Gender Wage Gap and Segregation during Transition: the Case of Hungary

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Abstract

We examine the evolution of the gender wage gap over a sixteen-year period (1986-2002), concentrating on the role of occupation and firm-level segregation. Based on matched employer-employee data for medium and large firms in the non-public sector we find important differences between socialist times and current dates in the determinants of the gender wage gap. First, we show that while occupational segregation has slightly eased, there has been a marked increase in firm-level segregation. Second, we find that during socialism, occupational feminisation had a large negative effect on workers' wages, and this form of segregation explained nearly thirty percent of the gender wage gap. In post-transition times, on one hand, the negative effect of occupational segregation has halved, on the other hand, the role of firm-level segregation has increased, with the proportion of females at the firm level significantly lowering women's wages but not affecting male wages. Finally, controlling for more detailed occupational and firm characteristics reveals that at current dates, the penalties to working in "female jobs" and "female firms" is small and insignificant.

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1 Introduction

Economic transition has brought about a significant decrease in the gender wage gap in Central Europe. Despite the egalitarian rhetoric of the communist governments, and the equal pay for equal work guarantees inscribed in constitutions of the period, women's wages lagged far behind men's, mostly due to gender differences in the occupational distribution. With the move to a market economy, both the revaluation of skills resulting from a major shift in the structure of labour demand, and the weakening of institutionalised forms of gender discrimination due to the disappearance of centralised wage setting, might have lead to an increase in the relative wages in "female occupations". By contrast, a shift to shop-floor wage bargaining might mean that employers can exercise discriminatory behaviour, if competitive forces are relatively weak. Assessing the relative contribution of these changes calls for an examination the evolution of the effect of occupational and firm level gender segregation on wages. Furthermore, separating these different factors of the gender wage gap is instructive for estimating the potential success of to-be-introduced anti-discrimination policies.

This paper investigates the sources of the gender wage gap in Hungary, where the drop in the gender wage gap has been one of the largest among Central European countries, and an extensive anti-discrimination legislation is currently being adopted. We estimate the effect of occupational and firm-level segregation on wages based matched employer-employee data of medium and large firms in the non-public sector for a fifteen-year period (1986-2002). Thus, we are – to our knowledge – the first to be able to assess the importance of occupational segregation in accounting for the gender wage gap in socialist times based on nationally representative data. Furthermore, we give an estimate of the effect of labour demand and discriminatory behaviour on the changes in relative wages of women during transition. Finally, by controlling for job characteristics we make a

first step towards analysing the determinants of low wages in "female jobs and firms" and the relevance of public intervention.

2 The effect of gender composition on wages

2.1 Gender wage gap and segregation in transition from socialism

Despite their claimed goal of gender equality, socialist countries were characterised by large gender wage gaps. As wage setting was to a large extent centralised, and inter-firm wage differentials suppressed, this situation did not come about due to employer discrimination, rather occupational differences in pay and occupational segregation (see McAuley [1981]). First, the "productive sphere" – where women traditionally were under-represented – was given priority over services, and setting base pay for occupations in these sectors high institutionalised this preference. Second, wages were set in a way in order to compensate for physical demands of the job, alongside with certain restrictions of women entering these jobs. Third, in a given occupations men earned higher wages due to the obsolete production technology employed often required a high level of physical effort, which favoured men in jobs with piece-rates. Furthermore, such gender inequalities in occupational distribution of employment were institutionalised through the educational system.

In transition from socialism, women's relative wages have risen in most Central-European countries, even after controlling for productive characteristics. Three hypotheses have been advanced to account for this residual improvement in women's wages. First, as the fall in labour demand hit the employment of low-skill workers particularly hard, there might have been a rise in women's level of unobservable skills due to selection effects (Hunt [2002]). Second, labour demand shifted from heavy industry to services, a change that favours women, resulting a relative increase in the price of women's skills (Kertesi-Köllő [2003]). Third, discrimination towards women could have eased, due to an increase in product market competition as a result of privatisation and liberalization (Brainerd

[2001]). Our paper provides empirical evidence on the second two hypotheses for Hungary by looking at the effect of changes in occupational structure and in firm-level sex segregation on the gender wage gap.[1]

Previous literature has mostly neglected the possible beneficial effect of the restructuring of the occupational distribution – resulting from a shifts in labour demand - on the women's relative wages. The few studies looking the effect of occupational segregation have found that the legacy of the socialist era still hurts women in transition countries. Ogloblin [1999] analysing early transition Russia found that gender differences in occupational structure accounted for half of the gender wage gap. Jurajda [2003] looking at the same issue at a later date in the Czech and Slovak Republics came to similar results. Even though these two countries have made a greater progress in economic transformation, with possibly large changes in occupational structure, he found that occupational and job-cell segregation was responsible for 25-30 percent of the gender wage gap. By contrast, Jurajda-Harmgart [2003] find that although the occupational distribution of male and female employees is very different in East Germany, occupational feminisation has only a negligible negative effect of on wages, which they attribute to a selection effect: low-skill women disproportionately losing employment during the early years of transition. Using broad occupational categories, Galasi [2000] showed that between 1986 and 1996 in Hungary, women benefited both from the rise in the relative wages of white-collar occupations, and from entering managerial positions.

Although one might expect that with the loosening of centralised wage setting wages will reflect firm-level outcomes, thus leading to rising inter-firm wage inequality, which in turn – coupled with changes in the extent that discriminatory

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[1] Selection effects do not seem relevant for the Hungarian labour market. First, the fall in women's employment rate between 1990 and 1996 was only 2 percentage points higher than the one for men, while female unemployment rates were about 2 to 3 percentage points lower throughout the period. Second, although Campos-Jolliffe (2002) found that selection based on observables can account for 3 points out of the 15 log point decline in the gender gap, Galasi (2001) showed that sample selection bias was more important for men throughout the period, so the offered wages of

behaviour can be exercised – will have an important role in shaping gender wage differentials, only Jurajda [2003] has looked at the effects of firm-level gender segregation on wages. He found that in the competitive sectors of both the Czech and Slovak republics, the higher the proportion of women at the firm level, the lower the average wages will be, and that due to inter-firm segregation, women suffered a 5.5 and 3.5 wage disadvantage (respectively). The evidence (Kertesi-Köllő [2003]) that when controlling for both individuals and firm-level variables (notably productivity and capital-labour ratio), the substantial rise in wage inequality during transition can be accounted for by changing returns to observable characteristics, suggest that inter-firm wage differentiation can also be expected to play and important role in Hungary.

2.2 Wage effects of gender composition

There exist three essential explanations of the causes of gender segregation across occupations and firms, and the relationship between "femaleness" and the gender wage differentials: exclusion (due to institutional factors or discrimination), differences in skills, or differences in tastes for job characteristics (see Blau et al. [1998]). The crowding model of occupational segregation posits that women face barriers in entering into "men's occupations", and if supply in other occupations incidentally exceeds demand for labour, wages will be lower in the "feminised" jobs. Second, there might exist productivity differences between workers in different occupations - due to current or past discrimination. This comes about either through sorting of workers based on unobservable skills, given that only women with high unobserved skills will be able to enter "male occupations", or as a result of substitution of labour for capital in low-wage, female-intensive sectors leading to lower labour productivity. Finally, the concentration of women in some occupations and low wages in these jobs can arise from women having greater taste for costly job characteristics (flexible hours etc.), in the presence of compensating wage differentials.

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women increased by 15 percentage points relative to men (as opposed to the 6 point increase in

Similar arguments have been advanced in order to account for the negative correlation between the proportion of minorities in a given firm and its wage level. Theories building on discriminatory behaviour reach different predictions according to whether employers or co-workers are assumed to have negative tastes for minorities (Becker [1957]). In the former case the above empirical regularity could only be observed if discriminatory employer have some source of rents, so they can afford to hire more expensive male labour[2]. If discrimination stems from majority workers' preferences, then given that employers would have to offer a compensating differential for working together with minority co-workers firms, one ought to observe a more negative correlation between minorities' wages and their share in a firm than for majority workers. By contrast, quality-sorting type arguments build on the assumption that minority workers have lower unobservable skills but there is no current discrimination in the labour market (Hirsch-Macpherson [1995]). Thus a situation might prevail – with certain assumptions on technology and the distribution of skills (see Kremer-Maskin [1996]) - where firms are segregated by skills, and employers with more skilled labour will pay higher wages, and incidentally have lower proportion of minority workers.

3 Data and samples

The data used comes from the Wage and Earnings Survey of the Hungarian National Labour Centre, which is an annual survey conducted in May 1986, 1989, and each May since 1992, covering a representative sample of firms and 10% random samples of their workers. The sample frame included all full-time employees in private and public firms with more than 20 employees, starting from 1995 firms with 10-20 employees were added, while from 1999 onwards the sampling was extended to micro-firms also. The survey contains basic individual

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observed wages).

[2] In absence of such rents, non-discriminating employers will tend to hire more women and pay men and women equally.

characteristics: wages, gender, education, age and occupation, and firm-level information: number of employees, ownership, industry, and settlement.

One major problem of our study is that in 1994 there was a change in the occupational classification system. Although it is possible to match occupations across the two different classification at the two-digit level, we prefer to analyse occupational segregation at a more disaggregated level. Furthermore, given that the industrial classification system also changed in 1995, we will analyse two seven-year periods: 1986-1993, and 1995-2002. We further restrict the sample to firm with at least 100 employees in the non-public sector, and additionally to firms to which at least 5 employees could be matched.

We measured segregation with proportion of females in a particular occupation and firm. The proportion female is measured at the three-digit level, and is calculated based on employees in all firms with 20 or more workers. A few occupations with less than 20 observations were aggregated, thus we analysed 125 different occupational categories for the 1986-1993 period, and 120 categories for 1995-2002. The wage measure we use is gross monthly earnings, (including bonuses, overtime work, other special payment etc.) given that the number of hours worked was not recorded before 1999. Although not adjusting for hours might obviously bias the gender gap upwards in any given year, the extent of this bias is probably moderate, as there was no major difference in work hours by gender among full-time employees (see Nagy [2002]).

4 Trends in segregation and the wage gap

We first document the basic changes in the gender wage gap, female employment and gender segregation, and due to the above limitations, we shall analyse two periods early transition (1986-1993) and the renewal period (1995-2002) separately.

In order to measure segregation of the labour force, we use the standard dissimilarity indices:

$$D = \sum_{i}^{T} \frac{1}{2} |f_i - m_i|$$

where f_i and m_i represent the share of female and male employees in occupation (firm) i, respectively, which ranges from 0 to 1, with 1 meaning maximum unevenness.

As Carrington-Troske (1997) have shown, even random allocation individuals across units can generate segregation, and the degree of this "random segregation" critically depends on the number of individuals in each unit of analysis. In our sample, the number workers matched to their firms is relatively low, thus we can expect that a part of observed segregation is due to random components. Furthermore, as the average firm-size decreased during transition, it is possible that observed segregation might augment without an increase in segregation. Therefore, we calculate indices of "systematic segregation", which measures departure from random segregation:

$$\hat{D} = \begin{cases} \dfrac{D - D^*}{1 - D^*} & if \ D \geq D^* \\ \dfrac{D - D^*}{D^*} & if \ D < D^* \end{cases}$$

where D^* means the amount of segregation that would prevail under random allocation of individuals. This indice ranges between –1 and 1.

Let us now turn to the empirical results. Towards the end of the socialist period, women earned slightly less than three-fourth of men's average earnings. Similarly to other socialist countries (see McAuley [1981]), occupational segregation was relatively high, while firm-level segregation was substantially lower than in Western countries. During early transition, women have made large strides in their labour market outcomes relative to men. In this period, there was a 9.5 point decrease in the gender gap, and the proportion of female employees has increased slightly, by 3 points. By contrast, segregation was on the rise both at the occupation and firm level. This last change – which resulted in firm-level segregation reaching the same level as in the US (Carrington-Troske [1998]) - was

not due to a move toward smaller firms, as can be seen from the results on systematic segregation.

Table 1: Basic findings, 1986-2002

Year	Observed wage ratio	Proportion female	Occupational segregation	Firm-level segregation	
				Observed	Systematic
1986	0,738	0,401	0,595	0,364	0,276
1993	0,833	0,431	0,627	0,434	0,341
1995	0,805	0,438	0,589	0,428	0,335
2002	0,798	0,408	0,541	0,426	0,339

A rather different picture of the situation of women emerges for the second half of the nineties. While both women's relative wages and their employment deteriorated slightly, and there was no change in firm-level segregation, occupation-level segregation decreased markedly. Even with this recent drop, current levels of occupational segregation – like in other post-socialist countries (see Jurajda-Harmgart [2003], Ogloblin [1999]) - are substantially higher than the ones observed in Western countries[3].

We go on analysing the changes in the occupational structure of employment and occupational segregation. First, we shall look at the role of shifts in the structure of labour demand in explaining changes in female employment and occupation-level segregation, by separating the part of these changes due to shifts in the occupational structure of employment. This is done by calculating how much of the changes would have occurred, had the proportion of females in a given occupation stayed constant, and only the weight of different occupations changed. For women's share in employment, the above composition can be calculated as:

$$\frac{\sum_i F_i^{t2}}{\sum_i N_i^{t2}} - \frac{\sum_i F_i^{t1}}{\sum_i N_i^{t1}} = \sum_i \frac{F_i^{t1}}{N_i^{t1}}\left(\frac{N_i^{t2}}{\sum_i N_i^{t2}} - \frac{N_i^{t1}}{\sum_i N_i^{t1}}\right) - \sum_i \left(\frac{F_i^{t2}}{N_i^{t2}} - \frac{F_i^{t1}}{N_i^{t1}}\right)\frac{N_i^{t2}}{\sum_i N_i^{t2}}$$

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[3] Blau et al. [1998] report a value of 0.53 for the US, and Xenogiani [2003] 0.55 for the UK, with both studies measuring segregation at the four-digit level.

where F_i^t, N_i^t represent the number of women employed and the total employment in occupation *i*. The first term – the "between" effect – represents the change due to the changes in the occupational structure, while the second one those due to changes in the proportion women in a given occupation. The change in occupational segregation keeping the gender composition of a given occupation fixed at its original level, the between effect can be calculated as:

$$0.5\sum_i \left| \frac{f_i^{t1}N_i^{t2}}{\sum_i f_i^{t1}N_i^{t2}} - \frac{m_i^{t1}N_i^{t2}}{\sum_i m_i^{t1}N_i^{t2}} \right| - 0.5\sum_i \left| \frac{f_i^{t1}N_i^{t1}}{\sum_i f_i^{t1}N_i^{t1}} - \frac{m_i^{t1}N_i^{t1}}{\sum_i m_i^{t1}N_i^{t1}} \right|$$

The results of this exercise (presented in Table 2) show that in early transition all of the increase in women's share in employment can be attributed to a shift towards "female occupations", and that slightly more than half of the increase in segregation was due to a shift towards more segregated occupations. In the second period, the decrease in the weight of female and more segregated occupations can account for about half of the decrease in women's employment share and occupational segregation.

Table 2: Decomposition of the change in proportion female and occupational segregation

Year	Change in proportion female		Change in occup. segregation	
	Total	Between	Total	Between
1986-1993	0,030	0,039	0,032	0,018
1995-2002	-0,030	-0,015	-0,048	-0,025

We further address how the occupational structure changed by looking at the extent these shift came about due to the men or women changing occupations. In Table 3 we show the distributions of men and women by gender composition of their occupation, when gender composition is defined based on the proportion

female in the given occupation in the initial year of each period.[4] We can say that during early transition, - keeping in mind that this was a period of sharp decline in employment – the decline in demand for labour hit traditionally male occupations particularly hard. The main difference by gender was that in integrated occupations women lost their jobs disproportionately. During the period of renewal occupational desegregation came about due to women moving into traditionally male and integrated occupations.

Table 3: Distribution of workers by gender composition of occupation (%)

Sex composition of occupation	*1986*			*1993*		
	Women	Men	All	Women	Men	All
Male	6,9	61,7	39,6	5,4	57,2	35,6
Intergated	21,8	24,2	23,2	16,5	26,0	22,1
Female	71,3	14,1	37,2	78,1	16,8	42,3
	1995			*2002*		
	Women	Men	All	Women	Men	All
Male	8,4	59,6	38,2	11,0	58,8	40,0
Intergated	25,8	29,9	28,2	27,8	29,4	28,8
Female	65,8	10,5	33,6	61,2	11,9	31,2

The final question we look at is whether the occupational desegregation witnessed in the second half of the nineties came about because women who entered the labour market after the fall of the communist system had different skills (and preferences) that permitted them to access non-feminised occupations. In Table 4 we show mean differences between women and men in proportion female in occupation in 1995 by experience cohorts[5]. Apparently, this simple measure of segregation was lowest among young workers in 2002, supporting the skills story. The second two column suggest that this could only partly be true. First of all, part of the above difference between young and older workers in occupational segregation is a life-cycle effect, given that already in 1995

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[4] Occupations with up to 25% female share in employment were classified as „male", those with over 55% female share as „female", and the rest as „integrated".

[5] Thus, we fix the gender compostion of each occupation at its 1995 level, in order to look at the effects of changes in occupational composition.

segregation was lowest among workers with 0-10 years of experience. Second, we see that much of the desegregation was due to women moving into male occupations regardless of their levels of experience, which implies that there was either a general decrease in exclusion or an increase in women's tastes for "male work".

Table 4: Mean difference between women and men in proportion female in occupation, by cohort

Years of experience	2002	1995	1995 cohort in 2002
0-10	0,315	0,419	0,353
11-20	0,365	0,447	0,383
21-30	0,392	0,446	0,410
31-40	0,410	0,415	0,386

5 Gender composition and wages

5.1 The impact of gender segregation on wages

The basic method we use to evaluate the effect of gender composition on wages is to estimate wage regressions where next to observed individual and firm characteristics, where we include the proportion of women in the workers' occupation (and firm). Formally:

$$w_{ij} = X_{ij}\beta + PFEM_{ij}\gamma + v_{ij}$$

where w_{ij} stands for the log wages of individual i in occupation (firm) j, X_{ij} are individual characteristics, and $PFEM_{ij}$ is the proportion female at ij-th worker's occupation (firm).

The coefficient on our key variables might be biased due to two kinds of econometric problems: measurement errors or omitted variables. While measurement error in the proportion female variables will cause the usual attenuation bias, it is worth briefly considering the possible effect of omitted variables. The first type of omitted variable is occupation (firm) characteristics. As

it has been shown it the previous literature that those occupations where women work offer better conditions, thus – if there are compensating differentials - the omissions of these job characteristics will lead to a downward bias in the coefficient estimates (see Baker-Fortin [2001], Macpherson-Hirsch [1995]). Furthermore, due to aggregation bias, the size of the bias might vary by gender, given that in an occupational category women might hold jobs that have more advantageous, thus leading to a larger negative bias for women than for men. Second, we are unable to control for unobserved ability. On the one hand, if occupational segregation can be attributed to quality sorting, then our coefficient estimates will be downward biased. On the other hand, if occupational (firm-level) segregation was determined by discrimination, then we can argue that only women with high unobserved ability will be found in male jobs, thus introducing a negative bias for women, but no such bias will prevail on the case of men as they don't face discrimination.[6]

First, we use pooled wage regressions and a number of different specifications to quantify the effect of gender segregation on wages. In the first row of Table 4, we report the unadjusted gender wage gap: as discussed above the gender wage gap declined to a large extent in early transition, falling by 12 log points in six years time from –0.30 in 1986, while after that wage gap failed to decrease. Next, we looked at how much of the gap could be due to human capital differences between men and women. In line with earlier studies (see Brainerd [2000] for example), in socialist countries women's level of education was similar to men's, thus the adjusted gender wage was only slightly lower than the observed one. In post-socialist times this difference between men and women in human capital has disappeared, probably as a result of low-skill women disproportionately losing employment. Adding basic firm characteristics[7] to our regression makes the adjusted gender gap decrease by only 1 point in 1986, while

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[6] We shall consider the effect of measurement error and omitted job characteristics later on, but we are unable to control for unobserved ability, due to the lack of panel data.

[7] These included ownership, industry, firm size and firm location.

the contribution of women working in low-paying firms to the gender gap is slightly higher (3 points) in 2002.

Table 5: Estimation of the effect of occupational and firm-level segregation, pooled sample 1986-2002

	1986		1993		1995		2002	
	Coeff.	St. Err.	Coeff.	St. Err.	Coeff.	St. Err.	Coeff.	St. Err.
(1) No controls								
Female	-0,304	0,005	-0,183	0,015	-0,217	0,014	-0,227	0,016
Adjusted R²	0,16		0,03		0,04		0,04	
(2) Individual and firm controls								
Female	-0,276	0,004	-0,203	0,007	-0,195	0,008	-0,191	0,008
Adjusted R²	0,43		0,45		0,47		0,53	
(3) Individual and firm controls								
Female	-0,276	0,004	-0,203	0,007	-0,195	0,008	-0,191	0,008
Adjusted R²	0,43		0,45		0,47		0,53	
(4) Above + occup. segregation								
Female	-0,196	0,005	-0,172	0,008	-0,127	0,008	-0,157	0,008
p. female in occ.	-0,210	0,007	-0,086	0,012	-0,194	0,014	-0,115	0,017
Adjusted R²	0,44		0,45		0,48		0,53	
(5) Above +firm segregation								
Female	-0,195	0,004	-0,169	0,007	-0,127	0,007	-0,139	0,008
p. female in occ.	-0,210	0,007	-0,085	0,013	-0,194	0,014	-0,108	0,017
p. female in firm	-0,022	0,019	-0,029	0,034	-0,007	0,033	-0,151	0,043
Adjusted R²	0,44		0,45		0,48		0,53	
(6) Above +firm fixed effects								
Female	-0,195	0,004	-0,162	0,007	-0,120	0,006	-0,133	0,007
p. female in occ.	-0,209	0,007	-0,103	0,011	-0,209	0,016	-0,124	0,016
Adjusted R²	0,51		0,60		0,60		0,67	
N. of observations	123156		83119		78080		60725	
N.of firms	3716		2772		2518		2158	

Independent variable: natural logarithm of real gross monthly earnings.
Note: controls include 3 type of education dummies, (potential) experience and its square, 3 firm-size dummies, 27 industry dummies and 15 region/settlement size dummies.

We examine the effect of occupational segregation on wages by adding the proportion female in one's occupation to our independent variables. These regressions show that on the one hand, the feminisation of an occupation implies

lower wages in that occupation; on the other hand, the penalty attached to working in feminised occupation has been decreasing over time.[8]

In the next regressions, we estimate the effect of firm-level segregation, where we show that only at current times is there a wage penalty attached to the proportion female at the firm level. This finding empirically confirms that inter-firm wage differentials were not important in the socialist system. In essence, we can characterise transition as a move from a situation where an individual's earnings depended to a large extent – by the way of the wage tariff system - on her occupation, to one where wages set more in line with the performance of the firm.[9] This same pattern can be observed for gender wage differentials: while in 1986 about 8 points of the 30 point gender wage differential could be attributed to gender differences in occupational distribution, and only 0.1 points to inter-firm segregation, in 2002 these contributions were 3.4 and 2.8 points (respectively).

Finally, we added firm fixed effects to disentangle how much of the gender gap is due to within-firm differences. Contrarily to claimed gender equality, women earned about 18 percent less than men working in the same firm (and same type of occupation) towards the end of the socialist period. This intra-firm gender wage differential also decreased substantially (to 12.5 points), which is consistent with the previous literature in that most of the reduction in the gender wage gap is not due to changes in endowments (see Campos-Jolliffe [forthcoming]). [10,11]

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[8] The wage penalty for current dates is smaller than both results of Jurajda (2003) for the Czech and Slovak republics (-0.152 and –0.136, respectively), and those of Hellerstein et al (2003) for the US (-0.143) even though both studies measred occupational segregation at a more aggragated level.

[9] Wage regressions contolling for indvidual characteristics and firm fixed effects also support this hypothesis. In 1986 the increase in variance explained by adding firm effects (over the specification with only individual charecteristics) was 13 points, while it incresed to 23 points by 1993, and to 26 points by 2002.

[10] We are uncertain how much of the current within-firm gender wage gap can be attributed to violations of equal pay clauses, as we do not observe actual experience. In unreported regressions, we estimated fixed-effects regressions for workers younger than 25 years of age, for whom gender differences in actual experience due to childbearing might be the lowest, and found that the coefficient on the female dummy was –0.058, about half the one for the whole sample.

5.2 Segregation and the gender wage gap

In order to quantify the effect of gender segregation on the gender wage gap, we will use an Oaxaca-Blinder type decomposition of the form:

$$\overline{w}_m - \overline{w}_f = (\overline{X}_m - \overline{X}_f)\beta_m + (\beta_f - \beta_m)\overline{X}_f$$

where *m* denotes males and *f* females, and we include the proportion of female in the vector *X*. In this decomposition, the first term shows us how much of the gender wage gap is attributable to gender differences in characteristics, while the second term signifies the effect of different compensation of these characteristics by gender. We shall adopt the convention to treat the male returns as the one that would prevail in the absence of discrimination, given that possible exclusion will primarily affect the wages of women, and that we expect omitted variable bias to be less severe for men.

Our wage regressions by gender reveal important differences between men and women in the wage penalties attached to the concentration of females at the occupation and firm level. As for occupational segregation, it affected the wages of men and women to roughly the same magnitude in socialist times, with a worker in a "female" occupation (say a labourer in textiles, with 70 percent of employees were women) earned about 11 percent less than one with comparable skills in a "male" occupation (say a carpenter, of whom only 10 percent were female). This situation changed substantially in post-transition times in two respects. First, the negative impact of occupational feminisation fell in absolute value; second, the penalty to working in female occupation now is larger for a female employee than for a male.

Turning to segregation at the firm level, we can see that both in socialist times, and in early transition it had no effect on the wages of men, while it slightly

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[11] This specification also show that measurement error in the proportion female at the firm level is not a serious concern. Given that the measurement error is probably positively correlated with the fact of being a woman, we expect the coefficient on the female dummy to be biased downwards due to measurement error problems, but we see no significant decrease in the coefficient of th female dummy in our fixed-effects specification vis-a-vis the one with proportion female at the firm level.

depressed the wages of women. By contrast, there has been a radical change between 1995 and 2002: both men and women in firms with a higher share of female labour force earn lower wages, and this negative effect is much more pronounced for women than for men. This means that while a man working in feminised firm (with 80 percent female labour) earns 7 percent less than one in a firm with majority male employees (20 percent female), the same difference is 12 percent for a woman.

Table 6: The effect of segregation on wages by gender, and decompositions of the gender gap

Variable	1986		1993		1995		2002	
	Women	Men	Women	Men	Women	Men	Women	Men
Coeff. pr. female in occupation	-0,194*	-0,214*	-0,117*	-0,041†	-0,232*	-0,133*	-0,145*	-0,094*
Coeff. pr. female in firm	-0,052†	-0,013^n	-0,084†	-0,004^n	-0,049^n	0,001^n	-0,230*	-0,131†
prop. female in occupation	0,665	0,224	0,683	0,233	0,676	0,243	0,615	0,248
prop. female in firm	0,512	0,326	0,576	0,322	0,578	0,329	0,554	0,307

Variable	1986		1993		1995		2002	
	Char.	Coeff.	Char.	Coeff.	Char.	Coeff.	Char.	Coeff.
prop. female in occupation	0,095	-0,014	0,018	0,052	0,058	0,067	0,035	0,031
prop. female in firm	0,002	0,020	0,001	0,047	0,000	0,029	0,033	0,055
All	0,120	0,184	0,002	0,181	0,073	0,143	0,089	0,138
Total wage gap	0,304		0,183		0,217		0,227	

Note: * significant at 0,01 or better; † significant at 0,05; ^{n} not significant at conventional levels

The static Oaxaca-Blinder decompositions reflect clearly the above-discussed changes. Over the years, we see a slight decrease in the contribution of occupational segregation in accounting for the gender wage gap. In socialist times, gender differences in occupational composition were the main force behind the gender gap: the fact that women worked in very different occupations than men

meant that their wages were 9 percent lower. As we have seen, there has been a modest occupational desegregation and a decrease in the wage penalty of female occupations, thus the effect of occupational composition has declined. Thus, at the current date, a woman earning lower wages than a man in an occupation with a given level of feminisation has a negative effect similar in magnitude to the one of the differences in typical jobs of men and women.

Firm-level concentration of females plays a growing role in the gender wage gap. As males suffered no wage penalty for working in a firm with high proportion female before 2002, the sorting of men and women into different firms did not affect the gender wage gap, even though women tended to work in firms where the proportion of women was 25 points higher than in firm where men typically worked. By contrast, in 2002 – with the growth the above-mentioned penalty - this component accounted for 15 percent of the total wage gap. While the negative effect of the proportion women at firm-level had always been stronger for women, the widening of this differential in recent years meant that its contribution nearly doubled, and can now account for one-fourth of the gender wage gap.

5.3 Changes in segregation and the gender wage gap

Finally, to assess how much of the changes in the wage structure came about due to changes in gender segregation between dates t_2 and t_1, we shall use a Smith-Welch (1989) type decomposition of the changes in the gender wage gap of the form:

$$\Delta W^{t2} - \Delta W^{t1} = \left(\Delta X^{t2} - \Delta X^{t1}\right)\beta_m^{t2} + \left(\overline{X}_f^{t2} - \overline{X}_f^{t1}\right)\Delta\beta^{t1} + \Delta X^{t1}\left(\beta_m^{t2} - \beta_m^{t1}\right) + \overline{X}_{t2}^{f}\left(\Delta\beta_{t2} - \Delta\beta_{t1}\right)$$

The first term, the "main effect" reflects the effect of changes in the gender differences in characteristics. It measures how wage differentials would have moved, had only changes in the differences in characteristics occurred. The second term (the "gender interaction") tells what part of the change can be attributed to changes in characteristics. The third term (the "year interaction"), shows the effect of changes in returns, had the differences in characteristics stayed at their starting level and returns changed in the same direction and same

magnitude for the two groups. It measures this effect, supposing that gender differences in returns stayed at their initial values, while the changes in characteristics were the same for the two groups. The final term (the "gender-year interaction") reflects the changes in gender differences in returns.

Table 7: Decomposition of the change in the gender wage gap

Variable	Change in wage gap 1986-1993				Change in wage gap 1995-2002			
	Main effect	Gender interac.	Year interac.	Gender - year	Main effect	Gender interac.	Year interac.	Gender - year
prop. female in occupation	0,000	0,000	-0,077	0,065	-0,006	-0,006	-0,017	-0,029
prop. female in firm	0,000	0,003	-0,002	0,021	0,000	-0,001	0,033	0,027
All	-0,044	-0,014	-0,074	0,013	-0,007	-0,011	0,023	0,006
Total change		-0,121				0,011		

Our results indicate that during early transition, when the gender gap decreased, the fall in the wage penalty for working in a female occupation substantially improved the relative position of women. By contrast, the fact that above fall was much smaller for women than for men increased the gender wage gap to a similar extent. As we have already discussed, firm-level segregation only had a modest effect in this period, working towards widening the gender gap, given that the relative wages of women in firms with a high proportion female decreased, while no similar change happened for men. In the renewal period (1995-2002), changes in returns to occupations favoured women, closing the gender gap by 4.5 percentage points, while changes in returns to the proportion female in one's firm had an opposing effect of the magnitude of 6 points. The above beneficial effect of came about both through a decrease in the wage penalty associated with working in a female occupations, and because this decrease was more pronounced for women than for men. The returns to proportion of women at the firm level changed in the opposite direction: the gap between workers at firms with a male and female dominated firms was growing, and there was an increase in the gender differences in the wage penalties to working in a feminised firm.

5.4 Robustness checks

We conducted two types of robustness checks, to assess the effect of measurement errors on our estimates. Due to the limitations of the data available, we restricted our attention to 2002.

The first possible source of measurement error is the use of monthly wages, which if women worked systematically less than men would bias our estimates of the gender wage gap upwards (in absolute value). We found that using hourly wages instead of monthly earnings did not have a major impact on the estimated wage gap, as the hourly gender gap was 0,218 log points, while the same measure in terms of monthly earnings was 0,227 points.[12] Our estimates of the effect of sex segregation on wages were slightly decreased when controlling for hours of work, and this decrease was more marked for men than for women. Thus, both in occupations and firms with a high proportion of women, employees work shorter hours, with this difference being more pronounced for men.

Table 6: The effect of segregation on wages in 2002, robustness checks

| | Hourly wages | | | | At least 5% workers matched | | | |
| | Women | | Men | | Women | | Men | |
	Coeff.	St. Err.	Coeff.	St. Err.	Coeff.	St. Err.	Coeff.	St. Err.
p. female in occ.	-0,139	0,022	-0,077	0,024	-0,153	0,024	-0,078	0,025
p. female in firm	-0,225	0,038	-0,118	0,060	-0,218	0,041	-0,157	0,063
Adjusted R^2	0,54		0,50		0,55		0,51	
N. of observations	26348		34366		24711		32497	
N.of firms	1943		1988		1657		1687	

Second, we look at the sensitivity of our estimates to measurement error in the proportion female at the firm level, which might prevail as we only have a sample of workers in each firm. Therefore, we re-estimated our wage regressions based firms for which at least 5 percent of the labour force were sampled in the Wage Survey (with hourly wages as the dependent variable). For men, the results are in line with our expectations: the coefficient on the proportion women in the

firm grows in absolute value, and there is no change in the estimated effect of occupational segregation. For women, the effect of restricting the sample is quite different: it is the coefficient on occupational level segregation that becomes larger, which might be due to possible correlation between the measurement error at the firm and the occupation level.

5.5 The role of job characteristics

Finally, we consider introducing additional occupation (firm) characteristics to try to get rid of part of the omitted variable bias. This can be done in two alternative ways. First, we can simply introduce these control variables in our main equation:

$$w_{ij} = X_{ij}\beta + PFEM_{ij}\gamma + Z_{ij}\delta + v_{ij}$$

The alternative is a two-step estimation procedure, where we first estimate occupation (firm) fixed effects, with OCC_{ij} occupation dummies:

$$w_{ij} = X_{ij}\beta + OCC_{ij}\eta_j + v_{ij}$$

Then, in a second stage, we regress these occupation (firm) effects on the proportion female and other occupation (firm) characteristics:

$$\eta_j = PFEM_j\gamma + Z_j\delta + \varepsilon_j$$

As Fortin and Baker (2001) have discussed, these two estimates of the effect of gender segregation on wages will differ – unless we have captured all relevant characteristics -, if the individual characteristics X_{ij} are correlated with the proportion female, which will be the case if the part of the occupation (firm) effect is related to the average skills of workers in the given occupation (firm). [13]

The measures of occupation characteristics come from the Labour Force Survey, as it provides more detailed information than the Wage Survey. In order to minimise measurement error, we used pooled data from 2001 and 2002 (the sample size was 117928 observations). We extracted average years of schooling,

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[12] Women worked only slightly less than men: the monthly number of hours worked were 185.9 and 187.7, respectively.

potential experience and tenure to measure the skill and training requirement of different occupations. The flexibility of work schedule was measured by the average usual hours worked, the proportion of employees regularly working in multiple shifts, with changing work schedules, doing night shifts, and working on weekends. We computed indices of firm characteristics directly from the Wage Survey. These included average years of schooling, potential experience, usual number of hours worked per week, number of overtime hours worked per month. In absence of information on tenure, we also calculated the proportion of employees with fixed-term contracts, as those workers might receive less firm-specific training.

Our results on occupation-level segregation suggest that other occupational characteristics can account for "female jobs" paying less than male jobs. For women, this penalty decreases to roughly one-third of its value in the two-step procedure (one-fourth in the one-step estimation), and is not statistically significant. For men, once we control for firm fixed effects and work hours, the proportion of women in a given occupation has an insignificant negative effect. Adding job characteristics leads to the surprising result that men earn more in predominantly female occupations. Thus, men working as blacksmiths, where the proportion of women is only 6 percent, would earn about 6.5 percent less per hour, than men working as metal-processing plant operators (with 56 percent female). We can also note that results also are sensitive to the estimation procedure used, but they are qualitatively similar.[14] We are fairly confident that our specification is appropriate, as the coefficient estimates of job characteristic are consistent with expectations. The measures of skill requirements are positively related to wages, as well as longer usual work hours and higher proportion doing multiple shifts.

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[13] We continue to use the sample restricted to firms with at least 5% of workers matched, and use hourly wages as the dependent variable.

[14] The results reported come from specifications where the proportion female in the occupation is also calculated from the Labour Force Survey. We got very similar results when using proportion

Table 7: Estimation of the effect of segregation, with detailed occupational and firm characteristics

	Occupation				Firm			
	Women		*Men*		*Women*		*Men*	
	Coeff.	St. Err.	Coeff.	St. Err.	Coeff.	St. Err.	Coeff.	St. Err.
One-step estimates								
No controls	-0,192	0,096	-0,088	0,061	-0,148	0,039	-0,156	0,057
With controls	-0,047	0,053	0,177	0,075	-0,066	0,042	-0,043	0,049
N. of observations	24711		32497		24711		32497	
Two-step estimates								
No controls	-0,129	0,075	-0,054	0,058	-0,058	0,028	-0,069	0,050
With controls	-0,044	0,054	0,123	0,062	-0,038	0,029	-0,069	0,048
N. of observations	112		117		1657		1687	

Controlling for firm-level characteristics leads to similar conclusions about the effect of female concentration on wages: although firms with a high proportion women pay lower wages to both men and women, this is due to differing work conditions and skills mix. It appears that the negative relationship between concentration of women at the firm level and wages is brought about by these firms having less educated labour force and requiring less overtime work, as both these firm characteristics lead to higher wages. Coupled with the observation that wages have become more responsive to productivity in the second half of the nineties (see Kertesi-Kollo (2003), Kezdi(2002)) this result suggests that the proportion of females at the firm level is a proxy for labour productivity.

6 Discussion and conclusions

Our analysis revealed that looking at the changing effect of occupational and firm-level gender composition on wages during transition can provide us with further insight on how the socialist wage setting differed from today's, how economic transition affected women's relative wages, and revealed important differences

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female from the Wage Survey. In fact, the correlation of the two measures was 0.97, which shows that the measurement error in the variable calculated from the Wage Survey should be small.

between the labour market in initial transition shock period and the recovery phase.

In the socialist labour market, as wages were tied to one's occupation and wages in predominantly female occupations were set at a low level, much of the gender wage gap was due to gender differences in the occupational composition. We observed that between 1986 and 1993 both the relative employment weight and the relative wages in of feminised occupations increased. Thus transitional recession brought about a major shift in the structure of labour demand favouring female occupations and leading to a large improvement in the relative wages of women. At the same time, there was a re-segregation of some previously integrated occupations, and the relative wages of women in these feminised occupations deteriorated. We are unable to say whether with the disappearance of institutionalised forms of exclusion, these phenomena came about due to the discriminatory behaviour of employers, or because women had lower levels of unobservable skills.

During the period of employment growth and technological renewal there are signs of a decrease in occupational exclusion: the women started enter traditionally male occupations in growing number, and the wage penalty associated with female jobs continued to fall, with both these changes closing the gender wage gap. Our analysis also showed that, the wage penalty associated with a high proportion female disappears one we control for job characteristics. Currently, the direct effect of gender composition on wages is negative and not significant for women, while it is positive for men. This suggest that large part of current occupational segregation is due to the discriminatory barriers faced by women during socialist times, which might have an effect on the economic situation of women through their unobservable skills and preferences. Further research is needed to ascertain whether this legacy is affects women entering the labour market today.

We also found that the move to free markets meant that an individual's wages are more determined by the firm she works at than by her profession. Early

transition brought an increase in firm level-segregation as well, but these changes only had modest effects on the gender wage gap, as the wage differential between firms where women tended to work and those with a high proportion of men were small. By contrast, the second half of the nineties saw a widening of the wage gap between feminised and male dominated firms, which caused a deterioration of women's relative wages. Based on our finding that the this negative relationship between the concentration of women at the firm level and wages is very modest once we control for firm characteristics we believe that workers at feminised firms earn less because these firms are characterised by low labour productivity.

Our research implies that although occupational and firm-level segregation is an important phenomenon in Hungary, the possible impact of the introduction of comparable worth policies on the relative wages of women might be very limited. We found that a large part of gender wage gap prevails within firms. Due to data limitations we are unable to say whether this phenomenon results from direct wage discrimination and unequal promotion within firms, but is suggest that the enforcement of equal pay policies might be of substantial benefit to women.

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