ISSN 1651-0852

FIEF Working Paper Series 2002

No. 179

Mandatory Earnings-Related Insurance Rights, Human Capital and the Gender Earnings Gap in Sweden*

by

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Abstract

Most labour market analyses take money wages as the sole measure of compensation for labour, thus excluding fringe benefits. We examine an extended compensation measure by incorporating mandatory collective earnings-related insurance rights: the rights of individual old age pension, sickness benefit insurance and survivors' pension. We estimate the return on investment in human capital and the gender earnings gap in a traditional earnings equation. The money wage and the extended wage are used as dependent variables in joint regressions, where a SUR framework enables proper joint cross-equation tests. The main finding is that the inclusion of earnings-related insurance rights does affect the return on education. When these non-wage benefits are included, the gender wage gap decreases by 21 per cent. However, the gender differences in returns to education are severely underestimated when money wage is used as a compensation measure.

Keywords: Non-wage benefits; Gender gap; Human capital; Occupational welfare
JEL classification: H55; J16; J26; J32; J33; M52

October 7, 2002

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*The paper was presented at the sixteenth Annual Conference of the European Society for Population Economics (ESPE2002). Financial support from the Swedish Research Council, Swedish Council for Working Life and Social Research and the National Social Insurance Board is gratefully acknowledged.

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I. Introduction

Traditional studies of wage differentials do not provide us with the complete picture of differences in remuneration for work. One reason is that compensation other than money wages is not included. This can result in misjudged wage differences, since wages are not only money wages. An employee's total labour compensation includes all benefits received in connection with his or her employment. In addition to money wage compensation may include earnings-related (employment-related) insurance rights, conventional fringe benefits, working conditions, promotion opportunities, employment security, etc.

In this study of 1995 year's wage differentials in Sweden we use an extended earnings measure. In addition to money wage, old age pension rights, survivors' pension rights and sickness benefit insurance rights derived from the occupational and earnings-related social insurance schemes are included in the wage measure. Particular for Sweden is that these insurance schemes are mandatory and collective. Since they are not marketable (on the individual level) we cannot directly observe the individual value of the non-wage benefit that the security package represents. Instead, the non-wage benefits have to be determined by indirect means.

In the study we analyse how the inclusion of earnings-related insurance rights in the earnings equation changes the returns on human capital and affect the gender earnings gap.

The paper is organised as follows: Section I gives the introduction. Section II presents previous studies. In section III data is presented and the individual non-wage benefit of the security in times of old age, widow/widowerhood and sickness is estimated. Section IV presents the econometric specifications, sample and variables. Section V contains empirical results. Conclusions and reflections are given in the final Section VI.

II. Previous studies

In most studies and comparisons of earnings inequality, the money wage is used as the measure of labour compensation, although in fact a broader measure should be used. Only a few empirical studies have been made of the role of non-wage benefits in the distribution of earnings. Townsend (1979) shows that conventional fringe benefits reinforce the inequality in earnings distribution between British blue-collar and white-collar workers.

Atkinson (1983, p. 81) reports similar findings. Smeeding (1983) suggests that if measures of the non-cash compensation normally enjoyed by high-wage professionals and administrators were included in the analysis, the distribution of compensation would appear more unequal. Granqvist (1998) using Finnish data finds that conventional fringe benefits increase earnings differentials and gender differences in earnings inequality. Using Swedish data, Selén and Ståhlberg (1998) find that, according to the coefficient of variation, relative variability increases when acquired pension rights are included in the wage measure.

Most empirical findings about the way non-wage benefits affect the return on human capital reveal little or no change in the return when non-wage benefits are included in the earnings measure. However, using micro data simulation techniques to construct a data set from grouped US data for 1980, Smeeding (1983) reports results suggesting that different measures of compensation can be expected to have a substantial effect on the previously determined impact of various explanatory variables on hourly wages and salaries. In a Finnish study, based on micro data for 1987, Asplund (1993) shows that when the tax value of conventional fringe benefits is added to normal earnings, the estimated wage effects do not differ significantly from the wage effects estimated when non-wage benefits are not included. Granqvist (1998) using Finnish data finds that the inclusion of fringe benefits in the wage measure does affect the gender gap and the return on human capital. Kiker and Rhine (1987), using US data, find that the mean rate of return on an additional year of work experience is higher for both males and females when health insurance are included. Selén and Ståhlberg (1996), using Swedish data, find that experience makes a greater impact in estimations where the wage concept includes money wage and acquired pension rights, than in estimations that consider the money wage only. Results presented in Fornwall (1994), also based on Swedish data, indicate that the parameter estimate of education and educational achievements decreases in size and significance when conventional fringe benefits are included in the earnings measure. This, the author concludes, indicates that education and educational achievements make a different impact on non-wage benefits than on salary.

There are numerous studies of male-female earnings differentials, but only a handful has analysed gender differences in non-wage benefits. Most of them focus on gender differences in the probability of receiving insurance provisions. A number of US studies of non-wage benefits focus on gender differences in insurance provisions. Currie (1993) estimates linear probability models on the provision of different non-wage benefits. She finds that women are less likely to be offered pensions, health coverage

and disability plans even after controlling for characteristics like age, education, marital status and number of children. Even and Macpherson (1990) report that for a given set of observed characteristics a woman is 10-20 per cent less likely than a man to have a pension benefit. In contrast, Averett and Hotchkiss (1995) find that women are more likely to receive medical, life and retirement benefits.

III. Data

Our estimation is based on a representative sample of the Swedish adult population 18-64 years old. More precisely we employ the household income survey for 1995 (Statistics, Sweden). This yearly survey is based on about 10 000 households in all. Individuals are interviewed concerning labour market status, household structure and housing conditions. The interviews are supplemented with register data on income from different sources and with other variables. The non-response rate for 1995 was below 20 percent.

Estimated non-wage benefits

In addition to earnings-related social insurance Sweden has quasi-mandatory occupational insurance schemes where the mandate is not a legal requirement imposed by the state, but the result of contractual agreements between labour unions and employers. What is unusual about the situation in Sweden is that practically all employees are covered by occupational insurance that is drawn up in a very small number of occupational schemes. There are four main schemes: one for private sector white-collar workers, one for private sector blue-collar workers, one for state employees, and one for local authority and county council employees. They cover the same areas as the social insurance scheme. They raise the level of compensation especially upon illness and retirement. They also compensate for loss of income above the level of earnings covered by social insurance. In 1995, social and occupational insurance schemes are mandatory, encompassing, and non-actuarial (on the individual level). We cannot directly observe the individual value of the annual non-wage benefit that a mandated collective insurance represents. Instead, it has been estimated as follows.

Old age pension rights

In 1995, Sweden had five typical defined benefit pension plans,[4] which promise a yearly pension during retirement equal to

$$B = K \times T_{\mathrm{N}} \times W$$

where

B = annual retirement benefit,

T_{N} = accumulated years of service at retirement date,

W = annual salary (usually the terminal salary or the average of the last year's salaries),

K = a constant.

For each individual in the sample we calculate P, the yearly increase in the present value of pension liabilities from employment during the year (according to Selén and Ståhlberg 1998[5]).

$$P = (L_1 - L_0) \times S_{A,N} \times \left[1/(1+r)^{N-A}\right] \times \sum_{i=N}^{D} S_{N,i} \times \left[1/(1+r)^{i-N}\right]$$

where

$L_1 = K \times T_1 \times W_1$

$L_0 = K \times T_0 \times W_0$

W_1 = annual earning (terminal salary or the average of the last year's salaries) at end of year 1

W_0 = annual earning (terminal salary or the average of the last year's salaries) at end of year 0,

T_1 = years of service at end of year 1,

T_0 = years of service at end of year 0

D = age at death,

N = age at retirement,

A = current age (year 1)

$S_{A,N}$ is the probability of surviving from age A to age N

r = real rate of discount, $r = 0.02$.

[4] Pension experts usually distinguish between two pension plan types, the defined benefit (DB) and the defined contribution (DC) pension. In a DB plan, a formula for retirement income based on the worker's wage and service is specified. In a DC plan, benefits at retirement depend on the total contribution the worker has accumulated into the plan by retirement age.

[5] See also for example Moore (1987).

L_1 and L_0 have been calculated according to the rules of the five old age pension schemes described in Appendix Table A1.

Survivors' pension rights

We estimate the individual value of the survivors' pension from the 1995 occupational insurance schemes and income-related social insurance scheme (according to Selén & Ståhlberg 2001).

$p_i \times B_{i,j}^{Occ} + A_j^{Occ} = \Pi_{i,j}^{Occ}$, that is the expected value of the occupational survivors' pension for individual *i* who belongs to the occupational insurance scheme *j*.

$p_i \times B_i^{Soc} + A^{Soc} = \Pi_i^{Soc}$, that is the expected value of the survivors' pension from the earnings-related social insurance system for individual *i* where

p_i = the probability of the insurance situation occurring, that is, the mortality risk. This is calculated by age and sex.

$B_{i,j}^{Occ}$ = the discounted value of the benefit amounts from occupational insurance.

$B_{i,j}^{Occ} = B_{i,j}^{Occ}$(age, married/cohabitee, annual wages, marginal tax rate, age of spouse/cohabitee, mean life expectancy, number of children, children's ages, rate of discount) according to the survivors' pension rules. Table A2 in Appendix gives a short description of the rules.

B_i^{Soc} = the discounted value of the benefit amounts from social insurance.

$B_i^{Soc} = B_i^{Soc}$(married/cohabitee, pension points in the earnings-related social insurance old age pension scheme, number of years with pension points, marginal tax rate, number of children, children's ages, rate of discount) according to the survivors' pension rules. See Appendix Table A2 for a short description.

A_j^{Occ} = administrative costs of the occupational insurance scheme *j*.

A^{Soc} = administrative costs of the social insurance scheme.

$A_j^{Occ} = A^{Soc} = 0$

r = real rate of discount, $r = 0.02$.

Sickness benefit insurance rights

We estimate the individual value of the income security in times of sickness (according to Selén & Ståhlberg 2002). The risk of sickness is diversified according to sex, age, socio-economic group, and occupational sector. The sickness benefit rules are described in Appendix Table A3.

For each individual in the sample it would be possible to estimate the expected benefits given the expected number of days at each replacement level, that is,

at level *A* (corresponds to days 2-14 in each sick-period),
at level *B* (15-90 days),
at level *C* (91-365 days).

This can be done if there is information on

the probability for 1 day on level *A*, and for 2 days,..13 days, 14 days, 15 days …etc

the probability for 1 day on level *B*, and for 2 days,..13 days, 14 days, 15 days…etc

the probability for 1 day on level *C*, and for 2 days,..13 days, 14 days, 15 days…etc.

The expected benefits on level *A* thus are

$c_A \times w \times (p_{1A} + 2 \times p_{2A} + 3 \times p_{3A} \ldots..)$, where

c_A is a constant determined by the sickness benefit rules

p_{iA} is the probability for *i* days on level *A*

w is wage income.

Correspondingly, the expected benefits on level *B* and *C* are

$c_B \times w \times (p_{1B} + 2 \times p_{2B} + 3 \times p_{3B} \ldots..)$

$c_C \times w \times (p_{1C} + 2 \times p_{2C} + 3 \times p_{3C} \ldots..)$.

That is, we need information of the weighted sum of the probabilities $(p_{1A} + 2 \times p_{2A} + 3 \times p_{3A} \ldots..)$, $(p_{1B} + 2 \times p_{2B} + 3 \times p_{3B} \ldots..)$, $(p_{1C} + 2 \times p_{2C} + 3 \times p_{3C} \ldots..)$

by occupational sector, socio-economic group, sex and age.

Instead of pursuing this task, we follow the simpler path of Selén and Ståhlberg (2002). This is mainly dictated by the available data, where information on sickness periods is lacking and an individual's sickness compensation is known only for days 15 and onwards aggregated over the year. The strategy is to non- parametrically estimate sickness behaviour for different groups, and calculate the benefits under certain assumptions utilising data from 1990 when all sickness compensation was administered by the National social administration and therefore centrally registered.

Estimates from Selén and Ståhlberg (2002) concerning sickness benefits by class, sex and age group cross-classified (cf. table 4.2 ibid.) are imputed to the individuals in the data-base employed here.

IV. Econometric specifications, sample and variables

In the analysis two earnings measures are used: money wage and total wage, which includes money wage and the total value of non-wage benefits, $W + NWB$. The non-wage benefits are those earnings-related insurance rights that we described above. The H_0-hypothesis to be tested states that omitting non-wage benefits from the earnings equation does not bias the return on human capital, because a change in the money wage will be a good proxy for the change in the total wage.

In order to test this hypothesis we jointly estimate the two earnings equations in a Mincer equation context: the logarithm of money wage and the logarithm of total wage. Money wage and non-wage benefits are assumed to be related through the disturbance terms for each observation. Why should non-wage benefits and money wages be related to each other in this way? The reason is that some non-observed characteristics of a given employee have similar effects on the disturbances in the money-wage equation and in the non-wage/total wage equation. We therefore use a GLS estimator to estimate the seemingly unrelated regression model (SUR).

Above all, using this framework makes *joint cross-equation tests* possible. In a statistical sense it is not adequate to compare coefficients from different OLS regressions, if the samples cannot be treated as independent samples. However, in this case there are no differences in the estimated parameter vectors of using GLS or OLS, because the X vector is exactly the same in every equation. Nevertheless the variance-covariance matrix Σ, is different from that of the separate OLS regressions, given that the off-diagonal elements are not zero.[6]

Therefore we first test whether the off-diagonal elements in the variance-covariance matrix Σ are zero, i.e. we test for correlation between the disturbances in the money-wage equation and the non-wage benefit equation. The test statistic used is the Lagrange multiplier statistic, which is

[6] Although the well-known mathematical fact that the OLS and GLS estimators are similar if the explanatory variables are the same in each equation, we should still estimate the model using GLS, because coherent inference can only be drawn using the full variance-covariance matrix including the off-diagonal elements (Jäntti, 1994).

asymptotically χ^2 distributed under H_0, as suggested by Breusch and Pagan (1980). See Judge *et al.* (1985, p. 476) for a description of the statistic.

The hypothesis of equal coefficient vectors across equations is tested, using the SUR off-diagonal elements of the variance-covariance matrix. The test statistic is a Wald test statistic (see Judge *et al.*, 1985, pp. 20-28, and STATA6 Manual Su-Z, pp. 183-186).

A sample of 10 897 employees aged 20-60 is used in the analyses. The female/male share is 50.6 / 49.4 per cent. The sample means are shown in Table 1. The equation used in every regression is an extended Mincer equation consisting of traditional human capital variables plus job-related characteristics, which are predicted as playing a part in the wage-level equation. A gender dummy for women is included. Instead of a continuous schooling variable, seven dummy variables are used to indicate the educational level with the lowest level as the reference level. Work experience is constructed on the basis of earned pension points included in the data set. This is a more adequate measure of experience than potential experience, which is usually used in earnings equations. Experience squared is also included. Six dummy variables indicating sector and socio-economic class with the private blue-collar group as the reference level are included. Dummies for working full time and living in a big city (Stockholm, Gothenburg and Malmö) are included along with variable measuring the number of children under 12 years old and a dummy for being married.

Annual before-tax money wage is the basis of the dependent variable employed in the regressions. This type of compensation includes overtime and holiday pay.[7] The ”total wage” variable is constructed by adding the total annual value of non-wage benefits (the sum of the derived values of old age pension rights, sickness benefit insurance rights and survivors’ pension rights) to the annual money wage. The dependent variables are the logarithm of annual money wage and the log of the annual total wage. To get an idea of the magnitudes of the non-wage benefit/total-wage ratio and non-wage benefit/money-wage ratio in the sample, the shares are shown in Table 1. The mean non-wage-benefit/total-wage ratio is about 18 per cent and the mean non-wage-benefit/money-wage ratio is about 27 per cent.[8]

[7] We use annual earnings in stead of hourly earnings because the information on working time in the data set is not reliable. The inclusion of a full-time dummy is expected to somewhat alleviate this shortcoming.

[8] Some of the derived values of non-wage benefits are negative since L_1 can be less than L_0.

Table 1. Means of variables. Employees aged 20 to 60. Standard deviations in parentheses.

	All	*Female*	*Male*
Income measures:			
Logarithm of annual money wage	12.10 (0.45)	11.92 (0.38)	12.29 (0.44)
Logarithm of annual total wage	12.33 (0.53)	12.16 (0.45)	12.50 (0.55)
Annual money wage (SEK)	200 731 (115 859)	162 148 (65 189)	240 297 (140 501)
Annual total wage (SEK)	264 502 (202 642)	213 177 (125 260)	317 134 (248 232)
1 Non-wage benefits, old age pensions (SEK)	50 888 (110 005)	38 216 (74 582)	63 883 (135 923)
2 Non-wage benefits, sickness insurance rights (SEK)	9 933 (4 920)	10509 (4 290)	9 341 (5 428)
3 Non-wage benefits, survivors' pension (SEK)	2 950 (3 267)	2 304 (2 133)	3 612 (4 011)
Non-wage benefits, total (Σ 1,2,3) (SEK)	63 771 (112 349)	51 029 (76 333)	76 837 (138 766)
NWB shares, %:			
NWB / total wage	18.4	19.9	16.9
NWB / money wage	27.5	28.6	26.3
NWB, old age pensions / money wage	20.4	20.3	20.6
NWB, sickness insurance rights / money wage	5.5	6.8	4.2
NWB, survivors' pension / money wage	1.5	1.5	1.5
Women, %	50.6		
Educational levels, %:			
Primary education, less than 9 years	8.0	6.5	9.4
Primary education 9 years (10 years)	10.4	9.5	11.3
Upper secondary education, 2 years	35.8	38.8	32.7
Upper secondary education, > 2 years	14.7	12.6	16.8
University education, less than 3 years	16.2	17.8	14.5
University education, 3 years or more	14.2	14.3	14.2
Doctoral education	0.7	0.4	1.1
Work experience, years	19.8 (9.3)	18.7 (8.4)	21.0 (9.9)
Full time, %	68.0	50.1	86.3

(Table 1 cont.)

Table 1 (cont.)

Sector and socio-economic class, %:			
Private white collar	32.3	25.2	39.6
State white collar	6.9	6.6	7.3
Local authority and county council white collar	18.2	27.1	9.1
State blue collar	1.7	1.2	2.2
Local authority and county council blue collar	14.3	23.7	4.6
Private blue collar	26.5	16.2	37.1
Big city (Stockholm, Gothenburg, Malmö), %	14.6	14.8	14.5
No of children under 12 years old	0.70 (0.97)	0.68 (0.94)	0.72 (0.99)
Married, %	58.9	60.2	57.7
# of observations	10 897	5 517	5 380

The non-wage benefit shares are somewhat higher for women than for men. For example, the ratio of average sickness benefit rights to the money wage is larger for women than for men since the sickness rate is higher for women. The average survivors' pension rights relative to the money wage are the same for women and men, while the average old age pension rights relative to money wage is somewhat higher for men.

To account for structural gender differences each set of equations is estimated separately for men and women.[9]

Table 2. Correlations between the residuals of the money-wage equation and the non-wage-benefit equation. The probability values of the Breusch-Pagan tests are shown in parentheses.

	All	Female	Male
No. obs.[10]	10 738	5 482	5 256
	0.62 (pr=0.000)	0.60 (pr=0.000.)	0.63 (pr=0.000)

[9] Each set of equations was also estimated separately for the four occupational schemes. The results, not presented here, are available upon request.

[10] Note that the number of observations is somewhat smaller than of the sample used in the analyses. This is due to negative total values of non-wage-benefits, which we deleted to be able to take the logarithm of the non-wage benefit values.

V. Results

Before we analyse the effects of including earnings-related insurance rights in the traditional earnings equation, we test the hypothesis of independence. To calculate the correlation matrix of the residuals, we estimate a SUR model where the log of annual non-wage benefits and the log of annual money wage are the dependent variables. The explanatory variables described above are included in the regressions. The correlations and probability values of the tests are reported in Table 2. The Breusch-Pagan test of independence was rejected. The significant positive correlation of the residuals between money wages and non-wage benefits is about 0.6.

The results of the SUR regressions[11] using the money wage and the total wage as the dependent variables, are shown in Table 3.[12] The woman dummy coefficient in the wage-level regressions without non-wage benefits is about -0.21. Comparing the woman dummy coefficients indicates that non-wage benefits decrease the gender gap, *ceteris paribus*. The returns on different educational levels increase and so do the coefficients of the experience variables and the returns on most other variables in the model. The separate regressions for women and men show, on the other hand, that for women the returns to the four lowest educational levels actually *decrease* when non-wage benefits are taken into account. For men, the return on every level increases beyond the reference level.

To analyse whether these differences are significant, the hypothesis of equal coefficient vectors across equations is tested, using the SUR off-diagonal elements of the variance-covariance matrix described above. The hypothesis of equal coefficient vectors (except for the constants) is rejected at the 5 per cent level and below. The χ^2-values for tests of the whole coefficient vector (except for the constant term) and of groups of coefficients, are shown in Table 4. The tests of the coefficient groups show that an inclusion of non-wage benefits do affect the returns.

The equality between separate coefficients across the equations was also tested, to find out which variables generate the differences discussed above. Coefficients printed in ***bold italics*** in the Total Wage columns in Table 3 show significant differences between the money-wage and the total-wage

[11] No weights are used in the estimations.

[12] The ”goodness of fit” measure R^2 is not quite appropriate in a GLS context. However, the reported R^2 values are calculated prior to combining the information across equations. In this case they are exactly identical to the R^2s from OLS regressions on the separate equations, so they are reported in quotation marks. Nonetheless, some possible alternative R^2 definitions for the SUR model are suggested. See, Judge *et al.*, 1985, p. 477.

coefficients. The woman dummy coefficient decreases in absolute value. This means that non-wage benefits in their capacity as insurance rights narrow the earnings gap.

There also seem to be gender differences in the returns on education, but in the usual direction. In the case of men, every education level, except the lowest one, shows a significant increase in the average return beyond the basic level when non-wage benefits are included. This is not the case for women, when non-wage benefits are taken into account the only significant change due to non-wage benefits is a *decrease* in the return for women with a short upper secondary education.

To get an impression of the "quantity" of the differences, the changes in returns are calculated.[13] The gender gap decreases by about 21 per cent due to non-wage benefits in their capacity as earnings-related insurance rights. The calculations show that, in the case of men, the average returns on the educational levels increase within a range of 25 to 37 per cent (average 31 per cent) beyond the reference level due to non-wage benefits. The only significant change in the case of women refers to those with a short upper secondary education. The return on this educational level decreases by about 17 per cent. This means that the gender differences in returns to education are underestimated when money wage is used as the compensation measure in earnings regressions.

The coefficients of the experience variables show significant changes due to non-wage benefits for both women and men. For women the increase is more than 100 per cent and for men about 57 per cent.

Non-wage benefits significantly increase the earnings differentials for private and state white-collar employees compared to private blue-collar workers. The negative earnings gap between local authority and county council white-collar employees and private blue-collar workers widens even more due to non-wage benefits. This is in agreement with the principles underlying the construction of the insurance schemes.

Non-wage benefits do not widen the earnings gap between employees living in the three biggest cities of Sweden and those living outside these cities. Women with children seem to be more punished concerning non-wage benefits - the ”punishment” for having children gets larger. For men there is no significant effect of children. However, the significant marriage premium for men increases due to non-wage benefits. The increase in the male marriage premium is about 40 per cent.

[13] When the coefficient exceeds 0.1, the percentage is measured as (*exp*[coefficient]-1)*100. The change in returns due to non-wage benefits is calculated like this: For example, for men with a long university education (coefficients 0.439 and 0.528) the change is (0.695 - 0.551) / 0.551=0.261.

Table 3. SUR regressions on a sample of employees, aged 20 to 60. Dependent variables: logarithm of annual money wage and logarithm of annual total wage (money wage + non-wage benefits). Non-wage benefits are old age pension rights, sickness benefit insurance rights and survivors' pension rights. Standard errors in parentheses.

	All		*Female*		*Male*	
	Money wage	Total Wage	Money Wage	Total Wage	Money Wage	Total Wage
Intercept	11.373** (0.018)	11.152** (0.024)	11.250** (0.024)	11.187** (0.027)	11.312** (0.026)	11.201** (0.032)
Woman	-0.210** (0.007)	***-0.169***** (0.009)				
Educational level:						
Primary education, less than 9 years	0	0	0	0	0	0
Primary education 9 years (10 years)	0.070** (0.015)	0.071** (0.018)	0.097** (0.020)	0.081** (0.023)	0.036 (0.022)	0.054 (0.027)
Upper secondary education, 2 years	0.114** (0.013)	0.118** (0.015)	0.111** (0.017)	***0.093***** (0.020)	0.108** (0.020)	***0.134***** (0.024)
Upper secondary education, > 2 years	0.167** (0.015)	***0.191***** (0.017)	0.129** (0.020)	0.119** (0.023)	0.190** (0.021)	***0.248***** (0.026)
University education, less than 3 years	0.206** (0.015)	***0.233***** (0.018)	0.192** (0.020)	0.190** (0.023)	0.205** (0.023)	***0.260***** (0.030)
University education, 3 years or more	0.424** (0.016)	***0.470***** (0.019)	0.391** (0.021)	0.399** (0.024)	0.439** (0.024)	***0.528***** (0.030)
Doctoral education	0.676** (0.038)	***0.786***** (0.046)	0.663** (0.063)	0.694** (0.073)	0.677** (0.050)	***0.844***** (0.062)
Work experience	0.034** (0.001)	***0.062***** (0.002)	0.029** (0.002)	***0.060***** (0.002)	0.040** (0.002)	***0.063***** (0.003)
(Work exp^2) *1000	-0.564** (0.039)	***-1.110***** (0.046)	-0.437** (0.054)	***-1.065***** (0.062)	-0.694** (0.059)	***-1.119***** (0.073)
Full time	0.295** (0.007)	0.294** (0.009)	0.284** 0.008	0.286** (0.009)	0.297** (0.014)	0.292** (0.018)

Table 3 (cont.)

Table 3 (cont.)

	All		*Female*		*Male*	
	Money wage	Total Wage	Money Wage	Total Wage	Money Wage	Total Wage
Sector and socio-economic class:						
Private white collar	0.149**	***0.167*****	0.139**	0.139**	0.148**	***0.173*****
	(0.009)	(0.010)	(0.013)	(0.015)	(0.012)	(0.015)
State white collar	0.055**	***0.157*****	0.079**	***0.193*****	0.031	***0.111*****
	(0.014)	(0.017)	(0.019)	(0.022)	(0.022)	(0.027)
Local authority and county council white collar	-0.047**	***-0.094*****	-0.014	***-0.061*****	-0.086**	***-0.147*****
	(0.012)	(0.014)	(0.015)	(0.017)	(0.020)	(0.024)
State blue collar	-0.006	***0.107*****	0.040	***0.157*****	-0.040	***0.069***
	(0.024)	(0.029)	(0.037)	(0.042)	(0.032)	(0.040)
Local authority and county council blue collar	-0.018	-0.027*	0.005	-0.014	-0.120**	-0.124**
	(0.011)	(0.013)	(0.013)	(0.015)	(0.023)	(0.029)
Private blue collar	0	0	0	0	0	0
Big city (Stockholm, Gothenburg, Malmö)	0.028**	0.031**	0.035**	0.034**	0.026	0.032*
	(0.009)	(0.010)	(0.011)	(0.013)	(0.014)	(0.017)
No of children under 12 years old	0.001	***-0.003***	-0.011*	***-0.024*****	0.008	***0.014***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.007)
Married	0.010	***0.029*****	-0.025**	***-0.012***	0.045**	***0.064*****
	(0.007)	(0.008)	(0.009)	(0.010)	(0.011)	(0.014)
# of observations	10 897	10 897	5 517	5 517	5 380	5 380
"R^2"	"0.485"	"0.470"	"0.410"	"0.449"	"0.381"	"0.399"

*Significant at 5 % level, **significant at 1 % level

Coefficients printed in ***bold italics*** significantly differ from the corresponding coefficients in the money-wage equation according to the computed Wald tests. The hypothesis of equal coefficients is rejected at the 5 % level and below. R^2 is not well defined in the GLS context, so the values are reported in quotation marks. See footnote 12 for further explanations.

Table 4. χ^2-values for Wald tests of equal coefficient vectors across equations; equality between groups of coefficients and equality between the whole coefficient vector except for the constant term.

Variables	All	Female	Male
Woman dummy (df=1)	118.0**		
Education dummies (df=6)	89.7**	24.0 **	83.9**
Experience + exp^2 (df=2)	822.9**	1750.0**	512.8**
Full-time dummy (df=1)	0.0	0.3	2.6
Sector/class dummies (df=5)	557.1**	521.9**	244.4**
Big city (df=1)	0.3	0.1	0.4
Children (df=1)	6.7**	37.6**	4.5*
Married (df=1)	27.8**	11.3**	8.8**
All coefficients (df=18 / 17 / 17)	3336.8**	3003.6**	1117.7**

*Significant at 5 % level, **significant at 1 % level

These results are much in line with a study of Granqvist (1998) on Finnish data, where the total value of conventional fringe benefits was included. Especially the pattern of the gender differences in returns to education seem to be identical; the differences for women were not significant except in one case, while every male difference was significant. This means that the gender differences in returns to education are underestimated when money wage is used as compensation measure in earnings regressions.

The conclusion is that the exclusion of non-wage benefits in the traditional extended earnings equation, does bias the return on human capital. A change in the money wage is therefore not a good enough proxy for the change in the total wage.

VI. Concluding remarks

In this paper we have looked at the question as to whether or not the inclusion of non-wage benefits in their capacity as earnings-related insurance rights in the earnings equation changes the gender gap and returns on human capital. The tested H_0-hypothesis states that omitting non-wage benefits from the wage equation does not bias the return on human capital, because a change in the money wage will be a good proxy

for the change in the total wage. The non-wage benefits included in the compensation measure were earnings-related old age pension rights, survivors' pension rights and sickness benefit insurance rights.

The conclusion is that the inclusion of non-wage benefits in the traditional extended earnings equation, does affect estimates of the return on human capital. A change in the money wage is therefore not a good enough proxy for the change in the total wage.

The inclusion of earnings-related insurance rights in the earnings equation significantly decreases the gender gap, and increases the returns on education levels beyond the reference level for males. This is not the case for women. The only significant change is a decrease in the returns for women with a short upper secondary education. This means that the gender differences in returns to education are underestimated when money wage is used as compensation measure in earnings regressions.

The gender gap narrows by about 21 per cent due to non-wage benefits. On average, the returns on different educational levels for men increase on average about 31 per cent due to non-wage benefits. In the case of women the only significant effect stemming from non-wage benefits appears for those with a short upper secondary education, where the decrease in return is 17 per cent.

To sum up: the results of this paper indicate that money wage only is a too narrow compensation measure.

Appendix

Table A1. The 1995 rules in the earnings-related social insurance pension (ATP), the occupational pension for private blue-collar workers (STP), private white-collar workers (ITP), state employees and local authority and county council employees.

	Social insurance earnings-related pension (ATP)	Occupational pension for private blue-collar workers (STP)	Occupational pension for private white-collar workers (ITP)	Occupational pension for state employees	Occupational pension for local employees
The ceiling for pensionable income	7.5 base amounts	7.5 base amounts	30 base amounts	30 base amounts	30 base amounts
Pension can be earned from age	16	28	28	28	28
Number of qualifying years required for full pension	30	30	30	30	30
Pensionable income on which pension is calculated	15 best annual incomes	3 best annual wages between ages of 55 and 59	The final wage	Final 5 annual wages	2nd, 3rd and 4th best of final five annual wages
Level of pension (full pension)	60% of average of 15 best annual incomes	10% of average of 3 best annual wages between ages of 55 and 59	10% on fractions of wage up to 7.5 base amounts, 65% on fractions of wage between 7.5 and 20 base amounts, 32.5% on fractions of wage between 20 and 30 base amounts. A minor defined contribution pension is added	Same as in ITP	Pension is coordinated with national basic pension and ATP. It is calculated on basis of average of 2nd, 3rd and 4th best final five annual wages. Compensation varies with income bracket
Pensionable age	65	65	65	65	Normally 65. For large occupational groups, e.g. within the health-care sector a lower pensionable age applies

Note: The 1995 base amount is 35 700 SEK

Table A2. The 1995 survivors' pension rules.

Social insurance earnings-related survivors' pension	Occupational survivors' pension for private blue-collar workers	Occupational survivors' pension for private white-collar workers	Occupational survivors' pension for state employees	Occupational survivors' pension for local employees
Widow/widower/ cohabitee's* pension: On fractions of the deceased's annual wage below 7.5 base amounts. For six months.	Widow/widower's pension: None	Widow/widower's pension: If the deceased's annual wage is above 7.5 base amounts. For the rest of her/his life if she/he does not remarry.	Widow/widower/cohabitee's* pension: For five years. Ceases at remarriage. Supplementary widow/widower/ cohabitee's* pension: If the deceased's annual wage is above 7.5 base amounts. For the rest of her/his life if she/he does not remarry.	Widow/widower/ cohabitee's* pension: For five years. Ceases at remarriage.
Child pension: On fractions of the deceased's annual wage below 7.5 base amounts. Until (at most) 20 years of age.	Child pension: None	Child pension: If the deceased's annual wage is above 7.5 base amounts. Until 20 years of age.	Child pension: Until 20 years of age. Supplementary child pension: If the deceased's annual wage is above 7.5 base amounts.	Child pension: Until 20 years of age.
	Occupational life insurance	Occupational life insurance	Occupational life insurance	Occupational life insurance

* if children in common

Table A3. The 1995 sickness benefit insurance rules.

	Private sector blue-collar workers	Private sector white-collar workers	State employees	Local authority and county council employees
Day 1	No-benefit day	No-benefit day	No-benefit day	No benefit-day
Day 2-14	Sick pay 80 per cent of whole wage	Sick pay 80 per cent of whole wage	Sick pay 80 per cent of whole wage	Sick pay 80 per cent of whole wage
Day 15-90	Social insurance: 80 per cent on fractions of wages below 7.5 base amounts	Social insurance: 80 per cent on fractions of wages below 7.5 base amounts	Social insurance: 80 per cent on fractions of wages below 7.5 base amounts	Social insurance: 80 per cent on fractions of wages below 7.5 base amounts
	Occupational insurance: 10 per cent on fractions of wages below 7.5 base amounts	Occupational insurance: 10 per cent on fractions of wages below 7.5 base amounts 90 per cent on fractions of wages between 7.5 and 30 base amounts.	Occupational insurance: 10 per cent on fractions of wages below 7.5 base amounts 90 per cent on fractions of wages between 7.5 and 30 base amounts.	Occupational insurance: 10 per cent on fractions of wages below 7.5 base amounts 90 per cent on fractions of wages between 7.5 and 30 base amounts.
Day 91 -	Social insurance: 80 per cent on fractions of wages below 7.5 base amounts.	Social insurance: 80 per cent on fractions of wages below 7.5 base amounts.	Social insurance: 80 per cent on fractions of wages below 7.5 base amounts.	Social insurance: 80 per cent on fractions of wages below 7.5 base amounts.
		Occupational insurance: 65 per cent on fractions of wages between 7.5 and 20 base amounts, 32.5 per cent on fractions of wages between 20 and 30 base amounts.	Occupational insurance: 80 per cent on fractions of wages between 7.5 and 30 base amounts.	Occupational insurance: 80 per cent on fractions of wages between 7.5 and 30 base amounts.

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