Wage differentials and gender discrimination – changes in Sweden 1981-1998

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Abstract
The purpose of this paper is to follow the development of the Swedish gender earnings gap through the 1980s and 1990s. We follow the changes in the wage gap and in factors to which it can be related, step-by-step, and year-by-year. This is done by analysing cross sectional data from statistics Sweden (HINK) for the years 1981, 1983-1991 and 1993-1998. The preliminary results show that the unadjusted wage gap varied between 15-20 percent up to 1989 when the differentials began to increase. During the 90s the size of the gap was around 25 percent. There is an increase in the wage differentials between the 1980s and late 1990s. In a decomposition analysis we find that the measured differences in jobs and qualifications between women and men can account only for between two and three fifths of the gender wage gap, if they are assumed to be rewarded according to the wage function for men. If the female wage function is applied, considerably less of the differentials are explained. Differences in the educational requirements for jobs have contributed considerably to gender earnings inequality. The impact has, however, decreased over the period studied and is about half as large in the 1990s as it was in the 1980s.

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1. Introduction

The purpose of this paper is to follow the development of the Swedish gender earnings gap through the 1980s and 1990s. In the course of these two decades, very significant changes with strong impact on the wage setting process took place in Sweden. The most conspicuous alteration is the increase in overall income and earnings differentiation in a country, which for a long time was know as one of the least unegalitarian in this respect. It has been forcefully argued, in international comparisons, that the greater the total spread in earnings, the larger the gender gap (Blau and Kahn 1992). It may therefore be more than a coincidence that an increase in earnings differentiation and a halt in the trend towards gender earnings equality have occurred simultaneously in Sweden.

Behind, or concomitant with, the increase in differentiation are a whole series of institutional and economic changes, such as the disintegration of the system of centralised wage bargaining, the income tax reform of the early 90s, the boom of the 1980s, which was followed in 1992-97 by a downturn with levels of unemployment unseen since the Great Depression, Swedish entry into the European Union, the currency crises of 1992 and strong fiscal pressure against public sector activities.

In this context of manifold events, we want to not just compare a certain point in time at the beginning of this period with another at the end of it. We want to follow the changes in the wage gap, and in factors to which it can be related, step-by-step, and year-by-year. We do this by analysing data from repeated cross section surveys from Statistics Sweden (the HINK-database) for the years 1981, 1983-1991 and 1993-1998. This data set will be discussed in more detail below (section 4), but it can be said at the outset that we consider the quality of sampling and interviewing etceteras, to be good. The problems with the data set are due, first, to the fact that it was not created for the purpose of wage-analysis and, second, that some questions and, thus, some variables have changed over the almost twenty years that the survey has been conducted. Therefore we have had to use proxies for, or approximations of, some important variables, because this was the best that the data permitted or to ensure commensurability over time. To some extent, this is always the case in empirical analysis covering a long time span. Any data including different points in time would have to take into account, and make imputations to correct for, institutional changes, which necessitate changes in definition and interpretation of variables.

We consider, however, that to have this rich time-series, enables us to make a unique contribution which should be seen as a complement, not an alternative, to studies based on data sets which include other variables but not such a continuous development over time.

2. Theories

Attempts at explanation of inequality in earnings between women and men have traditionally emphasised a number of interrelated explanatory mechanisms. Some of these mechanisms are briefly described below. (For a more extensive discussion, see Katz, 1994, 2001.)

Economists distinguish two main types of explanation: "Pure" wage discrimination, which means that women are paid less than equally productive men are. In neo-classical theory, this discrimination is explained by "preferences for discrimination" on the part of employers, co-workers or customers. If these preferences are not equally strong everywhere, in the long run, discrimination would tend to be replaced by segregation (Becker, 1971, Cain, 1986).

The second line of argument is that women are paid less by profit-maximising employers because they are less productive. Obviously, both things could be true, simultaneously and explain parts of the gender gap in wages. Also, the reasons for the assumed lower productivity of women include other forms of discrimination, both inside the labour market (in hiring, on-the-job-training and promotion) and outside it (in households or education). The argument may be made both in terms of the individual woman's productivity and corresponding wage and of employers paying all women according to the average productivity of female workers (statistical discrimination).

According to some economists, because of the division of labour (specialisation) in the household women have weaker labour market attachment and less incentive to invest time and effort on education and careers. Since women often take more responsibility for family and household work, women's labour force participation is often interrupted and women more often work part time (Mincer and Polachek 1974; Polachek 1981; Becker 1985). This would imply that women generally accumulate less education; job training and work experience compared to men and are hence, less productive and less paid. In particular, if women expect to make career breaks, they may prefer occupations with higher starting wages but lower

returns to experience (wage growth) in order to minimise the loss from temporary absence (Polachek, 1981, Kim and Polachek, 1994). This hypothesis is, however, disputed. England et al. (1988) estimate an earnings model with fixed (time- and individual-) effects on US panel data to investigate the relationship between earnings and sex composition of occupations, for black and white men and women. They find significant negative effects of percentage female in the occupation on starting wages, for full-time workers in all four race/gender groups. Thus, women do not appear to choose job with higher starting wages. England (1982) tests for a relationship between sex composition, on the one hand, and rewards to experience or "penalties" for post-school years spent out of the labour force, on the other and finds that women do not maximise lifetime earnings by working in traditionally female occupations.

The theory of compensating differentials predicts that wages will be lower in jobs with more desirable working conditions[1]. It is feasible that men receive a higher wage as a compensation for more unattractive working conditions. According to Filer (1985), because of different tastes, men and women on the average choose occupations with different characteristics. Daymont and Andrisani (1984) found that the values and preferences expressed by young men were conducive to higher wages than those more common among young women. In this case, there appears to be a “compensation” also for attractive features of male dominated jobs.

Sociologists often emphasise the effects of job segregation. According to this explanation women tend to hold less advantageous work positions and to be employed within less favourable work structures than men, regardless of intrinsic or potential productivity. Thus, job segregation by sex is, in this sense, the main source of gender differences in labour market out-comes. In the terminology of economic theory, job rationing allows discriminatory sorting of women and men into branches and firms with different levels of productivity. Historical and sociological studies find underestimation of the value and skill content of occupations perceived as “female” (Walby, 1988, Phillips & Taylor, 1980).

Both the returns to skills and the size of the premium for employment in particular industries have a potentially important role in the determination of the gender pay gap. (See e.g. Blau and Kahn, 1999.) All else equal, the larger the returns to skills and the larger the rents received by individuals in favoured industries, the larger the gender gap will be. Similarly,

[1] See Rosen (1986).

labour market discrimination and/or actual female deficits in unmeasured skills result in employers treating women as if they had lower unmeasured as well as measured skills. Thus, the higher the rewards to unmeasured skills, the larger the gender gap, after controlling for measured characteristics

The distinction between wage differences due to (different kinds of) discrimination and productivity related differentials is complicated by endogeneity or feedback effects. For instance, if women expect not to be paid according to their "human capital" they may choose to acquire less than they would have in the absence of discrimination.

3. Background and Previous Studies

The Swedish labour market is characterised by a high level of unionisation. Both the strong legal standing of the collective bargain and the strength of Swedish trade unions (including white-collared) and employer organisations make collective bargaining a central instrument for labour market regulation. Since the eighties there has been a general tendency to decentralise wage bargaining and contracts to the branch, and even to the firm, level. This tendency to decentralisation of the bargaining process has not been limited to wage bargaining but also concerned working time arrangements. Trade union membership in Sweden has risen constantly since the mid-1960s even though the union density experienced a weak decline in connection with the sharp increase of unemployment in the early 1990:s.

3.1 Women's position in the labour market

The Swedish gender earnings gap was significantly reduced between the 60's and the early 80's. However, since the mid 80's the reduction in wage inequality has been halted. One explanation for the improved situation of Swedish women is the compression of the overall wage structure. This particularly favoured women who often had wages in the lower deciles of the distribution. Another explanation behind the increasing relative wages for women prior to the early 1980's was the interplay of wage policy and demand/supply factors, which raised the price of unskilled work, a large proportion of which was performed by women. A number of political reforms strengthened women's labour market attachment. Concerning direct legal regulation of equal pay, Sweden as late as 1980 enforced an anti discrimination law.

However, such regulation had in practice been enforced in the early 70's through collective bargaining.

The expansion of the educational system seems to have improved women's position in the labour market. Since, the mid 70's the rate of enrolment in education of young women (20-24 years of age) has exceeded that of men, and it has increased over time. Separate taxation of spouse was introduced in 1971 and, in conjunction with the progressive rates of taxation in force until 1991, had a strong effect on the labour force participation of married women (Gustafsson and Bruyn-Hundt, 1991). Subsidised child-care and a generous parental leave system, relative to most countries, are important means for young women to retain their labour force attachment and human capital accumulation, compared to leaving employment in order to care for young children Gustafsson and Stafford, 1992). The work experience foregone, as well as perceived depreciation of skills, during parental leave does, however, have a considerable negative impact on wages (Albrecht et. al., 1997). A hypothetical situation without employment breaks or with parental leave equally shared between parents would result in a smaller gender wage gap.

3.2 Previous studies

Most studies of the Swedish gender wage gap focus on the 80:s and early 90:s. The most frequently used data source is the Level of Living Survey (LNU), which covers the years 1968, 1981, 1991 and 2000. Another is the HUS panel. The 1984, 1986, 1993 waves of HUS have been used for such studies.

A study by Löfström (1989) – using HUS 1984 - finds that the female/male wage ratio would have been 15-25 percentage points higher in the absence of gender wage discrimination. Among other thing she finds that returns of education and to work experience are lower for women than for men. Andersson (1995) analyses HUS data for the years 1984, 1986 and 1993. He finds that the wage offer gap[2] increased over the years, and so did the amount which can be ascribed to discrimination[3], but not to the same extent. In 1984 the male-female log wage gap was 21 percentage points of which market discrimination accounted for 13

[2] The wage gap corrected for selectivity, see section 4 below.
[3] The method of decomposing wage differentials into one part attributable to characteristics and one ascribable to discrimination is described in section 4, below.

percentage points (or 60 % of the gap). In other words, according to his wage-model, women's wages would have been on average 13 percentage points higher on average in the absence of discrimination. In 1986 this had increased slightly, while in 1993 the log wage gap had increased to 23 percentage points, discrimination to 19 percentage points (81 % of the gap). In separate analysis of wages in the public and private sectors, Andersson finds that the log wage offer gap was 27 percentage points (19 % of which was discrimination) in the private and 20 percentage points (15 % discrimination) in the public sector. In a further decomposition of the productivity differentials, human capital variables turned out to be the most important. Trying to trace compensating wage differentials, he finds that most of the estimated parameters for undesirable job characteristics had negative signs, except for "shift work".

Studying LNU data for 1981, le Grand (1991) finds that human capital and family obligation explanations for the gender pay gap account for about 30 percent of the total gap. According to his calculations, human capital variables explain approximately one-fifth of the gender pay gap. However, job segregation seems to be the most important explanatory factor in the model. Compensating wage differentials cannot be shown to make any significant contribution to the gender pay gap. In a cross section analysis on LNU -81, -91 Le Grand (1997) shows that the correlation between occupational segregation and wage does not depend on female occupations being more compatible with housework and family obligation. However, employees in male dominated occupations receive on average more on the job training. According to le Grand the correlation between the gender composition in the occupation and the wage can be explained by skill requirements, on the job training, management responsibility, social class and sector.

Taking into account the explanations mentioned above there remains a wage effect due to the proportion of women in the occupation, which cannot be explained by other variables. This net wage effect -- which le Grand interprets as the lowest possible level for the valuation of wage discrimination -- implies that women employed in a male dominated occupation (at least 90 per cent men) receive at least 9 per cent more per hour compared to women in female dominated occupations (90 per cent women). The corresponding difference for men is 6 per cent. With a model that does not control for social class and occupational segregation, the wage difference between male and female dominated occupations is 14 per cent for women and 10 per cent for men.

Palme and Wright (1992) test the hypothesis that there is a compensating wage differential associated with undesirable job characteristics, using LNU 1981. Generally, they find no evidence that the unexplained gender wage differences are associated with undesirable job attributes.

Edin and Richardsson (1999) investigate the role of wage compression for the gender gap in Sweden during the period 1968-1991 (using LNU data) and find that the effects of change in the wage structure on women's wages have varied over time and have partly counteracting effects. According to Edin and Richardsson, changes in the wage structure were particularly important up to the mid 70's, but in 1981 the wage compression effect accounted only for a minor proportion of women's relative wage gains, compared to the mid 70's. The small increase in the gender wage gap between 1981 and 1991 seemed according to Edin and Richardsson be driven by changed inter-industry wage differentials.

Arai and Thoursie (1997) finds that there are systematic, gender specific wage differentials, i.e. women earn less than men both across and - even more so - within occupations, and that these wage differentials cannot be explained by observed personal background characteristics, or by individual productivity-related or job-related characteristics. If women were distributed over occupational groups in the same way as men are, their share would fall noticeably in "health and social work", "financial and office-technical work" and "services". On the other hand, the female share would increase considerably in "manufacturing" and in "technical and medical work, etc. "

According to Arai and Thoursie, if women chose or were selected into occupational groups in the same way as men, the female share would increase considerably in the category "blue-collar, skilled". The female share would also increase in the category "white-collar high level" but would fall in "blue-collar, unskilled" and in "white-collar, unqualified". According to the segregation indices, the differences in men and women's occupational choices cannot be explained to any great extent by level of education.

Using register data from employers, Meyerson and Petersen (1997) study the gender wage gap for women and men at the same work establishment and with similar duties and level of position. They show that the total gender pay gap in 1990 was on average 12.8 percent for

blue-collar workers and 27.8 for white-collar workers. According to their analysis the total gender wage gap increased by 1.5 per cent between 1970 and 1990, while the gap for white-collar workers declined during the period.

le Grand, Szulkin and Thålin (2001) follow changes in the Swedish wage structure through the LNU. As Edin and Richardsson (ibid.), they find that the gender wage gap, both unadjusted and adjusted for education and experience, decreased in the periods 1968-74 and 1974-81, particularly in the former, while it remained virtually constant 1981-91. The latest wave of LNU, indicates that from 1991 to 2000 there was a slight decrease in the unadjusted gap and a slight increase in the adjusted. le Grand, Szulkin and Thålin conclude that the most important factors behind the decrease in the gender gap 1968-81 were an improvement in the relative position of women compared to men in the same education and experience-categories and, particularly during the first period, decreased wage differentiation within these categories. Conversely, the convergence between men and women in terms of education and experience after 1981 has not resulted in a commensurate convergence in wages, mainly because wage differentiation, given education and experience, has grown.

le Grand, Szulkin and Thålin note that the adjusted gender wage gap was larger in the private than in the public sector. In the first three waves of LNU women earned more in the public than in the private sector, given education and experience. In 1991 and 2000 they earned more in the private sector.

4. Empirical model

In order to examine determinants of female and male wages, cross-sectional wage equations are estimated for the years 1981-1991 and 1993-1998. The first step is to estimate wage equations separately for women and men. The hourly wage of individual i may be written as

$$\ln W_i = X_i \beta_M + e_i \qquad [1]$$

if i is male and as

$$\ln W_i = X_i \beta_F + e_i \qquad [2]$$

if i is female. The subscripts M and F indicate that the parameter refers to male and female, respectively. $\ln W_i$ is the natural logarithm of the hourly wage, X_i is a vector of variables believed to determine earnings and e is an error term with zero mean and normal distribution.

It is common to refine the wage equation by using Heckman's (1979) correction for sample selection bias. In this case, a reduced-form probit equation of the probability of having any observed wage (i.e. of W_i being greater than zero) is estimated and used for the construction of the so-called Mills ratio, the inverse of which ("Heckman's lambda") is introduced into the wage equation. The reason for the correction is that if the probability of being employed is correlated with unobserved capacity to earn, the error term in the wage equation will be correlated with wages. The distribution of observed wages will differ from the distribution of "offered wages", which also include the potential wages of those who are not employed and parameter estimates will be biased.

A correction was done in the present study, with a selection equation including dummies for age categories, citizenship, marital status, presence of children in different age intervals, regional (county level) unemployment rate and a variable indicating whether the individual is entitled to disability benefits. The inverse of the Mill's ratio was significant in the wage equation for women in six years out of 16, but only in two years for men. In addition, the parameter for lambda in the male equations was negative in all but two cases (and in these it was not significant). Because of this, and of the well-known difficulty of specifying the selection equation correctly, we concluded that with the restrictive filters we had applied, selectivity in employment did not significantly affect our results and that it was better to omit the attempt at correction.

In this paper we will decompose the gender wage differential, following the standard method of Oaxaca (1973). Since residuals are assumed to have zero mean, the difference between the average log wages for men and women is:

$$(\ln \overline{W}_M - \ln \overline{W}_F) = (\overline{X}_M \hat{\beta}_M - \overline{X}_F \hat{\beta}_F) \qquad [3]$$

where hats (^) denote parameter estimates (estimated by OLS) and bars (¯) indicate mean values.

Assuming that a non-discriminatory wage structure, β*, is known it is possible to rewrite [3] as:

$$(\ln \overline{W}_M - \ln \overline{W}_F) = \overline{X}_M (\hat{\beta}_M - \beta^*) + \overline{X}_F (\beta^* - \hat{\beta}_F) + (\overline{X}_M - \overline{X}_F)\beta^* \qquad [4]$$

The terms $\overline{X}_M (\hat{\beta}_M - \beta^*)$ and $\overline{X}_F (\beta^* - \hat{\beta}_F)$ on the right hand side in [4] may be interpreted as possible discrimination. These terms represent the amount by which men's and women's pay, respectively, differ from the assumed non-discriminatory wage. The third term, $(\overline{X}_M - \overline{X}_F)\beta^*$, represents difference in average characteristics between men and women weighted by the non-discriminatory rate of return.

There are several ways of constructing the assumed non-discriminatory wage structure, β*. It may be defined by a weighting matrix, as:

$$\beta^* = \Omega\hat{\beta}_M + (I - \Omega)\hat{\beta}_F \qquad [5]$$

where Ω is a weighting matrix and I is the identity matrix.

Setting Ω=I implies that $\beta^* = \hat{\beta}_M$ and equation [4] becomes

$$(\ln \overline{W}_M - \ln \overline{W}_F) = \overline{X}_F (\hat{\beta}_M - \hat{\beta}_F) + (\overline{X}_M - \overline{X}_F)\hat{\beta}_M$$

With the opposite assumption, Ω=0, and $\beta^* = \hat{\beta}_F$. Equation [4] becomes

$$(\ln \overline{W}_M - \ln \overline{W}_F) = \overline{X}_M (\hat{\beta}_M - \hat{\beta}_F) + (\overline{X}_M - \overline{X}_F)\hat{\beta}_F \qquad [7]$$

In [6] the male wage function is treated as the true representation of the relationship between characteristics and productivity, while the female function is assumed true in [7]. The last

term in each of equations [4], [6] and [7] are called “the endowment term” or “the explained part” because they indicate the part of the wage gap which can be attributed to measured differences in characteristics (endowments). The remainder represents the part, which cannot be explained by the variables included in the wage model, and is sometimes referred to as “the discrimination term”,

Another possibility, as in Oaxaca and Ransom (1994) is to use $\Omega=(X'X)^{-1}(X'_M X_M)$. This produces a β^* equal to the OLS-estimate that would be obtained from estimating the wage-equation on the pooled sample of men and women.

5. Data and definitions

5.1 Data

The Swedish Household Income Survey (HINK) is a survey tailored to the study of income distribution in Sweden, and has been conducted annually since the mid 70s. The reference population consists of all persons living in Sweden at least half of the calendar year. Survey data is collected through telephone interviews, but also from administrative registers and tax return forms. Both the selected respondent (“the sampling person”), who has to be of age 18 or older, and his/her household, are included in the survey. HINK includes 10 000 – 18 000 households annually.

The survey is rich in variables concerning income, transfers and taxes. There are many background-variables as well as, for example, the industry a person is working in, occupation, region of residence and marital status. These characteristics, i.e. a relatively large sample, the richness of variables and the fact that the survey is conducted annually, make it suitable to use HINK to investigate the male-female wage gap in Sweden.

From HINK, we have drawn a sub-sample, consisting of respondents (“the sampling persons”, not the other members of their households) 20-64 years of age, reporting any labour related income. We have excluded self-employed, farmers and full-time students as well as agricultural workers and persons working in forestry and fishing. In addition, observations

with missing values for any variables used in the models are deleted. This has left us with data sets including between 3400 and 5600 individuals each year.[4]

5.2 Choice of model

The variables used in the wage equations are: age, age squared, dummy variables for level of education, for being a blue- or white-collar worker, industry, region, for being employed in central government, local government or in the private sector, citizenship, share women in occupation. (For exact definitions, see Table A1.) As HINK is a stratified data set, where the stratification has been changed several times during the period of study, we have used weights when estimating mean values and in regressions. The weights are the inverse of the probability of being included in the sample. [6]

As may be seen in Table A2, the classification of industry[7] and, more important, the variable for wage per hour are defined somewhat differently in the period 1981 to 1991 compared to the period 1993 to 1998.[8] In the period 1981 to 1991 it is not possible to measure the exact working time, as respondents were asked about their normal, not actual, working time. This means that absence due to sickness, parental leave or holidays are included in the working time. For this reason, the calculation of hourly wages during the first period includes time as well as pay both for working time, sick leave, parental leave and holidays.[9] During the period 1993 and onward, respondents are asked about their actual working time, not including time of absence. For this period, hourly wage is, therefore, estimated from hours actually worked and pay for this work.

[4] The reason for excluding the two latter groups is that they are very small and in some survey waves there are no female respondents working there. Also, we did not find any "natural" other group to include them in

[6] The weights used in this study are not identical to those provided by Statistics Sweden for HINK, but based on the same information. The original weights were constructed for the sample of all household members and had to be adjusted to take into account that we only included the "sampling persons".

[7] 1981 to 1991 employed were classified according to SNI69, while from 1993 and onward they were classified according to SNI92. At the relatively aggregated level used in this study discrepancies are not too large.

[8] Also, the 1990-1991 tax-reform changed the definition of taxable income. This makes it difficult to compare the wage gap before and after the tax reform.

[9] As sickness benefits and pay for parental leave did not amount to 100% of wage during the period, these sums are adjusted up to full payment. If we had not made this adjustment, there would have been larger downward bias in the measurement of women's wages than in that of men's, since women use parental leave more often than men. The initiation of the "employer-period" (arbetsgivarperiod) in the sickness benefits in 1992 makes it

Also, it is not possible to determine the level of education of the individuals before 1988. To take education into account, we have instead used the normal educational requirement for positions, from the socio-economic classification of the population.[10] Thus, the variable does not directly reflect education of the individual, but the educational requirement of the occupation in which the individual is employed. This is not standard in wage-models but has advantages as well as disadvantages. The standard education variables (years or highest level of schooling) are included in wage equations as a measure of human capital, which is assumed to be a determinant of the productivity of individuals. The human capital represented by an education that is not utilised in the actual work of the respondent does not necessarily increase productivity whereas knowledge and skills acquired in non-standard ways may be as productivity enhancing as formal schooling. This is a rationale for including variables indicating educational requirements for a position into the wage-equation. This rationale is stronger the more education is seen as skill enhancing and weaker the more it is taken as just signalling general ability.

This reasoning is in line with that behind the ORU models, which include either years of Over-, Required and Under-education as three separate variables or years or level of required education as well as dummies for being over- or undereducated. Hartog (2000) discusses different measures of required education and specification of ORU-models. According to his survey of studies from different countries, the results are very similar in three respects: Returns to required schooling are higher than the returns to actual education. Years of over-education are rewarded, but less than years of required education. Undereducated workers earn less than workers in similar jobs who have the required level of education, but more than workers with same level of education but in jobs where the required level is lower. Tests of the ORU-model against the standard Mincer equation indicate that the ORU specification is superior (see Hartog op. cit. and references therein). The Mincer model includes actual education but omits required. Our model does the reverse. Thus, both approaches can be seen

impossible to construct the hourly wage rate used between 1981-1991, therefore this year is excluded from the analysis.

[10] The classification is made as follows: unskilled blue-collar workers and some lower level white-collar workers (where normal educational demands after primary education is less than two years) are being categorised as having the lowest level of education. The second level includes those in jobs which require at least two but less than three years of schooling beyond primary education, such as skilled blue-collar workers and some lower level white-collar workers.. The third level of educational requirements is defined as at least three but less than six years beyond primary education. This includes middle level white-collar workers. Last, higher white-collar workers and staff in leading positions normally need the highest level of education, at least six years of education after primary school.

as faulty relative to a desirable ORU-model. The relationship of the ORU-model to economic theory, in particular human capital theory, is complex. Since space does not permit an extended discussion, the reader is referred to Hartog (op. cit.).

In the HINK-samples from 1988 onwards both actual and required education are available. [11] Men are more likely than women and older respondents more likely than younger to have jobs corresponding to a higher level of education than their formal schooling while women are more likely to have higher education than the job requires. This agrees with the results of Oscarsson (2001) and Böhlmark (2001) as well as with studies from other countries (for references, see Böhlmark, 2001)

Oscarsson (2001) finds that the share of under-educated workers in the Swedish private sector in 1999 was about 35 percent while 9 percent were over-educated. The probability of being under-educated is larger for men, increases with age and decreases with experience. The largest group of under-educated is men with lower secondary education working in jobs that require upper secondary education.

According to Oscarsson, the probability of under-education is highest in knowledge-intensive industries. When an industry goes through rapid expansion and technological change, formal training for jobs may not be available or not able to keep pace with demand. This may create openings for "self-taught" workers or on-the-job learning as a substitute for formal education. Examples are engineering industries and some services 30-40 years ago and the young IT-industries today. We consider under-education partly to reflect periods when the rate of structural change and social mobility in the Swedish economy were higher than the rate of expansion or adjustment of the education system. The fact that more men than women in the

[11]Our proxy for education is correlated with the actual level. From 1988 onward, we have information about the educational attainment of individuals. Of respondents in our lowest education category, 31-34 percent have only primary education (the range is over the years of observation), 48-62 percent have secondary education (mostly short secondary education), and 2-7 percent have university education. In the second category, 18-32 percent have primary education, 59-71 percent secondary (mostly short), and 5-11 percent university education. In the third educational category, 8-15 percent have primary education, 32-40 percent secondary education and 45-56 percent university education (mostly shorter than three years). Finally, in the highest category of education, 3-8 percent have only primary education, 18-24 percent have secondary education and 68-77 percent have university education (mostly longer than three years). Conversely, of those with primary education (förgymnasial utbildning), 36-49 percent are being categorised in the lowest category of educational requirements, 18-27 in the second category, 8-10 in the third, and last, only 2-3 percent in the highest category of education. 29-39 percent of respondents with secondary education (gymnasial utbildning) fall in the lowest category, 29-38 percent in the second category, 13-19 percent in the third and 4-6 percent in the highest. Of those who have university

sample have lower education than is usually required for their jobs, indicates that the possibility of advancement without the formal qualifications was greater for men.

According to both Oscarsson and Böhlmark (ops. cit.) women and immigrants are more likely than men to be over-educated which may indicate discrimination, and the likelihood decreases with experience, which could reflect that search time is necessary for job-education matching.

The share of women in occupation was measured at the two-digit level of classification. Some occupations in some years included few observations. To increase precision and stability in estimates the average share for the whole period was used instead of the share for each year.

The model was also estimated with variables for occupation at the one-digit level of classification added. Including occupation, industry and share female in occupation created problems of collinearity and the parameter estimates became quite volatile. Therefore occupational categories were omitted from the final model. We can note, however, that the sample shows a high degree of occupational segregation by gender. The three most common occupations for women are health care-, service- and accounting and clerical work. While these categories together include 55-60 percent of the women, only about 10-15 percent of the men belong to them. For men, mining- and manufacturing and scientific and technical occupations make up about 60-65 percent of the male workforce, but only about 20 percent of the female. During the period, most occupations have maintained their share of population at a relatively stable level.

Another aspect of segregation is the predominance of women in the local government sector. While most studies only control for public versus private sector employment, the HINK data allow us to distinguish also between central and local government.

The earlier waves of HINK do not include information about country of birth, only about citizenship. (In a more detailed study of the 1990's we have access to information about country of birth.). We included dummies for Swedish, Nordic and non-Nordic citizenship. A more detailed division was not meaningful due to the limited number of observations.

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education, 3-7 percent are included in the lowest category of educational requirements, 7-10 percent in the second category , 38-53 percent in the third and 29-41 percent in the highest.

Descriptive statistics of the data are found in Tables A2-A3 in the appendix.

6. Results

6.1 Average wage differentials

TABLE 1A AND 1B ABOUT HERE

Table 1A shows observed arithmetic mean differentials and geometric mean differentials of hourly wages expressed in percent of the female wage. The table shows that the wage gap was between 15-20 percent up until 1989, when there was a relatively sharp increase in the gender wage gap.[12] In the 90s the observed differentials are between 20-25 percent. There is no marked trend either during the 1980s or the 1990s, but two different levels. Both measures indicate an increase in the wage differentials between 1981 and 1998.

Some increase in the gender gap in 1990 could be an artefact due to the tax reform 1990-1991. By decreasing marginal tax rates in higher income brackets and widening the tax base, the reform encouraged a shift from non-monetary fringe benefits to salaries. A more detailed look at wage growth 1989/90 and 1990/91 for different gender and socio-economic categories in the private and public sector led us to the conclusion that this was not an important reason for the observed increase in the gender gap.[13]

[12] It is worth noting that the increase in the gender wage gap occurs before both the tax-reform of 1991 and the changed income-definition in the HINK-data from 1993 onwards, which indicates that the increase is not due to changes of definition of income.

[13] If men are more likely to have enjoyed fringe benefits than women, a shift from beneftis to money would make an existing but hidden gap visible in the wage data. Therefore we have looked at the year-to-year development of nominal wages for 12 subsamples - male and female higher level and middle/lower level white collar staff and blue collar workers in the private and public sectors, respectively. It seems reasonable to assume that higher level white collar staff in the private sector are likely to have most fringe benefits. There could also be a bias towards men, within categories. What we find is that the gender gap increases in all categories in 1990, but more in the public than in the private sector, if the average is taken across socio-economic categories. The growth 1989/90 is highest for female higher level employees in the public sector. It is also high for male higher and lower white collar workers in the public sector and female higher level employees in the private, but not for male. Whatever drives the increase in the gender gap that particular year, it does not seem to be high increase in monetary rewards to male managerial staff in the private sector which would be the main expected "tax reform effect". The following year, 1991, higher level male employees in the private sector do have higher wage growth

Table 1B shows the unadjusted geometric mean differentials (same as in Table 1A) as well as the differentials adjusted for the wage structure. We find that both the adjusted and the unadjusted gender wage gaps increase over time. This agrees with Holmlund (2001) who finds a slightly lower gender wage ratio in 1998 than in 1992 and a slightly larger adjusted wage gap. le Grand et. al. (2001) find that the unadjusted gender differential increased from 1981 to 1991 and decreased from 1991 to 2000. (The total increase is three percentage points.) The gender differential adjusted for human capital variables and for working in the private sector is practically constant. This differs from our results, both as regards the size of the increase in the observed gap and in that we find an increase also in the adjusted gap. (The results need not be incompatible since we control for more variables.)

In both studies decompositions of the Juhn-Murphy-Pierce type are performed and indicate that while *ceteris paribus* the convergence in qualifications between employed women and men should have caused a convergence also in wages, changes in the wage structure, which were unfavourable to women, resulted in a net increase in the gender gap. This is very much consistent with our finding of an increased difference between adjusted and unadjusted wage gaps. (See table 2.)

TABLE 2 ABOUT HERE

In Table 2 our results are compared to those of other studies estimating gender wage differentials on Swedish data. The differences between estimates made within a short time period and between different studies using the same data indicate that results of this kind of estimates are sensitive to changes in sampling, sample inclusion and definitions.

6.2 Mean values

The variable means as well as sample sizes for women and men, respectively, are reported in Table A2 and Table A3. In this section we will summarise the main changes in labour force characteristics for women and men over the period of observations.

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than other groups, which may have something to do with the tax reform. But in 1991 there is little change in the gender gap.

Mean age was fairly constant over time, for both women and men, approximately 39 years, until the beginning of the 1990s. At this point mean age began to increase, faster for women than for men. In 1998, mean age was about 42 years for women and 41 for men, mainly because the number of employed women aged 45-54 grew faster than that of men of that age during this period.

Men had a higher average level of education, or rather jobs with a higher level of educational requirements, than women during the whole period under study but, although the level increased for both sexes, the increase was larger for women. Thus the education gap was reduced over this period. As was explained in the previous section, "educational requirements", is divided into four categories. For women, the share in the lowest category of education decreased from over 50 percent to about 35 percent, the share in the second category was roughly constant with 24-27 percent of the population. The shares of the population belonging to the two highest categories of education increased during the period. For women, the third category increased from 15-20 percent in the beginning of the period to just over 25 percent at the end of it, while the share of the highest category increased from about 6 to 15 percent. For men, the lowest category of education decreases from about 30 percent to 25 percent. Also, the share in the second category of education decreases from about 35 percent to about 30 percent. The two highest levels of education increased their share of the male population also, from about 20 percent to about 25 percent and from 13 percent to 20 percent, respectively.

There are also large differences between the distributions of male and female employees over the nine main industries Just over a half of the women work in the social and related community services industry (including education and health care), while this is true for only 12-14 percent of male workers. About one third of the men are working in the mining and manufacturing industry. Of the women, 11-14 percent are working here. These shares are also relatively stable over time. The share of the employed[14] working in mining- and manufacturing industry decreases somewhat, while the share working in financial institutions, insurance, real estate and business service industry and social and related community service industry increases slightly.

[14] For simplicity, ”employed” is used for working respondents even though we have excluded the self-employed.

Of employed men, 71-83 percent work in the private sector, while this is the case for 38-46 percent of employed women. Both shares increase over time. About half of the women work in local government, but only 11-17 percent of the men. The shares working in central government are rather similar: 5-11 percent of the women and 6-16 percent of the men. The total share working in central government has decreased from over 20 percent in the early 1980s to 13 percent in 1998. One reason is the transfer of schools from central to local government authority. Despite this, there is nevertheless a decrease in local government employment in the 1990s.

6.3 Regression results

This section mainly reports the development of the parameter estimates. In Table A4 and Table A5, we report the results for the years 1981, 1986, 1991, 1995 and 1998 for women and men, respectively. (Estimates for the remaining years are available from the authors on request.)

Starting with parameter estimates for educational requirement, estimates are relatively stable over time. There are no large differences between estimates for women and men either during the 1980s or the 1990s. However, during the 1990s, the earnings premium for being in the highest educational category falls slightly.

If education requirements for a job always matched the actual education of the incumbent, the estimated premium for a given education-level would be the same irrespective of whether required or actual education was used. If the mismatches were all due to under-education, it follows from the argument in section 5.2, that the premium for "university education" would be lower if this means "university education required" than if it meant "respondent has university education".

Conversely, if all mismatches were due to over-education, the "university premium" would be higher if it referred to "required university education" than if it meant "actual university education".

le Grand et al. (2001), Oscarsson (2001) and Böhlmark (2001) all find that over-education is relatively more common among Swedish women than among men, while under-education is more common among men. If this is true also for the HINK sample and if the effects of over- and under-education were the same for men and women, the estimated difference between male and female premia for higher education, would come out smaller in the equations using required education than if we had used actual education[15]. The last "if" is, of course, a big one, and impossible to prove. It seems, however, a plausible hypothesis to say that a reason why while the premia for higher education for men is clearly higher than that for women according to the studies of Holmlund (2001) and le Grand et. al (2001), this is not the case with our "required-education"-estimates. At least, the results are not incompatible.

The dummy variable for being a white-collar worker has a positive effect on male wages, while there is no visible effect on female wages. This may indicate that the difference in pay between female dominated and male dominated occupations is larger for white-collar work than for blue-collar work.

Effects on earnings of living in different regions are all relatively small and insignificant. The exception is living in the Stockholm region, which entails significantly higher pay throughout the period. At the end of the period, there is also a significant wage premium for living in the Göteborg or Malmö regions.

Working in central government, local government or in private sector does not seem to have much effect on wage rates, for either women or men, when industry is controlled for. Yet, in some years we find a significant positive wage premium for men working in central government, compared to the private sector.

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[15] To make the argument clearer: Assume that a wage equation is estimated with a variable for "a job which requires higher education" for men and women. respectively. Call the parameter for this variable α A second equation is estimated with a variable for actual university education, instead- Call the parameter β. Our argument implies that for each sex i, the difference $\delta_i = \alpha_i - \beta_i$ is smaller, the greater the proportion of undereducated, and greater the proportion of overeducated individuals.

To conclude from this that $\delta_f > \delta_m$ we would need to know not only that the level of actual education relative to required education is higher for women, we would need to know that the impact of "non-matching" education is the same for men and women. If and only if the latter is true, it follows logically that $(\alpha_m - \alpha_f) - (\beta_m - \beta_f) = (\alpha_m - \beta_m) - (\alpha_f - \beta_f) = \delta_m - \delta_f < 0$

and, thus, $(\alpha_m - \alpha_f) < (\beta_m - \beta_f)$, i.e. that our specification produces a small gender difference in education premia than a standard Mincer specification.

Also, having a foreign citizenship does not seem to affect wages much, in either direction although the parameter for being born in other countries than the Nordic is significant in some wage-regressions. However, it may be the case that the disadvantages for immigrants consisted more of being excluded from the labour market than in wage discrimination (see le Grand and Szulkin, 2000). Given the relative small number of non-Swedish nationals in our sample, conclusions from it must, however, be only tentative.

The share of women in an occupation has no significant effect on wages for women, but for most years there is a significant negative effect on wages for men. It appears that women would not gain much in terms of wages by switching to traditionally male-dominated jobs but men are penalised if they choose to work in a female dominated occupation.

Finally, the parameters for sector as well as for industry fluctuate heavily. There are two possible explanations for this – first, the numbers of observations in some of these categories are very small for either of the sexes and second, sector, share of women and industry of occupation are all correlated which makes the estimates makes the estimates unstable, even though we have omitted the occupation dummies (see above).

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6.4 Decomposition results

Tables 3 and 4 show the decomposition of the endowment term into parts attributable to different variables or groups of variables, (in percent of the total log differential), weighted according to the female and male equations respectively, as described in section 4 above.

TABLES 3 AND 4 ABOUT HERE

A positive number may be interpreted as the percentage by which the gender wage gap would be reduced if men and women were equal in respect to this characteristic assuming that the characteristic is rewarded according to the estimated wage function for women/men. If a term is negative it means that if women were more like men in this respect but wage functions remained the same, the gender gap would actually increase. As an illustrative example, the variables for region tend to produce a negative contribution to the wage gap of 1-2 percent.

Both men and women have somewhat higher wages in the Stockholm region (all else equal). Therefore the slightly higher share of the female workforce living in Stockholm raises women's average wage relative to that of men. If as few women as men lived there, the gender gap would increase.

The first column in Table 4 shows that if the male wage equation is used as a benchmark the variables included in our wage equation explain a part of the gender wage gap. The results indicate that if we evaluate jobs and qualifications as is done in the male wage equation, then differences in terms of these account for between 45 and 60 percent (with the exception of 1985 and 1987) of the gender wage gap. The rest remains unexplained by the variables in this model.

Table 3, however, indicates that if male and female endowments had been similar, the wage gap would have been reduced also if they were rewarded according to the female wage function, but by much less than according to the male function.

The education (or, to be precise, educational requirement) term has had a considerable impact on gender earnings differences, irrespective of which wage function we use. The impact has, however, decreased over the period studied and is about half as big in the 1990s as it was in the 1980s. Most of the share attributable to education is due to the premium for the highest education category. Most of the decrease over time is explained by a decreasing difference between the proportions of women and men whose jobs require this level of education.

During the first part of the period of observation, the average age of male and female respondents is almost the same. In the second half of the 1990s, the average age of female respondents is about a year higher than that of male. Since there is a positive age premium, this reduces the gender gap, although by a very small amount.

Neither gender differences in region of residence or in country of birth have any impact on the wage gap. In the regressions, only "living in Stockholm" was significant among the regional dummies but the differences in proportions between men and women are small. Being a citizen of a Nordic country other than Sweden cannot be shown to have any importance for the overall gender wage gap – since only 2-4 percent of the samples are foreign citizens it

would have taken a very large difference in degree of discrimination of male and female immigrants to contribute significantly to the endowment term.

Concerning the endowment term attributable to sector of occupation, i.e. central and local government in relation to private sector, it is interesting to note that the main impact is found for employment in local government irrespective of which wage function we use. However, the term is volatile and we find no clear trend over time but on average it tends to reduce the gender pay gap.

The term attributable to the proportion of women in occupation indicates a strong positive impact on the gender wage gap using the male equation. When using the female equation the term is negative in the majority of years. In the cases when it is positive, it is small. This may indicate that women, given their wage structure, do not choose jobs that are badly paid. However, because of the quality of the variable we are cautious in drawing further conclusions from this term in the decomposition analysis. Generally, we find very little impact of the term attributable to white-collar worker.

7. Summary and Conclusions

In this paper we have analysed the development of the Swedish gender earnings gap through the 1980s and the 1990s. We followed changes in the wage gap and in factors to which it can be related and focused on trends and patterns rather than individual years.

One such pattern was the variation in the observed wage differentials, which varied between 15-18 percent of the average female wage up to 1989 when the differentials increased. During the 1990s the differential varied between 20-25 percent. Since the data allows us to study each year we can see that the shift is attributable to a change in the level rather than a continuous increasing trend.

In the first stage of the empirical analysis separate wage equations were estimated for women and men. We find small differences between women's and men's earnings premium in the highest category, a difference that has decreased over the period observed. Thus, while the premium for higher education for men is clearly higher than that for women according to the

studies of Holmlund (2001) and le Grand et. al (2001), this is not the case with our estimates. A plausible reason for this is that in our specification "university education" means that this is required for the job, in theirs it stands for acquired education. Due to gender differences in incidence and wage-impact of over- and under-education, the choice of variables is likely to affect results.

The proportion of women in occupation generally had a negative effect on men's wages, while the parameter estimates were not conclusive for women. Thus, it appears to be the case that men working in female dominated occupations are being penalised in terms of pay, but there is not conclusive evidence of a corresponding reward for women entering male dominated jobs. Among men, white-collar workers generally gain compared to blue-collar workers, while, again, the results are inconclusive for women. We found no clear evidence that work in central government, local government or private sector affect wages much.

Industry parameters fluctuate heavily and we found no clear effects on either women's or men's wages. One reason for this could be that the numbers of observations in some of these categories are very small with respect to gender and second, industry, public/private employment and share of women in occupation all are correlated which makes the estimates volatile.

As expected living in the Stockholm region entails significantly higher pay throughout the period and is also true for the larger cities (Göteborg and Malmö) during the economic upturn in the late 1990's. There was, however, no evidence that foreign citizenship affected wages negatively, which is almost certainly caused by the small numbers of immigrants in the sample.

When differences in observed characteristics between male and female employees were evaluated according to the wage function for men, they accounted for almost exactly one half of the gender wage gap. This is taking averages of the "endowment share" over the years. For all but two years, the share is within the range 46-54 percent. When the differences in endowments are priced according to the female wage function the percentage accounted is considerably smaller but also fluctuates more - from -4 to +25 percent (even when one "outlier" year is excluded). When using the female wage function we see a tendency for the endowment share to increase over time, but not when using the male. (If anything, there is a

very slightly tendency for it to increase.) The difference between the endowment shares when using male or female parameters indicates a large "chilling effect" in Sweden (Daymont and Andrisani, 1984). In other words, men loose much and women gain relatively little by acquiring untypical labour market characteristics

Instead of shares of a varying gender wage gap we can look at the percentage point-difference between male and female wages that cannot be accounted for by the model. This amount turns out to be more stable over time. When endowments are evaluated according to the male wage function, a gender gap of 6-9 percentage points is unexplained in 1981-91 (with one exception) and of 10-11 percent in 1993-1998. When the female wage function is used, the "discrimination term" corresponds to a gender gap of 11-15 percent in 1981-91 and of 15-19 percent in 1993-98. Thus, in these terms we see an increase in the gender wage gap over time, despite some convergence in observed characteristics which, all else equal, would have decreased it. This agrees with other studies of the 1980s and 1990s.

Although our analysis confirms the results of previous studies concerning human capital factors and the development of the gender wage gap over time it is difficult to disentangle some driving forces behind this trend. The distinct shift in the observed wage differentials between 1989 and 1990 is clearly an interesting new feature. As mentioned above, our results indicate that the difference between adjusted and unadjusted wage gap has increased over the period. In the light of our results, as well as of other studies cited above, we believe this to be mainly attributable changes in the wage structure, which are not well captured by standard human capital and job-characteristics. Further analysis should concentrate therefore on structures, on wage setting, employment and promotion procedures as well as other institutional factors.

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Table 1A. Male-female wage differentials (percent)

	Observed arithmetic mean differentials [a]	Observed geometric mean differentials or log differentials [b]
HINK		
1981	18.7	18.3
1982		
1983	16.4	14.4
1984	15.4	15.0
1985	16.5	17.0
1986	14.7	15.0
1987	15.9	15.6
1988	17.3	18.0
1989	16.6	16.4
990	22.0	21.1
1991	20.9	19.2
1992		
1993	23.0	23.0
1994	22.8	21.9
1995	25.0	24.5
1996	25.2	23.5
1997	23.7	21.8
1998	23.7	22.8

a $\left[\frac{\overline{W}_M}{\overline{W}_F} - 1\right] x100$

b $\left[\exp(\overline{\ln W}_M - \overline{\ln W}_F) - 1\right] x100$

Table 1B. Unadjusted and adjusted arithmetic wage differentials

	Unadjusted wage differential [a]	Adjusted wage differential [b]	Unadjusted female/male wage ratio [c]	Adjusted female/male wage ratio [c]	Unadjusted-adjusted wage differential
1981	18.3	9.5	0.85	0.91	8.8
1982					
1983	14.4	6.7	0.87	0.94	7.8
1984	15.0	7.7	0.87	0.93	7.3
1985	17.0	11.1	0.85	0.90	5.8
1986	15.0	6.5	0.87	0.94	8.5
1987	15.6	2.9	0.86	0.97	12.7
1988	18.0	9.3	0.85	0.92	8.7
1989	16.4	6.6	0.86	0.94	9.8
1990	21.1	9.7	0.83	0.91	11.4
1991	19.2	9.4	0.84	0.91	9.8
1992					
1993	23.0	12.1	0.81	0.89	10.9
1994	21.9	11.0	0.82	0.90	10.8
1995	24.5	12.9	0.80	0.89	11.6
1996	23.5	12.0	0.81	0.89	11.5
1997	21.8	11.5	0.82	0.90	10.4
1998	22.8	11.5	0.81	0.90	11.4
1998	22.8	11.5	0.81	0.90	11.4

a $\left[\exp(\overline{\ln W}_M - \overline{\ln W}_F) - 1\right] x100$

b $\left[\exp(\overline{\ln W}_M - \overline{\ln}(\beta_F X_M)) - 1\right] x100$

[c] Average female wage in percent of male

*Table 2. Comparison with previous findings from Swedish data**

	Observed arithmetic mean differentials	**Observed geometric mean differentials**
LNU		
1981[a]	27.4 (18.7)	21.3 (18.3)
1981[b]		19.7 (18.3)
1981[c]	24 (18.7)	
1981[d]	20.5 (18.7)	20.6 (18.3)
1981[e]		20.6 (18.3)
1991[c]	22 (20.9)	
1991[f]		21 (19.2)
1991[e]		21.5 (19.2)
HUS		
1984[g]	23.1 (16.4)	21.0 (15.0)
1986[g]	13.4 (14.7)	18.5 (15.0)
1993[g]	17.5 (23.0)	19.5 (23.0)

*Corresponding HINK-results in brackets

[a] Palme and Wright (1992)
[b] le Grand (1991)
[c] Arai and Thoursie (1997)
[d] Gustafsson and Lantz (1985)
[e] Edin and Richardsson (1999)
[f] le Grand (1994)
[g] Andersson (1995)

Table 3. Decomposition of the gender gap in log wages using women's parameter estimate in percent

	FEND	EDUC	SEITJM	AGE	INDUST	REG	CITIZEN	STATE	MUNICIP	PR W
1981	8	29	0	0	20	0	0	2	-12	-30
1982										
1983	12	18	-1	1	27	0	0	4	-19	-19
1984	-4	13	0	0	-6	-1	1	-1	6	-15
1985	47	24	2	-1	12	0	0	-1	8	4
1986	-4	14	0	-1	15	-1	0	-1	2	-32
1987	2	17	0	0	-2	-2	0	-1	3	-14
1988	2	9	-1	0	5	-1	0	0	-3	-8
1989	12	10	0	-2	-11	0	0	0	13	3
1990	16	22	0	0	-3	-1	0	0	7	-9
1991	15	16	1	-1	4	0	0	0	8	-12
1992										
1993	20	9	0	-1	14	0	0	0	2	-4
1994	4	14	0	1	-5	0	0	0	8	-13
1995	9	6	0	-2	9	1	0	0	-5	1
1996	16	7	-1	-1	3	0	0	0	11	-3
1997	21	6	-1	-8	18	-2	0	0	2	5
1998	26	10	0	-3	23	-1	0	0	-4	0

FEND total endowment term in percent of total wage gap, weighted by parameters in the wage equation for women.

EDUC;	Seiutb1-Seiutb4
AGE ;	Age, Age2
INDUST;	Ngr23-Ngr93
REG;	RegSth-RegN2790
CITIZEN ;	FSverige, FNorden, FOvarlden
STATE;	Yrkst1
MUNIC;	Yrkst2
PR W;	Andkvin

Table 4. Decomposition of the gender gap in log wages using men's parameter estimate in percent

	MEND	EDUC	SEITJM	AGE	INDUST	REG	CITIZEN	STATE	MUNIC	PR W
1981	46	25	1	0	3	0	0	1	-3	19
1982										
1983	52	18	-6	2	29	0	0	0	-19	22
1984	47	7	-7	0	32	-1	0	1	-16	24
1985	33	11	-4	-2	-1	-1	0	-1	3	23
1986	55	14	-4	-1	15	-1	0	1	-1	28
1987	80	20	-3	0	33	-1	0	1	-7	36
1988	46	20	-1	0	23	-1	0	0	2	3
1989	58	10	-2	-3	24	0	0	0	9	17
1990	52	19	-2	-1	16	0	-1	1	-6	23
1991	49	13	-2	0	23	0	0	1	-6	19
1992										
1993	45	9	-2	-1	7	-1	0	0	2	29
1994	47	11	-3	1	13	0	0	1	5	17
1995	45	2	-4	-2	17	1	0	0	14	12
1996	46	8	-2	-1	17	-1	-1	0	15	10
1997	45	0	-8	-6	44	-3	0	1	-20	29
1998	48	6	-3	-3	25	-1	0	0	0	20

MEND total endowment term in percent of total wage gap, weighted by parameters in the wage equation for men.

EDUC; Seiutb1-Seiutb4

AGE ; Age, Age2

INDUSTRY; Ngr23-Ngr93

REG; RegSth-RegN2790

CITIZEN; FSverige, FNorden, FOvarlden

STATE; Yrkst1

MUNIC; Yrkst2

PR W; Andkvin

Appendix

Table A1. Definitions of variables

Variable	Definition of variable
LnWH	Natural logarithm of wage per hour -1981 to 1991 the working time is defined as the number of hours a person usually is gainfully employed including holidays, sickness periods, and periods of parental leave. The wage includes pay for work as well as holiday pay, benefits for sickness absenteeism and parental leave. -From 1993 and onwards, the working time is defined as the number of hours a person actually is gainfully employed, not including holidays, sickness periods, and periods of parental leave. The wage includes pay for work.
Age	Age
Age2	Age squared
SeiUtb1	Division of educational variables is based on socio-economic classification standards. Normal educational demands after primary education less than two years.
SeiUtb2	Division of educational variables is based on socio-economic classification standards. Normal educational demands after primary education at least two but less than three years.
SeiUtb3	Division of educational variables is based on socio-economic classification standards. Normal educational demands after primary education at least three but less than six years.
SeiUtb4	Division of educational variables is based on socio-economic classification standards. Normal educational demands after primary education at least six years.
SeiArb	Blue-collar work
SeiTjm	White-collar work
Ngr23	Mining- and manufacturing branch (1981-1991 according to SNI69, 1993 and onwards according to SNI92)
Ngr4	Electricity and gas branch (1981-1991 according to SNI69, 1993 and onwards according to SNI92)
Ngr5	Construction branch (1981-1991 according to SNI69, 1993 and onwards according to SNI92)
Ngr6	Retail trade, restaurants and hotel branch (1981-1991 according to SNI69, 1993 and onwards according to SNI92)
Ngr7	Transport and communication branch (1981-1991 according to SNI69, 1993 and onwards according to SNI92)
Ngr8	Financial institutions, insurance, real estate and business service branch (1981-1991 according to SNI69, 1993 and onwards according to SNI92)
Ngr9	Public administration and defence branch (1981-1991 according to SNI69, 1993 and onwards according to SNI92)
Ngr93	Social and related community services (1981-1991 according to SNI69, 1993 and onwards according to SNI92)
RegSth	Stockholm (H-region 1)
RegGbgMa	Göteborg or Malmö (H-region 2)
Reg90	Medium-sized cities (H-region 3)
RegS2790	Southern Sweden (H-region 4)

RegN2790	Densely populated northern Sweden (H-region 5)
RegNGl	Sparsely populated northern Sweden (H-region 6)
Yrkst1	Employed by central government
Yrkst2	Employed by local government
Yrkst3	Employed by private company
FSverige	Swedish citizen
FNorden	Nordic citizen
FOvarld	Non-nordic citizen
Andkvin	Percentage of female in occupation (estimated from HINK-data on two-digit level)

Table A2. Descriptive statistics for the female respondents.

	1981	1983	1984	1985	1986	1987	1988	1989	1990	1991	1993	1994	1995	1996	1997	1998
WH	38,99	44,61	47,31	51,27	56,06	59,23	64,85	68,61	76,66	83,97	86,02	89,82	88,64	94,37	97,27	101,33
LWH	3,61	3,75	3,80	3,87	3,96	4,02	4,10	4,17	4,28	4,37	4,38	4,42	4,41	4,47	4,51	4,54
AGE	39,49	39,19	38,60	38,88	39,45	39,16	38,94	39,37	39,76	39,89	40,42	40,46	40,86	41,39	42,20	41,87
SEIUTB1	0,57	0,50	0,48	0,49	0,49	0,47	0,47	0,46	0,45	0,42	0,40	0,40	0,38	0,38	0,36	0,35
SEIUTB2	0,23	0,25	0,25	0,25	0,26	0,27	0,24	0,27	0,27	0,27	0,25	0,26	0,27	0,25	0,24	0,25
SEIUTB3	0,15	0,19	0,21	0,20	0,19	0,19	0,21	0,21	0,22	0,23	0,24	0,25	0,24	0,26	0,28	0,26
SEIUTB4	0,06	0,06	0,06	0,06	0,07	0,07	0,08	0,06	0,06	0,08	0,10	0,09	0,11	0,11	0,13	0,15
SEIARB	0,53	0,49	0,48	0,48	0,49	0,47	0,48	0,50	0,49	0,46	0,44	0,45	0,43	0,43	0,38	0,40
SEITJM	0,47	0,51	0,52	0,52	0,51	0,53	0,52	0,50	0,51	0,54	0,56	0,55	0,57	0,57	0,62	0,60
NGR23	0,15	0,12	0,14	0,13	0,14	0,13	0,13	0,13	0,13	0,12	0,11	0,11	0,11	0,11	0,12	0,11
NGR4	0,00	0,00	0,01	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,00
NGR5	0,01	0,02	0,01	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
NGR6	0,14	0,15	0,12	0,13	0,13	0,14	0,13	0,14	0,14	0,12	0,14	0,12	0,12	0,15	0,13	0,13
NGR7	0,04	0,04	0,06	0,05	0,04	0,05	0,06	0,05	0,05	0,05	0,05	0,04	0,04	0,04	0,04	0,04
NGR8	0,07	0,07	0,07	0,08	0,08	0,08	0,08	0,08	0,08	0,09	0,08	0,09	0,09	0,09	0,10	0,10
NGR9	0,09	0,09	0,09	0,08	0,08	0,08	0,07	0,07	0,07	0,08	0,09	0,09	0,08	0,07	0,06	0,07
NGR93	0,50	0,52	0,50	0,51	0,52	0,52	0,51	0,51	0,51	0,53	0,52	0,54	0,55	0,53	0,54	0,54
REGSTH	0,19	0,19	0,20	0,21	0,19	0,21	0,21	0,19	0,20	0,20	0,21	0,20	0,20	0,21	0,21	0,21
REGGBGMA	0,15	0,14	0,15	0,15	0,13	0,14	0,16	0,15	0,14	0,15	0,16	0,14	0,14	0,15	0,14	0,14
REG90	0,33	0,32	0,32	0,33	0,33	0,31	0,30	0,32	0,36	0,36	0,35	0,35	0,37	0,39	0,36	0,37
REGS2790	0,19	0,21	0,20	0,19	0,22	0,20	0,19	0,20	0,18	0,18	0,18	0,19	0,19	0,16	0,18	0,17
REGN2790	0,09	0,08	0,09	0,07	0,08	0,09	0,09	0,08	0,05	0,06	0,06	0,06	0,05	0,06	0,07	0,06
REGNGL	0,06	0,07	0,05	0,05	0,05	0,05	0,05	0,06	0,06	0,05	0,04	0,05	0,05	0,04	0,04	0,05
YRKST1	0,09	0,09	0,11	0,10	0,09	0,09	0,09	0,08	0,08	0,09	0,09	0,07	0,06	0,05	0,07	0,07
YRKST2	0,48	0,52	0,51	0,51	0,52	0,51	0,51	0,51	0,51	0,52	0,50	0,52	0,50	0,49	0,48	0,48
YRKST3	0,42	0,39	0,38	0,39	0,39	0,40	0,40	0,40	0,41	0,39	0,42	0,41	0,44	0,46	0,46	0,45
FODSV	0,94	0,96	0,96	0,96	0,97	0,96	0,96	0,96	0,96	0,96	0,96	0,96	0,97	0,97	0,96	0,97
FNORDEN	0,04	0,02	0,02	0,02	0,02	0,02	0,02	0,03	0,02	0,02	0,03	0,03	0,02	0,02	0,02	0,02
FOVARLD	0,02	0,01	0,02	0,02	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,01	0,02	0,01	0,02	0,01
ANDKVIN	0,72	0,73	0,70	0,72	0,72	0,71	0,72	0,72	0,71	0,71	0,71	0,72	0,71	0,70	0,66	0,67
Antal obs	1944	1946	1921	2004	2088	2118	2096	2346	2191	2309	2666	1914	2822	1902	2743	1929

Table A3. Descriptive statistics for the male respondents.

	1981	1983	1984	1985	1986	1987	1988	1989	1990	1991	1993	1994	1995	1996	1997	1998
WH	46,29	51,92	54,59	59,72	64,31	68,65	76,07	79,97	93,55	101,53	105,79	110,31	110,77	118,17	120,37	125,36
LWH	3,78	3,88	3,94	4,03	4,10	4,17	4,27	4,33	4,47	4,55	4,58	4,62	4,63	4,68	4,71	4,75
AGE	39,18	39,52	39,15	38,88	39,43	39,38	38,94	38,92	39,70	39,67	40,08	40,82	40,13	40,62	40,65	41,06
SEIUTB1	0,31	0,30	0,31	0,32	0,33	0,31	0,30	0,31	0,28	0,29	0,26	0,27	0,28	0,28	0,27	0,25
SEIUTB2	0,35	0,37	0,37	0,34	0,33	0,33	0,34	0,36	0,34	0,32	0,32	0,31	0,32	0,31	0,30	0,30
SEIUTB3	0,22	0,20	0,19	0,21	0,21	0,21	0,22	0,22	0,22	0,26	0,26	0,25	0,25	0,25	0,26	0,26
SEIUTB4	0,13	0,12	0,13	0,13	0,13	0,14	0,14	0,11	0,16	0,13	0,16	0,17	0,15	0,16	0,17	0,20
SEIARB	0,52	0,55	0,57	0,53	0,54	0,53	0,53	0,57	0,52	0,50	0,48	0,49	0,49	0,47	0,47	0,45
SEITJM	0,48	0,45	0,43	0,47	0,46	0,47	0,47	0,43	0,48	0,50	0,52	0,51	0,51	0,53	0,53	0,55
NGR23	0,37	0,35	0,38	0,39	0,37	0,35	0,34	0,35	0,33	0,32	0,31	0,32	0,33	0,31	0,33	0,32
NGR4	0,02	0,02	0,01	0,01	0,02	0,02	0,02	0,01	0,02	0,02	0,01	0,01	0,01	0,01	0,01	0,01
NGR5	0,10	0,12	0,11	0,10	0,10	0,11	0,12	0,12	0,12	0,12	0,12	0,12	0,10	0,12	0,10	0,10
NGR6	0,11	0,13	0,11	0,10	0,11	0,11	0,12	0,12	0,12	0,11	0,14	0,12	0,14	0,13	0,14	0,15
NGR7	0,12	0,10	0,10	0,09	0,12	0,12	0,11	0,10	0,10	0,11	0,09	0,09	0,08	0,10	0,09	0,10
NGR8	0,07	0,06	0,07	0,07	0,07	0,09	0,08	0,07	0,09	0,09	0,11	0,11	0,13	0,12	0,12	0,13
NGR9	0,09	0,10	0,10	0,09	0,09	0,09	0,10	0,09	0,08	0,09	0,09	0,09	0,07	0,07	0,07	0,06
NGR93	0,12	0,12	0,12	0,14	0,11	0,11	0,13	0,12	0,13	0,13	0,13	0,14	0,14	0,14	0,14	0,14
REGSTH	0,19	0,18	0,19	0,19	0,17	0,18	0,18	0,18	0,19	0,19	0,21	0,19	0,21	0,20	0,16	0,19
REGGBGN	0,16	0,14	0,15	0,14	0,17	0,16	0,16	0,16	0,15	0,15	0,14	0,14	0,15	0,14	0,14	0,15
REG90	0,33	0,31	0,32	0,31	0,32	0,32	0,34	0,32	0,36	0,37	0,36	0,37	0,37	0,37	0,41	0,39
REGS2790	0,20	0,22	0,22	0,22	0,21	0,20	0,20	0,21	0,19	0,18	0,19	0,19	0,18	0,20	0,19	0,17
REGN2790	0,07	0,08	0,07	0,08	0,08	0,07	0,08	0,08	0,05	0,06	0,06	0,06	0,05	0,05	0,06	0,06
REGNGL	0,05	0,07	0,05	0,06	0,06	0,05	0,05	0,05	0,05	0,05	0,04	0,05	0,04	0,04	0,05	0,05
YRKST1	0,13	0,16	0,14	0,13	0,13	0,13	0,11	0,09	0,10	0,12	0,11	0,08	0,07	0,07	0,08	0,06
YRKST2	0,13	0,13	0,15	0,17	0,15	0,14	0,15	0,14	0,14	0,14	0,12	0,14	0,12	0,13	0,12	0,11
YRKST3	0,74	0,71	0,72	0,71	0,73	0,73	0,73	0,76	0,76	0,74	0,77	0,78	0,82	0,80	0,81	0,83
FODSV	0,95	0,95	0,96	0,96	0,97	0,96	0,96	0,95	0,95	0,96	0,97	0,97	0,97	0,97	0,97	0,97
FNORDEN	0,03	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,01	0,02	0,01	0,01	0,01
FOVARLD	0,02	0,01	0,02	0,01	0,01	0,02	0,02	0,02	0,03	0,02	0,02	0,01	0,02	0,02	0,02	0,01
ANDKVIN	0,28	0,27	0,27	0,29	0,27	0,29	0,28	0,28	0,29	0,29	0,30	0,31	0,31	0,30	0,29	0,29
Antal obs	1551	1588	1478	1491	1795	2159	2089	2598	2199	2246	2827	1816	2744	1892	2781	1912

Table A4. Regression results, women, some selected years.

	1981		1986		1991		1995		1998	
Variables	**Par. Est**	**st-error**	**Par. Est**	**st-error**	**Par. Est**	**st-error**	**Par. Est**	**st-error**	**Par. est**	**st-error**
INTERCEPT	3.300**	0.106	3.568**	0.105	4.290**	0.079	3.732**	0.098	3.993**	0.117
AGE	0.012*	0.005	0.015**	0.005	0.000	0.004	0.026**	0.005	0.021**	0.005
AGE2 * 1000	0.102	0.066	-0.153**	0.059	0.050	0.047	-0.229**	0.056	-0.160*	0.064
SEIUTB1	-0.081**	0.026	-0.024	0.020	-0.074**	0.017	-0.013	0.020	-0.084**	0.022
SEIUTB3	0.067	0.036	0.066**	0.024	0.117**	0.018	0.080**	0.021	0.082**	0.025
SEIUTB4	0.325**	0.049	0.222**	0.030	0.274**	0.030	0.275**	0.030	0.237**	0.032
SEITJM	-0.021	0.025	-0.010	0.022	-0.039*	0.017	0.006	0.021	0.013	0.023
NGR4	0.028	0.081	-0.266	0.160	-0.029	0.087	0.101	0.072	-0.165	0.105
NGR5	0.017	0.105	-0.013	0.074	-0.021	0.040	-0.095	0.128	-0.146	0.114
NGR6	-0.052	0.037	-0.096**	0.036	-0.058*	0.025	0.016	0.036	-0.076*	0.034
NGR7	-0.008	0.070	0.059	0.036	0.000	0.039	0.007	0.047	-0.014	0.043
NGR8	-0.037	0.039	0.002	0.037	0.007	0.031	0.000	0.036	-0.039	0.040
NGR9	-0.086	0.049	-0.001	0.043	-0.078*	0.035	-0.012	0.041	-0.096	0.050
NGR93	-0.082	0.048	-0.052	0.038	-0.025	0.032	-0.063	0.036	-0.161**	0.041
REGSTH	0.011	0.029	0.019	0.025	0.078**	0.021	0.062*	0.025	0.092**	0.028
REGGBGMA	-0.015	0.038	-0.013	0.028	0.026	0.022	0.074**	0.027	0.098**	0.028
REG90	-0.010	0.027	-0.005	0.022	0.022	0.017	0.019	0.023	0.011	0.023
REGN2790	-0.016	0.037	0.108**	0.039	0.005	0.027	0.006	0.035	0.030	0.035
REGNGL	-0.008	0.038	0.006	0.040	0.029	0.028	-0.008	0.032	-0.036	0.040
YRKST1	0.068	0.041	-0.052	0.029	0.000	0.029	-0.033	0.041	-0.066	0.048
YRKST2	0.057	0.037	-0.007	0.031	-0.036	0.026	0.030	0.026	0.019	0.033
FNORDEN	0.109	0.063	0.067	0.058	-0.032	0.048	-0.064	0.049	-0.085	0.054
FOVARLD	0.025	0.058	0.041	0.062	-0.108*	0.048	-0.118*	0.053	-0.071	0.052
ANDKVIN	0.113*	0.051	0.100**	0.036	0.053	0.030	-0.006	0.044	0.000	0.041
N	1944		2088		2309		2822		1929	
Adj-R^2	0.1161		0.07522		0.1272		0.1320		0.1772	

** Significant at 1%-level. * Significant at 5%-level

Table A5. Regression results, men, some selected years.

	1981		1986		1991		1995		1998	
Variables	**Par. Est**	**st-error**	**Par. Est**	**st-error**	**Par. Est**	**st-error**	**Par. Est**	**st-error**	**Par. est**	**st-error**
INTERCEPT	3.237**	0.151	3.519**	0.097	3.914**	0.085	3.865**	0.111	4.050**	0.105
AGE	0.017*	0.007	0.021**	0.005	0.025**	0.004	0.030**	0.005	0.025**	0.005
AGE2 * 1000	-0.142	0.084	-0.201**	0.055	-0.251**	0.053	-0.296**	0.064	-0.226**	0.063
SEIUTB1	-0.046	0.024	-0.033	0.020	-0.068**	0.017	-0.028	0.019	-0.072**	0.021
SEIUTB3	0.064	0.033	0.064*	0.030	0.040	0.028	-0.011	0.028	-0.031	0.032
SEIUTB4	0.351*	0.040	0.314**	0.035	0.311**	0.032	0.253**	0.030	0.228**	0.034
SEITJM	0.113**	0.033	0.104**	0.028	0.082**	0.026	0.147**	0.027	0.138**	0.030
NGR4	0.080	0.066	0.025	0.052	0.058	0.034	0.061	0.037	0.086	0.052
NGR5	0.013	0.036	-0.041	0.026	0.022	0.022	-0.067*	0.027	-0.166**	0.029
NGR6	-0.004	0.028	-0.107**	0.029	-0.037	0.026	-0.051*	0.026	-0.104**	0.026
NGR7	-0.029	0.036	-0.018	0.027	-0.042	0.026	-0.119**	0.027	0.003	0.027
NGR8	0.127**	0.044	0.007	0.033	0.038	0.031	-0.050	0.027	0.024	0.032
NGR9	-0.050	0.041	-0.088**	0.027	-0.063*	0.029	-0.106**	0.034	-0.077	0.050
NGR93	-0.011	0.060	-0.060	0.042	-0.102**	0.031	-0.122**	0.036	-0.167**	0.046
REGSTH	0.089**	0.032	0.142**	0.024	0.088**	0.024	0.091**	0.024	0.125**	0.029
REGGBGMA	0.022	0.029	0.075**	0.023	0.038	0.023	0.064*	0.026	0.114**	0.028
REG90	0.049	0.027	0.064**	0.021	0.017	0.017	0.040	0.021	0.051*	0.021
REGN2790	0.019	0.043	0.078**	0.028	0.035	0.031	0.010	0.040	0.033	0.039
REGNGL	-0.004	0.048	-0.014	0.030	-0.005	0.038	0.008	0.033	-0.012	0.039
YRKST1	0.057	0.038	0.019	0.024	0.036	0.022	0.035	0.035	0.057	0.041
YRKST2	0.014	0.054	0.003	0.032	0.030	0.027	-0.080**	0.031	0.000	0.043
FNORDEN	0.005	0.045	0.022	0.073	0.081	0.077	0.019	0.053	-0.118**	0.041
FOVARLD	0.059	0.044	-0.139**	0.042	-0.116	0.059	-0.071	0.080	-0.221**	0.076
ANDKVIN	-0.075	0.044	-0.089*	0.037	-0.079*	0.034	-0.065	0.033	-0.112*	0.046
N	1551		1795		2246		2744		1912	
Adj-R^2	0.3562		0.3167		0.2446		0.2384		0.2765	

** Significant at 1%-level. * Significant at 5%-level