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ABSTRACT

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We compare how U.S. and Danish gender wage gaps have developed between 1983 and 1995 using U.S. PSID and Danish Longitudinal Sample data. Using a new decomposition method, we show that changes in returns to observable skills and ranking effects outweigh women's gains due to qualifications and account for a rising gap in Denmark, while these effects cannot counter the large decline in the wage gap in the U.S. in this period. Increased wage dispersion has a minimal effect on the gap in both countries. Women at the highest decile in Denmark face the biggest increase in the gap, while in the U.S., the decline is largest at the top and at the middle of the distribution.

JEL Classification: J7

Keywords: gender wage gaps, decomposition method

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Introduction

This paper compares the relative wage positions of women between Denmark and the U.S. This comparison is interesting because in terms of wages, women have historically earned more relative to men in Denmark and the other Scandinavian countries than in the U.S. At the same time, wages are less dispersed in the Danish labor market than in the U.S. It is instructive therefore to examine the prospects for change in the relative labor market position of women in two very different economic and institutional settings. Another advantage to making the comparison with Denmark is accessibility to a high quality data set on Danish workers.

Our underlying motivation is to document and contrast how, despite a presumably favorable public policy concerning women in Denmark and a more free market, laissez faire public policy in the U.S., the gender wage gap is rising in Denmark and falling in the U.S. The question of interest is why Danish women seem to have stalled in their quest for gender equality in wages, while American women have been steadily "swimming upstream" by narrowing the gender wage gap despite penalizing changes in the wage structure (cf. Blau and Kahn, 1997). In a more recent paper, Blau and Kahn (2000) show evidence from Current Population Survey data that the U.S. gender wage gap may also be showing signs of leveling off in the mid 1990s, further underscoring the need to understand the processes behind the stagnation of the gender gap that has already taken place in countries such as Denmark. A closer examination of the development of the gender wage gaps and the factors determining wages in the United States and Denmark over the 1980's and the 1990's is therefore necessary in order to understand the reasons behind this differential development and thereby review the effectiveness of labor market policies designed to promote gender equality in Scandinavia in the light of the American experience.

In our attempt to understand the reasons behind this striking difference in development of the gender wage gap in the two countries, we analyze several hypotheses within the framework of a decomposition of the evolution of the gender wage gaps in the United States and in Denmark in the 1983-1995 period. We present a decomposition methodology that is similar in spirit to Juhn, Murphy and Pierce's (1991) method, which quantifies the impact of unobservables on the pay gap. However, in our method the overall wage distribution (men and women combined) is used as the distribution of reference instead of only using the male distribution such as in Juhn et al. Using the male wage distribution as the reference distribution assumes that male wages are unchanged by improvements in the relative position of women, whereas using the overall wage distribution allows the relative wage gains or losses for women to affect the overall wage structure that applies to both women and men. Thus, our paper makes a contribution to the recently developed methods of decomposing wage inequality over time in the discrimination literature. A central concern of the paper is also to document that the effects on the wage gap of explanatory factors may be quite different at different points in the wage distribution, thereby requiring a full distributional analysis of the wage decomposition.

Background

While the female-male earnings ratio in Denmark as in the other Scandinavian countries remains among the highest in the world (between 80-88% in 1996)[1], there has been almost no movement in this ratio since the late 1970s (see Rosholm and Smith, 1996). The same process of stagnation can also be seen in the gender wage gaps in Sweden and Finland since the start of the 1980s, see for instance Edin and Richardson (2002). Only Norway has experienced a steady decline in its gender wage gap in the last two decades (see Asplund et al., 1997). During the same period, the U.S. average female-male earnings ratio has shown considerable progress, going from a virtually unchanged 60% throughout the 1960s and 1970s to a high of 76.3% in 1999 for full-time workers.[2] What is further remarkable is that this decrease in the U.S. gender wage gap has taken place mainly in the 1980s, a time of rising prices of skills such as experience, a skill that women typically have less of than men, see for example O'Neill and Polachek (1993).

Several hypotheses can be considered as explanations for this divergence in outcomes. First, could the differential development of the gender wage gaps in the two countries be due to the fact that Danish women have not improved their labor market qualifications such as experience and representation in high-paying occupations and the private sector to the same extent as their American counterparts? Or could it be due to unfavorable wage structure changes that have overwhelmed the progress made in human capital qualifications?

Scandinavian countries such as Denmark and Sweden have led the way in the pursuit of gender equality by designing public policies such as childcare and paid parental leave legislation that accommodate women's employment. In comparison, American women have only recently acquired the right to unpaid parental leave. Yet, the gender wage gap has stagnated in Scandinavian countries and is closing rapidly in America. Could it be that the special features of the Danish welfare state, particularly the various 'family-friendly schemes', have boomerang effects on the position of women because women tend to participate in these schemes to a much larger extent than men? For instance Ruhm (1998) finds that extensions of parental leave schemes in OECD countries tend to increase the gender wage gap.

Wage inequality has been shown to be strongly positively correlated with the gender wage gap. In a comparison of earnings of full-time men and women in eight countries, Blau and Kahn

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[1] The actual gap depends on whether the wage measure is straight time wages or includes leave pay, see Pedersen and Deding (2000).

[2] The wage gap is 82.3% among blacks, 85% among Hispanics and 75.5% among whites. Among part-time workers, women's usual weekly earnings now exceed those of men. These statistics are taken from the BLS' Usual Weekly Earnings Survey summary data based on the CPS, and which are available on the web address: http://www.stats.bls.gov/newsrels.htm.

(1992) find that the large difference in the gender earnings ratio between the northern European countries and the U.S. can be explained by the fact that their wage distributions are far more compressed than that of the U.S., so that the pay differentials between high- and low-paid workers are not as wide. Over this period, both countries have experienced increased wage dispersion, so the question is to what extent is change in wage dispersion responsible for the differential development in the gender wage gaps in the two countries? One of the sources of increased dispersion in the 1980s and 1990s in the U.S. is skill-biased technological change that led to a widening of the wage distribution. Earlier studies have found that the shifts in the composition of demand that have led to the decline of unionized, manufacturing jobs and the rise of service-sector jobs have benefitted women relative to men at the low end of the skill distribution, and men relative to women at the high end of the skill distribution, i.e. a "gender twist" phenomenon (Katz and Murphy, 1992, Blau and Kahn, 1997). However, Fortin and Lemiuex (1998) show that the finding of a gender twist pattern is sensitive to the distribution of reference in the wage decomposition analysis, i.e. male or overall. Thus, the evidence remains mixed in the case of the U.S. and our analysis adds new input to this debate. In Denmark over this period, there has been increased decentralization in the wage bargaining process. In a recent study micro-study of 22 countries, Blan and Kahn (2003) demonstrate that highly centralized wage bargaining settings increase female wages relative to male wages by setting wage floors at the bottom of the distribution where females tend to be located, and therefore decentralization should adversely affect the gender wage gap.

The public sector is the largest employer of women in Denmark, accounting for more than half of the female labor force compared to 20% of the male labor force. While the expansion of the public sector in the 1960s and 1970s accommodated the large-scale entry of women into the Danish labor force, wage growth in the public sector has lagged behind the private sector and several previous studies have shown that this has contributed to the stagnation of the gender wage gap in Denmark. For example, beginning in the mid 1970s, the Danish government embarked on a wage-twist policy to restrict public-sector wage growth in order to reduce public-sector wages relative to private-sector wages. Rosholm and Smith (1996) using a panel data model show that the policy not only succeeded in its stated objective, but it also widened the gender wage gap largely because women were much more likely than men to be employed in the public sector. Datta Gupta et al. (2000) use a decomposition methodology and show that if private sector prices had been applied in the public sector, the overall gender wage gap would have been about 3 percentage points lower in 1994. Pedersen and Deding (2000) also find that the gender wage gap in Denmark is largely due to women's over-representation in the public sector. Public-sector jobs are attractive for women because of their generous benefit coverage that includes paid maternity leave as well as paid leave for taking care of sick children, own sickness, holidays etc. Yet, career wage growth and progression for women is limited in the public sector. More recently, Nielsen, Simonsen and Verner (2002) use detailed information on career patterns for Danish women in the 1981-1997 period and find after controlling for the endogeneity of sectoral choice and fertility, that women in Denmark indeed self-select into the public sector according to the choice of having children, and that women with children and child-related career interruptions face lower wage penalties of absences in the public sector in Denmark.

The high level of unemployment in Denmark in the 1980's may also have had an impact on the gender wage gap as female unemployment rates had been consistently higher than male unemployment rates during this period, and may have led to more negative impacts on female wages than males wages.

Finally, what has been the role of changes in discrimination and unobserved factors in explaining the development of the gender gap in each country? Has discrimination (measured residually) increased or decreased in each country, and to what extent is this responsible for the differential development in the gender wage gaps?

Decomposition Analysis

Our methodology is related to the decomposition technique developed by Juhn et al. (1991) (hereafter JMP), which has been applied by Blau and Kahn (1997) to the study of changes in the U.S. gender wage gap on a sample from the PSID data, for the period 1979-1988. JMP develop a new methodology for decomposing changes in the wage gap between two groups of workers which allows for changes in the overall wage distribution to affect the wage gap. Thus, they are able to differentiate the effects of a change in the dispersion of the unobservable components of the overall wage distribution from the effects of a change in the location of the skill distribution of one group relative to the other. JMP base their decomposition on the male wage regression. Our method, on the other hand, anchors the analysis on the pooled wage regression rather than only on the male wage regression.[3] There are several benefits to using the pooled wage regression as the foundation for the decomposition. First of all, all of the available data is utilized. Second, the index number problem does not arise in this case and the philosophic notion of a non-discriminatory wage structure is more closely approximated by the pooled method than by assuming that either (only) male prices or female prices would prevail in the absence of discrimination. Each of the these methods takes an extreme position, i.e. all of the unexplained gap is either due to favoritism towards males or due to pure discrimination against females. Earlier work by Oaxaca-Ransom (1994) and Neumark (1988) on the generalized decomposition clearly demonstrate the advantages of the pooled method. Other studies have also explored alternative decomposition techniques. An alternative method which produces qualitatively similar

[3] To see how JMP's model differs from ours, we have compared gender wage decompositions on the Danish sample in the 1983-1995 period using alternately JMP's and our method in Appendix A7. While some of the important effects are estimated to be the same, other differences do arise when the entire wage distribution is used as the distribution of reference instead of only the male wage distribution.

results to the JMP estimator has been suggested by Richardson (1997). Recently, Fortin and Lemieux (1998) use a rank-based procedure to decompose changes in the wage gap. Their results show that the decomposition results are sensitive to the choice of the distribution of reference (male vs. overall distribution). A brief outline of our method is given below:

The gender wage gap at time t is denoted by $G_t = (\tilde{W}_m^t - \tilde{W}_f^t)/\tilde{W}_f^t$, where $\tilde{W}$ is the geometric mean of the hourly wage rate, and the subscripts m, f denote male and female, respectively. Thus, the log wage ratio is defined by $ln(G_t + 1) = ln(\tilde{W}_m^t / \tilde{W}_f^t)$. In line with the Oaxaca-Blinder decomposition, the log wage ratio may be decomposed in the following terms:

$$\ln(G_t + 1) = \ln(Q_t + 1) + \ln(D_t + 1), \qquad (1)$$

where $ln\ (Q_t + 1)$ is the qualification component (the explained part of the wage gap) evaluated at the sample means, $\bar{X}_m$ and $\bar{X}_f$, and $ln\ (D_t + 1)$ is the 'discrimination' component (the unexplained part of the wage gap). Here 'discrimination' means the proportion of the wage gap not explained by differences in measured skills. This definition does not take into account feedback effects of labor market discrimination on women's investments in human capital. Also, the unexplained gap could potentially reflect gender differences in the level of unmeasured skills that would lead to an overestimation (underestimation) of discrimination if men are more (less) qualified than women with respect to such skills.

Equation (1) may be further dis-aggregated to evaluate the effects on the observed development in the gender wage gap of both the increased wage dispersion and the changing relative ranking of women in the common wage distribution. Evaluated at the sample mean, the wage equation may be written as:

$$\ln\left(\tilde{W}_i^t\right) = \bar{X}_i^t \hat{\beta}^t + \hat{\sigma}^t \hat{\theta}_i^t, \qquad (2)$$

where $\tilde{W}_i^t$ is the geometric mean wage in year t in group i $(i = m, f)$, $\bar{X}_i^t$ is the vector of mean characteristics in group i, $\hat{\beta}^t$ is the estimated parameter vector from the pooled wage regression, $\hat{\sigma}^t$ is the standard error estimate, and $\hat{\theta}_i^t$ is the mean standardized residual in group i. Thus, $\hat{\beta}^t$ is an estimate of the vector of observed prices, and $\hat{\sigma}^t$ is an estimate of the wage dispersion, which is often interpreted as an estimate of unobserved prices, see Blau and Kahn (1997). Finally, $\hat{\theta}^t$ represents the individual ranking in the common wage distribution, after controlling for differences in observed characteristics. If $\hat{\theta}^t < 0$ (> 0) the person is situated in the lower (upper) part of the distribution.

By combining the Juhn-Murphy-Pierce and Oaxaca-Ransom decomposition techniques, it can be shown that changes between two periods (denoted by Δ) in the two components on the RHS of (1) may be expressed in the following way:

$$\Delta \ln(D_t + 1) = \hat{\sigma}^1\left(\Delta\hat{\theta}_m - \Delta\hat{\theta}_f\right) + \Delta\hat{\sigma}\left(\hat{\theta}_m^0 - \hat{\theta}_f^0\right), \qquad (3)$$

$$\Delta \ln(Q_t + 1) = \left(\Delta\bar{X}_m - \Delta\bar{X}_f\right)\hat{\beta}^1 + \left(\bar{X}_m^0 - \bar{X}_f^0\right)\Delta\hat{\beta}, \qquad (4)$$

where $\Delta\hat{\beta} = \beta^1 - \beta^0$, $\Delta\hat{\sigma} = \hat{\sigma}^1 - \hat{\sigma}^0$, $\Delta\hat{\theta}_j = \hat{\theta}_j^1 - \hat{\theta}_j^0$, $\Delta\bar{X}_j = \bar{X}_j^1 - \bar{X}_j^0$, and $j = m,f$.

The first RHS term of (3) represents the effects of changes in the degrees of male favoritism and pure discrimination against women using period 1 as the base period. In particular, $\hat{\sigma}^1\Delta\hat{\theta}_m$ is the effect of changes in male favoritism or equivalently the effect of movements of males in the wage distribution after adjusting for changes in human capital characteristics. Similarly, the term $-\hat{\sigma}^1\Delta\hat{\theta}_f$ is the effect of changes in pure discrimination against women. Equivalently, this term measures the effect of movements of females in the wage distribution at time 1 after controlling for changes in human capital characteristics. The second RHS term of (3) measures the effect of changes in the wage dispersion on discrimination. This term may also be interpreted as the 'unobserved prices effect', see for instance Blau and Kahn (1997). Note that Suen (1997) criticizes JMP's decomposition by pointing out that their interpretation of the first and second terms in the RHS of (3) above as changes in the level of unmeasured skill and changes in the returns to unmeasured skill is misleading because wage dispersion and the percentile ranking are not independent, due to the fact that more dispersed distributions have thicker tails. Our approach is more general in that we identify the ranking effect and dispersion effect with general time-varying 'discrimination', which is therefore not subject to the same identification problem. In our formulation, both the ranking effect and the dispersion effect terms are functions of overall 'discrimination' and the dispersion parameters, see Edin and Richardson (2002). More generally, the treatment of dispersion in relation to labor market discrimination is explored in Oaxaca and Ransom (1999). Furthermore, the terms $\Delta\hat{\sigma}\,\hat{\theta}_m^0$ and $-\Delta\hat{\sigma}\,\hat{\theta}_f^0$ represent the effects of changes in wage dispersion on the degrees of male favoritism and pure discrimination against females.[4]

The first term on the RHS of (4) measures the effect of the gender difference in changes in human capital characteristics valued at the period 1 estimated coefficients. The individual terms $\Delta\bar{X}_m\hat{\beta}^{(1)}$ and $\Delta\bar{X}_f\hat{\beta}^{(1)}$ estimate the effects of changes in the human capital of males and females, respectively. The second term on the RHS of (4) measures the effect of changes in human capital

[4] An alternative decomposition of the change in discrimination is obtained by using period 0 as the base period for changes in the degrees of favouritism and pure discrimination and period 1 as the base period for changes in wage dispersion. The results from the calculation of these alternative decompositions do not deviate much from the results shown here.

valuations on the human capital gender gap in period 0 (the effect of changes in observed prices). Changes in the value of the human capital of males and females in period 0 are measured respectively by $\bar{X}_m^0 \Delta\hat{\beta}$ and $\bar{X}_f^0 \Delta\hat{\beta}$.[5]

Data

The data set for Denmark is created from a 0.5% representative sample of the Danish population extracted from the register-based Danish Longitudinal Sample data. We use the years 1983-1995 in the estimations. In the case of the U.S., we use the PSID Family data 1983-1995, with additional information merged in from the Individual and Supplemental Files.

The Danish sample consists of salaried workers who work more than 1000 hours annually and excludes the self-employed and their assisting spouses. We restrict our attention to salaried workers only, because this group constitutes the largest fraction of the Danish labor force and because the wage structure may be different for manual workers. However, as wage levels and fringe benefits are comparable across these groups, this selection is in fact inconsequential. The hours restriction is needed because hours information is unreliable under 1000 annual hours. This is because the hourly wage in the Danish Longitudinal Sample is calculated from information on employers' contributions to the ATP scheme (a step-wise function of the degree of employment) and these contributions are only required for each wage earner who works more than 9 hours a week. It can be shown that the hourly wage imputation is upwardly biased for part-time workers and overtime workers. Hourly wage rates are deflated into 1983 prices, converted into US $ and restricted to be at least $1.3 per hour. Controls include actual labor market experience and its square[6], years of non-experience[7] (proxy for time out of the labor market), years of education and its square, residence in provinces, occupational indicators and sector. Occupational indicators (high manager, middle manager and non-managerial salaried workers) primarily reflect differences in supervisory responsibilities, with high managers defined as salaried employees supervising more than 20 employees, middle managers as salaried employees supervising up to 20 employees and non-managerial salaried workers as salaried employees having no supervisory power.[8]

The PSID sample is similarly restricted to non-self-employed white workers between the ages of 18 and 65 who work more than 1000 hours annually. The hourly wage is measured as the ratio

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[5]The derivation of analytical standard errors of the decomposition terms above is available as a separate appendix from the authors.

[6] A quartic in experience was tried, but higher order terms turned out to be insignificant.

[7]Defined as potential experience minus actual experience.

[8] A full description of the Danish sample is available at http://www.cls.dk.

of annual labor income to annual hours and is restricted to be at least $1 (1983-84 prices). Special algorithms are needed in order to construct the variables measuring education and experience. For example, in 1983, education was recorded as the years of education obtained when respondents (heads and spouses) first entered the sample. Subsequent education was not recorded and the original value was simply brought forward in 1983. We go back and find respondents' educational status in each year since the year they entered the sample (for wives, we can only go back to 1979), and basing on respondents' full-time student status in each year up to 1983, we accordingly update years of education. Similarly for experience in 1983, the variable "years worked since age 18" contains the years worked since age 18 at the time the respondent entered the sample. To account for experience gained since entering the sample, we update this variable with the years equivalent of respondents' working hours in each year. In 1995, the problem is further compounded because in the early release PSID data file for 1995, years worked since age 18 is only asked of new respondents, i.e. those entering the sample in 1995. Therefore for all other respondents we need to combine information from both individual and family-level data and create a variable containing the value of "years worked since age 18" equivalent to the variable from 1983, with updating for each subsequent year in the sample based on annual work hours. Both wage earners and salaried workers are included. Controls include actual labor market experience and its square, years of non-experience, years of education and its square, dummies for whether the current job is covered by a union contract, 1-digit industry and occupation dummies, region dummies and sector.

In Appendices A3-A6, we present wage regressions in which we add to a simple quadratic specification in education and experience (Model 1) successively sector/industry/etc. indicators (Model 2), occupational indicators (Models 3) and years of non-experience (Model 4). The coefficients to experience, sector and province remain essentially unchanged, while the returns to education change as occupation is entered, suggesting a correlation between the two latter variables, but for the most part, the regression results indicate that inclusion of occupational indicators in the pooled male-female wage regression does not lead to serious endogeneity problems.

Descriptive Evidence

According to the evidence presented in Table 1, in the 1983-1995 period the unadjusted female-male wage ratio in Denmark goes down from 78% to 74%. Both male and female real hourly wages show a strong increase in this period. At the same time, in the U.S. PSID data, the raw wage ratio rises nearly 7 percentage points, from 66% in 1983 to 73% in 1995. This rise reflects a considerable gain (19.5%) in real female wages in this period while a lesser increase in male real wages (8% gain). Wage inequality rises in the U.S. (i.e. the standard deviations of log wages in Table 1 increase), particularly more for women than for men, 0.067 log points for women versus 0.031 log points for men. In Denmark, the wage distribution widens for men but not for women, 0.026 log points versus -0.015 log points. In terms of the mean of women's percentiles in the overall wage distribution, in the Danish data the average woman ranks at the 39th percentile of the overall wage distribution in 1983 and the average man at the 61st percentile. In 1995, the average woman moves down to a percentile rank of 38 in the overall wage distribution while the average man moves up to the 64th percentile. Thus, men and women become even more concentrated at the upper and lower ends of the distribution, respectively, than before. In the U.S. PSID data, the situation in 1983 is very comparable, with the average woman ranking at the 36th percentile. However, in 1995 the average woman moves up to a percentile rank of 41. Thus, the typical U.S. woman ranks higher in the overall wage distribution at the end of the period than at the beginning. Explanations for the improvement in women's ranking in the U.S. wage distribution and its deterioration in Denmark are further expanded on in the decomposition analysis where we compare women's relative gains in human capital accumulation and changes in the unexplained component of the wage gap in each country.

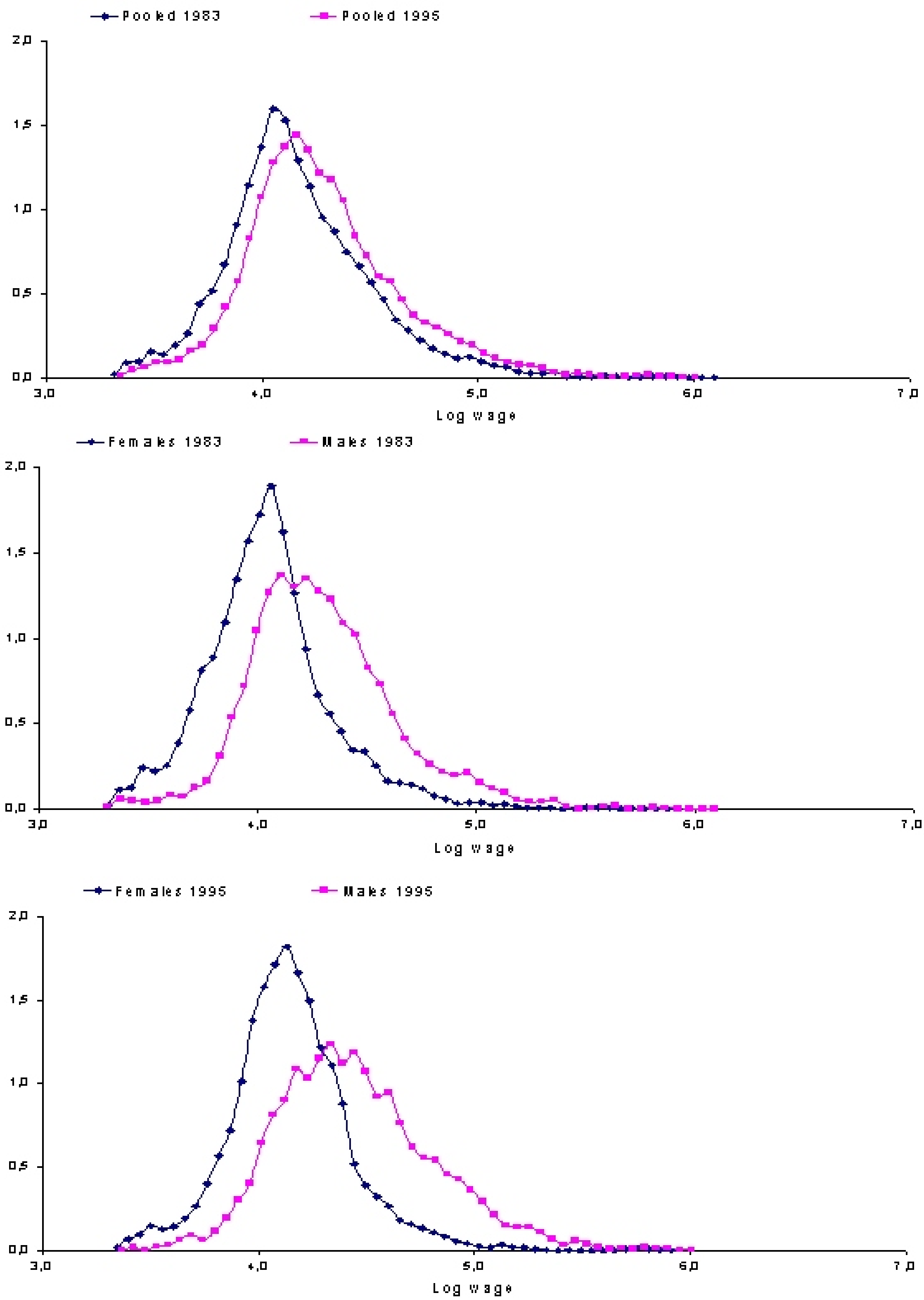
Table 1: Mean Log Wages and Wage Inequality, 1983-1995, Denmark and the U.S.

	DENMARK				*U.S.*			
	1983		1995		1983		1995	
	M	F	M	F	M	F	M	F
Log hourly wage	4.3	4.05	4.45	4.15	2.29	1.87	2.37	2.05
Standard deviation	0.34	0.3	0.37	0.28	0.54	0.5	0.57	0.57
Mean wage rank	61.3	38.6	63.7	38.4	58.6	36.4	56.6	40.9
Female-male wage ratio	78%		74%		66%		73%	

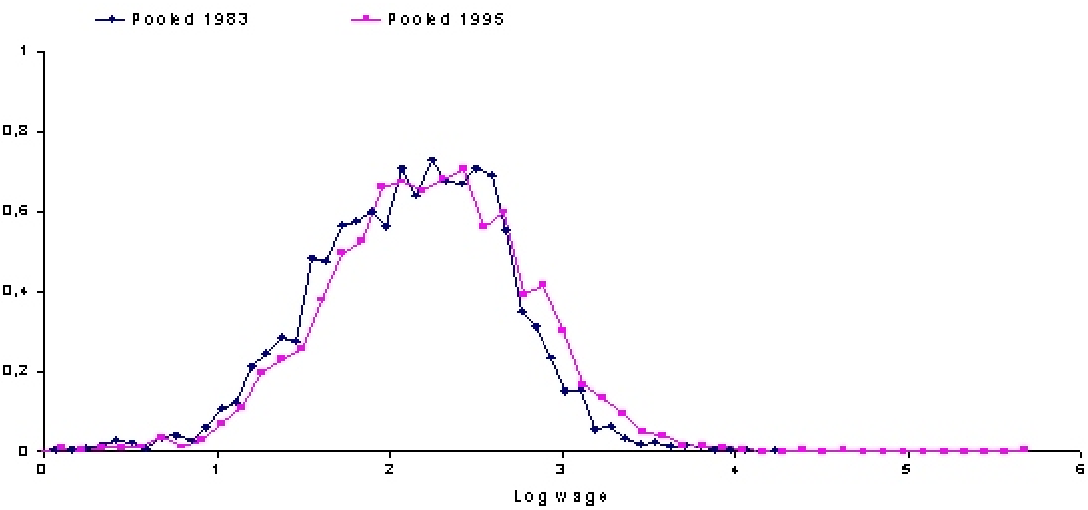
Wages in DK are real (1980) kroner/hour, in U.S., real (1983-84) dollars/hour. Sample size in Denmark: 1983: 2,000 males, 2,190 females; 1995: 2,025 males, 2,601 females. Sample size in U.S.: 1983: 1,945 males, 1,353 females; 1995:2,272 males, 1,870 females. Mean wage rank is the average rank in the pooled wage distribution.

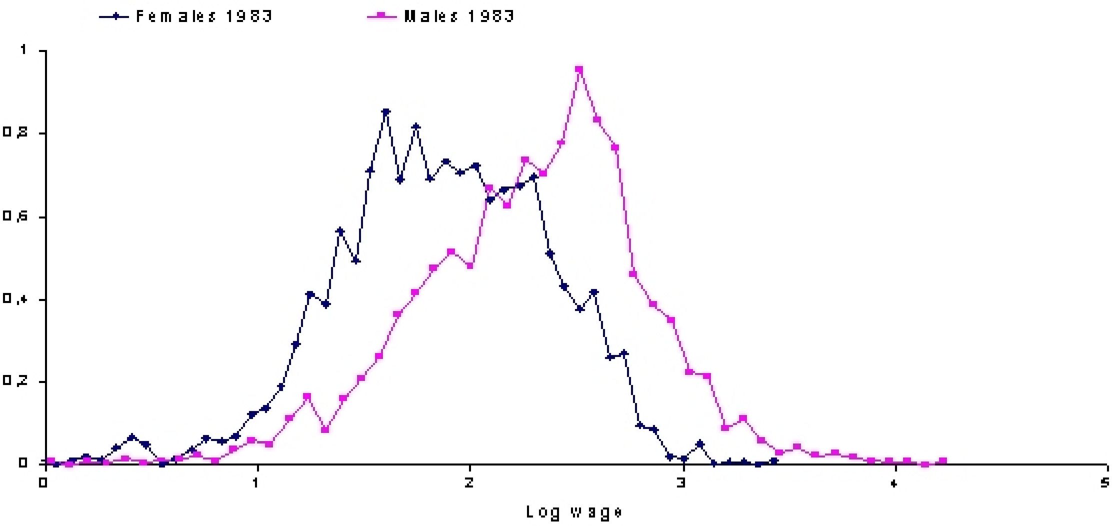
Figure 1: Kernel Density Estimates, Denmark and the U.S., 1983 and 1995.

Denmark



U.S.


Pooled 1983
Pooled 1995
1
0,8
0,6
0,4
0,2
0
0
1
2
3
4
5
6
Log wage


Females 1983
Males 1983
1
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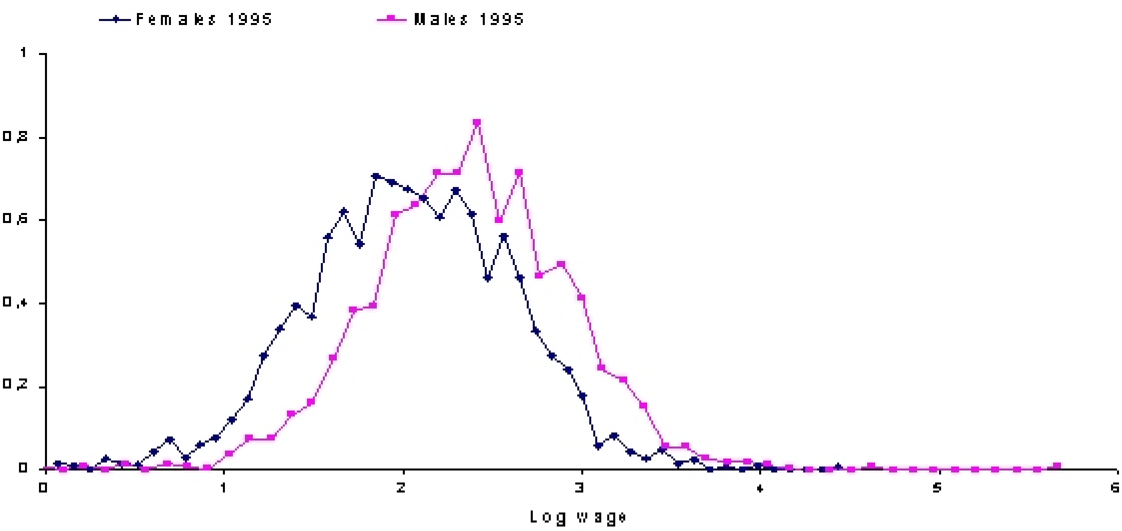
0,4
0,2
0
0
1
2
3
4
5
Log wage


Females 1995
Males 1995
1
0,8
0,6
0,4
0,2
0
0
1
2
3
4
5
6
Log wage

Kernel density estimates of real log wage densities are shown in Figure 1.[9] All diagrams are based on a common (real) dollar scale. These densities clearly show that the wage distribution is far more compressed in Denmark than in the U.S. Further, a clear translation to the right of the Danish pooled wage distribution has taken place between 1983 and 1995, in both male and female distributions. Wage dispersion for men, but not for women, increases in this period and skewness decreases slightly. In the U.S., the same degree of translation to the right has not occurred, but dispersion has increased and skewness decreased between 1983 and 1995 but these changes are small. More dramatic changes have occurred for the female wage distribution in terms of dispersion, and the female distribution begins to resemble the male wage distribution over time.

Means of the key variables are shown in Appendices A1-A2. In 1983, Danish women have less experience and a little less education, and they are much less likely to be in high-salaried and medium-salaried occupations and much more likely to be in low-salaried occupations than men. They are also much more likely to work in the public sector and have had more time away from the labor market. Over time, women improve their education and experience and reduce time spent away from the labor market, but gender representation in the high-manager occupations remains skewed, although more women enter the medium-manager occupations in 1995. For example, in 1983 about 29% of women work in high- and medium-manager occupations and by 1995 the proportion of the female sample working in these occupations is about 37%. The comparable figures for men are 62% in 1983 and 66% in 1995. Finally, women's over-representation in the public sector does not change over time and in both years, a full 56% of the women in this sample work in the public sector as compared to about one third of the men.

In the case of the U.S., in 1983 there is no longer a gender gap in education but there are significant differences in the occupational distribution by gender. Women are much less likely than men to be in managerial, crafts and labor occupations and more likely to be in service occupations and about equally represented in professional and sales occupations. There are big differences in industrial representation. Women are more likely to be in the service sector and men are more likely to be in agriculture, construction, durable and non-durable manufacturing. In 1995, both industrial and occupational segregation persist, although many more women are drawn into the professional and managerial occupations than before, i.e. in 1983 about 33% of women work in professional and managerial occupations, and in 1995 this increases to 41%. Both men and women leave manufacturing (durable and non-durable) and join the service sector. Also,

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[9] The kernel density estimate is calculated by summing the weighted values calculated with the kernel function K as in: $f_K(x) = (1/nh) \sum_{i=1}^{n} K[(x - X_i)/h]$, where K is the normal density, h the bandwidth, n the number of observations and x the log wage. The Gaussian kernel function is adopted for log wages as the data are approximately normal although experimentation with Epanechnikov and other kernels produced very similar results. Experimentation with the bandwidth led to a choice that produced the best results in terms of the degree of smoothness.

both men and women are less likely to be in unionized jobs in 1995 than in 1983. These figures clearly reflect the decline of the manufacturing and unionized sector in the U.S. in this period. Women are slightly more likely to be found in public sector jobs than men, but the female public sector over-representation is much less pronounced in the U.S. compared to Denmark.

Estimation Results

Based on estimation of pooled wage functions for Denmark and the U.S. in 1983 and 1995, we perform the decompositions described in relations (3) and (4). The estimation results are shown in Appendices A3-A6. The wage regressions in each country are well-behaved and accord with human capital theory. Wages rise with experience (the experience-earnings profile is concave), education, union status and occupational rank and fall with residence in the province and employment in the public sector[10]. The decompositions are shown at the mean and at the 10th and 90th percentile of the wage distribution. Finally, we analyze the separate contribution from different observed factors to the development of the gender wage gap.

These estimation results allow us to test the hypotheses presented in the background section on the reasons for the different development of the gender wage gap in the two countries in this period. Below, we first consider the effect of changing qualifications, ranking and dispersion. Further, we explore the effect of general labor market conditions (unemployment rates) on the changes in the gender wage gaps in both countries. In the latter part of this section we are able to consider the effect of time away from the labor market on the gender wage gap, the role of sector as well as the effect of the low-skill/high-skill gender twist hypothesis in each country, in which changing supplies and demands of skills affect skill prices of women relative to men differentially within different skill groups.

Decompositions at the Mean

The first two columns in Table 2 below present the wage decomposition results at the mean for both countries. The change in the total gap in Denmark is measured to be 0.054 log points, or 5.4 percentage points which indicates a significant widening of the gender wage gap in this period (standard errors in parentheses). This increase in the gap is mostly due to the effect of a positive and significant change in the discrimination gap (82%=0.044/0.054). The change in the qualifications gap is positive but insignificant. However, looking at its individual components, we see that Danish women improve their qualifications in this period so as to reduce the gender wage gap by 3.7 percentage points (2/3rds of the overall gap), whereas the effect of observed prices raises the gap by 4.7 percentage points, thereby wiping out any gains made through improved labor market characteristics. Note that both components of the qualifications gap are

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[10]Note the negative coefficient to education in the Danish earnings regressions (and U.S. in 1995) is offset by the positive coefficient on the squared term (which is constructed as education-sq/100) so that the returns to education turn positive starting at fairly low levels of education.

significant.

Table 2: Wage Decompositions at the Mean, Denmark and the U.S., 1983-1995.

	Denmark	*U.S.*
Total gap	**0.054***	**-0.096***
$\Delta ln\ (G_t + 1)$	**(0.012)**	**(0.021)**
Qualifications gap	**0.010**	**-0.109***
$\Delta ln\ (Q_t + 1)$	**(0.006)**	**(0.012)**
Qualifications effect	-0.037*	-0.059*
$(\Delta\bar{X}_m - \Delta\bar{X}_f)\ \hat{\beta}^1$	(0.001)	(0.003)
Observed prices effect	0.047*	-0.050*
$(\bar{X}_m^0 - \bar{X}_f^0)\ \Delta\hat{\beta}$	(0.007)	(0.013)
Discrimination gap	**0.044***	**0.013**
$\Delta ln\ (D_t + 1)$	**(0.009)**	**(0.016)**
Ranking effect	0.047*	0.0001
$\hat{\sigma}^1 (\Delta\hat{\theta}_m - \Delta\hat{\theta}_f)$	(0.012)	(0.023)
Dispersion effect	-0.003*	0.013*
$\Delta\hat{\sigma}\ (\hat{\theta}_m^0 - \hat{\theta}_f^0)$	(0.001)	(0.003)

Note: Standard errors in parentheses. Danish Longitudinal Sample (0.5%) consists of salaried non-self-employed workers observed to work >1000 hours annually. Controls include: intercept, education and its square, experience and its square, years of non-experience, occupational indicators, province and sector. Sample sizes are 4,190 individuals in 1983 (2,000 men, 2,190 women), 4,626 individuals in 1995 (2,025 men, 2,601 women). U.S. PSID Family data, 1983-1995, sample restricted to white, non-self-employed workers, aged 18-65, who work >1000 hours annually; controls include actual experience and its square, years of non-experience, years of education and its square, dummies for union contract coverage, 1-digit industry and occupation dummies, region dummies and sector. Sample sizes are 3,298 individuals in 1983 (1,945 men, 1,353 women), 4,142 individuals in 1995 (2,272 men, 1,870 women). *significant, p<=0.5.

In terms of the discrimination gap, the main contributor seems to be a significant and positive ranking effect, which is interpreted as the effect of women's movement in the pooled wage distribution, after controlling for the effect of observed characteristics. This effect significantly increases the gender wage gap by 4.7 percentage points. Increased wage dispersion has a minimal effect on the gender wage gap.

The conclusion is that Danish women have improved their qualifications, but rising observable skill prices that favor men completely wipe out these gains, plus a rise in male favoritism and/or female discrimination (or equivalently a movement of women down the common wage distribution, after controlling for characteristics) contribute to an overall change in the gender gap of 5.4 percentage points. Therefore, it can be said that the average Danish woman is floating downstream in this period, in that rising observed skill prices and worsened ranking effects more than offset women's wage gains from skill improvement so that the gender wage gap actually increases by 5.4 percentage points.

Looking next at the estimates for the U.S. in Table 2, we see that quite a different picture emerges for the average American woman. In marked contrast to Denmark, the overall gender wage gap in the U.S. has fallen 0.096 log points (9.6 percentage points) between 1983 and 1995 due to a large reduction in the qualifications gap. In fact, women in the U.S. would have reduced the wage gap by a full 10.9 percentage points simply through relative improvements in observed labor market skills and skill price effects, with about 54% attributable to women improving their qualifications relative to men and the balance to changes in skill prices that also favorably affect the gender wage gap. The discrimination gap works to increase the wage slightly by 1.3 percentage points mainly due to a small significant effect on the wage gap of increased dispersion in this time period. Women also move down the common wage distribution in terms of their unobservables but this effect is minimal. Overall, the discrimination gap is not significant. We therefore find that women in the U.S. are strongly swimming upstream, faced by a weak current working against them![11] [12]

Decompositions at 10th and 90th Percentiles

In this subsection, we compare U.S. and Danish wage decompositions at the 10th and 90th percentile in addition to at the mean. That is, the pace of skill accumulation, both observed and unobserved, may differ at different points in the wage distribution. While the standard Oaxaca decomposition is carried out at the mean, more recently researchers have explored methods that allow decompositions at various deciles of the wage distribution. For example, Fortin and

[11] Cf. Blau and Kahn (1997) who report similar findings in their analysis of the trend in the U.S. gender wage gap in the 1980's.

[12] The results in Tables 2 are robust across a number of different specifications. For example to test the impact of changing unemployment conditions on the development of the wage gap, we merge state unemployment rates by gender to the PSID sample by the individual's region. For Denmark, we merge to the data the union unemployment rates (lagged) by gender by the individual's union affiliation. The addition of local labor market conditions does not affect the basic results as the unemployment variable turns out to have only a small impact on wage determination in either country.

Lemieux (1998) have used a rank-based procedure to perform decompositions at each percentile of the wage distribution, and Blackaby et al. (1999) investigate sectoral wage premiums using JMP's method performed at different deciles of the wage distribution. We perform our pooled wage decomposition at the 10^{th} and 90^{th} percentile by identifying the "average" observation at the 10^{th} and 90^{th} percentile in each sex's wage distribution. This means we assign percentile ranks to the males and females within their own wage distributions and then take averages of the wage, conditioning variables and residuals in a small neighborhood (+ or - 5% of the observations) around the respective deciles. This is done in order to minimize the effect of outliers. Next, we perform our decomposition holding constant the estimated skill prices but allowing wages, characteristics and residuals to vary by decile.[13]

Table 3 presents results of this decomposition for both Denmark and the U.S. at the 10^{th} and 90^{th} percentile. Clearly, large differences exist between the 10^{th} percentile, the mean (reported in Table 2) and the 90^{th} percentile. In the case of Denmark, the wage gap shows a small (but insignificant) narrowing at the 10^{th} percentile, a small and significant increase at the mean and a large and significant increase of 14.8 percentage points at the 90^{th} percentile in the 1983-1995 period. We find that women at the highest decile have improved their qualifications the most (reducing the wage gap by a full 8.1 percentage points), followed by women at the the mean (reduction by 3.7 percentage points) and by women at the lowest decile (reduction by 0.8 percentage points). At the same time, observed prices have hurt women at the highest decile and mean much more than women at the lowest decile. While women at the lowest decile have benefitted from reduced discrimination (mostly due to an improvement in the ranking effect), women at the highest decile have experienced an increase in the wage gap due to discrimination by a full 17.0 percentage points, again almost entirely due to the large, positive and significant ranking effect, and this has completely countered the effect of improved qualifications.

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[13] By imposing the same wage structure across deciles, we assume that the returns to various labor market characteristics are the same at all points in the distribution. The alternative would be to run separate quantile regressions and thereby estimate the marginal effect of a covariate on log wage at different quintiles of the distribution. The disadvantages with that approach is that first, our focus is on the unconditional (as opposed to the conditional) distribution and second, we are interested in decomposing the gender wage gap into its components using the overall wage distribution as the distribution of reference, an exercise which cannot be implemented using quantile regression.

Table 3: Wage Decompositions, Denmark and U.S. PSID, 1983-1995, 10^{th} and 90^{th} Percentiles

	Denmark		*U.S.*	
	10^{th} pctile.	90^{th} pctile.	10^{th} pctile.	90^{th} pctile.
Total gap	**-0.024**	**0.148***	**0.0003**	**-0.103***
$\Delta ln\ (G_t + 1)$	**(0.015)**	**(0.016)**	**(0.028)**	**(0.029)**
Qualificat. gap	**0.019***	**-0.022***	**-0.071***	**-0.142***
$\Delta ln\ (Q_t + 1)$	**(0.005)**	**(0.009)**	**(0.016)**	**(0.013)**
Qualifications	–0.008*	-0.081*	-0.017*	-0.073*
effect	(0.002)	(0.003)	(0.004)	(0.006)
Observed prices	0.027*	0.058*	-0.055*	-0.070*
effect	(0.005)	(0.009)	(0.017)	(0.016)
Discriminat.gap	**-0.043***	**0.170***	**0.072***	**0.039**
$\Delta ln\ (D_t + 1)$	**(0.014)**	**(0.013)**	**(0.023)**	**(0.026)**
Ranking effect	-0.038*	0.172*	0.062*	0.025
	(0.012)	(0.012)	(0.023)	(0.023)
Dispersion effect	-0.005*	-0.002*	0.009*	0.014*
	(0.002)	(0.001)	(0.003)	(0.004)

*significant, p<=0.5.

In the U.S, the story is again entirely different, with high-wage and average women experiencing a considerable decline in their gender wage gaps of 10.3 and 9.6 percentage points respectively, whereas low-wage women experience almost no change in the wage gap in this period, i.e. an increase of 0.3 percentage points. As in Denmark, the middle and upper groups improve their relative skills the most, the qualifications effect being estimated to be -14.2, -5.9 and -7.1 percentage points for at the 90^{th}, mean and 10^{th} decile, respectively. All wage groups also experience a decline in the wage gap of 5-7 percentage points due to changing skill prices.

The aggregate analysis on our data therefore does not show support for Blau and Kahn's (1997) hypothesis that a gender twist in the supply and demand for skills has worked to the disadvantage of high-skilled women in the U.S.. Our findings are more in line with Fortin and Lemiuex (1998), who use CPS data and find these effects have not been strong enough to mask the big decline in the gender wage gap occurring at the top of the U.S. female wage distribution in this period. We investigate this hypothesis further in the disaggregated analysis in Table 4.

In the case of the U.S., Table 3 shows that changes in the discrimination gap increase the gender wage gap for all three groups, but is only significant at the bottom of the distribution where the discrimination gap increases the wage gap by a full 7.2 percentage points. However, here too there are differences across wage groups as to the reason for changes in the discrimination gap, as mainly increases in wage dispersion affect the top and middle groups while the reverse for low-wage women, the ranking effect is the dominant source of the negative wage effect of discrimination. At the highest decile in the U.S data, women experience only a small (and insignificant) worsening of their ranking in the distribution of unobservables, to the tune of 2.5 percentage points (and insignificant). This is in sharp contrast to Denmark, where the highest decile moves down the common wage distribution in terms of the unobservables, and where this effect (17.2 percentage points) constitutes the entire change in the discrimination gap.

This section provides strong evidence that a glass ceiling effect is present in Denmark, so that women in the highest decile experience the biggest widening in the gender wage gap over this period, and this effect is almost entirely due to their worsening position in the common distribution of the unobservable components of wages. We also find that a comparable glass ceiling effect does not exist in the U.S. where women in the highest decile experience the largest narrowing of the wage gap, and where the role of unobservables is small and insignificant. A similar finding is reported by Albrecht et al. (2003) for Sweden in the 1990s, where the gender wage gap at the top of the Swedish wage distribution is larger than the corresponding gap in the U.S., despite the average gender gap being much smaller in Sweden than in the U.S.

Contribution of Independent Variables

We further decompose the Danish and U.S. wage gaps to show the separate contributions of the independent variables to the qualifications gap, i.e. the separate contributions to the qualification effect and the observed prices effect. This allows further analysis of the hypotheses presented in the background section. These results are given in Table 4 below. In an Oaxaca wage decomposition, the separate contributions to the discrimination gap by sets of indicator variables are not invariant to the choice of omitted category, while the estimated separate contributions of sets of dummy variables to the explained portion of the wage gap are invariant with respect to the choice of the omitted reference groups, see Oaxaca and Ransom (1999). Here, as the constant term is eliminated, the separate contributions have to be invariant with respect to dummy variable normalizations. Therefore, unlike in the standard case, it is possible to report the separate contributions of the independent variables to both qualifications and observed price effects.

Table 4. Effect of Conditioning Variables on Qualifications Gap: Denmark and the U.S. , 1983-1995.

	Qualifications effect			*Observed Prices effect*		
	10th perc.	Mean	90th perc.	10th perc.	Mean	90th perc.
Denmark						
Exp+Exp-sq	-0.028*	-0.028*	-0.038*	0.010*	0.014*	0.017*
Years of non-experience	0.000*	-0.003*	-0.006*	0.007	0.008	0.009
Educ+Educ-sq	-0.002*	-0.004*	-0.026*	0.000	0.002	0.005
High manager	0.005*	0.003*	0.002*	0.002	0.006	0.011
Middle manager	0.012*	-0.009*	-0.013*	0.000	0.001	-0.001
Public	0.006*	0.004*	0.008*	0.007*	0.016*	0.018*
Province	0.009*	-0.000*	-0.007*	0.000	-0.000	-0.000
Total	-0.008*	-0.037*	-0.081*	0.027*	0.047*	0.058*
U.S.						
Actual Exp + Actual Exp-sq	0.020*	-0.021*	-0.045*	-0.000	-0.002	-0.003
Years of non-experience	0.007*	-0.016*	0.020*	-0.079*	-0.082*	-0.080*
Educ+Educ-sq	-0.006*	-0.017*	0.008*	0.007*	0.009*	0.002*
Occupation						
Professional	-0.010*	-0.019*	-0.012*	0.001*	-0.002*	-0.016*
Managerial	-0.019*	-0.014*	-0.041*	0.009*	0.008*	0.018*
Sales	0.007*	0.003*	0.017*	-0.005*	0.001*	0.001*
Service	-0.001	-0.001	-0.001	–0.026*	-0.009*	-0.002*
Crafts	-0.003*	-0.005*	-0.029*	0.033*	0.029*	0.025*
Labor	0.006*	0.002*	0.001*	0.016*	0.010*	0.000*
Industry						
Construction	-0.000	-0.000	0.001	0.005	0.004	0.003
Non-durable manufac.	-0.000	-0.000	-0.000	-0.001*	0.002*	0.010*
Service	-0.005*	-0.001*	-0.026*	-0.012	-0.012	-0.019
Agriculture	0.002*	0.000	0.005	-0.001	-0.001	-0.002*
Public	0.003	0.001	-0.003	0.001	-0.000	-0.003
Union	-0.012*	-0.008*	0.016*	-0.002	-0.003	0.001
Total	-0.017*	-0.059*	-0.073*	-0.055*	-0.050*	-0.070*

*significant, p<=0.5. Contribution of region is not shown for the U.S.

For each country, the specification is the most general wage regression model which forms the basis for the decompositions in Tables 2 and 3. For compactness, we report the total effect of experience and education, although these variables and their squares were entered separately in the wage regressions.

In Denmark, we see that all three wage deciles have improved their qualifications particularly with respect to experience and to a lesser degree non-experience and education and that these factors account for most of the qualifications effect. However, being in the public sector has hurt all three groups. The wage penalty to women of being in the public sector in Denmark has also been documented in a number of previous studies, mentioned in the background section. Partly this is due to the slow-down in wage growth in the public sector relative to the private sector in the 1980's and 1990's (the public-private wage twist policy) and partly due to the generally flatter career profile in the public sector. These effects account for between 4/10s to 8/10s of a percentage point increase in the wage gap in this period. The highest decile and mean also show significant improvements due to occupational upward mobility to the middle manager level.

In terms of the observed price effect, a low-skill/high-skill wage twist phenomenon is evident in the in which the prices of skills such as experience, education and being in the public sector have worked to the detriment of particularly high-wage women. For this group, changes in the returns to experience increase the wage gap by 1.7 percentage points and changes in the return to public sector employment increase the gap by 1.8 percentage points. Surprisingly, changes in the returns to non-experience do not significantly affect the wage gap of women in Denmark. The idea behind including this variable was that Scandinavian women in general take extended leaves from the labor market for childbirth and family reasons and although such leave is paid (though not fully) and job rights are preserved, there may be effects on career progression and wage growth. However, no such effect is present. A similar result is reported by Datta Gupta and Smith (2002), who find that the earnings capacity of Danish women who experience career interruptions resulting from childbirth or unemployment periods is not affected by the interruptions although the loss of human capital during leaves can have negative effects on individual wage growth. All Danish women, whether they have children or not, are found to have flatter wage profiles than men. Alternatively, our results show that it is not leave-taking in itself that affects the gender wage gap as much as women self-selecting into slower-track occupations in the public sector with lower wages but generous benefit coverage such as paid maternity leave and sick days, and which have experienced limited wage growth vis-a-vis the private sector in this period.

In the U.S. case, we see that the strong reduction in the wage gap due to the qualifications effect at the mean and 90th decile is mostly due to occupational mobility and to improvements due to experience (higher deciles) and education (mean). At the lowest decile, the decline in the pay gap due to qualifications is a little more modest but still due to improvements in education and occupational mobility. At the lowest decile, the wage gap actually worsens significantly with experience. The typical woman also experiences a significant narrowing of the wage gap due to unionization. A change in the industrial distribution, particularly women's representation in service industries, has also worked to the advantage of especially the high-wage and average woman. In terms of observed skill prices, while all three groups face a narrowing of the wage gap due to the rising return to experience and non-experience, they are penalized due to higher returns to education. The pay gap also increases from rising returns to being in managerial, crafts, sales and labor occupations although slightly offset by decreases in the gap arising from returns to professional and service occupations and in general, these negative occupational effects are relatively large, especially for the lowest decile. Particularly the middle and lower groups experience a narrowing of the gender wage gap due to industry and union but these effects are not significant. At the highest decile, the estimated effects of being in non-durable manufacturing (relative to durable manufacturing) are positive, i.e. raising the wage gap.

Even at the very disaggregated level, we do not find sufficient evidence of a clear low-skill/high-skill wage twist phenomenon in which changes in the prices of skills (reflecting the changing supply and demand of skills) have particularly disadvantaged women relative to men at the highest decile. While it is true that the return to education and the returns to managerial, sales and crafts occupations (relative to clerical) and the return to non-durable manufacturing have indeed impeded the progress of high-wage women, these effects are not strong enough to mask the big decline in the gender wage gap that occurs at the top of the female wage distribution in this period. Further, it is not the case that women in the highest decile are particularly disadvantaged relative to the other groups where the returns to human capital are concerned, particularly education, which hurts the two lower groups relatively more, and experience, which in fact narrows the wage gap for all three groups, but particularly the high-wage group.

Conclusion

This paper considers the reasons behind the stagnation of the gender wage gap in Denmark since the late 1970s versus the rapid convergence in the pay gap between men and women in the United States in the same period. Denmark, like the other Scandinavian countries, has traditionally led the way in equal rights amendments and in the design of flexible leave schemes and subsidized childcare programs that accommodate women's participation in the labor market. Yet, the evidence in this paper suggest that Danish women, despite being in the international forefront in the 1970s with respect to the female-male wage ratio, are now slowing down relative to their American counterparts in the race to wage parity. Using a new decomposition methodology that is anchored on the overall wage distribution, we show that mainly unfavorable wage structure effects (changes in observed skill prices) and worsened ranking effects more than wipe out any gains that Danish women make in their human capital over this period. In contrast, these effects are either favorable or not strong enough to offset the wage gains that American women make through the improvements in their human capital, despite increasing wage dispersion in the U.S. in this period. Increased wage dispersion has a minimal effect on the wage gap in both countries.

Large differences are present across wage deciles, with women at the highest decile in Denmark experiencing the greatest increase in the gender wage gap. This effect is almost entirely due to their moving down the overall wage distribution in terms of unobservables. We interpret this as strong evidence of a 'glass ceiling effect' in Denmark, so that even after controlling for human capital characteristics women at the highest decile face a widening wage gap due to their worsened ranking in the distribution of unobservables that to some extent may reflect discrimination. For the U.S., we find exactly the opposite development, compared to Denmark, at the upper end of the skill distribution. In the U.S., the wage gap decline is greatest at the highest decile, while the pay gap actually increases at the lowest decile. Thus, there is no 'glass ceiling effect' present for American women. Further, there is no clear evidence in our data of a "gender twist" phenomenon in the U.S. labor market in that shifts in demand relative to supply have favored women over men in the lower part of the distribution and men over women in the upper part of the distribution. Even when present, such effects are not strong enough to significantly impede the progress of high-wage women in the U.S.

Thus, this paper gives clear evidence that more qualified Danish women seem to stall or even float downstream while the U.S. women in the upper half of the qualification distribution manage to swim upstream in a country with much less favorable family-friendly welfare schemes and in a labor market with a much larger and increasing wage dispersion. Our results complement the literature which points to the potential negative ‘boomerang’ effects on female wages and careers, especially for highly educated women, from the different ‘family friendly’ welfare schemes particularly available in the public sector in Denmark, such as maternal leave schemes, care days, and flexible working hours and cheap, publicly provided child care. Though these types of family friendly policies may facilitate women’s entrance into the labor market they may at the same time imply that women (mothers) become less attractive for employers compared to men. Though many of the Scandinavian welfare schemes are available for both men and women, the take-up rate is far much higher for women than men. Scandinavian women tend to have higher absence rates, stronger preferences for short working hours etc., and more inflexible labor supply because day care institutions close early in the afternoon. For U.S. women, many of these welfare options are not available, and the U.S. women to a much larger extent have to find alternatives in the form of private child care or housekeepers.

In this way, the Scandinavian welfare state model may have important backlash effects on the position of women which do not exist in the less liberal American welfare state. The policy implications of these findings may be puzzling. For the low skilled women, the situation is undoubtedly much more favorable in the Scandinavian labor market than in the U.S., but for the high skilled women, this is not quite as obvious. The Scandinavian experience may yield important lessons for future U.S. development. It may not be an optimal strategy just to strive for extensions or introduction of new family friendly welfare schemes which are directed towards the female labor force. If these schemes tend to make women less attractive for employers, they may have serious long term effects on women’s position in the labor market as it has been the case in Denmark. In theory, one alternative might be to run the welfare state backwards and liberalize the labor market and welfare state. At present, this is probably a fairly unrealistic alternative in the Scandinavian countries. Another alternative, which is much discussed in all Scandinavian countries these years, is to increase incentives for men (fathers) to increase their participation in family friendly welfare schemes and thereby induce a more equal allocation of time within the household. However, at the present time this alternative is mostly only advocated by female voters and politicians and has yet to gain acceptance within the population at large.

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Appendix A1: Variable Means, Denmark, 1983 and 1995

	1983		*1995*	
	Women	*Men*	*Women*	*Men*
Log wage	4.051	4.298	4.151	4.452
	(0.298)	(0.339)	(0.283)	(0.365)
Experience	11.062	17.678	14.728	18.428
	(6.934)	(11.966)	(8.260)	(10.722)
Experience-sq./100	1.704	4.556	2.851	4.545
	(2.016)	(5.433)	(2.794)	(4.538)
Years of non-	6.434	2.940	5.611	3.285
experience	(6.646)	(3.619)	(6.506)	(4.709)
Education	12.087	12.689	12.861	13.318
	(2.255)	(2.830)	(2.360)	(2.729)
Education-sq./100	1.512	1.690	1.710	1.848
	(0.578)	(0.765)	(0.634)	(0.756)
Province	0.569	0.558	0.601	0.596
	(0.495)	(0.497)	(0.490)	(0.491)
High manager	0.059	0.317	0.082	0.349
	(0.236)	(0.465)	(0.275)	(0.477)
Middle manager	0.226	0.305	0.296	0.313
	(0.419)	(0.461)	(0.456)	(0.464)
Public	0.559	0.390	0.561	0.361
	(0.497)	(0.488)	(0.496)	(0.480)
N	2190	2000	2601	2025

Note: standard deviations in parentheses.

Appendix A2: Variable Means, U.S., 1983 and 1995

	1983		*1995*	
	Women	*Men*	*Women*	*Men*
Log wage	1.869 (0.501)	2.288 (0.537)	2.047 (0.568)	2.369 (0.568)
Experience	15.564 (10.422)	21.275 (13.607)	17.476 (9.025)	20.840 (10.860)
Experience-sq./100	3.508 (4.615)	6.377 (7.104)	3.868 (3.714)	5.522 (5.510)
Years of non-experience	1.266 (7.307)	-3.981 (4.171)	2.143 (8.738)	-1.108 (8.454)
Education	13.082 (2.157)	13.165 (2.564)	13.282 (2.774)	12.971 (3.554)
Education-sq./100	1.758 (0.576)	1.799 (0.660)	1.841 (0.629)	1.809 (0.717)
Professional	0.223 (0.417)	0.209 (0.407)	0.276 (0.447)	0.213 (0.410)
Sales	0.049 (0.215)	0.056 (0.229)	0.042 (0.200)	0.056 (0.231)
Crafts	0.022 (0.147)	0.256 (0.437)	0.018 (0.132)	0.238 (0.426)
Labor	0.103 (0.304)	0.207 (0.405)	0.074 (0.262)	0.201 (0.401)
Managerial	0.103 (0.305)	0.169 (0.375)	0.137 (0.344)	0.173 (0.278)
Service	0.151 (0.358)	0.051 (0.220)	0.129 (0.335)	0.064 (0.245)
Agriculture	0.010 (0.098)	0.039 (0.193)	0.010 (0.100)	0.029 (0.167)
Construction	0.009 (0.094)	0.081 (0.273)	0.012 (0.110)	0.085 (0.280)
Nondur. manufac.	0.086 (0.281)	0.103 (0.304)	0.067 (0.250)	0.101 (0.301)
Service	0.803 (0.398)	0.578 (0.494)	0.842 (0.365)	0.625 (0.484)
Public	0.223 (0.417)	0.188 (0.391)	0.231 (0.422)	0.178 (0.382)
Union	0.160 (0.366)	0.258 (0.438)	0.136 (0.343)	0.207 (0.405)
West	0.208 (0.406)	0.189 (0.391)	0.190 (0.392)	0.185 (0.388)
South	0.328 (0.470)	0.319 (0.466)	0.340 (0.474)	0.338 (0.473)
North	0.249 (0.433)	0.292 (0.455)	0.284 (0.451)	0.288 (0.453)
N	1353	1945	1870	2272

Note: standard deviations in parentheses.

Appendix A3: Pooled Wage Regressions, Denmark, 1983

	-1	-2	-3	-4
Intercept	4.566 (0.108)	4.591 (0.107)	4.176 (0.104)	2.767 (0.149)
Experience	0.022 (0.001)	0.021 (0.001)	0.018 (0.001)	0.032 (0.002)
Experience-sq./100	-0.027 (0.004)	-0.027 (0.004)	-0.027 (0.003)	-0.043 (0.004)
Education	-0.141 (0.017)	-0.138 (0.017)	-0.056 (0.016)	0.088 (0.019)
Education-sq./100	0.708 (0.063)	0.705 (0.062)	0.294 (0.062)	-0.083 (0.067)
Province		-0.057 (0.009)	-0.058 (0.009)	-0.079 (0.008)
Public		-0.067 (0.010)	-0.042 (0.009)	-0.124 (0.008)
High manager			0.326 (0.015)	0.297 (0.014)
Middle manager			0.132 (0.011)	0.115 (0.010)
Years of non-experience				0.291 (0.021)
adj.-R^2	0.236	0.251	0.331	0.331
N	4190	4190	4190	4190

Note: Standard errors are in parentheses. Omitted occupational category is other (non-managerial) salaried workers.

Appendix A4: Pooled Wage Regressions, Denmark, 1995

	-1	-2	-3	-4
Intercept	4.721 (0.118)	4.704 (0.114)	4.216 (0.110)	2.72 (0.158)
Experience	0.022 (0.001)	0.023 (0.001)	0.021 (0.001)	0.033 (0.002)
Experience-sq./100	-0.022 (0.004)	-0.025 (0.004)	-0.029 (0.003)	-0.047 (0.004)
Education	-0.160 (0.018)	-0.149 (0.017)	-0.057 (0.017)	0.090 (0.020)
Education-sq./100	0.774 (0.065)	0.766 (0.063)	0.313 (0.062)	-0.087 (0.069)
Province		-0.050 (0.009)	-0.053 (0.008)	-0.079 (0.008)
Public		-0.163 (0.009)	-0.140 (0.008)	0.292 (0.014)
High manager			0.346 (0.014)	0.114 (0.010)
Middle manager			0.149 (0.010)	-0.124 (0.008)
Years of non-experience				0.305 (0.022)
adj.-R^2	0.28	0.335	0.417	0.445
N	4626	4626	4626	4626

Note: Standard errors are in parentheses. Omitted occupational category is other (non-managerial) salaried workers.

Appendix A5: Pooled Wage Regressions U.S., 1983

	-1	-2	-3	-4
Intercept	0.963 (0.171)	0.993 (0.168)	0.903 (0.165)	1.065 (0.168)
Experience	0.035 (0.003)	0.033 (0.002)	0.030 (0.002)	0.029 (0.002)
Exp.-sq./100	-0.041 (0.005)	-0.039 (0.005)	-0.036 (0.005)	-0.038 (0.005)
Education	0.023 (0.026)	0.029 (0.025)	0.056 (0.024)	0.044 (0.024)
Education-sq./100	0.220 (0.099)	0.242 (0.096)	0.024 (0.095)	0.037 (0.094)
Public		-0.051 (0.022)	-0.046 (0.021)	-0.043 (0.021)
Union		0.279 (0.021)	0.306 (0.020)	0.303 (0.020)
Professional			0.292 (0.028)	0.281 (0.028)
Managerial			0.349 (0.029)	0.335 (0.029)
Sales			0.173 (0.039)	0.162 (0.039)
Crafts			0.241 (0.028)	0.216 (0.028)
Labor			-0.004 (0.029)	-0.023 (0.029)
Service			-0.125 (0.032)	-0.123 (0.032)
Years of non-experience				-0.008 (0.002)
Industry controls	No	Yes	Yes	Yes
Region controls	No	Yes	Yes	Yes
R^2	0.253	0.319	0.383	0.387
N	3298	3298	3298	3298

Note: Standard errors are in parentheses. Omitted occupational category is Clerical.

Appendix A6: Pooled Wage Regressions U.S., 1995

	-1	-2	-3	-4
Intercept	1.609 (0.053)	1.806 (0.059)	1.659 (0.059)	1.505 (0.062)
Experience	0.033 (0.003)	0.031 (0.003)	0.026 (0.003)	0.027 (0.003)
Exp.-sq./100	-0.048 (0.001)	-0.046 (0.006)	-0.039 (0.005)	-0.034 (0.005)
Education	-0.074 (0.008)	-0.075 (0.008)	-0.043 (0.007)	-0.036 (0.007)
Education-sq./100	0.648 (0.037)	0.669 (0.037)	0.409 (0.038)	0.423 (0.038)
Public		-0.027 (0.022)	-0.018 (0.021)	-0.031 (0.021)
Union		0.253 (0.022)	0.287 (0.021)	0.279 (0.021)
Professional			0.389 (0.026)	0.390 (0.026)
Managerial			0.453 (0.027)	0.457 (0.026)
Sales			0.369 (0.038)	0.374 (0.039)
Crafts			0.321 (0.028)	0.340 (0.028)
Labor			0.054 (0.028)	0.071 (0.028)
Service			-0.041 (0.030)	-0.029 (0.030)
Years of non-experience				0.008 (0.001)
Industry controls	No	Yes	Yes	Yes
Region controls	No	Yes	Yes	Yes
R^2	0.217	0.269	0.353	0.362
N	4142	4142	4142	4142

Note: Standard errors are in parentheses. Omitted occupational category is Clerical.

A7: Comparison of Our Method to JMP's Method

Appendix Table A7 shows decompositions using our method and JMP's method respectively on the Danish sample. The total gap is 0.054 log points, which indicates a small but significant widening of the gender wage gap in this period. Our results show that this is due mostly to a positive and significant discrimination gap. The qualifications gap is also positive but relatively small in magnitude and insignificant. The same overall conclusions are reached using the JMP method on this sample. The only real difference seems to be that the observed price effect is estimated to be about 1.3 times larger under our method, and the dispersion effect has a small negative effect on the wage gap whereas in JMP's method it has a small positive effect. The latter is due to the fact that in JMP's method, women's ranking, which is based only on the male wage distribution worsens because of increased dispersion in the male distribution that occurs in this period. Our method bases the decomposition on the overall wage distribution, which does not become significantly more dispersed over time. The difference in the estimated standard error (root MSE) over the two years is in fact slightly negative, while the average male residual is positive and the average female residual negative in the year 0 overall distribution, giving an overall negative dispersion effect, calculated according to the formula $\Delta\hat{\sigma}\ (\hat{\theta}_m^0 - \hat{\theta}_f^0)$. Whereas basing the decomposition on male wages only leads to the conclusion that changes in dispersion have increased the gender wage gap.

While the two methods yield close estimates of the important effects, our method has the advantages that it is easier to implement (the assigning of percentile ranks is not necessary), and uses both male and female data to estimate the prices of labour-market skills that would prevail in the absence of discrimination.

Table A7: Comparison of Our Decomposition Method to JMP's Decomposition Method: Denmark, 1983-1995.

	DK, 1983-1995 Our method	DK, 1983-1995 JMP's method
Total gap	0.054*	0.054
$\Delta ln\ (G_t + 1)$	(0.012)	
Qualifications gap	0.010	0.001
$\Delta ln\ (Q_t + 1)$	(0.006)	
Qualifications effect	-0.037*	-0.037
	(0.001)	
Observed prices effect	0.047*	0.037
	(0.007)	
Discrimination gap	0.044*	0.053
$\Delta ln\ (D_t + 1)$	(0.009)	
Ranking effect	0.047*	0.044
	(0.012)	
Dispersion effect	-0.003*	0.008
	(0.001)	

Note: Sample consists of salaried workers observed to work >1000 hours annually. Controls include: intercept, education, education-sq, experience, experience-sq., years of non-experience, occupational indicators, province and sector. Sample sizes are 4190 individuals in 1983 (2000 men, 2190 women), 4626 individuals in 1995 (2025 men, 2601 women).

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