THE GENDER WAGE GAP IN HUNGARY: AN UNCONDITIONAL QUANTILE REGRESSION-BASED DECOMPOSITION APPROACH

By

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Abstract

This thesis examines the gender wage gap in Hungary in 1998-2011 along the wage distribution by using decompositions with recentered influence function regression approach by Firpo et al. (2007). Using 1998, 2005, 2011 wage data from the National Employment Office, the regression-compatible decompositions at the mean show that the total wage gap in my sample increases over time, while the explained gap is negative in all the years, particularly due to firm characteristics, occupation and residence indicators. Along the distribution, the gender wage gap is upward sloping, indicating the glass ceiling effect for women. Before the recession, the total explained gap is positive starting from 95-99th quantile, while after the recession the total explained gap is negative at all the quantiles, especially due to education reversal. Thus, although before the recession women were less qualified for high paying jobs, in 2011 the women should earn higher wages at any quantile of the wage distribution in the absence of unexplained gap. To address the robustness of my findings I use the matching approach proposed by Ñopo (2008), which addresses the issue of differences in the supports of the distributions of characteristics. I find that once the industrial dummies and firm characteristics are added, the portion of matched observations decreases, which hints at the high industrial and firm segregation by gender.

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1. Introduction

Women have always earned less than men, but the gap have decreased in the recent years in most of the transition economies. The gender pay gap in Hungary is still a problem despite a list of laws and regulations introduced to realize the equal pay for equal work. According to the Fundamental Law of Hungary, there should be no discrimination on grounds of sex (Fundamental Law of Hungary, 2011). Article 12 of the Labor Code guarantees equal treatment for all workers. According to it, the employers should allow mothers to work part-time until their youngest child turns three (Act I of 2012 on the Labor Code, 2011). Some bodies were established to address the equal gender pay issue. The Equal Treatment Authority, which has operated since 2005, deals with individual and public complaints of violation of the equal pay law. "The Equal Pay for Equal Work" working group was established to fulfill the EU Roadmap targets by proposing legal amendments, organizing conferences on the topic, etc.

In this paper I want to analyze how the wage gap evolved in Hungary after the transition for selected quantiles of the wage distribution, specifically the period 1998- 2011.

A number of research has been made about the wage gap in Hungary. The Institute of Economics at the Hungarian Academy of Sciences used nation-wide survey from 1986-2004, and found that adjusted wage advantage of men over women reduced from 0.26 in 1986 to 0.16 in 2004. Borbély and Vanicsek (2008), using 2007 descriptive statistics, found that net mean wage gap was 17.7%, while gross median wage gap was 14%. Rigler and Vanicsek (2008) used Oaxaca-Blinder (OB) Decomposition methods for 2006-2007 data and found that the net pay gap in Hungary was 17.7%, from which the total endowment effect is -7.2% and the total discrimination effect is 26.9%. They find that the main factors of discrimination are education, experience and women's share in

organization. Lovasz (2008) tests Becker's model of employer-taste discrimination, and finds a significant negative relationship between competition and gender gap.

To the best of my knowledge there has been no research about gender wage gap made for Hungary using unconditional quantile regression-based decompositions, and matching approach developed by Ñopo (2008). I will try to fill in this gap in the literature.

The collapse of socialism brought many structural changes to the economies in Central and Eastern Europe. On the one hand, the market-oriented economy introduced a wage gap, which was not common in the socialistic regime. The transition from socialism resulted in a fewer childcare subsidies, and increased jobless population. On the other hand, the competitive market reduced the gap down. According to the Becker's model there is a positive correlation between market power and discrimination (Becker 1971).

There are some traditional factors which affect the gender wage gap. One of the most important ones is the labor force participation. Over time married women's rising participation rates has influenced the "quiet revolution" in gender roles, which has contributed to the decrease of gender gap over time (Goldin 2006). Goldin constructs her theory based on 2 elasticities of labor supply-income and substitution elasticities. She finds that income elasticities of females became closer to males over time, which made them more comparable to men. (Blau and Kahn, 2017). On the other hand, improvements of household technologies could serve as substitutes to housekeeper's labor supply.

Another important factor is education. In most of the economically advanced countries, such as the USA, studies find education reversal of the gender differential. (Goldin, Katz, and Kuziemko 2006; Blau and Kahn 2017).

When talking about labor force participation, however, it is important to note the existing self-selection of women in low-paid jobs. Women's relative earnings may be lower due to their occupational and industry choice, as usually they decide to enroll in such jobs where skill depreciation doesn't play the highest role (Polachek 1981). Also, they prefer to work in jobs which have a lower wage penalty for flexibility and are more family friendly. The self-selection issues motivate researches to use decomposition methods for finding the explained and unexplained gap.

The structure of this thesis is as follows. In Chapter 2 I describe the data to present the preliminary gender gap assessment. Chapter 3 describes the decomposition strategies at the mean and quantiles, and the matching approach developed by Ñopo (2008). In Chapter 4 I summarize the results and conclude.

2. Data Summary

For my analysis I used an anonymous wage survey provided by the Center for Economic and Regional Studies of the Hungarian Academy of Sciences. The data is from the National Employment Office. I linked the wage survey to balance sheet firm data, and as a result I got Linked Employer-Employee Data (LEED) for the period from 1998-2011.

The sample is restricted to 25-55 years-old workers who belong to private companies and have positive income. This results in 965,081 observations. I dropped the observations below 25 years old because I wanted to exclude the schooling (including university) influence. The workers above 55-years old were also excluded because of the retirement effects, and since the retirement age differs for men and women in this period, I took the minimum retirement age, which is 55 for women. I focused on private company workers because the wage determination in their case is systematically different from other workers.

The dependent variable is the logarithm of real gross monthly wage adjusted by premium payments and converted into 2012 HUFs. The explanatory variables are included in 2 groups: individual characteristics and firm characteristics.

The individual characteristics group involves age, 5 dummies for education which composes of 5-scale finished educational attainment. I also included dummies for urban residence and Budapest. Experience variable stands for estimated experience years. I created 5 dummies indicating the experience. To have a skill variable, I generated 4 dummies from the Hungarian Standard Classification of Occupations. High-skilled white-collar occupation dummy corresponds to 1-3 classifications (such as lawyers, teachers, engineers), low-skilled white collar is the 4-5 classifications (such as accountants, customers service personnel), high-skilled blue-collar is the

6-7 classifications (such as woodworker, vegetable grower), and low-skilled blue-collar stands for 8-9 classifications (such as guards, cleaners). The main drawback of the data is the absence of variable indicating the marital status and number of children, which will lead to underestimating the explained gap.

The firm characteristics group includes 4 firm size dummies, which corresponds to the thresholds used in Eurostat's classification:

- Micro firm- less than 50 workers;
- Small firm- 50-99 workers;
- Medium- 100-249 workers;
- Large- at least 250 workers.

I also included 4 dummies for the age of the firm, and dummies for 3 ownership types of the firm: domestic, foreign, state and local government. I believe that exports might play a great role in indicating the wage of the worker, therefore I created a dummy indicating whether the firm is an exporting one. Firm characteristics group also consists of industry dummies which correspond to 15 industries of The Statistical Classification of Economic Activities in the European Community, commonly referred to as NACE.

Table 1 illustrates the means of the variables used in my analysis in 1998-2011, as well as 1998, 2005, 2011 separately to compare characteristics of men and women over time. I separate these years because 1998 is the earliest year in my sample; 2005 is important as it after Hungary joined EU in 2004; and 2011 is important as it is after the recession in 2008.

Table 1. Descriptive statistics of the private company employees aged 25-55.

	1998		2005		2011		1998-2012	
	Male	Female	Male	Female	Male	Female	Male	Female
Number of observations	51,331	36,016	21,692	13,929	23,888	14,546	578,730	386,351
Real wage	189039.3	159531.3	273745.4	213712.2	305232	244076.9	234806	193562.2
Demographic Controls								
Age	40.226	40.959	39.418	40.573	39.459	39.669	39.616	40.519
Education (in proportions)								
Elementary school (0-7)	.010	.007	.002	.004	.0002	.001	.005	.005
Elementary school (8)	.161	.228	.112	.188	.093	.128	.130	.182
Vocational school	.412	.189	.384	.198	.338	.198	.404	.206
Graduated school	.264	.472	.319	.460	.335	.428	.288	.465
Diploma	.154	.104	.182	.150	.234	.245	.173	.142
Type of residence (in proportions)								
Urban	.815	.850	.849	.864	.725	.699	.810	.834
Not urban	.185	.150	.151	.136	.275	.301	.190	.166
Capital City (in proportions)								
Not Budapest	.772	.724	.783	.752	.710	.668	.757	.713
Budapest	.228	.276	.218	.248	.290	.332	.243	.287
Experience (in proportions)	22.655	23.654	21.5012	22.953	21.212	21.454	21.836	22.915
2-10 years	.105	.090	.139	.137	.128	.153	.132	.131
11-18 years	.242	.192	.281	.220	.296	.259	.267	.215
19-26 years	.275	.291	.238	.228	.275	.260	.247	.241
27-34 years	.284	.341	.246	.282	.216	.219	.258	.295
35-43 years	.094	.086	.095	.134	.086	.109	.096	.117
Occupation by skill level (in proportions)								
High-skilled, white-collar	.301	.397	.347	.430	.361	.406	.325	.409
Low-skilled, white-collar	.081	.273	.088	.218	.086	.278	.086	.274
High-skilled, blue- collar	.360	.170	.313	.156	.236	.087	.330	.149
Low-skilled, blue- collar	.258	.161	.252	.196	.318	.230	.259	.168

	1998		2005		2011		1998-2012	
	Male	Female	Male	Female	Male	Female	Male	Female
Firm Controls								
Firm size								
Micro (0-49)	.252	.204	.274	.212	.274	.226	.367	.297
Small (50-99)	.094	.086	.082	.062	.083	.077	.092	.085
Medium (100-249)	.138	.145	.124	.132	.139	.135	.120	.131
Large (250-above)	.512	.563	.518	.592	.502	.560	.417	.483
Industry type by NACE 1-digit classification (in proportions)								
A: Agriculture, Hunting and Forestry	0.122	0.063	0.050	0.031	0.044	0.026	0.080	0.042
B: Fishing	0.001	0.000	0.002	0.001	0.001	0.001	0.002	0.001
C: Mining and quarrying	0.011	0.003	0.005	0.002	0.006	0.003	0.008	0.002
D: Manufacturing	0.369	0.391	0.433	0.455	0.414	0.415	0.376	0.391
E: Electricity, gas and water supply	0.067	0.038	0.035	0.021	0.034	0.020	0.044	0.026
F: Construction	0.077	0.021	0.038	0.012	0.043	0.013	0.080	0.021
G: Wholesale & retail trade; repair of motor vehicles, houses	0.089	0.153	0.162	0.180	0.177	0.237	0.146	0.200
H: Hotels and restaurants	0.015	0.026	0.004	0.008	0.012	0.023	0.014	0.026
I: Transport, storage and communication	0.156	0.125	0.220	0.211	0.168	0.120	0.146	0.121
J: Financial intermediation	0.019	0.088	0.006	0.015	0.015	0.036	0.015	0.062
K: Real estate, renting and business activities	0.053	0.066	0.036	0.047	0.066	0.080	0.064	0.076
L: Public administration and defense; social security	0	0	0	0	0.001	0.0001	0.0002	0
M: Education	0.003	0.001	0.001	0.001	0.000	0.001	0.002	0.004
N: Health and social work	0.001	0.004	0.000	0.005	0.002	0.008	0.002	0.010
O: Other service (community, social and personal)	0.017	0.019	0.009	0.012	0.017	0.017	0.020	0.020
Ownership (in proportions)								
Domestic	.517	.516	.437	.384	.386	.327	.525	.484
Foreign	.264	.303	.366	.418	.457	.569	.306	.368
State and Local Government	.219	.180	.197	.199	.158	.104	.170	.148
The age of the firm	14.41745	15.095	19.799	18.936	19.224	19.502	15.428	15.692
0-4	.116	.099	.061	.058	.077	.058	.098	.096
5-9	.611	.603	.170	.174	.127	.137	.332	.321
10-49	.256	.274	.626	.646	.728	.732	.501	.514
50-above	.017	.024	.143	.122	.068	.073	.070	.069
Exporting firm dummy (in proportions)	.539	.542	.936	.945	.880	.877	.619	.616

Compared to their male counterparts, female workers in my sample are more likely to be older, and reside in cities- especially Budapest. The share of men having higher education is higher relative to women, the real difference is that it is more common among the men to receive vocational training, at the expense of graduating simple schools, while the picture is completely the reverse for women. The majority of employees work for domestically owned firms. However, compared to men, the percentage of women working in foreign companies is much higher, and less at state and domestic firms. The proportion of women working at high-skilled white-collar occupations is higher relative to men, although it is the dominant skill-level occupation for both sexes. Women are more likely to work in large and medium companies, as well as companies established relatively earlier. The share of women working for financial intermediaries, real estate, hotels and restaurants, as well as wholesale and retail trade is substantially higher than those of men. In particular, in the sample including the full time period, compared to men, women are 2 times more likely to work in education than, and 5 times more likely to work in health and social work industries. These industries offer higher flexibility in working hours, and are more family-friendly, which coincides with the statements that women self-select themselves into low-paid jobs due to their household duties.

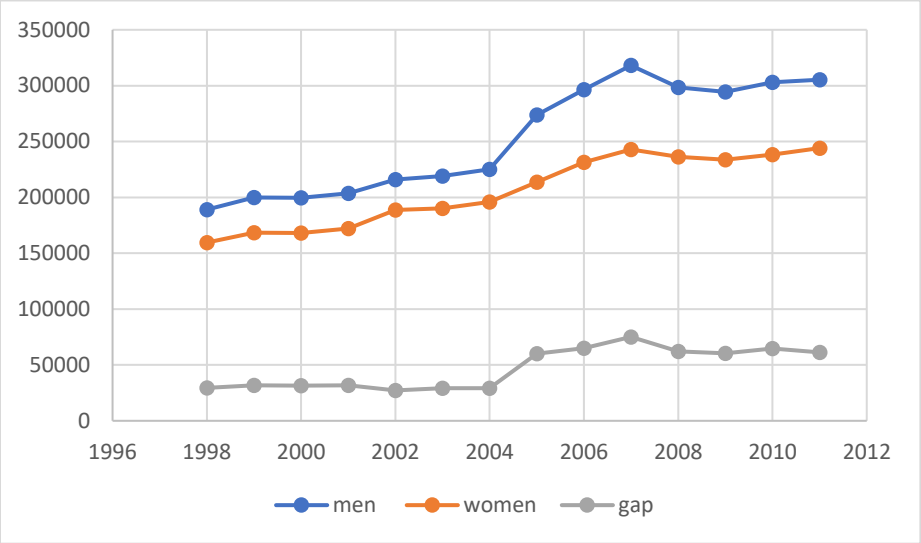
Table 1 also shows that over time both the demographic and firm characteristics changed, which indicates a structural change in the Hungarian economy. Some of the changes have a cyclical trend, while the other changes are more consistent.

During 1998-2011 workers became younger which may be due to decreasing significance of experience in employment. The urban residence in 1998-2011 has a cyclical trend. In 1998-2007, the percentage of workers living in Budapest and other cities increased, while from 2007 to 2011 it decreased. This may indicate that after Hungary joined the EU in 2004, the labor market provided

more opportunities in nonurban parts of Hungary. Higher education increased persistently over the years for both men and women; however, the magnitude of the increase for females was higher relative to males. This resulted in more women with higher education by 2011 than men. The percentage of workers at exporting companies increased by 60% over the sample period, which is a common trend due to globalization. Women in the sample from 1998 and 2005 are more likely to work for exporting firms than men; however, this gap slows down and slightly reverses in 2011. This is due to an increase in the proportion of workers in exporting companies over the years with male proportion eventually increasing at higher speed than the female one. The percentage of women working at foreign firms increased mostly at the expense of domestic firms. The biggest share of men in 1998 was working in high-skill blue-collar positions; however, over time high-skilled white-collar positions became dominant for both sexes.

Figure 1 shows that the wage gap increased after 2004, when Hungary joined the EU. This increase was driven by the increase in male real wages in that period which was accompanied by smaller increase in female real wages. Between 1998-2005 the male real wages increased by 44.8%, while the female real wages increased only by 33.96%. This expanded the gender pay gap. Between 2005-2011 the male and female wages increased by 10.12% and 4.43%, respectively. In particular, in 2007 the wage gap slightly decreased due to sharp decrease of male wages.

Figure 1. Real wages and the gender wage gap between 1998 and 2011

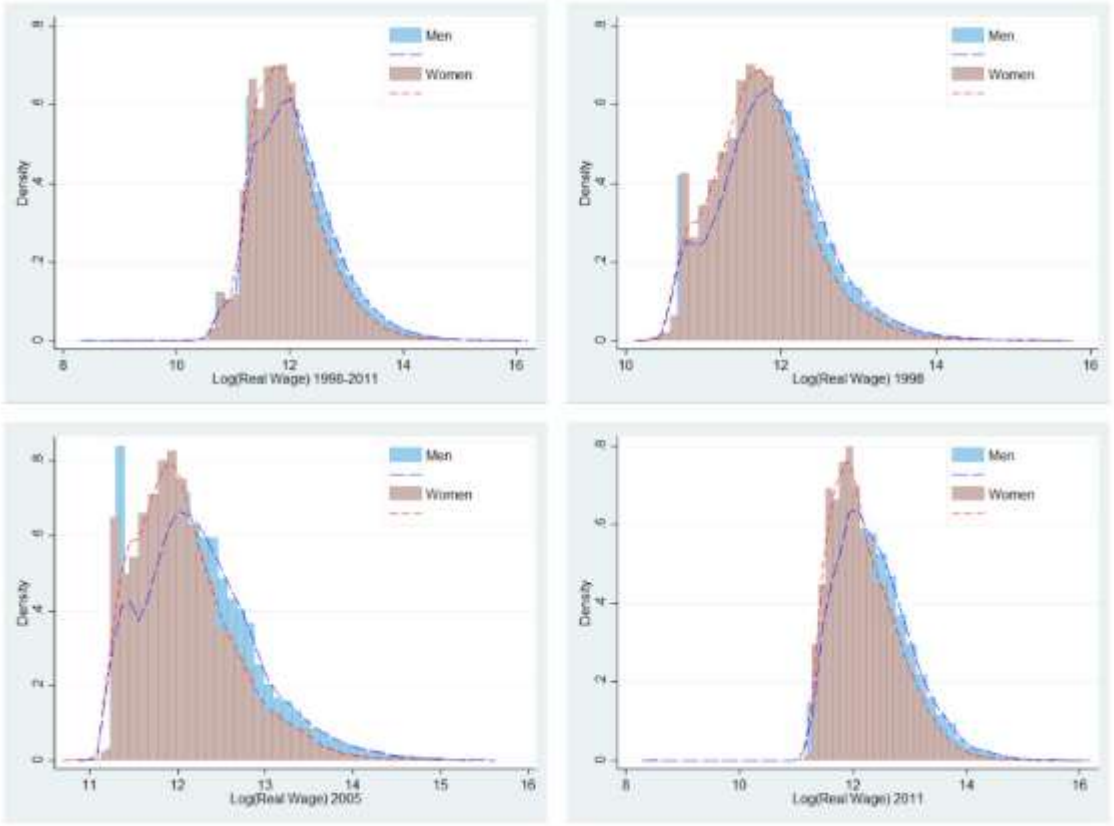


Source: on data

Behind the decline of the gender wage gap at the mean lie shifts in the shape of the gender wage gap across the wage distribution. Figure 2 shows the distribution of male and female logarithm of real wage. The average wage gap between men and women is mostly driven by the top of distribution, where men have higher wages than women. This is consistent with the glass ceiling effect. The bottom tail does not tell us very informative story because of the effect of minimum wage increases. On the figure this minimum wage effects are seen as spikes in the left tail of distribution, particularly in 1998 and 2005.

It is very interesting how the wage distributions evolved over time. In the early years of transition, the distributions overlapped more than in the later years, which coincides with the hypothesis that the socialism implied equal pay for workers, and transition increases the pay gap. In 2011 the gap at the glass ceiling effect is even more obvious. To sum up, the wage gap is not proportional along the distribution, which motivates quantile analysis.

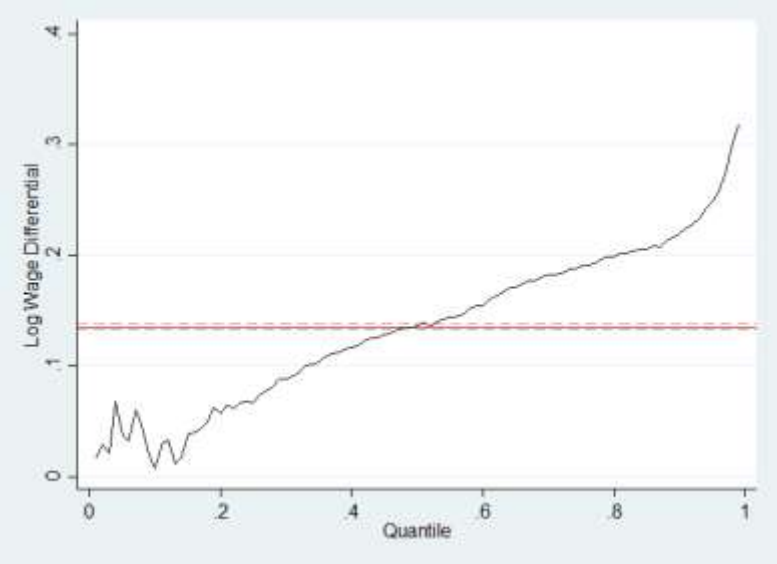
Figure 2. Densities of male and female logarithm of real wages over time



Source: on data

Figure 3 confirms the presence of glass ceiling effect in Hungarian labor market. Essentially it captures that in the 1998-2011, the gender wage differentials lie within standard errors of the average differential of 0.135 (.001).

Figure 3. Gender differential by quantile in 1998-2011



Source: on data

3. Framework and Specifications

3.1 Regression-Compatible Fortin Decomposition Approach

In practice, the problem of OB decomposition is the choice of the non-discriminatory wage structure (counterfactual weighted by either male or female coefficients) as it generates different results (Cotton 1988; Oaxaca and Ransom 1994). This motivated me to consider computing gaps based on pooled wage structure proposed by Neumark (1988) and Oaxaca and Ransom (1994), and rewritten by Fortin (2008).

Neumark (1998) makes use of the coefficients obtained from the pooled data regression, β_p, without including a dummy for gender.

$$\overline{Y_m} - \overline{Y_f} = \hat{\beta}_p\left(\overline{X_m} - \overline{X_f}\right) + [\overline{X_m}\left(\hat{\beta}_m - \hat{\beta}_p\right) + \left(\widehat{\beta_{0m}} - \widehat{\beta_{0p}}\right) - \overline{X_f}\left(\hat{\beta}_p - \hat{\beta}_f\right) + \left(\widehat{\beta_{0f}} - \widehat{\beta_{0p}}\right)]$$

where *Y* denotes real wages, *X* a set of individual and firm characteristics, and *m* and *f* indices of males and females respectively.

The first term in the equations above is the explained gap (also called a gap due to composition effects which is attributable to the fact that females could have different x's than males). The second term is the advantage of men, and the third term stands for the disadvantage of women; their difference gives unexplained gap (wage structure effect, which is attributable to the fact that women have worse β's than men).

However, to overcome the omitted variable (gender dummy) bias problem, I used the Neumark Decomposition approach, rewritten by Fortin (2008), which is based on the following equation:

$$\begin{aligned}\overline{Y_m} - \overline{Y_f} &= \hat{\gamma}\left(\overline{X_m} - \overline{X_f}\right) + \left[\overline{X_m}\left(\widehat{\beta_m} - \hat{\gamma}\right) + \left(\widehat{\beta_{0m}} - \widehat{\gamma_0}\right)\right] - \overline{X_f}\left(\widehat{\beta_f} - \hat{\gamma}\right) + \left(\widehat{\beta_{0m}} - \widehat{\gamma_0}\right)] \\ &= \hat{\gamma}\left(\overline{X_m} - \overline{X_f}\right) + [\widehat{\gamma_{0m}} - \widehat{\gamma_{0f}}]\end{aligned}$$

where $\hat{\gamma}$ is the coefficient on X-es of pooled regression with a dummy for gender, $\widehat{\beta_m}$ and $\widehat{\beta_f}$ are the coefficients on X-es of gender specific regressions, $\widehat{\gamma_{0m}}$ stands for advantage of males and $\widehat{\gamma_{0f}}$ is the disadvantage of females. $\widehat{\gamma_{0m}} - \widehat{\gamma_{0f}}$ is the negative of the coefficient of a female dummy in a familiar wage regression on the pooled sample.

As a result, I used two-fold decomposition using pooled model including the gender dummy.[1]

The drawbacks of this decomposition method include:

1. OB decompositions are usually reported without standard errors, as the linear standard errors are not very representative (Fortin, Lemieux, Firpo 2010).
2. It does not address the wage gap along the distribution.
3. Ñopo (2008) argues that the common support assumption does not hold in practice, which means that the linear estimators of the earnings equations are also valid out of the support of individual characteristics for which they were estimated. This leads to misestimating the unexplained gap.

The 1nd drawback can be easily solved by bootstrapping. Although there are complicated methods to compute the standard errors analytically, bootstrapping is a simpler method (Fortin, Lemieux, Firpo 2010). To address the 2rd issue, I also analyze the wage gap along distribution by using the unconditional quantile regressions described in the Section 3.2, and I test the 3rd problem of common support assumption by robustness check using the matching approach, described in Section 3.3

1 I used the new Regression-Compatible Oaxaca-Blinder decomposition, that is "oaxaca" procedure of Ben Jahn (2008) in stata with the "pooled" option that includes the gender variable in the pooled regression.

3.2 Unconditional Quantile Regression-Based Decomposition Approach

Before introducing recentered influence functions (RIF) as the base regressions for decomposing the wage gap at defined quantiles, Koenker (2005) used *conditional* quantile regressions.

However, Firpo et al (2009) state that conditional quantile regressions don't give interesting results as the conditional results cannot be generalized to the population. For instance, in OLS one can go from $E[y_i|x_i]$ to unconditional $E[y_i]$ expectation by applying the law of iterated expectations, which doesn't work for quantiles. Therefore, the τ −th unconditional quantile y_i might not be the same as the τ −th conditional quantile $y_i|X_i$. Conditional quantile decomposition methods can successfully decompose the gap into explained and unexplained gap; however, they cannot identify the contribution of the covariates in each gap (Fortin and Lemieux 1996).

Therefore Firpo, Lemieux and Fortin (2009) introduced *unconditional* quantile regressions, which represents running the regression of a transformation of the outcome variable (RIF) on the explanatory variables allowing to evaluate the marginal impact of changes in the distribution of the explanatory variables on the quantiles of the marginal distribution of the dependent variable.

First, at quantiles under interest, the raw wage gap is decomposed into explained and unexplained gap:

$$Q(Y_m)\text{-}\ Q\big(Y_f\big)= Q(Y_m) - Q(Y_c)+Q(Y_c)\text{-}Q\big(Y_f\big)$$

where

$Q(Y)$ is a quantile of a wage distribution Y;

Y_m is the male wage distribution;

Y_f is the female wage distribution;

and Y_c is the counterfactual wage distribution.

Then, the quantiles are transformed using the recentered influence function, $\widehat{RIF}(Y_g;\ \hat{q}_\tau) = X_g\hat{\beta}_g$, where the index =*m, f, c*. The estimated RIF coefficients $\hat{\beta}_g$ can be interpreted as the effect of increasing the mean value of X on the unconditional quintile. This interpretation is incorrect in the conditional quantile regressions since the law of iterated expectations does not apply in these cases.

So, the decomposition can be written as:

$$\hat{q}_\tau(Y_m) - \hat{q}_\tau(Y_f) = [\bar{X}_f(\hat{\beta}_c - \hat{\beta}_f) + \hat{\beta}_c(\bar{X}_m - \bar{X}_c)] + [\bar{X}_m\hat{\beta}_m - \bar{X}_f\hat{\beta}_c + \bar{X}_c(\hat{\beta}_c - \hat{\beta}_f)] =$$

$$= \bar{X}_f(\hat{\beta}_c - \hat{\beta}_f) + \hat{R}_{S\tau}] + [\bar{X}_m\hat{\beta}_m - \bar{X}_f\hat{\beta}_c + \hat{R}_{c\tau}]$$

where $\hat{R}_{s\tau}$ is the approximation error of the structure and $\hat{R}_{c\tau}$ is the approximation error of the composition effect.

I implement the RIF regression approach by using pooled coefficients described in Section 3.1. I address the problem of standard errors by doing bootstrapping with 200 replications.

3.3 Matching Approach

Ñopo (2008) argues that the decomposition approaches listed above are based on "out-of-support assumption", which leads to misspecification of the model, particularly there is a concern of overestimating the unexplained component. There are some combinations of characteristics where it is hard to find males, and some where it is hard to find females. For example, it is hard to find young females doing construction, or young male nurses, or kinder garden teachers. Table 1 shows that there is industrial and occupational segregation in Hungary among women. The matching approach introduced by Ñopo uses matching on characteristics rather than propensity scores.

Therefore, I use the matching approach developed by Ñopo (2008) to do robustness check of my decomposition results at the mean and selected quantiles.

The procedure of the matching approach:

1. Choose one female from the sample (*without replacement*)
2. Select all the males who have the same X characteristics as the female selected in previous step, and form a synthetic male whose wage is the average of all the males selected. This will be a match to the original female chosen in step 1.
3. Put the observations of both the original female and the synthetic matched male to the sample of matched individuals.
4. Repeat the steps above for all the female sample
5. Select one male from the sample (*with replacement*)
6. Repeat 2-4 steps for the male group, respectively.

Source: Ñopo (2008)

The raw wage gap can be broken by four additive components:

$$\Delta = \Delta_M + \Delta_F + \Delta_X + \Delta_0$$

where

$\Delta_M = \mu_M(Unmatched)\left(E_{M,unmatched}[Y|M]\right) - \left(E_{M,matched}[Y|M]\right)$ is the part of the gap that contributes to the differences between males who have characteristics that can be matched to female counterparts and those who do not, μ_M is the probability measure of the set S under the $dF_M(.) -$ conditional cumulative distribution functions of male's X characteristics;

$\Delta_F = \mu_F(Unmatched)\left(E_{F,matched}[Y|F]\right) - \left(E_{F,unmatched}[Y|F]\right)$ is the part of the gap that contributes to the differences between females who have characteristics that can be matched to their male counterparts and those who do not;

$\Delta_X = \left(E_{M,matched}[Y|M]\right) - \left(E_{F,matched}[Y|M]\right)$ is the part of the wage gap that due to the differences in the distribution of characteristics between the genders over the common support;

And $\Delta_0 = \left(E_{F,matched}[Y|M]\right) - \left(E_{F,matched}[Y|F]\right)$ is the unexplained part of the gap which contributes to unobserved characteristics and discrimination.

The sum of the first 3 terms will account for the explained portion of the gap $\Delta_F + \Delta_x + \Delta_M$, while the last term, Δ_0, will be left as unexplained. In OB decompositions, $\Delta_x + \Delta_M$ remain included in the unexplained gap, which tends to lead to misspecification of the discrimination.

4. Results

4.1 Regression-Compatible Fortin Decomposition Approach

The proposed decomposition procedure is compatible with the regression estimated on the pooled sample. Table A1 in the appendix shows the regression of logarithm of real wages on individual and firm characteristics, including a dummy for gender, that is $ln(w_i)=\delta_0 + \delta_{0m} * M_i + X_i\gamma + v_i$.

M is a dummy, which equals to one if the individual is a male. The γ vector of coefficients lies between the coefficients estimated from the gender specific samples, β_m and β_f.

The 1st column includes the regression of logarithm of real wages on a male dummy. As different explanatory variables are added to columns (2)- (7), the male dummy becomes larger due to step-by-step elimination of the omitted variable bias. When 4 dummies for education are added, along with the age and residence variables, this absorbs some part of the explanatory power of residence variables, reflecting the correlation between urban, Budapest residence and human capital. Column (4) adds 4 dummies of experience to the previous specification. Having from 11 to 18 years' experience increases the wages by 0.038 log points compared to the less than 11 years of experience. However, having over 18 years of experience decreases the wages holding other factors fixed. This captures the inverted-parabolic shape of experience, indicating that there is a positive effect of experience on wages up to a certain point. By addition of the occupation dummies, the coefficients on high school and higher education decrease significantly in the joint sample (decrease from 0.498 to 0.399 in case of high school graduation dummy, and from 1.115 to 0.897 in case of higher education dummy). This captures a high correlation between occupation and education. The inclusion of the industry dummies highly changes the coefficients on the occupation dummies, given the high connection. Column (7) represents the full specification. The

inclusion of the additional firm-specific characteristics changed the sign of urban residence to negative, and increased the signs on occupation dummies.

Table A2 in the appendix shows that over time the coefficient on age ranges from 0.012 to 0.017, while Budapest dummy ranges from 0.174-0.178. Over time the dummy standing for 11-18-year experience increases significantly (from -0.003 in 1998 to 0.080 in 2011), while the coefficients on the experience dummies including over 18-years of experience become even more negative. All the coefficients on the occupation dummies increased significantly, which makes the low-skill blue-color workers worse off over time. The pooled coefficients on electricity, gas and water supply, as well as construction and transport increase, while the coefficients on wholesale & retail trade decrease over time. Over time working at younger companies started to increase the wage. While working at small, medium and large company effects wages positively compared to micro companies, the magnitude decreased significantly over time. State and local owned companies give higher wages than domestically owned ones, but smaller than foreign owned companies in all the years.

In the gender specific regressions of Table A3 in the Appendix the Budapest dummy has larger effect in case of female sample. The male and female coefficients for age are not statistically different. The table reveals that in 1998 and 2005 having higher education had insignificantly larger impact on female wages than on male wages (0.860 vs 0.803 in 1998 and 0.761 vs 0.747 in 2005); however, in 2011 holding higher education had significantly higher effect on the male sample rather than female one (0.917 vs 0.624). The coefficients on all the experience dummies for males are statistically more significant than those for females. They also confirm some findings that experience has higher role in determining wages for males compared to women. Women always had higher returns on high-skilled white-collar occupations than men, moreover, women

always had positive coefficient on low-skill white-collar jobs, while men had negative coefficient, which captures that low-skill blue-collar jobs effect the female wages negatively, while the picture for men is different. The table A3 also reveals significant changes in most of the industry returns for men and women, particularly, women have negative coefficients on mining, manufacturing, construction and transport industries, while men have positive ones. The coefficients on foreign-owned companies are higher for males than for females in all the years, by 2011 they almost equalized.

I now turn to the implications of these findings to the gender pay gap. Between 1998-2011 the Hungarian economy expanded, which was associated with an increase in the wage gap from 0.134 to 0.172 log points. Table 2 presents the results of the regression-compatible Oaxaca decomposition. In particular, the unexplained gap in Table 2 can be also obtained from the coefficients on the male dummy shown on the 1st row of table A2 in the Appendix.

This unexplained part of the gap, which attributes to discrimination and omitted variables, contributed to the total pay gap by about 10% less in 2011 relative to 1998. My findings of the unexplained gap are larger than in similar literature, which may be driven by missing number of children and marriage variables.

However, the explained gap is negative in all the years, which results in bigger unexplained gap than the total gap. Negative sign shows that endowments are better among women. This implies that their demographic, occupation and firm characteristics included in regressions should have helped to narrow the gender wage gap. In the sample 2008-2011, 56.72% of the explained gap is attributable to the firm characteristics, while about 30% are attributed to demographic characteristics and occupation. Moreover, by 2011, due to education reversal, women's higher

level of education decreased the explained gap further. In 2011 education reversal happened because that women had higher education than men.

Table 2. Regression-compatible decomposition of the wage gap at the mean using pooled coefficients for the 1998, 2005, 2011 and 1998-2011 samples

Years	1998	2005	2011	1998-2011
Composition effects attributable to: ($\Delta\bar{x}'\widehat{\gamma}$)				
Demographic characteristics	-0.017***	-0.020***	-0.012***	-0.018***
	(0.001)	(0.002)	(0.002)	(0.000)
Education	0.002	0.008***	-0.016***	-0.001**
	(0.002)	(0.003)	(0.003)	(0.001)
Experience	0.003***	0.012***	0.009***	0.008***
	(0.001)	(0.002)	(0.001)	(0.000)
Industry	0.002	0.005***	0.014***	0.002***
	(0.001)	(0.001)	(0.001)	(0.000)
Firm characteristics	-0.028***	-0.033***	-0.037***	-0.038***
	(0.002)	(0.002)	(0.002)	(0.001)
Occupation	-0.022***	-0.023***	-0.019***	-0.020***
	(0.001)	(0.002)	(0.002)	(0.000)
Total composition gap	**-0.059*** **	**-0.051*** **	**-0.060*** **	**-0.067*** **
	(0.003)	**(0.005)**	**(0.005)**	**(0.001)**
As % of the raw gap	***-44.0***	***-27.3***	***-34.9***	***-49.6***
Advantage of men-disadvantage of women ($\widehat{\gamma_{0m}} - \widehat{\gamma_{0f}}$)	**0.193*** **	**0.238*** **	**0.232*** **	**0.202*** **
	(0.004)	**(0.005)**	**(0.005)**	**(0.001)**
As % of the raw gap	***144.0***	***127.3***	***134.9***	***149.6***
Raw log wage gap	**0.134*** **	**0.187*** **	**0.172*** **	**0.135*** **
	(0.004)	**(0.006)**	**(0.006)**	**(0.001)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).
Please see table A 4 in Appendix for the detailed decomposition, including contributions of each group to the unexplained gap.

4.2 Unconditional Quantile Regression-Based Decomposition Approach

Table 3 reveals that in the sample of 1998-2011 the gender wage gap is upward sloping, which again confirms the previous findings of the glass ceiling effect in the Hungarian Labor Market. Indeed, the gender wage gap was 0.042 log points at the 10th quantile and 0.318 log points at the 99th quantile.

Table 3. Decomposition of the gender wage gap based on unconditional regressions at selected quantiles, 1998-2011

Quantiles	10	50	90	95	99
Composition effects attributable to: $(\Delta\bar{x}'\widehat{\gamma})$					
Demographic characteristics	-0.003***	-0.011***	-0.042***	-0.060***	-0.079***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
Education	-0.003***	-0.016***	0.036***	0.061***	0.073***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
Experience	-0.000	0.000	0.029***	0.049***	0.068***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
Industry	-0.002***	0.004***	0.003***	-0.005***	-0.014***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
Firm characteristics	-0.015***	-0.037***	-0.045***	-0.045***	-0.037***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Occupation	-0.004***	-0.019***	-0.033***	-0.018***	0.008***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)
Total explained gap	**-0.027*** **	**-0.079*** **	**-0.053*** **	**-0.018*** **	**0.019*** **
	(0.001)	**(0.001)**	**(0.002)**	**(0.002)**	**(0.003)**
As % of the raw gap	***-180.0***	***-59.3***	***-24.2***	***-7.3***	***6.0***
Advantage of men-disadvantage of women ($\widehat{\gamma_{0m}} - \widehat{\gamma_{0f}}$)	**0.042*** **	**0.215*** **	**0.272*** **	**0.266*** **	**0.299*** **
	(0.001)	**(0.001)**	**(0.003)**	**(0.005)**	**(0.009)**
As % of the raw gap	***280.0***	***159.3***	***124.2***	***107.3***	***94.0***
Total pay gap	**0.015*** **	**0.135*** **	**0.219*** **	**0.248*** **	**0.318*** **
	(0.001)	**(0.001)**	**(0.003)**	**(0.004)**	**(0.008)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L industries are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).
Please see table A 5 in Appendix for the detailed decomposition, including contributions of each group to the unexplained gap.

The interpretation of the lower part of the distribution is not very descriptive of the true situation, as the minimum wage increase through 1998-2011 might have affected my results. Therefore, it is worthy to focus on the interpretation of the wage gap at the top of the distribution.

Looking at the total explained gap, it is obvious that the higher is the quantile, the more positive is the explained gender pay gap, reaching 6% at the 99th quantile. Along the distribution, some of the variable groups contribute to the explained gap in persistent way, while others have a cyclical pattern. Demographic characteristics become persistently more negative as we move towards the right tail of the distribution, while industry, firm characteristics and occupation have somewhat cyclical pattern. It is interesting to note that at the 90th quantile the education reversal doesn't take place anymore, as men have higher education than women at the top of earnings distribution, which decreases females relative gap.

Looking at the whole 1998-2011 sample may hide some changes in the Hungarian economy over time, therefore I turn to analyzing the gender wage gap separately before and after the recession.

4.2.1 Before the recession

As indicated above, Table 2 shows that from 1998 to 2011 the gender wage gap increased by 28%, with explained gap being always negative. However, the decomposition at the mean masks the reversal of the total explained gap at the top of distribution starting with 95th quantile in 1998, and 99th quantile in 2005, while the explained gap in 2011 is negative at all the quantiles.

While the shape of the distribution of the gender wage gap didn't change and stayed upward sloping in all the years, tables 4 and 5 show that in 2005 the magnitude of the gap increased in all the quantiles compared to 1998 sample.

Table 4. Decomposition of the gender wage gap based on unconditional regressions at selected quantiles, 1998

Quantiles	10	50	90	95	99
Composition effects attributable to: $(\Delta\bar{x}'\widehat{\gamma})$					
Demographic characteristics	-0.007***	-0.013***	-0.031***	-0.042***	-0.057***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.006)
Education	-0.015***	-0.018***	0.050***	0.096***	0.126***
	(0.002)	(0.002)	(0.004)	(0.005)	(0.007)
Experience	-0.000	0.000	0.013***	0.021***	0.036***
	(0.002)	(0.001)	(0.002)	(0.003)	(0.006)
Industry	0.014***	0.006***	-0.012***	-0.025***	-0.045***
	(0.002)	(0.001)	(0.002)	(0.004)	(0.007)
Firm characteristics	-0.037***	-0.028***	-0.027***	-0.025***	-0.017***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)
Occupation	-0.014***	-0.020***	-0.034***	-0.013***	0.018***
	(0.003)	(0.002)	(0.003)	(0.004)	(0.006)
Total explained by model	**-0.060*** **	**-0.074*** **	**-0.041*** **	**0.012**	**0.060*** **
	(0.005)	**(0.003)**	**(0.006)**	**(0.008)**	**(0.012)**
As % of the raw gap	***-157.9***	***-55.6***	***-20.9***	***6.0***	***22.6***
Advantage of men-disadvantage of women $(\widehat{\gamma_{0m}} - \widehat{\gamma_{0f}})$	**0.098*** **	**0.207*** **	**0.237*** **	**0.188*** **	**0.205*** **
	(0.008)	**(0.005)**	**(0.010)**	**(0.015)**	**(0.033)**
As % of the raw gap	***257.9***	***155.6***	***120.9***	***94.0***	***77.7***
Total pay gap	**0.038*** **	**0.133*** **	**0.196*** **	**0.200*** **	**0.265*** **
	(0.007)	**(0.005)**	**(0.010)**	**(0.014)**	**(0.029)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).
Please see table A 6 in Appendix for the detailed decomposition, including contributions of each group to the unexplained gap.

In both, 1998 and 2005 samples, the contribution of education to explaining the gap becomes positive at the 90th quantile. However, in 2005 the 90-99th quantiles the gap due to education became roughly twice less, which shows that although education reversal doesn't take place at the top of distribution, the comparative advantage in education of men at the top of distribution tends to decrease over time. The contribution of experience to the wage gap is increasing at the top of distribution, which shows that at the right tail women are worse off as they have less experience

relative to men. In 2015 the speed of increase of experience towards the top is even higher, so women have even higher comparative disadvantage in terms of experience. In both samples there is industry reversal, as the sign of industry group of variables becomes positive at the top of distribution. This might be since women are more representative at high-skilled white-collar jobs within the industries more typical for such occupations, which makes them at the advantage at the top of distribution.

Table 5. Decomposition of the gender wage gap based on unconditional regressions at selected quantiles, 2005

Quantiles	10	50	90	95	99
Composition effects attributable to: $(\Delta\bar{x}'\widehat{\gamma})$					
Demographic characteristics	-0.003	-0.013***	-0.058***	-0.076***	-0.093***
	(0.002)	(0.002)	(0.005)	(0.008)	(0.014)
Education	0.000	-0.004	0.038***	0.057***	0.057***
	(0.002)	(0.003)	(0.007)	(0.008)	(0.007)
Experience	-0.001	0.003	0.051***	0.072***	0.089***
	(0.002)	(0.002)	(0.005)	(0.008)	(0.016)
Industry	0.004***	0.007***	0.000	-0.003	-0.007
	(0.001)	(0.001)	(0.002)	(0.003)	(0.006)
Firm characteristics	-0.036***	-0.029***	-0.042***	-0.040***	-0.032***
	(0.003)	(0.002)	(0.004)	(0.004)	(0.006)
Occupation	-0.017***	-0.019***	-0.038***	-0.023***	-0.006
	(0.003)	(0.003)	(0.004)	(0.004)	(0.007)
Total explained gap	**-0.052*** **	**-0.054*** **	**-0.049*** **	**-0.013**	**0.008**
	(0.004)	**(0.005)**	**(0.011)**	**(0.011)**	**(0.014)**
As % of the raw gap	***-118.2***	***-26.7***	***-16.7***	***-4.0***	***1.7***
Advantage of men-disadvantage of women $(\widehat{\gamma_{0m}} - \widehat{\gamma_{0f}})$	**0.096*** **	**0.256*** **	**0.342*** **	**0.309*** **	**0.452*** **
	(0.007)	**(0.007)**	**(0.015)**	**(0.021)**	**(0.044)**
As % of the raw gap	***218.2***	***126.7***	***116.7***	***104.0***	***98.3***
Total pay gap	**0.044*** **	**0.202*** **	**0.293*** **	**0.297*** **	**0.460*** **
	(0.007)	**(0.007)**	**(0.017)**	**(0.021)**	**(0.039)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).
Please see table A7 in Appendix for the detailed decomposition, including contributions of each group to the unexplained gap.

4.2.2 After the recession

The 2008 recession had a significant effect on the gender pay gap. Table 2 showed that the gap at the mean decreased by 8%, while it is clearly seen from table 6 that the decrease at the mean is mostly due to decrease at the top of distribution (-7% at the 99th quantile and -22% at the 90th quantile).

Total explained gap is now negative even at the 99th quantile. Relative advantage of women in demographic characteristics at the 99th quantile of the wage distribution decreased by over 3 times in 2011 compared to 2005 sample. Education reversal is now seen at all the quantiles of distribution. This shows that due to gaining higher education than man, in absence of discrimination women would earn higher wages than men at all the quantiles. Occupation reversal disappears at the 99th quantile of distribution, which may be due to the fact that financial crisis hit the high-skill white-collar occupations negatively, and as women are most representative at such occupation, their advantage disappeared. Experience still explains wage gap with a positive sign, however the contributions decreased from 2005 to 2011, particularly, at the 99th quantile of the wage distribution the contribution decreased by about 57%.

To sum up, the raw wage gap increased in 2005, followed by a slight decrease in 2011, after recession. The decomposition at the mean masks the reversal of the total explained gap at the top of distribution starting with 95th quantile in 1998, and 99th quantile in 2005, while the explained gap in 2011 is negative at all the quantiles. This shows that there is self-selection of women into low-paid jobs at the top of distribution; however, it decreases over time, resulting in higher qualification of women at all the quantiles of the wage distribution, especially because of education reversal at all the quantiles of distribution.

Table 6. Decomposition of the gender wage gap based on unconditional regressions at selected quantiles, 2011

Quantiles	10	50	90	95	99
Composition effects attributable to: $(\Delta\bar{x}'\widehat{\gamma})$					
Demographic characteristics	-0.002***	-0.011***	-0.024***	-0.027***	-0.028***
	(0.001)	(0.001)	(0.004)	(0.005)	(0.008)
Education	-0.005***	-0.023***	-0.015***	-0.011**	-0.010*
	(0.001)	(0.003)	(0.005)	(0.005)	(0.005)
Experience	0.001*	0.004***	0.028***	0.034***	0.038***
	(0.001)	(0.001)	(0.003)	(0.004)	(0.006)
Industry	-0.001	0.021***	0.012***	0.014***	-0.009
	(0.001)	(0.002)	(0.003)	(0.003)	(0.008)
Firm characteristics	-0.024***	-0.042***	-0.052***	-0.046***	-0.030***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)
Occupation	-0.016***	-0.019***	-0.024***	-0.013***	0.001
	(0.002)	(0.003)	(0.004)	(0.004)	(0.008)
Total explained gap	**-0.047*** **	**-0.070*** **	**-0.075*** **	**-0.050*** **	**-0.038*** **
	(0.003)	**(0.006)**	**(0.009)**	**(0.009)**	**(0.013)**
As % of the raw gap	***-100.0***	***-35.3***	***-32.9***	***-18.1***	***-9.5***
Advantage of men-disadvantage of women $(\widehat{\gamma_{0m}} - \widehat{\gamma_{0f}})$	**0.094*** **	**0.268*** **	**0.303*** **	**0.327*** **	**0.444*** **
	(0.006)	**(0.007)**	**(0.014)**	**(0.021)**	**(0.042)**
As % of the raw gap	***200.0***	***135.3***	***132.9***	***118.1***	***109.5***
Total pay gap	**0.047*** **	**0.198*** **	**0.228*** **	**0.277*** **	**0.405*** **
	(0.006)	**(0.008)**	**(0.016)**	**(0.020)**	**(0.038)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).
Please see table A8 in Appendix for the detailed decomposition, including contributions of each group to the unexplained gap.

4.3 Robustness Check: Matching Approach

In this section I present the results of the statistical matching decomposition technique developed by Ñopo (2008), which solves the issue of non-overlapping supports of the other decomposition techniques.

I start the matching procedure with the simple model with only demographical variables and modify it by adding additional covariates until I reach the full specification.

- *Specification 1:* Demographic characteristics (age, and dummies for Budapest and urban residence);
- *Specification 2:* 1+Education dummies;
- *Specification 3:* 2+Experience dummies;
- *Specification 4:* 3+Occupation dummies;
- *Specification 5:* 4+industry dummies;
- *Specification 6:* 5+Firm characteristics (ownership dummies, exporting firm dummy, firm age dummies, size of the firm dummies).

I find that in the first specification, when I control only for the demographic characteristics, the unexplained gap is higher than the total gap, which indicates that women should be earning higher wages than men. When I add education and experience, it doesn't change the gap composition. However, when I also include the occupation dummies in the 4th specification, the explained gap becomes positive. Adding industry dummies increases the explained gap further, and, moreover, the Δ_M component of the gap becomes negative, which shows that in case of some industries together with other fixed characteristics there were some men who could not be matched to females, which indicates high industrial segregation between genders in Hungary. In case of the full specification, only 0.668% of men and 0.783% of women could be matched, resulting in 0.015 unexplained gap in terms of male log wages.

The point of this analysis is that any kind of OB, or quantile decompositions include Δ_M and Δ_F in the unexplained gap, which results in misspacing the unexplained gap.

Table 7. Ñopo (2008) decomposition (relative log gap expressed in terms of male log wages), 1998-2011

Decompositions	With identifying differences in supports **Ñopo matching**							
	Δ	Δ_x	Δ_0	Δ_M	Δ_F	$\Delta_F + \Delta_x + \Delta_M$	%M	%F
Specification 1	0.014	-0.001	0.015	0	0	-0.001	1	1
Specification 2	0.014	-0.001	0.015	0	0	-0.001	1	1
Specification 3	0.014	-0.001	0.015	0	0	-0.001	1	1
Specification 4	0.014	0.001	0.013	0	0	0.001	1	1
Specification 5	0.014	0.002	0.012	-0.001	0	0.001	0.955	0.989
Specification 6	0.014	0.001	0.015	-0.005	0.002	-0.002	0.668	0.783

Notes: the total gap $\Delta = \Delta_M + \Delta_F + \Delta_X + \Delta_0$.
Δ_0 is the wage structure effect, Δ_X is the endowment effect, Δ_F is the contribution of the differences in the characteristics of females who were matched to the males and those who could not be matched, Δ_M is the contribution of the differences in the characteristics of males who were matched to the females and those who could not be matched.
%M is the percentage of males who were matched to females, %F is the percentage of females who were matched to males.

Overall, the difference does not seem statistically significant, therefore, the results of decompositions in Sections 4.1-4.2 cannot be rejected, however it is necessary to take into account that there is a huge industrial and firm segregation in Hungary, which results in misspecification of the explained gap.

5. Conclusion

After the transition in Hungary, in 2011 the total wage gap in my sample increased by 28.36% relative to 1998, which contradicts to the findings of Lovasz (2008) about a negative relationship between competition and gender gap.

The explained part of the decomposition at the mean is negative in all the years. Most of the explained gap is driven by firm characteristics, occupation and residence indicators. My findings go in line with those done by Rigler and Vanicsek (2008), who find that the explained gap in Hungary is negative.

The decomposition at the mean hides the reversal of the total explained gap at the top of distribution. For all the years under consideration, the gender wage gap is upward sloping. This proves that there is a glass ceiling effect for women in Hungary. The total explained part of the gap becomes bigger as the quantile increases.

The recession had a great effect on the gender pay gap in Hungary. If before the recession the total explained gap is positive starting from 95^{th} and 99^{th} quantile in 1998 and 2005 respectively, after the recession the explained gap is always negative. Moreover, if before the recession the contribution of education to explaining the gender pay gap becomes positive at the 90^{th} quantile, after the recession there is an education reversal at all the quantiles These findings show that although before the recession women are less qualified for the jobs in terms of education and other characteristics at the top of distribution, this tendency decreased and by 2011 even at the top of distribution women became more qualified. Thus, in the absence of unexplained gap, the women should earn higher wages at any quantile of the wage distribution.

I performed the matching approach to test for the common support assumption. It showed that there is an industrial segregation in Hungary which contributes to a slight misspecification of the unexplained part of the gender wage gap.

Appendix

Table A 1. The impact of demographic and firm characteristics on logarithm of real wages, 1998-2011.

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male	0.135***	0.156***	0.169***	0.166***	0.159***	0.170***	0.202***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
age		0.004***	0.007***	0.013***	0.012***	0.011***	0.013***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Budapest		0.351***	0.180***	0.180***	0.172***	0.208***	0.166***
		(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
urban		0.070***	0.028***	0.028***	0.029***	0.006***	-0.020***
		(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Graduated Elementary School			0.122***	0.112***	0.121***	0.118***	0.115***
			(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Vocational School			0.226***	0.199***	0.207***	0.201***	0.212***
			(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Graduated School			0.530***	0.498***	0.399***	0.368***	0.352***
			(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Diploma (higher education)			1.160***	1.115***	0.897***	0.861***	0.801***
			(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Experience (11-18)				0.038***	0.035***	0.031***	0.029***
				(0.003)	(0.002)	(0.002)	(0.002)
Experience (19-26)				-0.039***	-0.036***	-0.041***	-0.036***
				(0.004)	(0.004)	(0.004)	(0.004)
Experience (27-34)				-0.113***	-0.106***	-0.109***	-0.095***
				(0.006)	(0.006)	(0.006)	(0.005)
Experience (35-43)				-0.144***	-0.132***	-0.132***	-0.134***
				(0.008)	(0.008)	(0.007)	(0.007)
High-white					0.238***	0.281***	0.279***
					(0.002)	(0.002)	(0.002)
Low-white					-0.102***	-0.032***	0.001
					(0.002)	(0.002)	(0.002)
High-blue					-0.025***	-0.013***	0.020***
					(0.002)	(0.002)	(0.001)
A						-0.162***	-0.130***
						(0.003)	(0.003)
B						-0.203***	-0.184***
						(0.015)	(0.013)
C						0.280***	0.159***
						(0.007)	(0.007)
D						0.115***	-0.063***
						(0.002)	(0.002)

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)
E						0.327***	0.148***
						(0.003)	(0.003)
F						-0.210***	-0.104***
						(0.003)	(0.003)
G						-0.109***	-0.110
						(0.002)	(0.002)***
H						-0.246***	-0.213***
						(0.004)	(0.004)
I						0.130***	-0.027***
						(0.002)	(0.002)
M						-0.371***	-0.135***
						(0.010)	(0.009)
N						-0.207***	-0.096***
						(0.008)	(0.007)
O						-0.042***	-0.005
						(0.004)	(0.004)
Domestically-owned							-0.097***
							(0.002)
Foreign-owned							0.275***
							(0.002)
Export dummy							0.109***
							(0.001)
Firm age							-0.040***
							(0.002)
Firm age							0.071***
							(0.002)
Firm age							0.063***
							(0.003)
Small							0.103***
							(0.002)
Medium							0.178***
							(0.002)
Large							0.221***
							(0.001)
Constant	11.943***	11.612***	11.119***	10.939***	10.997***	10.982***	10.764***
	(0.001)	(0.004)	(0.009)	(0.010)	(0.010)	(0.010)	(0.009)
R-squared	0.01	0.07	0.32	0.32	0.34	0.38	0.51
No. of observations	965,081	965,081	965,081	965,081	965,081	965,081	965,081

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1.

The following dummies are the reference group: Elementary school; not-urban area; not-Budapest; low-experience; low skilled-blue collar occupation; micro companies; state and local government owned company; financial intermediation, real estate and public administration and defense industries; young firms; not-exporting firms.

Table A 2. The impact of demographic and firm characteristics on logarithm of real wages for the 1998, 2005, 2011 and 1998-2011 samples

	1998	2005	2011	1998-2011
Male	0.193***	0.238***	0.232***	0.202***
	(0.004)	(0.005)	(0.005)	(0.001)
age	0.012***	0.013***	0.017***	0.013***
	(0.001)	(0.001)	(0.001)	(0.000)
Budapest	0.174***	0.178***	0.176***	0.166***
	(0.004)	(0.006)	(0.005)	(0.001)
urban	-0.014***	-0.009	-0.018***	-0.020***
	(0.005)	(0.007)	(0.005)	(0.001)
Graduated	0.174***	0.073*	0.091	0.115***
Elementary School	(0.018)	(0.044)	(0.094)	(0.007)
Vocational School	0.264***	0.167***	0.187**	0.212***
	(0.018)	(0.044)	(0.094)	(0.007)
Graduated School	0.424***	0.302***	0.331***	0.352***
	(0.018)	(0.044)	(0.094)	(0.007)
Diploma (higher	0.855***	0.788***	0.748***	0.801***
education)	(0.020)	(0.045)	(0.095)	(0.007)
Experience (11-18)	-0.003	0.051***	0.080***	0.029***
	(0.008)	(0.010)	(0.010)	(0.002)
Experience (19-26)	-0.036***	-0.002	-0.006	-0.036***
	(0.012)	(0.017)	(0.016)	(0.004)
Experience (27-34)	-0.065***	-0.093***	-0.133***	-0.095***
	(0.017)	(0.025)	(0.023)	(0.005)
Experience (35-43)	-0.113 ***	-0.153***	-0.246***	-0.134***
	(0.022)	(0.032)	(0.029)	(0.007)
High-white	0.278***	0.284***	0.355***	0.279***
	(0.006)	(0.008)	(0.007)	(0.002)
Low-white	0.000	0.015*	0.070***	0.001
	(0.006)	(0.009)	(0.008)	(0.002)
High-blue	0.025***	0.017**	0.068***	0.020***
	(0.005)	(0.007)	(0.007)	(0.001)
A	-0.117***	-0.081***	-0.104	-0.130***
	(0.008)	(0.016)	(0.014)***	(0.003)
B	-0.192***	-0.079	-0.124*	-0.184***
	(0.056)	(0.057)	(0.065)	(0.013)
C	0.222***	0.242***	0.178***	0.159***
	(0.020)	(0.039)	(0.032)	(0.007)
D	-0.015**	0.000	0.017*	-0.063***
	(0.007)	(0.012)	(0.009)	(0.002)
E	0.123***	0.184***	0.263***	0.148***
	(0.009)	(0.018)	(0.015)	(0.003)
F	-0.079***	-0.014	0.002	-0.104***

	1998	2005	2011	1998-2011
	(0.009)	(0.018)	(0.014)	(0.003)
G	-0.090***	-0.095***	-0.113***	-0.110
	(0.007)	(0.012)	(0.009)	(0.002)***
H	-0.189***	-0.256***	-0.227***	-0.213***
	(0.013)	(0.034)	(0.019)	(0.004)
I	-0.025***	0.038***	0.012	-0.027***
	(0.008)	(0.013)	(0.010)	(0.002)
M	-0.256***	-0.370***	-0.538***	-0.135***
	(0.035)	(0.077)	(0.102)	(0.009)
N	-0.295***	-0.021	-0.345***	-0.096***
	(0.035)	(0.050)	(0.032)	(0.007)
O	-0.036***	0.086***	-0.021	-0.005
	(0.013)	(0.025)	(0.018)	(0.004)
Domestically-	-0.088***	-0.028***	-0.191***	-0.097***
owned	(0.006)	(0.010)	(0.009)	(0.002)
Foreign-owned	0.231***	0.335***	0.166***	0.275***
	(0.006)	(0.009)	(0.009)	(0.002)
Export dummy	0.025***	0.063***	-0.014*	0.109***
	(0.004)	(0.011)	(0.007)	(0.001)
Firm age	0.007	-0.062***	-0.074***	-0.040***
	(0.005)	(0.011)	(0.010)	(0.002)
Firm age	0.028***	-0.057***	-0.044***	0.071***
	(0.006)	(0.010)	(0.009)	(0.002)
Firm age	0.026**	0.006	-0.077***	0.063***
	(0.013)	(0.013)	(0.012)	(0.003)
Small	0.152***	0.083***	0.051***	0.103***
	(0.006)	(0.010)	(0.009)	(0.002)
Medium	0.255***	0.129***	0.085***	0.178***
	(0.006)	(0.008)	(0.007)	(0.002)
Large	0.346***	0.210***	0.157***	0.221***
	(0.005)	(0.007)	(0.006)	(0.001)
Constant	10.513***	10.831***	10.903***	10.764***
	(0.026)	(0.053)	(0.098)	(0.009)
R-squared	0.48	0.52	0.56	0.51
No. of observations	87,347	35,621	38,434	965,081

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1.

The following dummies are the reference group: Elementary school; not-urban area; not-Budapest; low-experience; low skilled-blue collar occupation; micro companies; state and local government owned company; financial intermediation, real estate and public administration and defense industries; young firms; not-exporting firms.

Table A 3. Gender specific regressions of the impact of demographic and firm characteristics on logarithm of real wages for the 1998, 2005, 2011 and 1998-2011 samples

	1998		2005		2011		1998-2011	
	male	female	male	female	male	female	male	female
age	0.013***	0.010***	0.013***	0.013***	0.019***	0.016***	0.013***	0.012***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)
Budapest	0.137***	0.221***	0.158***	0.200***	0.173***	0.178***	0.141***	0.198***
	(0.006)	(0.006)	(0.008)	(0.009)	(0.007)	(0.008)	(0.002)	(0.002)
urban	0.002	-0.030***	-0.011	-0.001	-0.005	-0.038***	-0.014***	-0.026***
	(0.006)	(0.007)	(0.009)	(0.010)	(0.007)	(0.007)	(0.002)	(0.002)
Graduated	0.183***	0.155***	0.036	0.121**	0.244	0.047	0.147***	0.072***
Elementary School	(0.023)	0.029)	(0.066)	(0.055)	(0.165)	(0.107)	(0.009)	(0.010)
Vocational School	0.280***	0.170***	0.167**	0.117**	0.355**	0.077	0.253***	0.105***
	(0.023)	(0.029)	(0.066)	(0.055)	(0.165)	(0.107)	(0.009)	(0.010)
Graduated School	0.403***	0.363***	0.279***	0.260***	0.490***	0.222**	0.369***	0.260***
	(0.023)	(0.030)	(0.066)	(0.056)	(0.165)	(0.108)	(0.009)	(0.010)
Diploma (higher	0.803***	0.860***	0.747***	0.761***	0.917***	0.624***	0.806***	0.729***
education)	(0.025)	(0.032)	(0.068)	(0.057)	(0.166)	(0.108)	(0.010)	(0.011)
Experience (11-18)	0.011	-0.033***	0.070***	0.022	0.089***	0.068***	0.046***	0.002
	(0.010)	(0.012)	(0.014)	(0.016)	(0.013)	(0.014)	(0.003)	(0.003)
Experience (19-26)	-0.042***	-0.035*	0.025	-0.037	0.005	-0.028	-0.026***	-0.056***
	(0.016)	(0.018)	(0.023)	(0.025)	(0.021)	(0.024)	(0.005)	(0.005)
Experience (27-34)	-0.088***	-0.048*	-0.075**	-0.117***	-0.134***	-0.142***	-0.103***	-0.098***
	(0.023)	(0.025)	(0.033)	(0.036)	(0.030)	(0.034)	(0.007)	(0.008)
Experience (35-43)	-0.159***	-0.070**	-0.146***	-0.171***	-0.258***	-0.239***	-0.156***	-0.125***
	(0.029)	(0.033)	(0.042)	(0.046)	(0.039)	(0.044)	(0.009)	(0.010)
High-white	0.286***	0.351***	0.263***	0.396***	0.318***	0.437***	0.265***	0.362***
	(0.008)	(0.010)	(0.011)	(0.014)	(0.010)	(0.012)	(0.002)	(0.003)
Low-white	-0.129***	0.120***	-0.118***	0.159***	-0.042***	0.176***	-0.106***	0.110***
	(0.009)	(0.009)	(0.013)	(0.013)	(0.012)	(0.012)	(0.003)	(0.003)
High-blue	0.023***	0.025***	-0.007	0.047***	0.061***	0.041***	0.016***	0.023***
	(0.006)	(0.008)	(0.008)	(0.012)	(0.008)	(0.013)	(0.002)	(0.003)
A	-0.034***	-0.172***	-0.066***	-0.061**	-0.096***	-0.102***	-0.083***	-0.163***
	(0.011)	(0.012)	(0.021)	(0.024)	(0.018)	(0.023)	(0.003)	(0.004)
B	-0.110*	-0.285**	-0.007	-0.165	-0.099	-0.155	-0.152***	-0.147***
	(0.063)	(0.130)	(0.069)	(0.102)	(0.080)	(0.112)	(0.015)	(0.029)
C	0.331***	-0.102**	0.319***	0.071	0.214***	0.018	0.215***	0.002
	(0.023)	(0.045)	(0.046)	(0.083)	(0.038)	(0.063)	(0.008)	(0.015)
D	0.090***	-0.093***	0.061***	-0.057***	0.049***	-0.030**	-0.002	-0.114***
	(0.010)	(0.009)	(0.017)	(0.015)	(0.012)	(0.013)	(0.003)	(0.003)
E	0.218***	0.005	0.251***	0.002	0.300***	0.172***	0.214***	0.036***
	(0.012)	(0.014)	(0.024)	(0.028)	(0.019)	(0.025)	(0.004)	(0.005)

	1998		2005		2011		1998-2011	
	male	female	male	female	male	female	male	female
F	0.004	-0.140***	0.042*	-0.039	0.022	-0.062**	-0.047***	-0.146***
	(0.012)	(0.018)	(0.022)	(0.033)	(0.017)	(0.030)	(0.003)	(0.005)
G	-0.002	-0.153***	-0.022	-0.176***	-0.079***	-0.167***	-0.046***	-0.169***
	(0.011)	(0.009)	(0.017)	(0.016)	(0.013)	(0.013)	(0.003)	(0.003)
H	-0.108***	-0.221***	-0.127**	-0.319***	-0.186***	-0.262***	-0.172***	-0.234***
	(0.020)	(0.016)	(0.054)	(0.041)	(0.028)	(0.023)	(0.006)	(0.005)
I	0.076***	-0.112***	0.093***	-0.020	0.015	0.004	0.031***	-0.091***
	(0.011)	(0.011)	(0.018)	(0.018)	(0.013)	(0.015)	(0.003)	(0.003)
M	-0.184***	-0.216***	-0.340***	-0.510***	-0.683***	-0.476***	-0.154***	-0.134***
	(0.042)	(0.067)	(0.114)	(0.098)	(0.155)	(0.129)	(0.013)	(0.012)
N	-0.269***	-0.362***	-0.363**	-0.096**	-0.252***	-0.401***	-0.082***	-0.150***
	(0.069)	(0.039)	(0.172)	(0.049)	(0.059)	(0.036)	(0.014)	(0.007)
O	0.059***	-0.113***	0.142***	0.007	0.043*	-0.117***	0.063***	-0.072***
	(0.019)	(0.019)	(0.036)	(0.034)	(0.024)	(0.027)	(0.005)	(0.005)
Domestically-owned	-0.105***	-0.064***	-0.068***	0.026*	-0.207***	-0.144***	-0.118***	-0.060***
	(0.007)	(0.009)	(0.013)	(0.015)	(0.012)	(0.015)	(0.002)	(0.003)
Foreign-owned	0.246***	0.216***	0.341***	0.325***	0.175***	0.173***	0.294***	0.260***
	(0.008)	(0.009)	(0.012)	(0.014)	(0.011)	(0.014)	(0.002)	(0.003)
Export dummy	0.008	0.060***	0.078***	0.026	-0.025***	0.034***	0.111***	0.116***
	(0.006)	(0.006)	(0.014)	(0.016)	(0.010)	(0.011)	(0.002)	(0.002)
Firm age	0.006	-0.007	-0.035**	-0.087***	-0.089***	-0.032**	-0.041***	-0.047***
	(0.007)	(0.008)	(0.015)	(0.016)	(0.013)	(0.016)	(0.002)	(0.003)
Firm age	0.013	0.017*	-0.028**	-0.094***	-0.066***	0.011	0.079***	0.045***
	(0.008)	(0.009)	(0.013)	(0.015)	(0.011)	(0.014)	(0.002)	(0.002)
Firm age	0.028	0.000	0.022	-0.029	-0.133***	0.038**	0.056***	0.056***
	(0.018)	(0.017)	(0.017)	(0.018)	(0.015)	(0.019)	(0.003)	(0.004)
Small	0.172***	0.122***	0.089***	0.067***	0.049***	0.045***	0.112***	0.079***
	(0.008)	(0.010)	(0.013)	(0.015)	(0.011)	(0.014)	(0.002)	(0.003)
Medium	0.288***	0.206***	0.158***	0.072***	0.096***	0.060***	0.197***	0.141***
	(0.008)	(0.008)	(0.011)	(0.012)	(0.010)	(0.011)	(0.002)	(0.002)
Large	0.397***	0.276***	0.265***	0.134***	0.189***	0.098***	0.264***	0.163***
	(0.007)	(0.007)	(0.010)	(0.010)	(0.008)	(0.009)	(0.002)	(0.002)
Constant	10.581***	10.657***	10.997***	10.939***	10.924***	10.986***	10.844***	10.901***
	(0.034)	(0.040)	(0.077)	(0.070)	(0.169)	(0.114)	(0.012)	(0.013)
R-squared	0.48	0.48	0.52	0.52	0.56	0.57	0.52	0.51
No. of observations	51,331	36,016	21,692	13,929	23,888	14,546	578,730	386,351

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1.

The following dummies are the reference group: Elementary school; not-urban area; not-Budapest; low-experience; low skilled-blue collar occupation; micro companies; state and local government owned company; financial intermediation, real estate and public administration and defense industries; young firms; not-exporting firms.

Table A 4. Oaxaca-Blinder decomposition of the gender wage gap at the mean for the 1998, 2005, 2011 and 1998-2011 samples

Reference Group:	**Panel A** *Composition effects attributable to:*				**Panel B** *Wage Structure Effects attributable to:*			
	1998	2005	2011	1998-2011	1998	2005	2011	1998-2011
Demographic characteristics	-0.017*** (0.001)	-0.020*** (0.002)	-0.012*** (0.002)	-0.018*** (0.000)	0.107* (0.060)	-0.032 (0.097)	0.128* (0.073)	0.060*** (0.018)
Education	0.002 (0.002)	0.008*** (0.003)	-0.016*** (0.003)	-0.001** (0.001)	0.045 (0.034)	0.005 (0.064)	0.268* (0.146)	0.109*** (0.014)
Experience	0.003*** (0.001)	0.012*** (0.002)	0.009*** (0.001)	0.008*** (0.000)	-0.014 (0.025)	0.040 (0.035)	0.014 (0.026)	0.013* (0.007)
Industry	0.002 (0.001)	0.005*** (0.001)	0.014*** (0.001)	0.002*** (0.000)	0.153*** (0.014)	0.115*** (0.023)	0.064*** (0.017)	0.102*** (0.003)
Firm characteristics	-0.028*** (0.002)	-0.033*** (0.002)	-0.037*** (0.002)	-0.038*** (0.001)	0.048*** (0.017)	0.161*** (0.041)	-0.095*** (0.026)	0.055*** (0.005)
Occupation	-0.022*** (0.001)	-0.023*** (0.002)	-0.019*** (0.002)	-0.020*** (0.000)	-0.070*** (0.007)	-0.111*** (0.010)	-0.085*** (0.009)	-0.080*** (0.002)
Constant	-	-	-	-	-0.076 (0.051)	0.058 (0.103)	-0.062 (0.152)	-0.057*** (0.018)
Total explained by model	**-0.059*** (0.003)**	**-0.051*** (0.005)**	**-0.060*** (0.005)**	**-0.067*** (0.001)**	**0.193*** (0.004)**	**0.238*** (0.005)**	**0.232*** (0.005)**	**0.202*** (0.001)**

Panel C.
Total Pay Gap

1998	**2005**	**2011**	**1998-2011**
0.134* (0.004)**	**0.187*** (0.006)**	**0.172*** (0.006)**	**0.135*** (0.001)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).

Table A 5. Decomposition of the gender wage gap based on unconditional regressions at selected quantiles, 1998-2011

Reference Group:	**Panel A** *Composition effects attributable to:*					**Panel B** *Wage Structure Effects attributable to:*				
	10	50	90	95	99	10	50	90	95	99
Demographic characteristics	-0.003*** (0.000)	-0.011*** (0.000)	-0.042*** (0.001)	-0.060*** (0.001)	-0.079*** (0.002)	-0.041** (0.017)	0.072*** (0.023)	0.085* (0.051)	0.154 (0.077)**	-0.004 (0.154)
Education	-0.003*** (0.000)	-0.016*** (0.000)	0.036*** (0.001)	0.061*** (0.001)	0.073*** (0.002)	0.071*** (0.022)	0.112*** (0.017)	-0.012 (0.018)	-0.131*** (0.028)	-0.215*** (0.056)
Experience	-0.000 (0.000)	0.000 (0.000)	0.029*** (0.001)	0.049*** (0.001)	0.068*** (0.002)	0.019*** (0.006)	0.019** (0.009)	0.010 (0.020)	-0.033 (0.030)	-0.006 (0.060)
Industry	-0.002*** (0.000)	0.004*** (0.000)	0.003*** (0.001)	-0.005*** (0.001)	-0.014*** (0.002)	0.042*** (0.003)	0.120*** (0.004)	0.105*** (0.010)	0.070*** (0.016)	0.060* (0.036)
Firm characteristics	-0.015*** (0.000)	-0.037*** (0.001)	-0.045*** (0.001)	-0.045*** (0.001)	-0.037*** (0.001)	0.006 (0.006)	0.068*** (0.006)	0.091*** (0.014)	0.111*** (0.019)	-0.000 (0.040)
Occupation	-0.004*** (0.000)	-0.019*** (0.001)	-0.033*** (0.001)	-0.018*** (0.001)	0.008*** (0.002)	-0.039*** (0.003)	-0.114*** (0.003)	-0.024*** (0.005)	0.010** (0.005)	0.034*** (0.008)
Constant	-	-	-	-	-	-0.015 (0.026)	-0.062*** (0.023)	0.016 (0.036)	0.085* (0.051)	0.430*** (0.115)
Total explained by model	**-0.028*** (0.001)**	**-0.079*** (0.001)**	**-0.053*** (0.002)**	**-0.018*** (0.002)**	**0.019*** (0.003)**	**0.042*** (0.001)**	**0.215*** (0.001)**	**0.272*** (0.003)**	**0.266*** (0.005)**	**0.299*** (0.009)**
Total Pay Gap	**0.015**** **(0.001)**	**0.135*** (0.001)**	**0.219*** (0.003)**	**0.248*** (0.004)**	**0.318*** (0.008)**	**0.015**** **(0.001)**	**0.135*** (0.001)**	**0.219*** (0.003)**	**0.248*** (0.004)**	**0.318*** (0.008)**

Panel C

Total Pay Gap

10	**50**	**90**	**95**	**99**
0.015** **(0.001)**	**0.135*** (0.001)**	**0.219*** (0.003)**	**0.248*** (0.004)**	**0.318*** (0.008)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L industries are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).

Table A 6. Decomposition of the gender wage gap based on unconditional regressions at selected quantiles, 1998

Reference Group:	**Panel A** *Composition effects attributable to:*					**Panel B** *Wage Structure Effects attributable to:*				
	10	50	90	95	99	10	50	90	95	99
Demographic characteristics	-0.007*** (0.001)	-0.013*** (0.001)	-0.031*** (0.002)	-0.042*** (0.003)	-0.057*** (0.006)	0.047 (0.129)	0.094 (0.076)	0.340** (0.173)	0.223 (0.240)	1.286** (0.526)
Education	-0.015*** (0.002)	-0.018*** (0.002)	0.050*** (0.004)	0.096*** (0.005)	0.126*** (0.007)	0.116 (0.117)	0.005 (0.044)	-0.043 (0.039)	-0.048 (0.060)	-0.180*** (0.068)
Experience	-0.000 (0.002)	0.000 (0.001)	0.013*** (0.002)	0.021*** (0.003)	0.036*** (0.006)	-0.031 (0.054)	-0.018 (0.029)	-0.055 (0.066)	-0.035 (0.095)	-0.286 (0.211)
Industry	0.014*** (0.002)	0.006*** (0.001)	-0.012*** (0.002)	-0.025*** (0.004)	-0.045*** (0.007)	0.111*** (0.024)	0.200*** (0.014)	0.125*** (0.037)	0.054 (0.055)	-0.107 (0.126)
Firm characteristics	-0.037*** (0.003)	-0.028*** (0.002)	-0.027*** (0.002)	-0.025*** (0.002)	-0.017*** (0.004)	0.096*** (0.037)	0.015 (0.018)	0.148*** (0.036)	0.087 (0.054)	0.004 (0.118)
Occupation	-0.014*** (0.003)	-0.020*** (0.002)	-0.034*** (0.003)	-0.013*** (0.004)	0.018*** (0.006)	-0.072*** (0.019)	-0.095*** (0.009)	0.031** (0.015)	0.048*** (0.015)	0.044* (0.025)
Constant	-	-	-	-	-	-0.169 (0.145)	0.005 (0.067)	-0.309** (0.124)	-0.141 (0.164)	-0.558 (0.376)
Total explained by model	**-0.060*** (0.005)**	**-0.074*** (0.003)**	**-0.041*** (0.006)**	**0.012 (0.008)**	**0.060*** (0.012)**	**0.098*** (0.008)**	**0.207*** (0.005)**	**0.237*** (0.010)**	**0.188*** (0.015)**	**0.205*** (0.033)**

Panel C

Total Pay Gap

10	50	90	95	99
0.038* (0.007)**	**0.133*** (0.005)**	**0.196*** (0.010)**	**0.200*** (0.014)**	**0.265*** (0.029)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).

Table A 7 . Decomposition of the gender wage gap based on unconditional regressions at selected quantiles, 2005.

Reference Group:	**Panel A** *Composition effects attributable to:*					**Panel B** *Wage Structure Effects attributable to:*				
	10	50	90	95	99	10	50	90	95	99
Demographic characteristics	-0.003 (0.002)	-0.013*** (0.002)	-0.058*** (0.005)	-0.076*** (0.008)	-0.093*** (0.014)	-0.258** (0.122)	0.140 (0.115)	0.450* (0.262)	-0.413 (0.339)	-1.122 (0.871)
Education	0.000 (0.002)	-0.004 (0.003)	0.038*** (0.007)	0.057*** (0.008)	0.057*** (0.007)	0.092 (0.217)	0.081 (0.094)	-0.102 (0.077)	-0.176** (0.085)	-0.175 (0.138)
Experience	-0.001 (0.002)	0.003 (0.002)	0.051*** (0.005)	0.072*** (0.008)	0.089*** (0.016)	0.108 (0.045)**	0.009 (0.044)	-0.095 (0.097)	0.109 (0.125)	0.419 (0.325)
Industry	0.004*** (0.001)	0.007*** (0.001)	0.000 (0.002)	-0.003 (0.003)	-0.007 (0.006)	0.050 (0.041)	0.106*** (0.026)	0.087 (0.081)	0.190 (0.121)	0.245 (0.240)
Firm characteristics	-0.036*** (0.003)	-0.029*** (0.002)	-0.042*** (0.004)	-0.040*** (0.004)	-0.032*** (0.006)	0.077 (0.055)	0.217*** (0.042)	0.396*** (0.093)	0.537*** (0.162)	0.336 (0.346)
Occupation	-0.017*** (0.003)	-0.019*** (0.003)	-0.038*** (0.004)	-0.023*** (0.004)	-0.006 (0.007)	-0.022 (0.018)	-0.175*** (0.015)	-0.036 (0.025)	0.001 (0.029)	0.019 (0.047)
Constant	-	-	-	-	-	0.048 (0.239)	-0.123 (0.127)	-0.358* (0.210)	0.061 (0.296)	0.730 (0.682)
Total explained by model	**-0.052*** **(0.004)**	**-0.054*** **(0.005)**	**-0.049*** **(0.011)**	**-0.013** **(0.011)**	**0.008** **(0.014)**	**0.096*** **(0.007)**	**0.256*** **(0.007)**	**0.342*** **(0.015)**	**0.309*** **(0.021)**	**0.452*** **(0.044)**

Panel C

Total Pay Gap

10	50	90	95	99
0.044* **(0.007)**	**0.202*** **(0.007)**	**0.293*** **(0.017)**	**0.297*** **(0.021)**	**0.460*** **(0.039)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).

Table A 8. Decomposition of the gender wage gap based on unconditional regressions at selected quantiles, 2011

Reference Group:	**Panel A** *Composition effects attributable to:*					**Panel B** *Wage Structure Effects attributable to:*				
	10	50	90	95	99	10	50	90	95	99
Demographic characteristics	-0.002*** (0.001)	-0.011*** (0.001)	-0.024*** (0.004)	-0.027*** (0.005)	-0.028*** (0.008)	0.103 (0.096)	0.237** (0.112)	0.172 (0.247)	0.154 (0.330)	0.623 (0.696)
Education	-0.005*** (0.001)	-0.023*** (0.003)	-0.015*** (0.005)	-0.011** (0.005)	-0.010* (0.005)	-0.297 (0.369)	0.516** (0.255)	0.293*** (0.103)	0.204** (0.098)	0.181 (0.162)
Experience	0.001* (0.001)	0.004*** (0.001)	0.028*** (0.003)	0.034*** (0.004)	0.038*** (0.006)	-0.001 (0.033)	-0.020 (0.040)	0.064 (0.096)	0.117 (0.118)	-0.110 (0.251)
Industry	-0.001 (0.001)	0.021*** (0.002)	0.012*** (0.003)	0.014*** (0.003)	-0.009 (0.008)	-0.040** (0.016)	0.124*** (0.019)	0.065 (0.053)	-0.009 (0.067)	0.105 (0.165)
Firm characteristics	-0.024*** (0.002)	-0.042*** (0.003)	-0.052*** (0.003)	-0.046*** (0.003)	-0.030*** (0.005)	-0.136*** (0.028)	-0.185*** (0.040)	0.169** (0.079)	0.098 (0.111)	0.091 (0.227)
Occupation	-0.016*** (0.002)	-0.019*** (0.003)	-0.024*** (0.004)	-0.013*** (0.004)	0.001 (0.008)	-0.084*** (0.014)	-0.123*** (0.016)	-0.008 (0.018)	0.003 (0.021)	-0.034 (0.035)
Constant	-	-	-	-		0.549 (0.379)	-0.281 (0.272)	-0.453** (0.204)	-0.240 (0.276)	-0.413 (0.554)
Total explained by model	**-0.047*** (0.003)**	**-0.069*** (0.006)**	**-0.075*** (0.009)**	**-0.050*** (0.009)**	**-0.038*** (0.013)**	**0.094*** (0.006)**	**0.268*** (0.007)**	**0.303*** (0.014)**	**0.327*** (0.021)**	**0.444*** (0.042)**

Panel C
Total Pay Gap

10	50	90	95	99
0.047* (0.006)**	**0.198*** (0.008)**	**0.228*** (0.016)**	**0.277*** (0.020)**	**0.405*** (0.038)**

Notes: standard errors in parenthesis; ***p<0.01, **p<0.05, *p<0.1. Bootstrapped standard errors (200 replications).
Demographic characteristics include age, and dummies for Budapest and urban residence;
Education includes 4 dummies for education, elementary education is the reference group;
Experience includes 4 dummies for experience, 2-10 years education dummy is the reference group;
Industry includes dummies for each industry (J, K and L are the reference group);
Firm characteristics include dummies for ownership (state and local government as the reference), dummy for exporting firms, dummies for firm age (with 0-4 years firms as reference), dummies for size of the firm (micro firms are the reference);
Occupation includes dummies for occupational categories (low-skilled blue-collar is the reference group).

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