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THE EVOLUTION OF GENDER WAGE DIFFERENTIALS OVER THE CAREER

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ABSTRACT: In this paper we study male-female wage differentials at different phases of the career over a period of ten years among industrial white-collar workers. According to our data the gender wage differential appears to be rather stable at different phases of the career and, on average, men's hourly wage is 1.5 times as high as that of women. This outcome is caused both by differences in background characteristics and by differences in remuneration from these characteristics. Our results show that the dynamics behind the evolution of gender wage differentials changes over time. At the same time when male and female employees become more similar in terms of observed characteristics, unexplained gender wage differential increases. On the other hand, in narrow job categories the gender wage gap is negligible throughout the career. Our results suggest that unobserved characteristics that determine the wage level and the decision to stay employed in the industry at different phases of the career have a strong influence on the male-female wage differential at later stages of the career. This suggests that the ways in which internal labour markets function, in particular, implicit promotion practices in different jobs, may play an important role in the evolution of the observed gender wage differentials.

KEY WORDS: wage discrimination, internal labour markets, career mobility

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TIIVISTELMÄ: Tutkimuksessa tarkastellaan naisten ja miesten välisen palkkaeron kehittymistä työuran ensimmäisen kymmenen vuoden aikana teollisuuden toimihenkilöiden keskuudessa. Aineistossamme naisten ja miesten välinen palkkaero näyttää pysyvän melko vakaana työuran eri vaiheissa, ja keskimäärin miesten tuntiansiot ovat 1.5 kertaiset naisten ansioihin nähden. Tämä palkkaero johtuu sekä sukupuolten erilaisista taustaominaisuuksista että eroista näistä saatavasta tuotosta. Tuloksemme osoittavat, että palkkaerojen taustalla on työuran suhteen muuttuva dynaaminen prosessi. Samaan aikaan, kun naiset tulevat miesten kanssa havaituilta ominaisuuksiltaan aiempaa samankaltaisemmiksi, sukupuolten välinen selittämätön palkkaero kasvaa. Toisaalta hyvin kapeissa tehtäväluokissa miesten ja naisten palkkaero pysyy vähäisenä koko työuran ajan. Tutkimuksemme mukaan havaitsemattomilla yksilöllisillä ominaisuuksilla, jotka vaikuttavat sekä palkkatasoon että päätökseen pysyä teollisuuden palveluksessa, on uran myöhemmissä vaiheissa suuri vaikutus naisten ja miesten välisen palkkaeron synnyssä. Tämä viittaa siihen, että yritysten sisäisten työmarkkinoiden toiminnalla, erityisesti eri tehtäviin liittyvillä ylennyskäytännöillä, on tärkeä rooli naisten ja miesten palkkaerojen kehittymisessä.

AVAINSANAT: palkkadiskriminaatio, sisäiset työmarkkinat, urakehitys

Summary

Gender wage differentials have been studied in many countries and a common observation is that even after controlling for individual and job characteristics women's remuneration in the labour market lags behind that of men. Several potential explanations have been given to this phenomenon. For instance, in theoretical literature it has been shown that gender wage gap can appear if women, on average, are regarded to have higher expected value of hometime (and higher probability of exit) than men. Earlier empirical research has supported this view by showing that career interruptions and women's earnings growth are closely related to one another. Further, it has been shown that due to potential career interruptions women have lower promotion probabilities than men, which in turn may play a central role in the evolution of the gender wage gap. These results suggest that to understand the observed gender wage differentials it is useful to have a closer look at the development of male and female wages over the career.

In this paper we study how male-female wage differential evolves at different phases of the career among industrial white-collar workers. The data base to be used in subsequent empirical analyses is collected by the Confederation of Finnish Industry and Employers (TT) during the period 1980-1994. The data consist of a random sample of white-collar workers who were new recruits during the period 1980-1985. All recruits have been followed up for ten years or for as long as they are present in the TT sample (if less than ten years).

The gender wage differentials over the career are studied in the internal labour markets of TT member-firms. All these firms follow the same centralised wage agreements and are governed by the same institutional rules. In this sense these firms form their own well-defined internal labour markets. Careers are, thus, followed at an industry rather at a firm level.

According to our results the gender wage differential appears to be surprisingly stable over time. On average, men's hourly wage appears to be 1.5 times as high as that of women at different stages of the career. This is partly due to the fact that men and women hold different positions in TT member-firms and partly because men and women receive different remuneration from their characteristics. The gender wage gap evolves in an interesting

fashion over the career. At the beginning of the career a major part of the wage differential, 25 per cent, is explained by different characteristics between the two sexes and a smaller part, 18 per cent, can be accounted for the different remuneration men and women receive from these characteristics (unexplained wage gap). According to our data men and women become more similar in terms of observed characteristics, which reduces wage gap due to differences in these characteristics to 19 per cent in the tenth year of employment. At the same time the unexplained wage gap increases to 26 per cent.

It appears from our wage equation estimations that the rise in the unexplained wage gap over the career is strongly affected by the unobserved individual characteristics that determine the the decision to stay employed and the wage level at different phases of the career. Men receive much higher rewards from uninterrupted careers than women. This may be due to many reasons. Women may have lower incentives to make unobservable productivity-enhancing investments in human capital than men if it is more difficult for them to signal about their productivity in the labour market. Further, women's potentially higher expected value in hometime may lead to a situation where women's promotion probabilities are lower than that of men, which leads to a rising wage gap over the career. This interpretation is supported by the fact that within narrow job categories gender wage differentials are negligible in our sample. Our results suggest that it is important to analyse how internal labour markets function in order to be able to say, which mechanisms are important in the evolution of gender wage differentials over the career.

Yhteenveto

Naisten ja miesten välisiä palkkaeroja on tutkittu useassa eri maassa. Yhteisenä piirteenä eri tutkimuksissa on se, että naisten ja miesten palkat näyttävät eroavan toisistaan senkin jälkeen, kun sukupuolten väliset taustaerot on otettu huomioon. Tälle ilmiölle voidaan antaa useita selityksiä. Esimerkiksi teoreettisessa kirjallisuudessa on osoitettu, että sukupuolten välisiä palkkaeroja esiintyy, jos naisilla ajatellaan olevan keskimäärin parempi tuotto kotona tehdystä työstä ja siten suurempi todennäköisyys jäädä työmarkkinoiden ulkopuolelle kuin miehillä. Aiemmat empiiriset tutkimukset, joissa on osoitettu, että naisten ansioiden nousun ja työuran katkosten välillä on selvä yhteys, tukevat tätä näkemystä. Lisäksi on esitetty, että juuri työuran mahdollisista katkoksista johtuen naisilla on miehiä alhaisempi todennäköisyys saada ylennyksiä, mikä puolestaan vaikuttaa sukupuolten välisten palkkaerojen syntyyn. Nämä tulokset viittaavat siihen, että on hyödyllistä tutkia naisten ja miesten palkkaeron kehittymistä työuran aikana.

Selvitämme tässä tutkimuksessa, miten teollisuuden toimihenkilöiden keskuudessa naisten ja miesten palkat määräytyvät työuran eri vaiheissa. Tilastoaineistona käytetään Teollisuuden ja Työnantajain Keskusliiton (TT) keräämää palkka-aineistoa vuosilta 1980-1994. Empiirisissä analyyseissä käytetään niiden teollisuuden toimihenkilöiden otosta, jotka oli rekrytoitu toimipaikkaansa uusina työntekijöinä vuosina 1980-1985. Rekrytoitujen toimihenkilöiden uraa on seurattu 10 vuotta tai niin kauan kuin he ovat olleet mukana TT:n aineistossa (jos alle 10 vuotta).

Sukupuolten välistä palkkaeroa on tutkittu TT:n jäsenyritysten "sisäisillä työmarkkinoilla". Kaikki nämä yritykset noudattavat samoja keskitettyjä palkkasopimuksia ja niitä määrittävät samat institutionaaliset säännöt. Tässä suhteessa yritykset muodostavat niiden omat hyvin määritellyt sisäiset työmarkkinansa. Työuraa on tutkimuksessamme siten seurattu toimialatasolla (eli TT:n jäsenyrityksissä) pikemmin kuin yksittäisessä yrityksessä.

Tulostemme mukaan naisten ja miesten palkkaero pysyy yllättävän vakaana työuran ensimmäisen kymmenen vuoden aikana. Miesten tuntiansiot ovat keskimäärin 1.5 kertaiset naisten vastaavista ansioista. Tämä johtuu osittain siitä, että miesten ja naisten tehtävät eroavat

toisistaan ja osittain siitä, että miesten ja naisten taustaominaisuudet (esim. koulutus) vaikuttavat eri tavalla palkkatasoon. Palkkaero kehittyy mielenkiintoisella tavalla työuran aikana. Uran alussa suurempi osa palkkaerosta, 25 %, selittyy naisten ja miesten erilaisilla ominaisuuksilla ja pienempi osa, 18 %, siitä, että naisia ja miehiä palkitaan samoista ominaisuuksista eri tavoin (selittämätön palkkaero). Aineistomme mukaan työuran jatkuessa miehet ja naiset tulevat havaittujen ominaisuuksiensa suhteen samankaltaisemmiksi, ja 10. vuotena erilaisista ominaisuuksista johtuva palkkaero jää 19 prosenttiin. Samaan aikaan selittämätön palkkaero nousee 26 prosenttiin.

Palkkayhtälöiden estimointituloksista ilmenee, että selittämätön palkkaero johtuu pääosin sellaisista yksilöiden havaitsemattomista ominaisuuksista, jotka vaikuttavat sekä päätökseen jatkaako vai ei teollisuuden palveluksessa että palkkaan. Miehet saavat huomattavasti suuremman tuoton keskeytymättömästä työurasta kuin naiset. Tämä voi johtua eri syistä. Naisilla voi olla pienempi motivaatio kuin miehillä investoida tuottavuutta lisääviin mutta havaitsemattomiin ominaisuuksiinsa. Lisäksi, naisten mahdollisesti miehiä suurempi kotityön arvo voi johtaa tilanteeseen, jossa naisia ei ylennetä työuralla samassa tahdissa kuin miehiä, mikä taas johtaa palkkaerojen kasvuun uran jatkuessa pitkään. Tätä tulkintaa tukee se seikka, että aineistomme mukaan kapeissa tehtäväluokissa sukupuolten välinen palkkaero on vähäinen. Tuloksemme viittaavat siihen, että sisäisten työmarkkinoiden toiminnan aiempaa syvällisempi analysointi on tärkeää, jotta voitaisiin tarkemmin selvittää, mitkä mekanismit tuottavat havaitut naisten ja miesten palkkaerot työuran eri vaiheissa.

1 Background

It is a well established fact that men and women are rewarded differently in the labour market even after observable individual and job characteristics are controlled for. In the theoretical literature on discrimination several potential explanations to this phenomenon have been suggested.[1] In statistical discrimination models the role of imperfect information in the labour market is emphasised. Statistical discrimination occurs when individuals are judged not as individuals, but on the basis of their group. Gender wage differentials can appear if men, on average, are regarded to have a higher probability of market work than women. If women have higher expected value of hometime than men they are more likely to exit from the labour market. This can lead to a situation where women have higher threshold levels of ability for promotion than men. According to Lazear and Rosen (1990) women's lower promotion probability plays a central role in explaining observed gender wage differentials.

Earlier empirical research has shown that there are close connections between career interruptions and women's earnings growth.[2] Comparisons between wages of women with no career breaks and those of similar men are quite rare when gender wage gap is discussed. The purpose of this paper is to give new information on this matter by studying male-female wage differentials at different phases of the career. A panel data set on Finnish industrial white-collar workers, who were new recruits at the beginning of the panel period, is used as a basis for empirical analyses. For each year of employment over a period of ten years wage equations are estimated separately for men and women. Wage models are conditional on the continuation of the career and estimations require sample selectivity corrections. These are made in line with Heckman (1979). Differences in career mobility, which according to Lazear and Rosen (1990) can be a major source of gender wage differentials, are accounted for by using several job-related measures in each year's wage equations. The estimation results allow us to compare changes in gender wage gap over the career.[3] These comparisons can give new insights into the dynamic nature of the wage determination process which studies using cross-section data for a single year are not capable of doing.

The paper proceeds as follows. In the second section our data is described. In the third section empirical wage models and the decomposition of gender wage gap are specified for different phases of the career. Estimation results are reported in the fourth section and concluding remarks are made in the fifth section.

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1 Cain (1986) provides an extensive survey on this literature.

2 See e.g. Cox (1984), Mincer and Ofek (1982) and Corcoran and Duncan (1979).

3 In our evaluations we use the measure of discrimination suggested by Oaxaca (1973).

2 Data

A panel data set on industrial white-collar workers collected by the Confederation of Finnish Industry and Employers (TT) during the period 1980-1994 is used as a basis for statistical analyses. TT gathers information on all employees from its member companies, and the collected sample is representative in *manufacturing sector*.

The data to be used in wage estimations consist of white-collar workers who were new recruits during the period 1980-1985. All recruits have been followed up for ten years or for as long as they are present in the TT sample (if less than ten years). We have chosen to gather data over six years (and have created "quasi cohorts") to allow for as many observations as possible in subsequent empirical analyses. At entry the sample consists of 1119 female and 1871 male recruits. After the ten years' follow-up period there are 163 women and 459 men present in the data set.[4]

The gender wage differentials over the career are studied in *the internal labour markets* of TT member-firms. All these firms follow the same centralised wage agreements and are governed by the same institutional rules. In this sense the firms form their own well-defined internal labour markets. Careers are followed at an industry level rather than at a firm level. In wage model estimations this should not create problems because we can control for the changes of workplace within TT member-firms in our analyses.

In centralised wage agreements employees are divided into three groups, i.e. into clerical, technical, and managerial[5] employees. Clerical and technical employees' wage agreements specify what kind of skills and responsibilities different jobs require. For clerical employees jobs are classified into twelve different requirement levels, and for technical employees jobs are classified into six wage groups. Career mobility within these two employee groups can be tracked down by these different job classification levels. Managerial employees' wage agreements do not specify similar classifications. However, employees have common job titles in all TT member-firms and changes in these job titles can be used as a further measure for career mobility, which includes also managerial employees.

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[4] Whenever a person exits from industry the observation is lost for subsequent years even in cases when the career break is temporary (e.g. due to maternity leave). This means that the sample consists of people who have had continuous careers within industry (not necessarily within the same firm). This explains partly why the number of women has declined more than that of men toward the end of the follow-up period.

[5] Top management is excluded from the data set.

Table 1. Sample means of variables at entry

Variables	Men N=1871	Women N=1119
Age	30.6	28.1
Previous work experience, %		
0-5 years	52.4	61.1
6-10 years	23.0	22.6
11-15 years	13.0	9.5
15+ years	11.5	6.8
Level of education, %		
Basic	7.2	22.5
Lower Secondary	4.3	12.8
Upper Secondary	45.2	48.5
University Graduate	42.4	15.8
University Post Graduate	0.9	0.4
Clerical employees, %	14.9	73.6
Job level 1A-1C	0.9	10.5
Job level 2A-2C	4.8	46.1
Job level 3A-3C	8.1	16.7
Job level 4A-4C	1.1	0.3
Technical employees, %	44.0	14.8
Wage group F	1.5	4.4
Wage group E	6.5	5.7
Wage group D	13.7	2.8
Wage group C	14.9	1.5
Wage group B	6.7	0.4
Wage group A	0.7	0.0
Managerial employees, %	41.1	11.6

Sample means of some central variables at entry are presented in Table 1. It appears that the average recruitment age is about 30 for male 28 for female industrial employees. Some of the employees have quite an extensive work experience before entry.[6] Previous work experience is over 15 years for over 11 per cent of men and 7 per cent of women. The majority of new recruits, however, have been working less than six years before entry.

Table 1 shows that the level of education is quite high among new recruits. As many as 43 per cent of men and 16 per cent of women have university education. Only 7 per cent of men and 22 per cent of women have no more than basic education. The high level of education among men is reflected in the share of managerial and technical recruits; over 41 per cent of men received managerial and 44 per cent technical posts at entry. Correspondingly only 15 per cent of men were recruited for clerical jobs. The contrary appears to be true for women. 74 per cent of women were recruited for clerical, 15 per cent for technical, and only 11 per cent for managerial posts. There appears to be a clear gender segregation of jobs at entry.

Among clerical employees the job levels are further divided into four main categories (1-4) and three subcategories (A-C). The least demanding job category is 1A and the most demanding is 4C. The jobs for technical employees are similarly grouped into six wage categories. The least demanding jobs belong to the wage group F and the most demanding to group A. Table 1 shows that the gender segregation at entry exists also within these two groups; the majority of men are recruited for the most demanding job categories whereas women are recruited for the least demanding categories.

During the follow-up period employees face different kinds of changes in their careers. Some employees are promoted, some demoted, and some exit from the industry. When 10 years have passed 24.5 per cent of male (N=459) and 14.6 per cent of female (N=163) recruits have had no career breaks and have stayed employed in TT member-firms (Table 2).

It appears from Table 2 that the composition of employees at recruitment and after the follow-up period of 10 years is very different. At the end of the follow-up period 54 per cent of men and almost 28 per cent of women are managerial employees. The growth in the share of managerial employees can be due to two reasons. First, during the years a number of

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[6] For managerial employees work experience is calculated as a potential work experience because there were no data on actual years of experience for this group of employees. In estimating wage equations we used both actual and potential work experience for clerical and technical employees in order to check the sensitivity of the results for the way in which work experience is measured. The results were not sensitive in this respect.

clerical and technical employees have been promoted to managerial positions. Second, the exit rates from industry have been lower than average among managerial employees.[7]

Table 2 shows also that the share of technical employees has dropped much less than that of clerical employees. Further, within these two employee groups people have shifted to more demanding jobs. About 62 per cent of male and 23 per cent of female clerical employees were recruited for the two highest job categories at entry. After ten years 68 per cent of clerical men and 51 per cent of clerical women belong to these job categories. A similar shift appears to be true for technical employees. About 51 per cent of male and 13 per cent of female technical employees were recruited for the three highest wage groups at entry. After the follow-up period 97 per cent of male and 36 per cent of female technical employees have jobs which belong to these three highest wage groups.

Table 2. Employee status after 10 years of employment

Variables	Men N=459	Women N=163
Age	39.4	38.4
Clerical employees, %	7.6	58.6
Job level 1A-1C	0.0	0.6
Job level 2A-2C	2.4	28.2
Job level 3A-3C	3.7	27.6
Job level 4A-4C	1.5	2.2
Technical employees, %	38.4	13.5
Wage group F	0.0	0.0
Wage group E	0.2	3.7
Wage group D	1.3	4.9
Wage group C	13.5	4.3
Wage group B	20.3	0.6
Wage group A	3.1	0.0
Managerial employees, %	54.0	27.9

[7] Career mobility in these different employee groups has been studied by Lilja (1995).

3 An empirical model

A traditional human capital model is used as a basis when we investigate the development of gender wage gaps among Finnish industrial employees. Wage equations are specified for different career phases starting from the first year after recruitment and continuing to subsequent years of employment over a period of ten years. The wage equation for person i with t years' employment record (t=1,...,10) is assumed to be as follows

$$(1) \qquad \ln w_{it}^k = \beta_{0t}^k + X_{it}^k \beta_t^k + u_{it}^k,$$

where superscript k=f refers to a female employee and k=m to a male employee. X_{it}^ks are vectors of independent explanatory variables and β_t^ks are corresponding coefficient vectors. The error terms u_{it}^k are assumed to be independently and identically normally distributed.

Sample selectivity bias arising from the fact that wages in different phases of the career are observed only if persons stay employed is corrected from the second year onwards in line with Heckman (1979). Let the following probit model describe the i's person propensity to be employed by a TT member-firm in year t (t=2,...,10)

$$(2) \qquad P_{it}^{k*} = Z_{it}^k \gamma_t^k + v_{it}^k$$

$$(3) \qquad P_{it}^k = 1 \; if \; P_{it}^{k*} > 0; \; 0 \; otherwise$$

$$E(v_{it}^k) = 0 \qquad E(v_{it}^k v_{it}^{k'}) = \sigma_{vt}^k I,$$

where P_{it}^{k*} is a latent variable obtaining the value greater than zero if person i remains employed at year t and less than zero if he or she exits from industry. Z_{it}^k is a vector of explanatory variables affecting the decision to remain employed at year t and γ_t^k is the corresponding vector of coefficients. In subsequent estimations background information from the first year of employment is used to evaluate how likely each person is to remain employed in the following years (t=2,...,10).[8] The error term v_{it}^k is assumed to be independently and identically normally distributed. The dichotomous variable P_{it}^k equals one if the person's employment continues and zero if not.

[8] An alternative way would be to do pairwise comparisons and to use previous years' information to evaluate how likely each person is to stay employed in the following year. Pairwise comparisons assume, however, that different year's participation decisions are independent of one another, which can be quite a restrictive assumption.

Let us further assume that the errors u_{it}^k and v_{it}^k are jointly normally distributed with a zero mean vector and a covariance term σ_t^k. Under these conditions we can write the expected wage rate conditional on the decision to remain employed as follows (t=2,...,10)

$$(4) \qquad E(\ln w_{it}^k \mid P_{it}^{k*} > 0) = \beta_{0t}^k + X_{it}^k \beta_t^k + E(u_{it}^k \mid P_{it}^{k*} > 0), \text{ where}$$

$$(5) \qquad E(u_{it}^k \mid P_{it}^{k*} > 0) = \sigma_t^k \phi\left(Z_{it}^k \gamma_t^k\right) / \Phi\left(Z_{it}^k \gamma_t^k\right) = \sigma_t^k \lambda_{it}^k,$$

and where ϕ and Φ are the density and distribution functions for the standard normal. The term λ_{it}^k in equation (5) represents the change in the error distribution resulting from the fact that the samples in different years do not include individuals who have previously exited from TT member-firms. In subsequent estimations this sample selectivity bias is corrected separately for each year of employment using maximum likelihood method which allows for simultaneous estimation of the probit and regression coefficients specified above.[9]

The results from wage model estimations for different years of employment are used to evaluate how different components of gender wage differential change over the career in our sample. To evaluate this we use the decomposition of wage gap suggested by Oaxaca (1973).[10] Averaging over all men and women at each year t the following equation holds true

$$(6) \qquad \ln \bar{w}_t^m - \ln \bar{w}_t^f = \sum_{j=1} \hat{\beta}_{tj}^m \left(\bar{X}_{tj}^m - \bar{X}_{tj}^f\right) + \hat{\sigma}_t^m \left(\bar{\lambda}_t^m - \bar{\lambda}_t^f\right) + \sum_{j=0} \bar{X}_{tj}^f \left(\hat{\beta}_{tj}^m - \hat{\beta}_{tj}^f\right) + \bar{\lambda}_t^f \left(\hat{\sigma}_t^m - \hat{\sigma}_t^f\right),$$

where the difference between male and female average log-wages is divided into two parts. The two first parts on the right hand side can be interpreted as the wage gap due to different background characteristics using the male coefficients. The next two parts can be interpreted as the discriminatory component of the wage gap, i.e. the wage gap which cannot be explained by differences in observed background characteristics. Equation (6) can be expressed as follows

$$(7) \qquad \frac{\bar{w}_t^m}{\bar{w}_t^f} = \exp\left(\sum_{j=1} \hat{\beta}_{tj}^m \left(\bar{X}_{tj}^m - \bar{X}_{tj}^f\right) + \hat{\sigma}_t^m \left(\bar{\lambda}_t^m - \bar{\lambda}_t^f\right)\right) \exp\left(\sum_{j=0} \bar{X}_{tj}^f \left(\hat{\beta}_{tj}^m - \hat{\beta}_{tj}^f\right) + \bar{\lambda}_t^f \left(\hat{\sigma}_t^m - \hat{\sigma}_t^f\right)\right)$$

or

$$(8) \qquad \frac{\bar{w}_t^m}{\bar{w}_t^f} = (1 + c_t)(1 + d_t).$$

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[9] The corresponding likelihood functions did not converge at years 2, 3 and 8. For these years we have used Heckman's two-step procedure in estimations.

[10] This index is based on the male wage structure is very common and its use makes comparisons over time and across countries easier.

In (8) the factor $1+c_t$ measures the difference in male and female wages at year t which is caused by differences in observed background *characteristics*. The factor $1+d_t$ represents the wage gap due to different *remuneration* of the observed variables and is a crucial indicator when evaluating the amount of potential discrimination (unexplained wage gap). The choice of regressors as well as the general explanatory power of the wage functions affect the evaluation of $1+d_t$. In subsequent empirical estimations we include a large number of human capital and job related explanatory variables in wage regressions in order to take into account as many factors affecting individual productivity and career mobility as possible when evaluating gender wage differentials.

4 Results

In section 2 of this paper we discussed the general features of the data on white-collar industrial employees. According to our data there appears to be a clear gender segregation of jobs at entry in Finnish industry. A larger amount of men than women are recruited for managerial and technical posts. Among technical and clerical employees men are in the majority in most demanding job categories and women in least demanding categories. The promotion patterns and exit rates from industry also vary between the sexes. These differences are reflected in the observed male-female wage differentials. In Figure 1 the overall gender wage gaps are calculated at different phases of the career using information on those employees who have had uninterrupted careers until the year in question (Figure 1).[11]

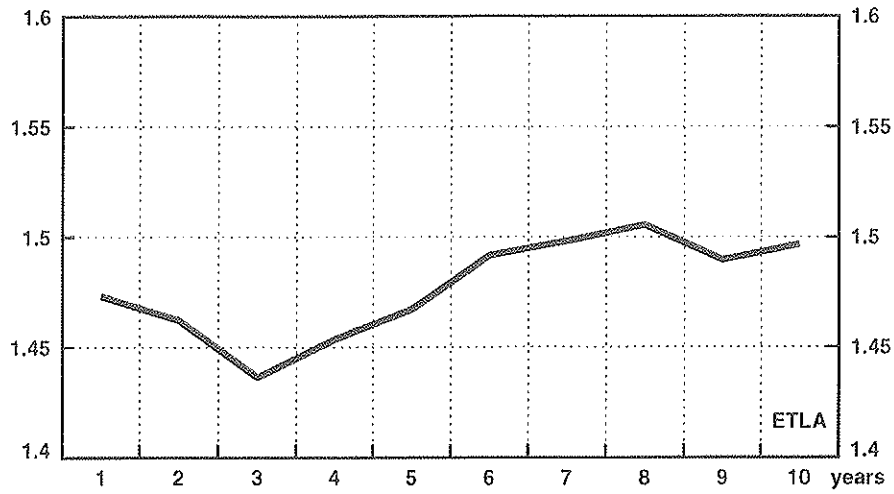
Figure 1 shows that wages of male employees are about 1.5 times as high as those of women. On average, women's hourly wages should increase by 50 per cent in order to reach men's wage level. The overall wage differential appears to stay relatively stable at all phases of the career.

To be able to analyse the observed gender wage differentials over the career in more detail estimation results from wage equations are required. In estimations we have used several human capital and job-related variables to control for differences in individual productivity and in career mobility. The basic set of variables has been chosen from variables that appeared to be statistically significant explanatory factors in the first year's wage equations. In subsequent years the same explanatory variables were included in wage models if their

[11] Thus, e.g. in calculations for the fifth year men and women who have had continuous work histories in TT member-firms during all five years are included in the sample. Wages refer to hourly wages including earnings for regular hours and shift work, fringe benefits, and bonuses. Because the data set is collected over a period of five years wages have been deflated by the general income-level index.

coefficients were significantly different from zero in either male or female equations. Table 3 reports the explanatory variables used in different wage estimations.

Figure 1. Ratio of male wages to female wages over the career



It appears from Table 3 that quite an extensive set of background characteristics proved to be important explanatory factors for male and female wages at different phases of the career.[12] The reference groups for different indicator variables are mentioned in the table. The reference individual is, among other things, a managerial or a higher level clerical or technical employee, who has less than 6 years of previous work experience at recruitment, who has a graduate degree from university, who was recruited in 1980 for his or her job, and who did not change workplace within Finnish industry during the year under study.

In Table 4 the adjusted coefficients of determination from the Heckman two-step procedure for different male and female wage model estimations are reported.[13] Even though in most years the models have been estimated using maximum likelihood method, the reported coefficients of determination in line of Heckman (1979) give us an easily comparable general estimate of the goodness of fit of the models.

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[12] Several other variables were included in preliminary estimations but the listed ones appeared to be the only relevant explanatory factors in our sample.

[13] Detailed estimation results are provided upon request.

Table 3. Set of explanatory variables in wage model estimations

Age, Age squared
Previous work experience, indicator variables 0-5 years (reference group) 6-10 years 11-15 years 15+ years
Level of education, indicator variables Basic education Lower secondary education Upper secondary education University graduate (reference group) University post graduate
Field of education, indicator variables General Humanistic subjects, theology Law Business Mathematics, science Others (reference group)
Job requirement level, clerical employees, indicator variables Job level 1A-1C Job level 2A-2C Job level 3A-3C Job level 4A-4C (reference group)
Wage group, technical employees, indicator variables Wage group F Wage group E Wage group D Wage group C Wage group B Wage group A (reference group)
Managerial employees (reference group)
Job description, indicator variables Production Purchase Sales Others (reference group)
Industry, indicator variables Graphic Chemical Forest Consultant Others (reference group)
Change of workplace indicator
Recruitment year indicators 1981-1985 (reference group 1980)
Local area indicator

It appears from Table 4 that the explanatory power of the wage equations is very high compared with those one normally gets from wage estimations using cross-section data. The reason to this is most likely related to the fact that our sample consists of relatively homogenous individuals (industrial employees) who all are in the same stage of their careers. Further, even though the sample consists of employees from different TT member-firms, these firms are bound by the same centralised wage agreements and job classifications which influence the observed wage levels.

Table 4. Adjusted coefficients of determination in wage regressions

Year	Men	Women
1	66.12	77.37
2	63.70	77.16
3	61.95	76.99
4	60.02	74.17
5	59.52	75.63
6	57.68	73.80
7	58.02	70.68
8	56.02	73.23
9	56.06	71.96
10	52.44	69.61

Table 4 shows that at the beginning of the career observed characteristics explain as much as 77 per cent of the variation of wages for women and 66 per cent for men. Thus, at recruitment employers seem to follow more closely similar general guidelines for female wages than for male wages. One of the reasons to this outcome may be that a much larger proportion of men than women in our sample have been recruited for managerial posts which are less regulated in centralised wage agreements than other posts. It also may be more difficult for women than men to signal about their unobservable positive characteristics (such as motivation) to employers. Whatever the reasons are for this difference, compared with other studies the adjusted coefficient for male wage equation is any way quite high at recruitment.[14]

When wage equations are estimated for subsequent years it appears from Table 4 that the explanatory power of the models start to decline gradually. Thus, more and more features which are not directly measurable begin to affect wages. Despite this the overall explanatory power of the models remains relatively high when the length of the career is extended.

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[14] See e.g. Asplund et al (1996) for evidence in Nordic countries.

The estimated wage equations allow us to study to what extent gender wage differentials reflect differences in background characteristics ($1+c_t$) and to what extent they are due to differences in remuneration (coefficients) of these characteristics ($1+d_t$). In Figure 2 the ratio of male wages to female wages is decomposed into these two components.

Figure 2. Components of the male-female wage differential

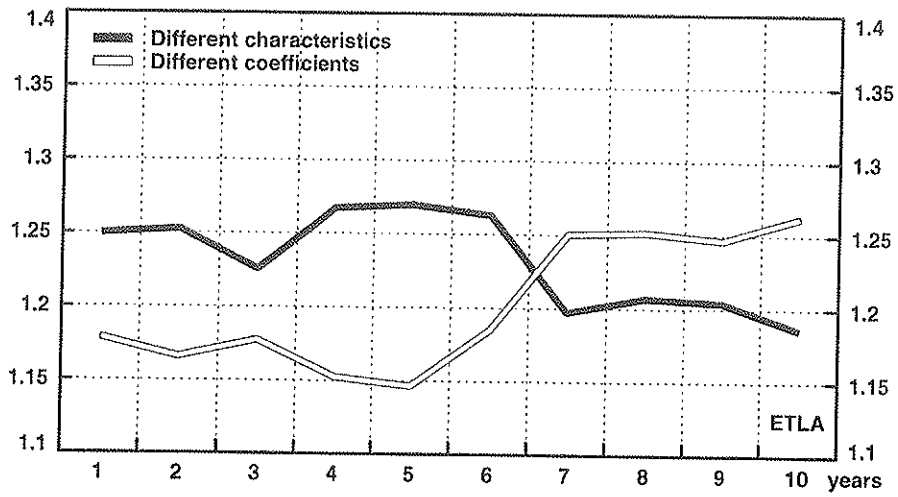


Figure 2 reveals an interesting pattern in the evolution of gender wage differentials over the career. At the beginning of the career a major part of the wage differential, about 25 per cent, is due to different characteristics and a smaller part, 18 per cent, is due to different remuneration of these characteristics (unexplained wag gap). According to a cross-section study from 1987 on all Finnish wage earners and salaried employees the gender wage gap due to discrimination amounted to 19 per cent, which was the highest figure among Nordic countries.[15] This estimate is very close to the amount of unexplained wage gap we observe at the beginning of the career among Finnish industrial employees. However, on average, wage earners and salaried employees appear to have remarkably equal labour market characteristics and only 1.6 per cent of wage differential in this group has been estimated to be due to different characteristics. One of the reasons for these different results is that we have been able to measure individual characteristics in a much more detailed manner than it is usually possible. This is reflected in high coefficients of determination in our estimations.

15 Asplund et al. (1996).

According to Figure 2 male and female employees become more similar and the gender wage gaps due to different characteristics decline over the years. The contrary is true for remuneration coefficients. After five years of employment in Finnish industry the unexplained gender wage gap starts to rise reaching the level of 26 per cent among employees whose career has lasted for 10 years. This result supports the idea that the dynamics in the internal labour markets differ substantially between men and women possibly in line with Lazear and Rosen (1990).

To analyse the observed evolution of the gender wage differentials over the career in a more detailed manner the estimation results are further split into the effects from different characteristics. In Figure 3 the effect of job level on wages and in Figure 4 the effect of wage group on wages are studied separately. These variables take into account the changes in the job status of clerical and technical employees, who remain employed in the lower job categories defined in Table 3.

Figure 3 shows that the gender wage differential in the group of clerical workers is mostly due to differences in the job levels and these differences seem to remain quite stable over time. The remuneration coefficients suggest that female clerical employees have a slight advantage over the male employees at the beginning of their careers. However, the unexplained gender wage differentials within the studied clerical employee groups appear to be rather small. This result is in line with the evidence from other empirical studies showing that gender wage gaps are small within narrow job categories.

What comes to technical employees Figure 4 suggests that the gender wage differential as a whole shows a slight advantage for women. It appears that technical men who work in lower wage groups are in a more disadvantaged position compared with male managerial and other higher level employees than technical women are in their own group. This disadvantage appears in both components of the gender wage differential. As was the case among clerical workers among technical employees unexplained wage gaps are also quite small throughout the career. This supports again the view that within narrow job categories male-female wage gaps are negligible.

Figure 3. The effect of job level on wages (clerical employees)

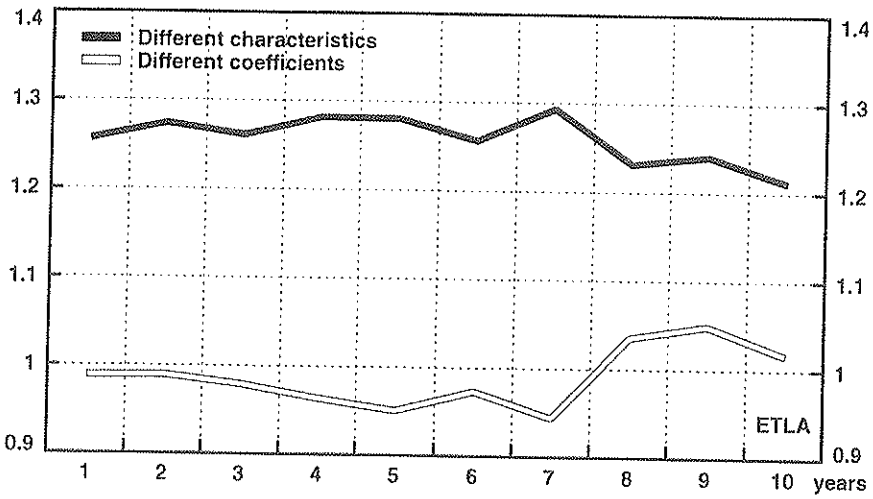
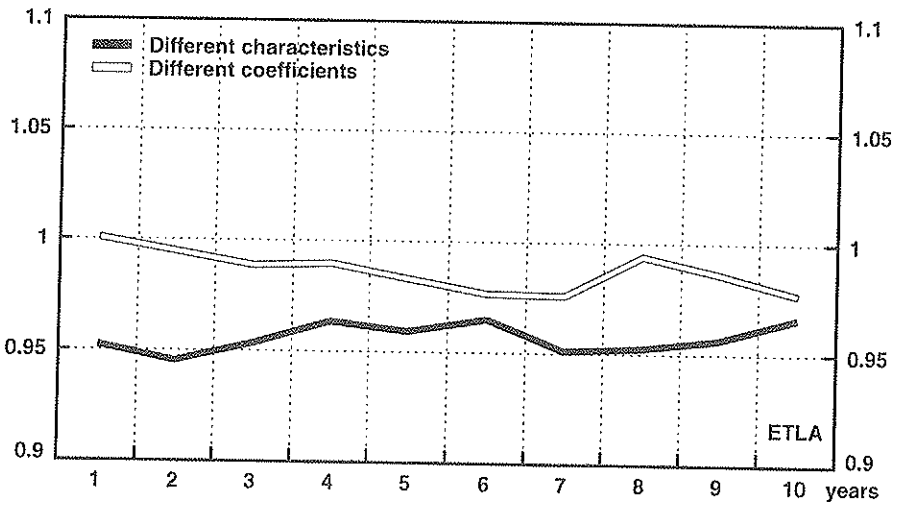


Figure 4. The effect of wage group on wages (technical employees)



In a dynamic model of statistical discrimination by Oettinger (1996) the main source of discrimination comes from the fact that the group discriminated against reaps smaller gains from job mobility. This is due to the fact that the productivity signal for that group is less informative than for the others. Oettinger's model implies that there is no discrimination at entry. Even though this does not hold true in our sample let us see what kind of a role job mobility has played in the evolution of gender wage gaps. In Figure 5 the effect of changing workplace on the gender wage differentials is studied at different phases of the career.

Figure 5. The effect of changing workplace on wages

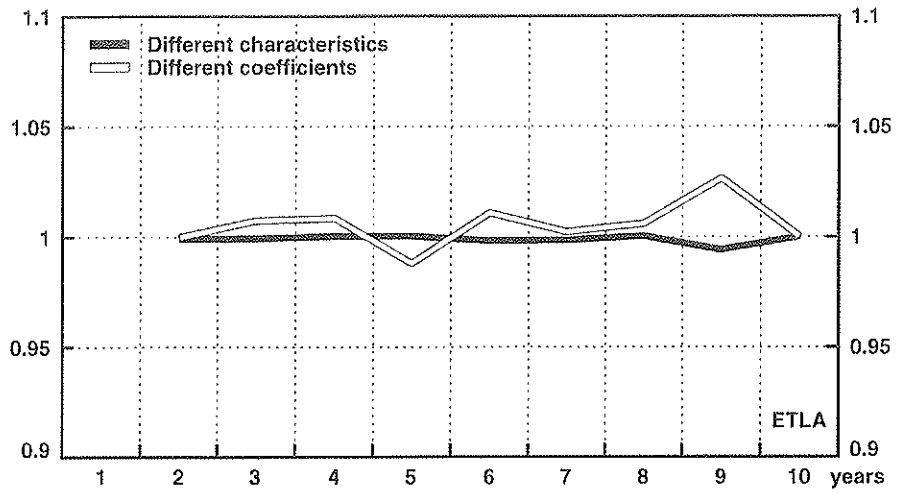


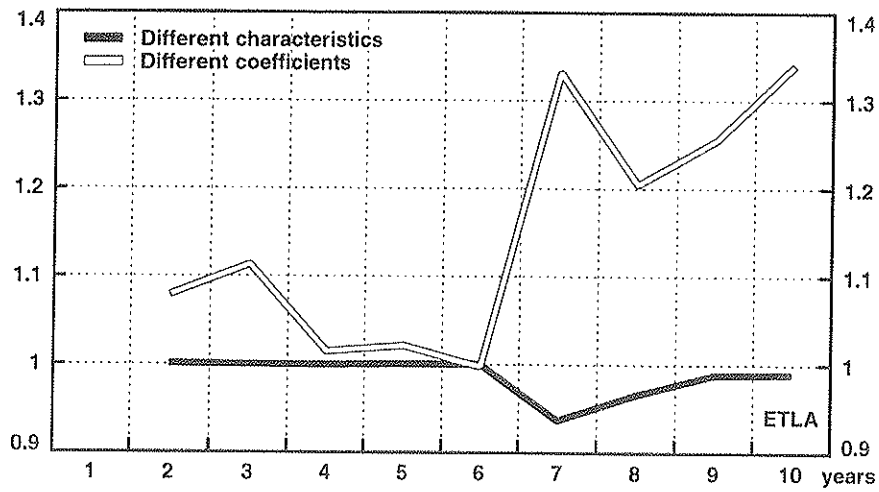
Figure 5 shows that in our sample of employees changing workplace within industry does not contribute much to the gender wage differential. It appears that women and men are equally likely to change jobs within industry (characteristics do not differ) and that the remuneration from this change is very similar for both sexes (coefficients do not differ). Thus, it appears that Oettinger's model does not seem to provide a plausible explanation to the observed male-female wage differentials among industrial employees.

The sample selection term (λ) appears to be the most important variable for which wage discrimination increases over the career in our estimations (Figure 6). This term measures the correlation between unobservable factors affecting the decision to continue employment and the wage level. It appears from Figure 6 that the contribution of these unobservable factors in the evolution of unexplained wage gap increases at later stages of the career. What does this mean? According to Lundberg and Startz (1983) if the group discriminated against (women)

find it more difficult to signal about their productivity in the labour market they will have a smaller incentive to make *unobservable* productivity-enhancing investments in human capital than the group that is not discriminated against (men) even prior to entering the labour market. In this situation women with the same observable characteristics than men would not have equal career progress and the gender wage gap over the career would increase.

It is also possible that the sample selection term picks up the effect of variables on wage determination which have not been included in our models. Our job-related variables can take into account career changes only in a limited fashion. For example, differences in managerial employees' promotion rates could no be accounted for properly.[16] If it is more difficult for women to be promoted as Lazear and Rosen (1990) suggest our sample selection term could partly take that effect into account in our estimations.[17]

Figure 6. The effect of sample selection on wages



[16] We did try to include some simple promotion indicators in our estimations but they failed to be statistically significant in most of the wage regressions.

[17] One explanation to this result can be that we have too crude sample selection measure in our estimations. The coefficients for the last four years were for women negative and for men positive and in either case significantly different from zero.

5 Concluding remarks

In this paper we have studied male-female wage differentials at different phases of the career over a period of ten years among industrial white-collar workers. The overall gender wage differential appears to be surprisingly stable over time, on average, men's hourly wage is 1.5 times as high as that of women. The dynamics behind the evolution of gender wage gap over the career appear to be interesting. At the beginning of the career a major part of the wage differential, 25 per cent, is due to different characteristics between the two sexes, and a smaller part, 18 per cent, can be accounted for different remuneration men and women receive from these characteristics (unexplained wage gap). When career proceeds the situation changes drastically. At the same time when male and female employees become more similar in terms of observed characteristics, unexplained wage gap increases. Among employees whose career has lasted for ten years gender wage differential due to different characteristics is 19 per cent. At the same time the unexplained wage gap increases to 26 per cent.

It appears from our estimations that the unexplained gender wage gap over the career is strongly affected by the unobserved individual characteristics that determine the decision to stay employed and the wage level at different phases of the career. Men receive much higher rewards from uninterrupted careers than women due to their unobservable characteristics. This can be due to many reasons. Women may have lower incentive to make unobservable productivity-enhancing investment in human capital than men if it is more difficult for them to signal about their productivity in the labour market. In this situation women with the same observable characteristics than men would perform worse in the labour market. On the other hand, women's potentially higher expected value in hometime may lead to a situation where at the same levels of ability women's promotion probabilities are lower than those of men leading, in turn, to rising unexplained wage gap over the career. Our results suggest that better understanding of the functioning of the internal labour markets is required to be able to say which mechanisms are important in the evolution of overall gender wage differentials.

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