the recentered influence function (RIF) approach (Firpo et al. 2007).

The analysis is based on the Survey of Income and Living Conditions (SILC). This is longitudinal survey of a representative sample of Macedonian individuals and their households, performed in accordance to the Eurostat SILC. It has been performed in Macedonia for the first time in 2010. The survey has a representative sample of about 13,800 individuals, out of which about 3.000 belong to the childbearing-age cohort of between 24 and 45 years of age. As mentioned, similarly to other studies, we choose a span of 20 years, for two reasons: on the one hand to allow more observations in the analysis (as compared to analysis based on one particular year of age); and on the other, to capture the entire childbearing age. This, inter alia, suggests that we exclude potential outliers: i.e. women with dependents becoming mothers too early or too late, as we believe motherhood in these ages is fairly unrelated to labor-market status or outcome[2].

## 5. Results and discussion

### 5.1. Does motherhood explain part of the gender wage gap

We start our analysis with estimating the gender and motherhood wage gaps in a simple OLS framework (Table 3). Columns (1)-(4) use the entire childbearing-age cohort to estimate the gender and motherhood wage gaps; while columns (5)-(6) use only the female childbearing-age population to calculate the motherhood wage gap only. Column 1 estimates the unadjusted (raw) gender wage gap, suggesting that childbearing-age females in Macedonia have on average 14.1% lower wage than males in the same age cohort. Recall that Petreski et al. (2014) find a gap of 12.5% for the entire working-age population in Macedonia. Column 2 adds the indicator of a mother, in order to separate the motherhood wage gap from the gender wage gap. Results suggest that childbearing-age mothers have a lower wage by 8.7% than childless women. The result is confirmed in column (5), whereby we drop all males in the sample. Importantly, the consideration of motherhood in the regression dwindles the gender wage gap to 8.1%, potentially suggesting that motherhood is powerful to explain a significant portion of the gender wage gap in Macedonia. Certainly, this is only a raw gap and such simple conclusions cannot be easily drawn.

Columns (3)-(4) adjust the estimates for the workers' characteristics. Several interesting conclusions can be drawn from there. First, the gender wage gap inflates to 20.4% when characteristics are controlled for. This suggests that an average employed woman in Macedonia has better labor-market characteristics than an average employed man (see Figure 1). This occurs because a significant portion of low-skilled women stays out of the labor market, meaning that they self-select out of employment due to the low opportunity cost of not working (higher female reservation wage at low-skill level), as we discussed on Figure 1. Note

[2] I.e. it is usually related to unwanted pregnancies in early age, or motherhood after a period of sterility in the late age.

that the gender wage gap inflates when controlling for motherhood (columns: 3 versus 1; and 4 versus 2). Avlijas et al. (2013) label this as the "Balkan" phenomenon, against the Western evidence of reducing gender wage gap when controlling for workers' characteristics. Second, motherhood's significance and magnitude are maintained, potentially suggesting that the average employed mothers have no different characteristics than the average employed men and childless women observed together.

We now turn to the cohort of women only. Column (5) replicates the conclusions for the motherhood wage gap obtained in column (2). However, when adding characteristics for females only, the motherhood gap loses significance, suggesting that indeed mothers who are employed in Macedonia have, on average, worse labor-market characteristics than the employed childless women (see Figure 2)

**Table 3 – Gender and motherhood wage gaps in an OLS regression**

| | Entire sample | | | | Females' sample | |
|---|---|---|---|---|---|---|
| | Raw gaps | | Adjusted gaps | | Raw gap | Adjusted gap |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Gender** | -0.141*** | -0.0811* | -0.204*** | -0.145*** | | |
| | (0.030) | (0.044) | (0.026) | (0.042) | | |
| **Mother** | | -0.0870* | | -0.0862* | -0.0870* | -0.00089 |
| | | (0.050) | | (0.048) | (0.050) | (0.059) |
| **Secondary education** | | | 0.185*** | 0.186*** | | 0.203*** |
| | | | (0.035) | (0.035) | | (0.056) |
| **Tertiary education** | | | 0.728*** | 0.727*** | | 0.790*** |
| | | | (0.041) | (0.041) | | (0.061) |
| **Age** | | | 0.00513 | 0.0122 | | 0.031 |
| | | | (0.029) | (0.029) | | (0.048) |
| **Age squared** | | | -0.00022 | -0.00033 | | -0.00056 |
| | | | (0.000) | (0.000) | | (0.001) |
| **Experience** | | | 0.0185*** | 0.0184*** | | 0.0187*** |
| | | | (0.003) | (0.003) | | (0.005) |
| **Marital status (1=married)** | | | 0.0475 | 0.0671* | | -0.124* |
| | | | (0.033) | (0.036) | | (0.067) |
| **Contract (1=fulltime)** | | | 0.219*** | 0.220*** | | 0.257*** |
| | | | (0.038) | (0.037) | | (0.057) |
| | | | | | | |
| **Constant** | 4.220*** | 4.220*** | 3.662*** | 3.535*** | 4.139*** | 3.046*** |
| | (0.018) | (0.018) | (0.494) | (0.501) | (0.040) | (0.816) |
| | | | | | | |
| **Observations** | 1,488 | 1,488 | 1,445 | 1,445 | 634 | 627 |
| **R-squared** | 0.015 | 0.017 | 0.257 | 0.259 | 0.004 | 0.305 |

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Estimates are robust to heteroskedasticity. Standard errors given in parentheses.*

Table 4 looks into the adjusted-for-characteristics gender and motherhood wage gaps at different level of skills. Expectedly, the gender wage gap is reduced with education, and vanishes at tertiary education level – similarly as in Petreski et al. (2014). Motherhood continues to be irrelevant for the wages, except for the secondary-education level, but the finding is not robust.

**Table 4 – Gender and motherhood wage gaps in OLS regression – by education**

| | *Dependent variable: Log of the net hourly wage* | | |
|---|---|---|---|
| | **Entire childbearing-age cohort** | | **Only childbearing-age women** |
| | **(1)** | **(2)** | **(3)** |
| **Primary** | | | |
| Female | -0.317*** | -0.267*** | |
| | (0.065) | (0.097) | |
| Mother | | -0.0654 | -0.0718 |
| | | (0.107) | (0.133) |
| **Secondary** | | | |
| Female | -0.235*** | -0.153*** | |
| | (0.034) | (0.053) | |
| Mother | | -0.119* | -0.0106 |
| | | (0.063) | (0.074) |
| **Tertiary** | | | |
| Female | -0.0753 | -0.0278 | |
| | (0.052) | (0.084) | |
| Mother | | -0.0759 | 0.0109 |
| | | (0.099) | (0.129) |

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Estimates are robust to heteroskedasticity. Standard errors given in parentheses. Labor-market characteristics not shown due to space.*

However, all these estimates are exposed to selection bias, as we extensively discussed in the sections above. Selection correction is needed, which we conduct through the repeated imputations technique. Namely, we assign each person whose wage is not observed a random wage below or above the medium in a repeated fashion. We classify the person to be above the gender/motherhood-specific median according to equation (2), whose marginal effects are presented in Table 5. Results suggest that education is a strong predictor of the position of the wage with respect to the median, as well experience and spouse's income. Their increase increases the probability that a person whose wage is not observed is classified above the median.

**Table 5 – Probit regression for assigning an individual without observed wage below or above the median**

| | Dependent: Dummy 1=if wage above median | |
|---|---|---|
| | **Entire childbearing-age cohort** | **Only childbearing-age women** |
| **Age** | 0.0105 | -0.324 |
| | (0.071) | (0.226) |
| **Age squared** | -0.00062 | 0.00453 |
| | (0.001) | (0.003) |
| **Secondary education** | 0.558*** | 0.797** |
| | (0.117) | (0.401) |
| **Tertiary education** | 1.793*** | 1.968*** |
| | (0.137) | (0.442) |
| **Experience** | 0.0582*** | 0.0595*** |
| | (0.008) | (0.020) |
| **Marital status (1=married)** | 0.068 | |
| | (0.101) | |
| **Spouse's income** | 0.00199*** | 0.00868*** |
| | (0.001) | (0.003) |
| **Number of children below the age of 3** | 0.146 | 0.282 |
| | (0.091) | (0.233) |
| **Number of children between the ages of 3 and 6** | -0.0128 | 0.0248 |
| | (0.069) | (0.191) |
| **Constant** | -1.047 | 3.38 |
| | (1.207) | (3.870) |
| **Observations** | 1,488 | 242 |

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Marginal effects reported. Standard errors given in parentheses.*

**Table 6** presents the results after imputations based on the probit predictions. We first work with the entire childbearing-age cohort (columns 1-3), and then reduce it to females only (columns 4-9). Note that for robustness checks, in columns (5) to (9) we add additional explanatory variables which may be related to the mother's wage: spouse's income, number of children, having at least one child below the age of 3 and at least one child between the ages of 3 and 6. There is discussion of whether these determine mother's wage per se, or mother's labor-market choice (decision to participate on the labor market or not), but presently we abstract from such discussion.

**Table 6 – Gender and motherhood wage gap with repeated imputations (100)**

*Dependent variable: Log of the net hourly wage*

| | Entire childbearing-age cohort | | | Only childbearing-age women | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** |
| **Female** | -0.0820*** | -0.0823*** | -0.0761** | | | | | | |
| | (0.025) | (0.025) | (0.038) | | | | | | |
| **Mother** | | | -0.00906 | -0.069* | 0.0332 | 0.0418 | 0.00456 | 0.0008 | 0.00232 |
| | | | (0.042) | (0.041) | (0.050) | (0.051) | (0.068) | (0.068) | (0.067) |
| **Secondary education** | | 0.0158 | 0.0153 | | -0.0479 | -0.0282 | -0.0209 | -0.0203 | -0.0216 |
| | | (0.030) | (0.030) | | (0.048) | (0.047) | (0.047) | (0.047) | (0.047) |
| **Tertiary education** | | 0.501*** | 0.500*** | | 0.404*** | 0.425*** | 0.434*** | 0.434*** | 0.433*** |
| | | (0.039) | (0.040) | | (0.061) | (0.058) | (0.058) | (0.058) | (0.058) |
| **Age** | | 0.0179 | 0.0187 | | 0.0117 | 0.0265 | 0.0203 | 0.0235 | 0.0195 |
| | | (0.024) | (0.024) | | (0.039) | (0.040) | (0.040) | (0.041) | (0.041) |
| **Age^2** | | -0.0003 | -0.0003 | | -0.0001 | -0.00037 | -0.00028 | -0.00031 | -0.00027 |
| | | (0.000) | (0.000) | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Experience** | | 0.009*** | 0.009*** | | 0.00431 | 0.00439 | 0.00479 | 0.00477 | 0.00489 |
| | | (0.002) | (0.002) | | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| **Marital status (1=married)** | | 0.0491 | 0.0511 | | -0.0688 | -0.0401 | -0.0446 | -0.0472 | -0.0425 |
| | | (0.031) | (0.032) | | (0.061) | (0.061) | (0.061) | (0.062) | (0.061) |
| **Log of spouse's income** | | | | | | -0.0191 | -0.0185 | -0.0186 | -0.0184 |
| | | | | | | (0.013) | (0.013) | (0.013) | (0.013) |
| **Number of children** | | | | | | | 0.0219 | 0.02 | 0.0263 |
| | | | | | | | (0.025) | (0.026) | (0.027) |
| **Children below the age of 3** | | | | | | | | 0.026 | 0.026 |
| | | | | | | | | (0.051) | (0.051) |
| **Children between the ages of 3 and 6** | | | | | | | | | -0.0161 |
| | | | | | | | | | (0.037) |
| | | | | | | | | | |
| **Constant** | 4.143*** | 3.705*** | 3.693*** | 4.102*** | 3.783*** | 3.531*** | 3.626*** | 3.562*** | 3.647*** |
| | (0.019) | (0.406) | (0.409) | (0.040) | (0.663) | (0.673) | (0.679) | (0.699) | (0.682) |
| | | | | | | | | | |
| **Observations** | 3,018 | 3,018 | 3,018 | 1,579 | 1,579 | 1,579 | 1,579 | 1,579 | 1,579 |

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Estimates are robust to heteroskedasticity. Standard errors given in parentheses.*

A couple of robust conclusions could be made from

**Table 6**:

i) The gender wage gap exists, but after considering selection into employment, the gap more than halves: from about 20% to about than 8.2%. **The finding suggests that selection could explain about 12 percentage points of the gender wage gap in Macedonia.** The finding is strongly consistent with Petreski et al. (2014) who find that the gap for the entire working-age population dwindles from 14% to 7.5%, after the selectivity bias has been accounted for. This finding suggests that indeed there is negative selection of females into employment: those with not-the-worst characteristics are outside the labor market;

ii) After considering selection issues, results suggest that **characteristics do not explain portion of the gender wage gap further to that explained by selection,** including motherhood. Namely, motherhood is not powerful to explain gender wage gap either.

iii) The selection-adjusted motherhood wage gap remains significant (column 4 in

iv) Table **6**), and with a similar magnitude when selection is not considered (column 5 in Table 3), suggesting that **selection does not play any role for the difference in wages between mothers and childless women**;

v) However, the addition of explanatory variables suggests that the motherhood gap identified in column (4) is actually entirely due to characteristics. Hence, **the motherhood wage gap becomes insignificant**, a conclusion which is consistent, irrespective of whether it is calculated within the entire childbearing-age cohort or only for the childbearing-age women.

vi) The addition of some variables which may be important for the motherhood wage gap does not alter the conclusion that the motherhood wage gap is insignificant. Spouse's income, number of children and the existence of child below the age of 3 and between the ages of 3 and 6 are insignificant, which, inter alia, may suggest that they indeed could be considered exclusion restrictions, i.e. may affect the labor-market choice of the mother, but not the wage directly.

Table 7 looks at the same estimates as in

**Table 6Error! Reference source not found.**, but at skills level. The coefficients are both adjusted for characteristics (not shown due to space, but available on request) and selection. The table suggests that what we concluded for the overall sample is valid for each education cohort.

**Table 7 – Gender and motherhood wage gap with 100 repeated imputations, by education**

*Dependent variable: Log of the net hourly wage*

| | **Entire childbearing-age cohort** | | **Only childbearing-age women** |
|---|---|---|---|
| | **(1)** | **(2)** | **(4)** |
| **Primary** | | | |
| Female | -0.0503 | -0.064 | |
| | (0.052) | (0.088) | |
| Mother | | 0.0166 | -0.0123 |
| | | (0.085) | (0.099) |
| **Secondary** | | | |
| Female | -0.123*** | -0.0773 | |
| | (0.033) | (0.050) | |
| Mother | | -0.0678 | -0.00809 |
| | | (0.057) | (0.072) |
| **Tertiary** | | | |
| Female | -0.0694 | -0.0448 | |
| | (0.053) | (0.075) | |
| Mother | | -0.0453 | 0.0402 |
| | | (0.090) | (0.118) |

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Estimates are robust to heteroskedasticity. Standard errors given in parentheses. Labor-market characteristics not shown due to space.*

**Overall, the analysis shows that once workers' characteristics and selectivity into employment are accounted for, employers in Macedonia commit discrimination against childbearing-age women in general, penalizing their wage by about 7-8% compared to men. Motherhood wage gap does not exist**

**and hence does not contribute to explaining the gender wage gap, while any differences in wages between mothers and childless women could be entirely explained by observable characteristics.**[3]

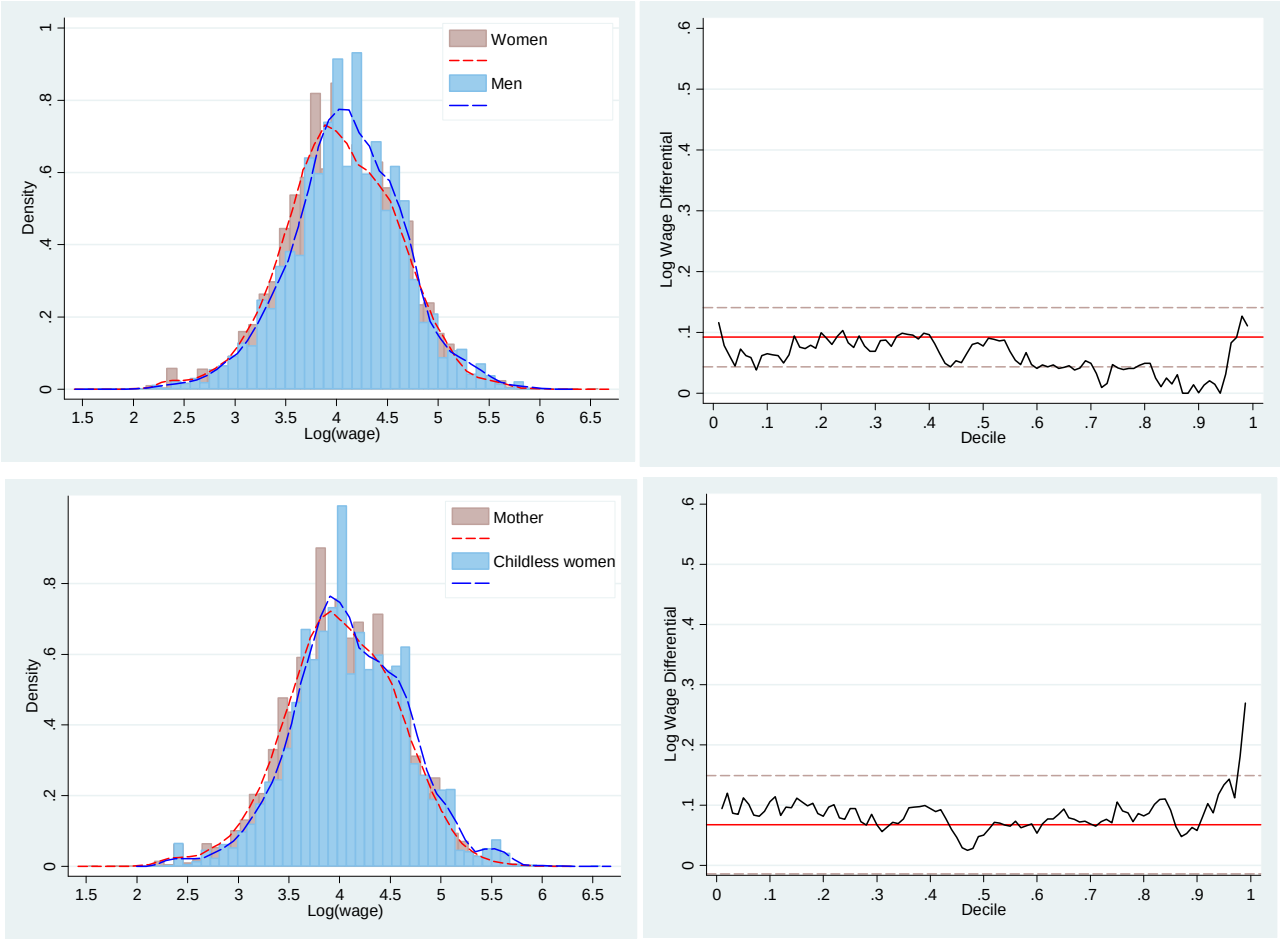
### 5.2. Decompositions of the gaps

This section presents the gender and motherhood wage gap decompositions. We go beyond the standard Blinder-Oaxaca decompositions, based on the medians, and focus our attention to decomposition by deciles. The reason is two-fold: first, the literature generally abandoned the decompositions at the mean; and second, we documented the overall motherhood wage gap to be statistically insignificant in explaining wage differentials as well for affecting the gender wage gap in Macedonia. However, we draw on the recognition that the wage gaps may be different at different points of the wage distribution.

Figure 4 visualizes the selection-corrected wage gaps – respectively for: gender and motherhood - and gives some support to our claim: the left graph suggests that females/mothers are more prevalent than man/childless women in the left part of the wage distribution, while men/childless women score better in the middle and to its immediate right. The right figure, gives the gap by deciles and finds that for the left-middle deciles, it hovers within the confidence interval of the average wage gap.

[3] As the Heckman selection correction approach has been more standard across the respective literature, we present the results of the Heckman correction in Appendix 1.

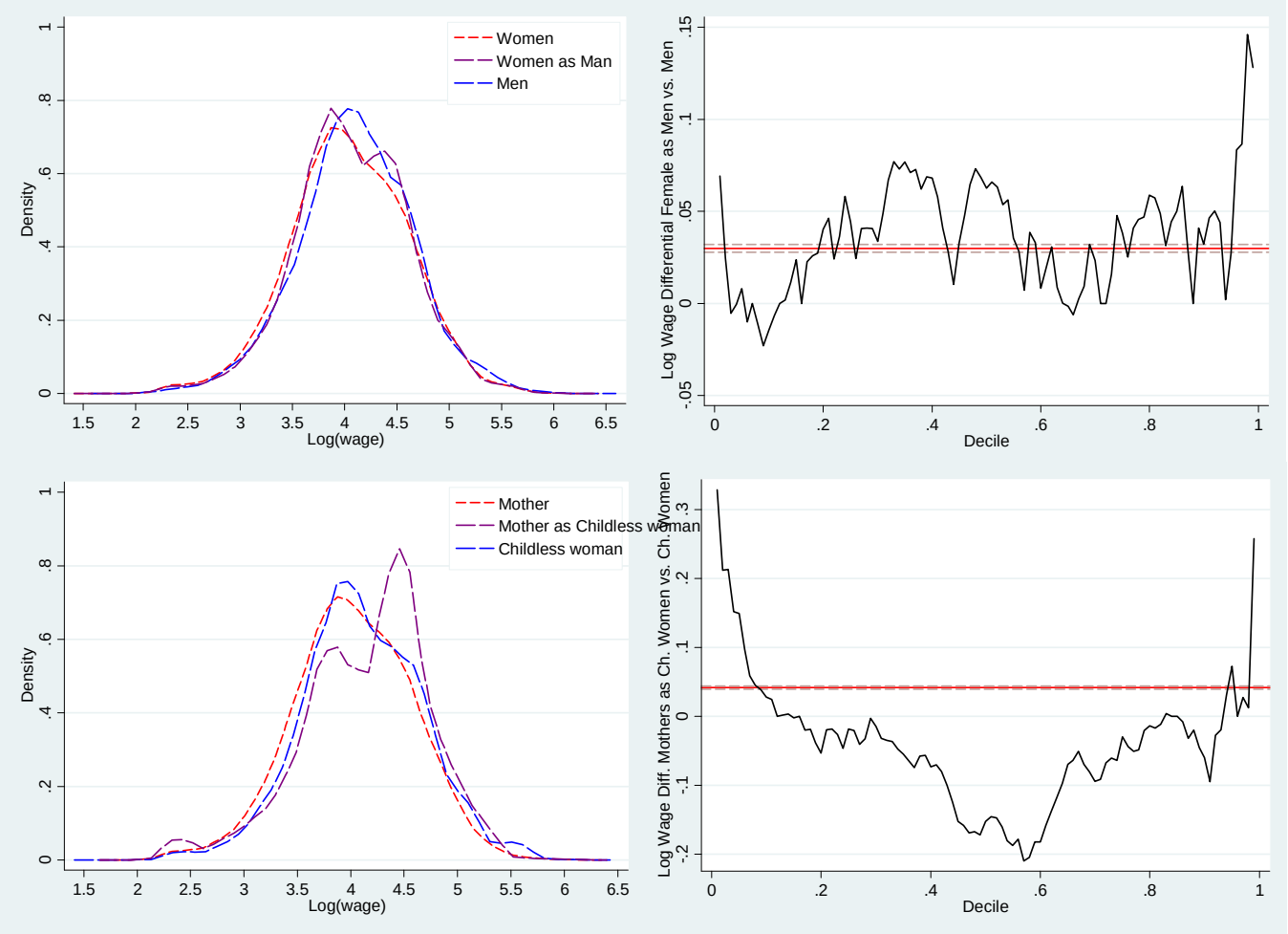
**Figure 4 – Densities of wages by gender/motherhood (left) and gender/motherhood differential by decile (right)**




*Source: Author's calculation.*

Our decomposition exercise starts with utilizing weights that equalize the empirical distributions of the explanatory variable. The weighting technique involves estimating a model for the probability of being male/childless woman rather than female/mother using a set of explanatory variables. We use a probit model to predict male/childless woman, and use the predictions to compute weights given by the ratio of the probability of being male/childless woman and the probability of being female/mother. Then, we operate with the weighted mean and deciles of log wages for females/mothers. These weighted statistics are the counterfactual mean and deciles of log wages for females/mothers as if they had the same distribution of characteristics of males/childless women. In our case, we may ask what the distribution of wages of women and mothers would look like if they had the same characteristics as men and childless women, respectively.

**Figure 5 – Densities of wages by gender/motherhood (left) and gender/motherhood differential by decile (right), after weighting**




*Source: Author's calculation.*

Figure 5 provides the answers. On the left panel, besides the distributions for men and women, and mothers and childless women, a wage distribution is shown representing females/mothers had they have the same observable characteristics as men/childless women, respectively (purple dashed line). The right panel presents the gender and motherhood wage gaps, respectively, once weighting has been pursued, i.e. once males' characteristics have been attached to females, and childless women' characteristics to mothers. Hence, Figure 5 is a replica of Figure 4, but weighting has been imposed. The right graphs suggest that after weighting, both wage gaps decline as well their standard error. The gender wage gap is persistent along the entire wage distribution, with possibly declining magnitude in the right half; and with a likely exception of the highest wages (above the 95$^{th}$ percentile) whereby it jumps as high as 15%, being a sign of a glass-ceiling effect for females in Macedonia. On the other hand, mothers likely face both sticky floor and glass ceiling, as the motherhood wage gap may actually go up to 30% on both ends of the wage distribution. In other words, had mothers have the same observable characteristics as childless women, it is likely that they would have faced lower wages for the lowest and the highest paid jobs than childless females, simply because they are mothers. In Macedonia, the lowest paid jobs belong to the textile and fur industry, while the highest paid jobs are managerial positions prevalently in the financial industry. There,

mothers are penalized because of their natural role. On the other hand, for jobs with wages around the middle, the motherhood wage gap is opposite, suggesting that mothers with same characteristics of childless women would have had higher wage. In Macedonia, middle-paid jobs belong mainly to the public sector, as well for non-managerial position in manufacturing and finance. It is likely that there, mothers are perceived as more stable and suitable for such 'quiet' workplaces and hence they have a reward.

Closely connected to the weighting approach, Firpo et al. (2007) proposed a concept whereby the dependent variable is replaced by the (recentered) influence function (RIF) of the statistic of interest. However, the estimation of the counterfactual in this approach is still based on a linearity assumption and possibly on out of the sample predictions (on the RIF approach, see further details in Firpo et al. 2009). The approach allows us to decompose the mean (or deciles') wage gap into an 'explained' part attributable to differences in characteristics between the two groups, and an 'unexplained' part, as well to decompose the contribution of the specific characteristics to the wage gap. Table 8 and Table 9 provide the decile estimates of the gender and motherhood wage gaps, respectively, decomposed on explained and unexplained part. Several conclusions could be made from here:

- The gender wage gap, after workers' characteristics and selectivity has been considered, exists along the entire wage distribution, with potentially declining size in the right half of it and vanishing for the highest-paid jobs.
- At each decile, generally small portion of the gender wag gap could be attributed to the education, age, experience and marriage, which is in line with the conclusions for the mean distribution (Table 6);
- On the other hand, Table 9 suggests that the existent difference in the wages between mothers and childless women could be entirely, if not overly, explained by characteristics, at any point of the wage distribution. The conclusion is similar as the one in Table 6.

**Table 8 – Gender wage gap – a RIF approach without weighting**

*Dependent variable: Log of hourly wages*

| | Deciles | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| **Mean RIF gender wage gap** | -0.0660*** | -0.0827*** | -0.0662*** | -0.101*** | -0.0765*** | -0.0533*** | -0.0536*** | -0.0466*** | 0.00314 |
| | (0.004) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| **Composition effects attributable to** | | | | | | | | | |
| **Education** | -0.0722*** | -0.0252*** | -0.00449 | -0.0283*** | -0.0371*** | -0.0486*** | -0.0783*** | -0.0693*** | -0.0289*** |
| | (0.005) | (0.004) | (0.003) | (0.003) | (0.003) | (0.004) | (0.004) | (0.004) | (0.004) |
| **Age** | 2.029*** | 0.807*** | 0.509*** | 0.627*** | 0.397*** | 0.169* | 0.241** | -0.644*** | -0.326*** |
| | (0.129) | (0.099) | (0.086) | (0.083) | (0.085) | (0.092) | (0.095) | (0.094) | (0.106) |
| **Experience** | -0.0245*** | -0.0418*** | -0.0447*** | -0.0676*** | -0.0627*** | -0.0524*** | -0.0363*** | -0.0267*** | -0.0213*** |
| | (0.003) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| **Marriage** | -0.0862*** | -0.0910*** | -0.0845*** | -0.0816*** | -0.106*** | -0.138*** | -0.150*** | -0.103*** | -0.0286*** |
| | (0.008) | (0.006) | (0.005) | (0.005) | (0.005) | (0.006) | (0.006) | (0.006) | (0.007) |
| **Motherhood** | -0.0196*** | -0.00785** | 0.0130*** | -6.49E-05 | 0.0564*** | 0.0606*** | 0.0800*** | 0.0512*** | 0.0314*** |
| | (0.005) | (0.004) | (0.004) | (0.003) | (0.004) | (0.004) | (0.004) | (0.004) | (0.005) |
| **Total explained by characteristics** | -0.0130*** | -0.0312*** | -0.0260*** | -0.0600*** | -0.0425*** | -0.0168*** | -0.0197*** | -0.0350*** | -0.00592 |
| | (0.005) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.004) |
| **Wage structure effects attributable to** | | | | | | | | | |
| **Education** | -0.0178*** | -0.0123*** | -0.00676*** | -0.0103*** | -0.0119*** | -0.0147*** | -0.0225*** | -0.0159*** | -0.00576*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Age** | -0.0176*** | -0.0149*** | -0.0100*** | -0.0114*** | -0.00916*** | -0.0110*** | -0.00640*** | -0.000752 | 0.00706*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Experience** | -0.0400*** | -0.0440*** | -0.0376*** | -0.0393*** | -0.0340*** | -0.0362*** | -0.0321*** | -0.0188*** | -0.00508*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Marriage** | 0.0224*** | 0.0197*** | 0.0141*** | 0.0203*** | 0.0210*** | 0.0254*** | 0.0271*** | 0.0238*** | 0.0128*** |
| | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Motherhood** | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Total wage structure** | -0.0530*** | -0.0515*** | -0.0403*** | -0.0406*** | -0.0340*** | -0.0365*** | -0.0338*** | -0.0116*** | 0.00906*** |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| | | | | | | | | | |
| **Constant** | 1.840*** | 0.673*** | 0.414*** | 0.510*** | 0.290*** | 0.00726 | 0.0762 | -0.757*** | -0.367*** |
| | (0.129) | (0.098) | (0.086) | (0.083) | (0.085) | (0.092) | (0.095) | (0.093) | (0.106) |

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Estimates are robust to heteroskedasticity. Standard errors given in parentheses.*

**Table 9 – Motherhood wage gap – a RIF approach without weighting**

*Dependent variable: Log of hourly wages*

| | Deciles | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| **Mean RIF motherhood wage gap** | -0.112*** | -0.0788*** | -0.0794*** | -0.0912*** | -0.0499*** | -0.0691*** | -0.0749*** | -0.0854*** | -0.0580*** |
| | (0.006) | (0.004) | (0.004) | (0.004) | (0.004) | (0.005) | (0.005) | (0.005) | (0.005) |
| **Composition effects attributable to** | | | | | | | | | |
| **Education** | -0.0633*** | -0.105*** | -0.0914*** | -0.0821*** | -0.110*** | -0.124*** | -0.131*** | -0.113*** | -0.0852*** |
| | (0.004) | (0.003) | (0.003) | (0.003) | (0.003) | (0.004) | (0.004) | (0.004) | (0.004) |
| **Age** | 0.00701** | 0.0199*** | 0.00938*** | 0.0146*** | 0.0140*** | 0.0226*** | 0.0185*** | 0.0003 | 0.0205*** |
| | (0.003) | (0.002) | (0.002) | (0.002) | (0.002) | (0.003) | (0.003) | (0.002) | (0.003) |
| **Experience** | -0.0372*** | -0.00445*** | -0.0115*** | -0.00340*** | 0.0111*** | 0.00171 | 0.00093 | 0.00330** | 0.00568*** |
| | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) |
| **Marriage** | -0.0105* | -0.0291*** | -0.0160*** | -0.0128*** | -0.0284*** | -0.0431*** | -0.0282*** | -0.0177*** | -0.00351 |
| | (0.006) | (0.005) | (0.004) | (0.004) | (0.004) | (0.005) | (0.005) | (0.005) | (0.006) |
| **Total explained by characteristics** | -0.104*** | -0.119*** | -0.110*** | -0.0837*** | -0.113*** | -0.143*** | -0.140*** | -0.127*** | -0.0626*** |
| | (0.007) | (0.006) | (0.005) | (0.005) | (0.005) | (0.006) | (0.006) | (0.006) | (0.007) |
| **Wage structure effects attributable to** | | | | | | | | | |
| **Education** | -0.0521*** | -0.0728*** | -0.0371*** | 0.00749 | -0.0290*** | -0.0233*** | -0.00757 | 0.0026 | 0.0183*** |
| | (0.007) | (0.005) | (0.005) | (0.005) | (0.005) | (0.006) | (0.006) | (0.006) | (0.007) |
| **Age** | -0.0626 | -0.842*** | -0.476*** | -0.568*** | -0.560*** | -1.287*** | -1.060*** | -0.453*** | -1.317*** |
| | (0.187) | (0.142) | (0.126) | (0.125) | (0.132) | (0.152) | (0.147) | (0.144) | (0.172) |
| **Experience** | -0.0277*** | 0.00894*** | -0.00470** | -0.0196*** | 0.0130*** | 0.00833*** | 0.0150*** | 0.00851*** | -5.43E-05 |
| | (0.003) | (0.003) | (0.002) | (0.002) | (0.002) | (0.003) | (0.003) | (0.003) | (0.003) |
| **Marriage** | 0.0263* | 0.0365*** | 0.0207** | 0.0162* | 0.0319*** | 0.0451*** | -0.00741 | 0.0141 | 0.0475*** |
| | (0.015) | (0.011) | (0.010) | (0.010) | (0.010) | (0.012) | (0.012) | (0.011) | (0.014) |
| **Total wage structure** | -0.00834 | 0.0404*** | 0.0301*** | -0.00751 | 0.0630*** | 0.0734*** | 0.0653*** | 0.0420*** | 0.00458 |
| | (0.009) | (0.007) | (0.006) | (0.006) | (0.007) | (0.008) | (0.007) | (0.007) | (0.009) |
| **Constant** | 0.108 | 0.910*** | 0.527*** | 0.556*** | 0.607*** | 1.330*** | 1.125*** | 0.470*** | 1.256*** |
| | (0.185) | (0.140) | (0.126) | (0.124) | (0.131) | (0.150) | (0.146) | (0.143) | (0.171) |

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Estimates are robust to heteroskedasticity. Standard errors given in parentheses.*

## 6. Conclusions

The objective of this paper is to estimate the motherhood wage gap, as well its contribution for the gender wage gap in Macedonia, after considering workers' characteristics and selectivity bias onto the labor market, for childbearing-age population. We estimate the gap by employing a repeated imputation technique, which imputes the wages of those who are unemployed or inactive by making assumption on their position with respect to the median wage. The latter is obtained through the predictions of a human-capital specification, whereby we add the spouse's income and the existence of small children, to account for the possibility that these factors affect the positioning of mother's wage below or above the median. Then, imputed samples are used to calculate the gaps adjusted for selectivity. Imputed samples are further used to decompose the gaps by weighing, whereby men's and childless women's characteristics are attached to women and mothers, respectively, and the gaps are obtained (Barsky et al. 2002); and by using recentered influence function (RIF) which swaps the log wage (Firpo et al. 2007). The Survey of Income and Living Conditions (2010) is used.

The main finding is that once workers' characteristics and selectivity into employment are accounted for, employers in Macedonia commit discrimination against women in general, penalizing their wage by about 7-8% compared to men. Selection has been found to explain about 60% of the existing gender wage gap. This finding suggests that indeed there is negative selection of females into employment: those with not-the-worst characteristics are outside the labor market. On the other hand, mothers' wage is not penalized, i.e. the motherhood wage gap does not exist and, hence, does not contribute to explaining the gender wage gap. Any wage differential between mothers and childless women could be entirely explained by observable characteristics. There is no motherhood-based selection bias in Macedonia.

The analysis by deciles suggests that the gender wage gap, after workers' characteristics and selectivity has been considered, exists along the entire wage distribution, with potentially declining size in the right half of it and vanishing for the highest-paid jobs. At each decile, generally small portion of the gender wage gap could be attributed to the education, age, experience and marriage. On the other hand, results suggest that the existent difference in the wages between mothers and childless women could be entirely, if not overly, explained by characteristics, at any point of the wage distribution.

## 7. References

Albrecht, J., A. van Vuuren and S. Vroman (2004) Decomposing the Gender Wage Gap in the Netherlands with Sample Selection Adjustment. IZA DP No. 1400.

Amuedo-Dorantes, C. and J. Kimmel (2005) The Motherhood Wage Gap for Women in the United States: The Importance of College and Fertility Delay. *Review of Economics of the Household,* 3(1), p.17-48.

Azmat, G., M. Güell and A. Manning (2006) Gender Gaps in Unemployment Rates in OECD Countries. *Journal of Labor Economics,* 24(1), p.1-37.

Barsky, R., John Bound, K. Charles, and J. Lupton (2002) Accounting for the Black-White Wealth Gap: A Nonparametric Approach. *Journal of the American Statistical Association,* 97, p.663-673.

Beblo, M., D. Beninger, A. Heinze and F. Laisney (2003) Measuring Selectivity-corrected Gender Wage Gaps in the EU. ZEW DP No. 03-74, Mannheim.

Black, D.A., Amelia M. Haviland, Seth G. Sanders and Lowell J. Taylor (2008) Gender Wage Disparities among the Highly Educated. Journal of Human Resources, 43(3), p.630-659.

Blank, R. 1990. Are part-time jobs lousy jobs?, in Burtless, G. (ed.), *A Future of Lousy Jobs?* Washington DC, Brookings

Blau, F. and L. Kahn (2003) Understanding International Differences in the Gender Pay Gap. *Journal of Labor Economics*, 21, p.106—144.

Blinder, A. S. (1973) Wage Discrimination: Reduced Form and Structural Estimates. *The Journal of Human Resources*, 8(4), 436-455.

Budig, M.J. and England, P. (2001) The Wage Penalty for Motherhood. *American Sociological Review,* 66(2), p.204-225.

Chernozhukov, Victor, Ivan Fernandez-Val, and Blaise Melly (2013) Inference on Counterfactual Distributions. Econometrica, 81(6), p.2205–2268.

Conley, T.G., Hansen, C.B. and Rossi, P.E. (2012) Plausibly exogenous. *The Review of Economics and Statistics*, 94(1): 260–272.

Corcoran, M, Duncan, G. and Ponza, M. (1983) A longitudinal analysis of white women's wages. *Journal of Human Resources*, 18(1), p.497–520.

Correll, S.J., S. Benard, and I. Paik (2007) Getting a Job: Is There a Motherhood Penalty? *American Journal of Sociology*, 112(5), p.1297-1339.

Daniel, F.K., A. Lacuesta, and N. Rodríguez-Planas (2013) The Motherhood Earnings Dip: Evidence from Administrative Records. *Journal of Human Resources,* 48(1), p.169-197.

Dolton, P. and Makepeace, G. (1987) Marital status, child rearing and earnings differentials in the graduate labour market. *Economic Journal*, 97, p.897–922.

Ermisch, J. F. and Wright, R. E. (1993) Wage offers and full-time and part-time employment by British women. *Journal of Human Resources*, 28(1), p.111–33.

Felfe, C. (2012) The motherhood wage gap: What about job amenities? *Labour Economics*, 19(1), p.59-67.

Firpo, Sergio, Nicole M. Fortin, and Thomas Lemieux (2007) Decomposing Wage Distributions using Recentered Influence Functions Regressions", mimeo, University of British Columbia.

Firpo, Sergio, Nicole M. Fortin, and Thomas Lemieux (2009) Unconditional Quantile Regressions,.*Econometrica* 77(3), p.953-973.

Fortin N. (2005) Gender Role Attitudes and the Labour Market Outcomes of Women across OECD Countries. *Oxford Review of Economic Policy*, 21(3), p.416-438.

Fortin, N., Thomas Lemieux, Sergio Firpo, (2011) Chapter 1 - Decomposition Methods in Economics, In: Orley Ashenfelter and David Card, Editor(s), *Handbook of Labor Economics*, Volume 4, Part A, p.1-102.

Frölich, M. (2002) Propensity score matching without conditional independence assumption—with an application to the gender wage gap in the United Kingdom. *The Econometrics Journal*, 10(2), p.359–407.

Fuchs, V. (1988) *Women's Quest for Economic Equality*, Cambridge, MA, Harvard University Press

Gangl, M. and A. Ziefle (2009) Motherhood, labor force behavior, and women's careers: An empirical assessment of the wage penalty for motherhood in Britain, Germany, and the United States. *Demography,* 46(2), p.341-369.

Graham, J.W., Olchowski, A.E. and Gilreath, T.D. (2007) How Many Imputations are Really Needed? Some Practical Clarifications of Multiple Imputation Theory. *Prev Sci,* 8, p.206-213.

Greenhalgh, C. (1980) Male–female wage differentials: is marriage an equal opportunity? *Economic Journal*, 90, p.751–75.

Gronau, R. (1974) Wage Comparison - A Selectivity Bias. *Journal of Political Economy*, 82(6), p.1119-1143.

Harkness, S. and J. Waldfogel. (2003) The Family Gap in Pay: Evidence from Seven Industrialized Countries. *Research in Labour Economics,* 22, p.369-413.

Heckman, J. (1976) The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models. *Annals of Economic Social Measurement,* 5(4), p.475-492.

Heckman, J. (1979) Sample Selection Bias as a Specification Error. *Econometrica*, 47, p.153- 163.

Hill, M. (1979) The wage effects of marital status and children, *Journal of Human Resources*, 14(4), p.579–94.

Jann, B. (2008) The Blinder-Oaxaca Decomposition for Linear Regression Models. *The Stata Journal*, 8(4), p.453-479.

Johnson, W., Y. Kitamura and D. Neal (2000) Evaluating a Simple Method for Estimating Black-White Gaps in Median Wages. *American Economic Review*, 90, p.339-343.

Jones, E. and Long, J. (1979) Part week work and human capital investment by married women. *Journal of Human Resources*, 14(4), p.563–78.

Joshi, H. (1990) The cash opportunity cost of childbearing: an approach to estimation using British evidence. *Population Studies*, 44, p.41–60.

Joshi, H. (1991) Sex and motherhood as handicaps in the labour market. In: Groves, D. and Maclean, M. (eds), *Women's Issues in Social Policy*, London, Routledge, p.179–93.

Joshi, H. and Newell, M.-L. (1989) *Pay Differentials and Parenthood: Analysis of Men and Women Born in 1946*, Institute of Employment Research Report, Coventry, University of Warwick.

Joshi, H. and Paci, P. (1998) *Unequal Pay for Women and Men*, Cambridge, MA, MIT Press.

Joshi, H., Macran, S. E. and Dex, S. (1996) Employment after childbearing and women's subsequent labour force participation: evidence from the British 1958 birth cohort. *Journal of Population Economics*, 9(3), p.325–48.

Joshi, H., Paci, P. and Waldfogel, J. (1999) The wages of motherhood: better or worse? *Cambridge Journal of Economics,* 23, p.543-564.

Korenman, S. and Neumark, D. (1992) Marriage, motherhood and wages, *Journal of Human Resources*, 27, p.233–55

Loh, E.S. (1996) Productivity Differences and the Marriage Wage Premium for White Males. *Journal of Human Resources*, 31, p.566- 89.

Lundberg, S. and E. Rose (2000) Parenthood and the Earnings of Married Men and Women. *Labour Economics*, 7, p.689-710.

Machado, C. (2012) Selection, heterogeneity and the gender wage gap. IZA Discussion Papers, 7005.

Machado, J.A.F. and José Mata (2005) Counterfactual decomposition of changes in wage distributions using quantile regression. *Journal of Applied Econometrics*, 20(4), p.445–465.

Makepeace, G., Paci, P., Joshi, H. and Dolton, P. (1999) Has equal treatment in pay progressed since the 1970s? A study across men and women in two cohorts. *Journal of Human Resources,* 34(3), p.534-556.

Manski, C. F. (1989) Anatomy of the Selection Problem. *Journal of Human Resources*, 24, p.343-360.

Mincer, J. (1974) *Schooling, Experience and Earnings*. Columbia University Press, New York.

Neal, D. (2004) The Measured Black-White Wage Gap among Women is Too Small. *Journal of Political Economy*, 112, p.S1-S28.

Neumark, D. and Korenman, S. (1994) Sources of bias in women's wage equations: results using sibling data. *Journal of Human Resources*, 29(Spring), p.379–405.

Ñopo, H. (2008) Matching as a Tool to Decompose Wage Gaps. *Review of Economics and Statistics*, 90(2), p.290-299

Oaxaca R. L. (1973) Male-Female Wage Differentials in Urban Labor Markets. *International Economic Review*, 14, p.693-709.

Petreski, M., Mojsoska-Blazevski, N. and Petreski, B. (2014) Gender wage gap when women are highly inactive. Evidence with Macedonian data. *Journal of Labor Research,* 35(4), p.393-411.

Petrongolo, B. and Olivetti, C. (2008) Unequal Pay or Unequal Employment? A Cross-Country Analysis of Gender Gaps. *Journal of Labor Economics*, 26(4), p.621-654.

Rubin, D.B. (1987) *Multiple Imputation for Nonresponse in Surveys, Wiley Series in Probability and Mathematical Statistics.* Wiley & Sons, New York.

Schafer, J.L. (1999) Multiple imputation: A primer. *Statistical Methods in Medical Research,* 8, p.3-15.

Schafer, J.L. and Olsen, M.K. (1998) Multiple Imputation for Multivariate Missing-Data Problems: A Data Analyst's Perspective. *Multivariate Behavioral Research,* 33(4)http://www.tandfonline.com/toc/hmbr20/33/4, p.545-571.

Waldfogel J. (1995) The price of motherhood: family status and women's pay in a young British cohort, *Oxford Economic Papers*, 47, p.584–610.

Waldfogel, J. (1997a) Working mothers then and now: a cross-cohort analysis of the effects of maternity leave on women's pay. In: Blau, F. and Ehrenberg, R. (eds), *Gender and Family in the Workplace*, New York, Russell Sage, p.92–126.

Waldfogel, J. (1997b) The effects of children on women's wages, *American Sociological Review*, 62, p.209–17.

Waldfogel, J. (1998a) Understanding the 'family gap' in pay for women with children, *Journal of Economic Perspectives*, 12(1), p.137–56.

Waldfogel, J. (1998b) The family gap for young women in the United States and Britain: can maternity leave make a difference? *Journal of Labor Economics*, 16(3), p.505–45.

## Appendix 1 – Heckman selection correction

As the Heckman selection correction approach has been more standard across the respective literature, herein we present the results of the Heckman correction. While the intuition behind this procedure is the same as with the repeated imputation, in a technical sense they are distinctive: Heckman relies on exclusion restrictions, i.e. variables entering the selection equation and hence the decision to participate in the labor market, but not the outcome variable, i.e. wages, except through the decision to participate. In this way, the selection due to unobservables is addressed. Heckman selection correction method has been, though, criticized for the arbitrariness in the choice of exclusion restrictions, as well for its incapability to actually correct the selection bias when missingness is pervasive. This has been extensively discussed in Petreski et al. (2014), so that here we only present the results. For the exclusion restrictions, we choose two variables: the number of children and the (log of) spouse wage. It could be argued that both do not affect the wage directly, but do affect participation and have some roots in the literature (e.g. Grimshaw and Rubery, 2015; Budig and England, 2001; Davies and Pierre, 2005; Aguero et al. 2011), as well in our estimates in columns (4) to (7) in

Table **6**. The other explanatory variables enter both the outcome and selection equations, but the coefficients are not reported due to space.

Table 10 presents the results. It suggests that indeed Heckman fails to provide any guidance on the potential presence of selectivity: it actually produces coefficients which are very similar to the OLS ones (Table 3 and Table 4), leading one to conclude that selection is not present in the data, or if it is, then it does not affect the wage gaps. However, due to Heckman's method weaknesses against the argumentation and finding above that selection is actually a pervasive problem in our data, the findings with the Heckman method should be approached with caution.

**Table 10 – Heckman selection correction**

| | Entire sample | Education cohorts | | |
|---|---|---|---|---|
| | | Primary | Secondary | Tertiary |
| **Female** | -0.197*** | -0.268*** | -0.230*** | -0.0717 |
| | (0.027) | (0.071) | (0.034) | (0.054) |
| **Female** | -0.165*** | -0.262** | -0.155*** | -0.0746 |
| | (0.041) | (0.119) | (0.054) | (0.071) |
| **Mother** | -0.0473 | -0.008 | -0.107* | 0.0046 |
| | (0.044) | (0.127) | (0.060) | (0.077) |
| **Female** | -0.101** | -0.104 | -0.0543 | -0.0778 |
| | (0.046) | (0.239) | (0.064) | (0.072) |
| **Wife** | -0.129*** | -0.173 | -0.225*** | 0.01 |
| | (0.050) | (0.242) | (0.070) | (0.080) |

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Estimates are robust to heteroskedasticity. Standard errors reported in parentheses.*