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PRIVATE RETURNS

TO EDUCATION IN FINLAND:

BACK TO BASICS

ABSTRACT: This study explores the evolution of private returns to education in Finland by using a simple Mincer earnings equation framework and cross-sections of the Finnish Labour Force Survey compiled by Statistics Finland. Attempts are also made to examine the sensitivity of educational returns to the specification of the earnings equation as well as to the adopted estimation technique.

The results indicate that the average return to an additional year of schooling has remained roughly unchanged among male workers over the 12-year period investigated, that is 1984–95. Among female workers, it was significantly lower in the 1980s, but increased in the early 1990s to approximately the same level as for men. Men and women fared equally well also when comparing average returns to different levels of education. These level-of-education returns further suggest that the marginal return to additional years invested in higher education is rather constant than declining. The addition of a broad set of personal and job-related background characteristics to the gender-specific wage equations has a minor influence on the estimated returns to education.

KEY WORDS: experience, gender, returns to education, sector, selection bias

TIIVISTELMÄ: Tutkimuksessa tarkastellaan koulutuksen yksilötason tuottoasteiden evoluutiota Suomessa, käyttäen hyväksi Mincerin ansioyhtälömenetelmää ja Tilastokeskuksen työvoimatutkimuksen poikkileikkausaineistoja. Lisäksi selvitetään koulutuksen tuottoasteiden herkkyyttä suhteessa ansioyhtälön spesifikaatioon ja käytettyyn estimointitekniikkaan. Tulokset osoittavat miespuolisten työntekijöiden keskimääräisen koulutusvuoden tuottoasteen pysyneen suurin piirtein muuttumattomana tutkitun 12 vuoden (1984-95) ajanjakson aikana. Naispuolisten työntekijöiden tuottoaste taas oli 1980-luvulla huomattavasti matalampi kuin miehillä, noustakseen 1990-luvun alkupuolella likimain samalle tasolle. Myös vertailtaessa eri koulutusasteiden tuottoja havaitaan miesten ja naisten ansaitsevan yhtä hyvin. Lisäksi koulutusasteiden pohjalta tarkasteltuna korkea-asteen koulutukseen investoitujen lisävuosien rajatuottavuus vaikuttaa ennemminkin olevan vakio kuin aleneva. Vihdoin huomataan kattavien henkilö- ja työkohtaisia ominaispiirteitä kuvaavien muuttujajoukkojen lisäämisen sukupuolittain eriteltyihin palkkayhtälöihin vaikuttavan estimoituihin koulutustuottoihin vain hyvin marginaalisesti.

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AVAINSANAT: kokemus, sukupuoli, koulutuksen tuotto, sektori, valikoitumisharha

CONTENT

1 INTRODUCTION

This study explores the evolution of private returns to education in Finland. The results to be presented are obtained from estimating simple Mincerian earnings equations using cross-sections of the Finnish Labour Force Survey (LFS) compiled by Statistics Finland. Attempts are also made to examine the sensitivity of educational returns to the specification of the earnings equation as well as to the adopted estimation technique.

The primary reason for basing the analysis of the interplay between interpersonal differences in wages and educational attainment levels on the LFS is that this is the only individual-level data set for Finland that allows the calculation of average hourly wages.[1] Moreover, the LFS has recently been supplemented with income data for two more years – 1984 and 1995 – in addition to the four years having been made available so far, that is, 1987, 1989, 1991 and 1993. Needless to say, the time period is nevertheless still too short to uncover longer-run trends over time.[2]

The subsequent analysis is undertaken separately for men and women in paid employment, thus excluding all self-employed. The investigated category of male workers is restricted to those in full-time employment, whereas the category of female workers comprises all women, that is, also those employed on a part-time basis. As such, this difference in the definition of the male and female samples has a negligible impact on the estimated returns to education for Finland; the share of part-timers in the Finnish labour force was still minor in 1995. In international perspective, on the other hand, the chosen definition of the male and female samples clearly improves the comparability of estimation results across countries, since the share of part-timers among women varies considerably across countries while the corresponding share among men is still small in most European countries.[3]

The next section presents briefly the data used and the specification of the basic earnings model to be estimated. Section 3 reports and discusses the estimated average returns to human capital with the emphasis on returns to years of schooling. Section 4 shifts the focus from the number of completed years of schooling to the acquired educational level. Section 5 compares gross and net (before- and after-tax) returns to education. Section 6 explores the possibility of a sample selection bias affecting the estimation results for female workers. Concluding remarks are given in Section 7.

2 DATA AND MODEL SPECIFICATION

The LFS is a representative sample of the whole Finnish population. The sample has traditionally contained some 9,000 individuals aged 15–64 as stratified according to age, sex and region. Apart from these individual characteristics, also the information on education and income is register based. The rest of the information is self-reported through questionnaires and interviews undertaken by Statistics Finland.

The basic earnings equation to be estimated is identical to the simple Mincer earnings model, with the natural log of individual earnings regressed on the individuals' completed years of schooling and their potential work experience (and its square). The earnings concept refers to the individual's average gross hourly wage as calculated from tax record information on taxable annual earnings and self-reported numbers of months and normal

hours worked. The annual earnings comprise all kinds of compensation, such as overtime and vacation pay. Separate information is provided on the taxable pecuniary value of fringe benefits, but the addition of fringe benefits to annual earnings exerts no significant influence on the estimation results.[4] The gross hourly wage appearing in the estimations reported in subsequent sections is exclusive of fringe benefits.

The education acquired by each individual is according to the Register of Degrees and Examinations compiled by Statistics Finland and based on information collected annually from educational institutions. The register gives the single highest education completed by the individual. If the individual has completed two or more degrees at the same level, only the most recent one is recorded with no indication of previous same-level degrees. Another shortcoming is that the register is restricted to completed degrees. Thus, a university student is assigned an upper secondary degree (mostly the matriculation examination from a Gymnasium) until (s)he has completed a university degree, which is estimated to take on average 3,5 years at the lower candidate (BA) level and 5,5 years at the higher candidate (MA) level. Considerable variation in finishing times occurs, however, depending on the student's educational field as well as degree of activity in working life while studying.

A distinction is made between a total of seven educational levels. The starting level is a 9-year basic education, which is compulsory for all children aged 7–16. The next level covers upper secondary education, which divides into general and vocational education. The general education is provided in Gymnasium and leads to a matriculation examination (= 12 years of schooling). The vocational education is provided by vocational schools and may last for less than 3 years (= lower level, 10–11 years) or about 3 years (= upper level, some 12 years). Higher (or tertiary) education comprises both vocational colleges and universities. Vocational colleges provide short non-university vocational education (= 13–14 years). Lower candidate (BA-level) degrees (= some 15 years), higher candidate (MA-level) degrees (= some 16 years) as well as post-graduate degrees (licentiate and doctoral degrees = 18 years or more) are taken at universities. This information on educational levels may be transformed into years of schooling by using the number of years given in parentheses, which correspond to the stereotype key constructed by Statistics Finland for turning degrees into years. The actual years used by the individual for completing the degree are not known.

Work experience is defined as the potential number of years an individual has spent in working life; that is, each sample individual's work experience is calculated as age minus completed years of schooling minus age of school start (7 years in Finland). For men an extra year has been subtracted since military service is compulsory for all Finnish men. Underlying this definition of experience is the assumption that all schooling is performed on a full-time basis and that the individual enters the labour market immediately after having completed his/her schooling and stays employed until retirement. This measure of work experience may, as a consequence, either underestimate or overestimate the individual's actual work experience. The rather common habit especially among more 'mature' university students of combining studies and work will underestimate the true experience the individual has gained in working life, while breaks in the working career due to unemployment spells or family responsibilities will overestimate the work experience acquired by the individual. The seriousness of this bias and its impact on the estimation results are explored in some detail in the next section.

Separate wage equations are specified for male and female workers. As noted in the outset, the analysis focuses on all female workers but only on full-timers among male workers. The female wage equation is therefore supplemented with a dummy capturing the wage

effect of being employed on a part-time instead of a full-time basis. The LFS indicates explicitly whether the worker is in part-time or full-time employment.[5]

3 RETURNS TO YEARS OF SCHOOLING

This section presents returns to years of schooling obtained from estimating conventional Mincer wage equations separately for men and women using the six cross-section LFS years available. Furthermore, the sensitivity of the estimated rates of return to an extra year in schooling is explored by adding additional wage-relevant background variables to the equations, by replacing potential experience with actual experience and by estimating separate wage equations for private-sector and public-sector workers. These sensitivity tests are restricted to the year 1993.[6]

3.1 Basic results

Table 1 gives the coefficients of the schooling and experience variables obtained from estimating the basic wage model. Comparing the estimates for 1984 and 1995 points to a

Table 1. Basic estimation results

MEN IN FULL-TIME EMPLOYMENT, GROSS HOURLY WAGE

	1984	1987	1989	1991	1993	1995
YEARS OF SCHOOLING	0.0950 (.0034)	0.0895 (.0038)	0.0895 (.0036)	0.0916 (.0035)	0.0856 (.0045)	0.0891 (.0051)
EXP, pot.	0.0294 (.0022)	0.0283 (.0025)	0.0247 (.0025)	0.0319 (.0027)	0.0381 (.0036)	0.0371 (.0040)
$EXP^2/100$, pot.	-0.0458 (.0050)	-0.0450 (.0061)	-0.0354 (.0058)	-0.0507 (.0061)	-0.0594 (.0085)	-0.0568 (.0096)
R^2 adj. No of obs.	0.3418 2274	0.3024 1876	0.2898 2089	0.3384 1975	0.3494 1175	0.3090 1016

WOMEN, ALL, GROSS HOURLY WAGE (incl. of part-time dummy)

	1984	1987	1989	1991	1993	1995
YEARS OF SCHOOLING	0.0793 (.0036)	0.0784 (.0041)	0.0815 (.0038)	0.0914 (.0036)	0.0882 (.0046)	0.0950 (.0051)
EXP, pot.	0.0136 (.0024)	0.0135 (.0031)	0.0086 (.0025)	0.0167 (.0025)	0.0084 (.0038)	0.0259 (.0037)
$EXP^2/100$, pot	-0.0180 (.0050)	-0.0211 (.0063)	-0.0075[i] (.0052)	-0.0228 (.0054)	-0.0037[i] (.0078)	-0.0359 (.0076)
R^2 adj. No of obs.	0.2209 2275	0.2012 1966	0.2071 2118	0.2917 2113	0.2578 1336	0.2928 1164

Notes: [i] indicates that the estimate is insignificant at the 5% level. Standard errors below the estimates.

weakly increasing trend in educational returns for women but a weakly declining trend for men. For most of the investigated time period, however, the average return of male workers to an additional year in schooling has remained roughly unchanged (according to a simple *t*-test), amounting to some 9.4 per cent.[7] Among female workers, on the other hand, the average return to an extra year in school was significantly lower in the boom years of the 1980s, but rose to approximately the same level as for male workers in the deep recession years of the early 1990s.[8]

This diverging trend in the average return to schooling between genders might be due to a more profound re-structuring of the female than of the male labour market. The explosion in unemployment rates from 1991 onwards first affected men more strongly, but spread gradually to female-dominated industries and sectors causing the unemployment rate of women to rise faster than that of men. As a consequence, in the mid-90s female unemployment was more severe than male unemployment. When further noting that the risk of becoming unemployed has been strongly biased towards low-skilled, low-paid people[9], the rise in the return to education among women seems to be primarily the outcome of relatively more low-skilled, low-paid female workers having become unemployed during the recession years. This hypothesis receives support from the stronger rise in both hourly wages and average education between 1991 and 1993 among employed women compared with employed men, but surely deserves more in-depth investigation.

The rewarding of work experience improved markedly among male workers in the early 1990s. Simultaneously the curvature of their experience-wage profile steepened substantially. In contrast, the work experience accumulated by female workers has persistently been only moderately reflected in their wages. In 1993, the initial experience-induced wage effect of female workers amounted to less than one-fourth of that of their male colleagues, and their experience-wage profile was on average flat compared to an increasingly steeper male wage profile. The sudden trend break in 1995 is obviously explained by the previously mentioned re-structuring of the LFS.

3.2   Addition of other explanatory variables

The variation in wages across individuals reflects only partially individual differences in human capital endowments. As can be seen from Table 1, schooling and work experience can, at most, explain about one-third of the observed dispersion in individual gross hourly wages. Moreover, the estimated returns to education might capture at least part of the wage effect of some crucial personal or job-related background characteristic omitted in the simple human capital model. The sensitivity of the years-of-schooling estimate to the inclusion of a selected number of other wage-relevant variables is evident from Table 2.

Adding a tenure variable (and its square) to capture the influence on wages of individual differences in the length of the current employment relationship, leaves the estimated rate of return to years of schooling unchanged for both genders. The inclusion of a set of variables reflecting differences in family responsibilities and residential location[10] causes a slight drop in the schooling estimate for both men and women, but for both groups the decline in the estimate is insignificant according to a simple *t*-test. Extending the wage equation with variables related to the individual's job has no significant effect on the schooling estimate, either. The same holds for industry affiliation.

In line with empirical evidence for other countries, the addition of variables stating the individuals' position in the socio-economic hierarchy causes a substantial decline in the es-

timated return to an additional year in schooling. This outcome is hardly surprising, though, since the socio-economic classification relies heavily on the individuals' acquired education. Moreover, the decline is of much the same magnitude (some 40 per cent) among male and female workers, thus retaining the aforementioned equality in educational returns across genders obtained for 1993.

Table 2.   Sensitivity of the schooling-year-return estimate to the addition of other explanatory variables, 1993

MEN	BASIC WAGE MODEL	ADDITION OF				
		Tenure, Tenure^2	Family variables[a]	Job-related variables[b]	2-digit industry dummies	12 socio-economic dummies
YEARS OF SCHOOLING	0.0849 (.0044)	0.0849 (.0044)	0.0785 (.0044)	0.0864 (.0045)	0.0899 (.0049)	0.0490 (.0062)
R^2 adj.	0.3565	0.3721	0.3945	0.3674	0.4105	0.4406
No of obs.	1119	1119	1119	1119	1119	1119
WOMEN						
YEARS OF SCHOOLING	0.0879 (.0046)	0.0870 (.0045)	0.0853 (.0046)	0.0902 (.0046)	0.0836 (.0050)	0.0564 (.0060)
R^2 adj.	0.2557	0.2700	0.2668	0.2589	0.2837	0.3036
No of obs.	1305	1305	1305	1305	1305	1305

Notes: [a] Dummy for married, children aged 0-7, children aged 8-17, living in the capital (Helsinki) area. [b] Dummy for temporary job contract, other than regular day-time work, other than normal pay scheme, unemployment during past 12 months, unionized. Standard errors below the estimates.

3.3   Potential versus actual work experience

As discussed earlier, the individual's potential years in working life may, for several reasons, deviate from his/her actual – i.e. self-reported – years spent working. The LFS allows a comparison of the two experience measures since the survey includes a question concerning each individual's actual number of working years.[11] As is to be expected, the two measures differ only slightly for male workers. In the 1993 LFS they are, in effect, almost identical (about 19,5 years on average). Among female workers, on the other hand, there is on average a 3-year gap between the two measures; in 1993 the average length of potential experience amounted to some 21,6 years compared to 18,6 years for the average length of actual experience. Replacing potential experience with actual experience in the basic wage model could, as a consequence, be expected to produce a larger change in the impact of accumulated work experience on female than on male wages.

Table 3 shows that the experience estimates do change – more so for women than for men, but this change is insignificant throughout.[12] The marginal change in the female estimates of work experience is obviously explained by the overall minor effect of work experience on female wages. Also the schooling estimates remain unaffected.

Table 3. Potential versus actual experience, 1993

	MEN IN FULL-TIME EMPLOYMENT		WOMEN, ALL (+ part-time dummy)	
	MODEL 1	MODEL 2	MODEL 1	MODEL 2
YEARS OF SCHOOLING	0.0856	0.0846	0.0882	0.0869
	(.0045)	(.0044)	(.0046)	(.0044)
EXP, pot.	0.0381		0.0084	
	(.0037)		(.0038)	
EXP^2, pot./100	-0.0594		-0.0037[i]	
	(.0085)		(.0078)	
EXP, actual		0.0367		0.0117
		(.0038)		(.0036)
EXP^2, actual/100		-0.0563		-0.0093[i]
		(.0084)		(.0082)
R^2 adj.	0.3494	0.3421	0.2578	0.2696
No of obs.	1175	1175	1336	1336

Notes: [i] indicates that the estimate is insignificant at the 5% level. Standard errors below the estimates.

3.4 Is there a sectoral gap in returns?

The estimation results obtained from estimating the basic wage equation separately by gender and sector point to notable similarities as well as dissimilarities in the rewarding of human capital endowments (Table 4). Among male workers the average return to an additional year of schooling is significantly higher in the private sector while the opposite pattern is discernible among female workers. Indeed, the estimated rate of return is of approximately the same magnitude (over 9 per cent) for men in private-sector employment as

Table 4. Private versus public sector, 1993

	MEN IN FULL-TIME EMPLOYMENT		WOMEN, ALL (+ part-time dummy)	
	Private sector	Public sector	Private sector	Public sector
YEARS OF SCHOOLING	0.0921	0.0805	0.0772	0.0946
	(.0066)	(.0057)	(.0085)	(.0057)
EXP, pot.	0.0367	0.0423	0.0047[i]	0.0114
	(.0044)	(.0061)	(.0056)	(.0052)
EXP^2, pot./100	-0.0527	-0.0723	0.0023[i]	-0.0100[i]
	(.0108)	(.0126)	(.0111)	(.0105)
R^2 adj.	0.3223	0.4553	0.1314	0.3614
No of obs.	832	343	677	659

Notes: [i] indicates that the estimate is insignificant at the 5% level. Standard errors below the estimates.

for women in public-sector employment. Public-sector men, on the other hand, are faced with an average return to schooling that is close to that of private-sector women (about 8 per cent).

In contrast to the schooling results, a distinction between sectors does not change the overall pattern of experience-induced wage effects. The accumulation of (potential) work experience is strongly reflected in male wages irrespective of sector. Female wages are, at most, only weakly affected by increasing work experience and the experience-wage profile is practically flat in both sectors.

4   RETURNS TO EDUCATIONAL DEGREES

Giving the schooling variable the form of a continuous measure contains the implicit assumption of there being a strict linear relation between wages and the completed number of years of schooling. Put differently, each additional year in school is assumed to increase wages to the same extent irrespective of at which level the schooling is undertaken. Replacing the years-of-schooling variable with educational level dummies allows for a simple test of whether this is a reasonable assumption. Estimation results for 1993 are reported in Table 5, with those having completed, at most, a basic education standing as the reference group.

**Table 5.   Returns to educational degrees, 1993**

	MEN IN FULL-TIME EMPLOYMENT		WOMEN, ALL (+ part-time dummy)	
	Dummy estimates	Year-based estimate (and corresp. %)	Dummy estimates	Year-based estimate (and corresp. %)
BASIC EDUCATION	0		0	
LOWER SECONDARY	0.0508	+1 y = 0.051 (5.2%)	0.0531	+1 y = 0.053 (5.4%)
(10-11 years)	(.0223)	+2 y = 0.025 (2.6%)	(.0222)	+2 y = 0.026 (2.7%)
UPPER SECONDARY	0.2298	+3 y = 0.071 (8.0%)	0.1541	+3 y = 0.049 (5.3%)
(12 years)	(.0277)		(.0262)	
SHORT NON-UNIV.	0.3437	+4 y = 0.077 (9.0%)	0.3847	+4 y = 0.085 (10.1%)
(13-14 years)	(.0450)	+5 y = 0.061 (7.1%)	(.0365)	+5 y = 0.067 (8.0%)
BA-LEVEL	0.4088	+6 y = 0.059 (7.0%)	0.4753	+6 y = 0.067(8.0%)
(15 years)	(.0623)		(.0488)	
MA-LEVEL OR MORE	0.6396	+7 y = 0.073 (9.6%)	0.6315	+7 y = 0.072 (9.4%)
(16 years +)	(.0362)	+8 y = 0.064 (8.3%)	(.0387)	+8 y = 0.063 (8.2%)
		+9 y = 0.056 (7.4%)		+9 y = 0.056 (7.3%)
EXP, pot.	0.0393		0.0106	
	(.0037)		(.0038)	
EXP^2, pot./100	-0.0648		-0.0114[i]	
	(.0085)		(.0077)	
R^2 adj.	0.3682		0.2736	
No of obs.	1175		1336	

Notes: [i] indicates that the estimate is insignificant at the 5% level. Standard errors below the estimates.

As is to be expected, the hourly wages increase with education. Moreover, the pattern is almost identical for men and women with upper secondary education being the only level at which female workers are significantly less rewarded for their education.[13] Plotting the estimates in a figure displays a roughly linear dependence between wages and schooling (Figure 1), suggesting that the years-of-schooling measure does provide quite a reasonable approximation of the average return to education in Finland.

Another way of comparing the size of the rate of return at different educational levels is to account for the number of years usually required for completing a degree at each particular level. This is done in columns 2 and 4 of Table 5. The numbers reported are calculated from the coefficients in columns 1 and 3, with the corresponding anti-log percentages given in parentheses. The outcome varies considerably depending on the number of years assigned to each educational level. Nevertheless, there seems to be no clear tendency of annual average returns to education to decline at the higher educational levels, not even when the MA-level university degree is assumed to require 6 years to complete.

Figure 1.   Rates of return to educational degree levels
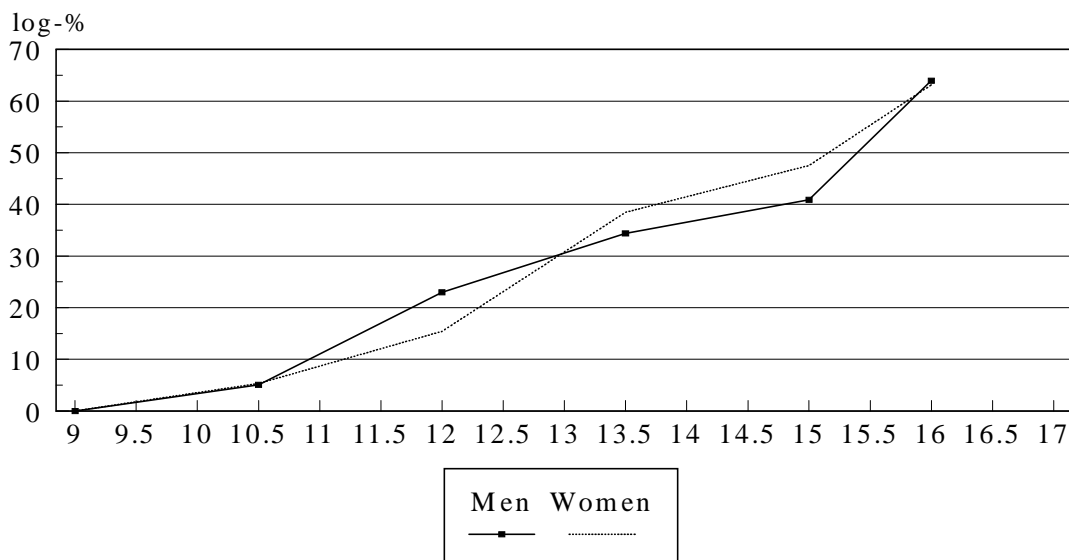
Furthermore, also the returns to different educational levels are only marginally affected when supplementing the wage equation with the same set of personal and job-related background characteristics as in the years-of-schooling based estimations above. Again the only information that causes a significant decline in the estimated returns to education is the individuals' socio-economic status.

In a previous section men employed in the public sector were found to have a lower average return to years of schooling as compared to their colleagues in the private sector. When repeating this comparison on an educational-level basis, the wage premium of private-sector men shows up at all educational levels except for lower secondary education (a few years in vocational school) (Table A1 of the Appendix). The favourable situation of women in public-sector employment, on the other hand, seems to be explained primarily by the much better rewarding of a lower secondary education in the public sector than in the private sector. These gaps in educational returns no doubt reflect the conspicuous dif-

ferences between the two sectors when it comes to occupational and industrial structures as well as pay and tenure systems.[14]

5 GROSS VERSUS NET RETURNS TO EDUCATION

The analysis has so far focused on the effects of education on individual *gross* (before-tax) hourly wages. Especially in countries with strongly progressive income tax systems, wage and salary earners may, however, be more concerned about their return to educational investments measured by means of *net* (after-tax) rather than gross hourly wages.

The tax register data added to the LFS include information not only on the individuals' annual taxable earnings but also on the total amount of income taxes *actually paid* to the state, to the local authority (the municipality) and to the state church. This means that the available information refers to the individuals' income tax burden after adjustment for both personal and family-related tax allowances and deductions. The individuals' after-tax earnings can thus be obtained by subtracting the sum of paid income taxes from the annual taxable earnings.

Table 6.   Gross versus net hourly wage, 1993

	MEN IN FULL-TIME EMPLOYMENT		WOMEN, ALL (+ part-time dummy)	
	Gross hourly wage	Net hourly wage	Gross hourly wage	Net hourly wage
YEARS OF SCHOOLING	0.0853	0.0722	0.0887	0.0736
	(.0044)	(.0042)	(.0046)	(.0044)
R^2	0.3572	0.3032	0.2662	0.2166
No of obs.	1158	1158	1316	1316
BASIC EDUCATION	0	0	0	0
LOWER SECONDARY	0.0567	0.0214[i]	0.0561	0.0330[i]
(10-11 years)	(.0222)	(.0216)	(.0219)	(.0216)
UPPER SECONDARY	0.2414	0.2213	0.1665	0.1449
(12 years)	(.0269)	(.0257)	(.0258)	(.0255)
SHORT NON-UNIV.	0.3413	0.3115	0.3753	0.3106
(13-14 years)	(.0450)	(.0441)	(.0354)	(.0332)
BA-LEVEL	0.4068	0.2811	0.4964	0.4127
(15 years)	(.0623)	(.0658)	(.0458)	(.0466)
MA-LEVEL OR MORE	0.6374	0.5350	0.6308	0.5159
(16 years +)	(.0362)	(.0331)	(.0389)	(.0366)
R^2 adj.	0.3758	0.3322	0.2807	0.2300
No of obs.	1158	1158	1316	1316

Notes: [i] indicates that the estimate is insignificant at the 5% level. Standard errors below the estimates.

However, this way of calculating net earnings is straightforward only if taxes have been paid merely out of income earned at the main job. This is because the available information on paid income taxes refers to all taxable earnings of the individual. Thus income taxes paid on earnings from, for instance, a second job are also included. This turned out to be a minor problem in the 1993 LFS, though. According to the tax register data a large majority of the sample workers has taxable earnings reported from one (the main) job only, and in the case of other taxable earnings, these are for the most part minor compared with the taxable earnings from the main job. In view of this it is hardly surprising that experiments to reduce the paid income taxes in proportion to eventual other than main-job taxable earnings, changed the estimation results only marginally.

The average rate of return to an additional year of schooling drops for both men and women from about 9 per cent to some 7.5 per cent when turning from gross to net hourly wages (Table 6). The returns to secondary education levels remain roughly unchanged while, as is also to be expected, the wage premium of higher education degrees is significantly lower when accounting for the progressivity of income taxes.[15]

6   TESTING FOR PRESENCE OF SAMPLE SELECTION BIAS

Women tend to have a more interrupted working career than men. Observing those employed at a specific point in time may accordingly cause a greater problem of sample selection among women than among men. To test for the potential presence of a sample selection bias in the estimation results for women, the basic wage equation for female workers is re-estimated together with a probit equation thought to capture women's choice between employment and non-employment. The selection process is assumed to be affected by the women's education, age, marital status, children and regional residence. The chosen explanatory variables predict the (non)employment status correctly for over 73 per cent of the sample women. Two methods of estimation are adopted: Heckman's two-stage least squares technique and full information maximum likelihood estimation (FIML) where the Heckman estimates as used as values of departure.

As is evident from Table 7, the results point to a non-negligible sample selection bias affecting the estimation results for female workers. This bias does not seem to influence the estimated returns to education to any significant extent, however. The estimates of potential work experience, in contrast, increase remarkably and approach, in the FIML-estimations, those of male workers.

Ignoring the potential presence of a sample selection bias thus turns out to leave the variable of main interest in this context – the return to education – unaffected. Nevertheless it may be justified to make two comments on the use or non-use of a sample selectivity approach. First, the Heckman correction for sample selection has, in recent years, been subject to rather serious critique due to the usually high correlation between the exogenous variables in the selection equation and the wage equation making even the FIML estimator very unrobust. In fact, such collinearity problems show up in the LFS data.[16] Second, the sample selection bias problem tends to disappear when more explanatory variables are added to the wage equation.[17]

Table 7. Sample selection correction for women, 1993

	OLS	HECKMAN 2-STAGE	ML-ESTIMATES
YEARS OF SCHOOLING	0.0883 (.0046)	0.0947 (.0048)	0.0961 (.0045)
EXP, pot.	0.0084 (.0038)	0.0285 (.0064)	0.0308 (.0039)
EXP^2, pot./100	-0.0037[i] (.0078)	-0.0476 (.0141)	-0.0526 (.0086)
LAMBDA		0.2194 (.0598)	
RHO (1,2)			0.6707 (.0541)
R^2 adj. Log-Likelihood	0.2578	0.2649	-1677.05
BASIC EDUCATION	0	0	0
LOWER SECONDARY *(10-11 years)*	0.0532 (.0222)	0.0917 (.0271)	0.0732 (.0256)
UPPER SECONDARY *(12 years)*	0.1541 (.0262)	0.2013 (.0299)	0.1793 (.0269)
SHORT NON-UNIV. *(13-14 years)*	0.3847 (.0365)	0.4307 (.0385)	0.4102 (.0361)
BA-LEVEL *(15 years)*	0.4754 (.0488)	0.5245 (.0472)	0.5008 (.0425)
MA-LEVEL OR MORE *(16 years +)*	0.6315 (.0387)	0.7064 (.0434)	0.6814 (.0380)
LAMBDA		0.2534 (.0685)	
RHO (1,2)			0.6123 (.0668)
R^2 adj. Log-Likelihood	0.2736	0.2806	-1663.65
No of obs.	1336	1336	1336
All obs.			2536

Notes: [i] indicates that the estimate is insignificant at the 5% level. Standard errors below the estimates.

7 CONCLUDING REMARKS

The average return to an additional year of schooling has remained roughly unchanged among male workers over the 12-year period investigated. Among female workers, it was significantly lower in the 1980s, but increased in the early 1990s to approximately the same level as for men. In 1993, men and women fared equally well also when comparing average returns to different levels of education. These level-of-education returns further suggest that the marginal return to additional years invested in higher education is rather constant than declining. This outcome is not affected when trying to correct the female estimation results for the potential presence of a sample selectivity bias.

The addition of a broad set of personal and job-related background characteristics to the gender-specific wage equations has a minor influence on the estimated returns to education. The only exception is the individuals' socio-economic status, which overtakes a considerable part of the wage impact estimated to arise from investments in education. The results further indicate that this 'trade-off' between the individuals' position in the socio-economic hierarchy and their education increases with the length of schooling.

A comparison between the private and the public sector, finally, suggests that men are on average better rewarded for their education when employed in the private sector, while the opposite holds among women. Sector-specific returns to educational levels reveal that men in public-sector employment fare slightly worse at principally all levels. The more advantageous position of women in public-sector employment, on the other hand, seems to arise primarily from notably better rewarding of lower secondary educations than in the private sector.

The results also indicate that male workers have faced a marked improvement in the rewarding of experience accumulated in working life. The experience of female workers, on the other hand, has persistently been only weakly rewarded in the Finnish labour market. Moreover, this finding obviously explains why, in contrast to what would be expected, also the female estimates remain roughly unchanged when replacing the sample workers' potential work experience with their actual work experience.

Unfortunately, the LFS offers no possibilities to investigate other crucial aspects of private returns to education, such as the impact of innate ability and family background. The LFS data set also proved to be too thin to allow for robust tests of the human capital theory against the screening hypothesis. However, these shortcomings do not concern the LFS data only. The same drawbacks characterise also other individual-level data sets readily available. This is the simple explanation for the so far rather limited perspective on private returns to education in Finland.

NOTES

1. Accordingly the LFS is also the only data set that allows a comparison of rates-of-return estimates when using annual earnings instead of hourly wages. For all years investigated, the estimated returns are significantly higher with annual earnings being the dependent variable. For example, for both male and female workers the hourly wage based return to an additional year in schooling amounted in 1993 to 9 per cent as compared to an annual earnings based return of 11 per cent.

2. Previous studies for Finland based on Population Census data for the period 1970–90 and individual annual earnings indicate that the return to education declined considerably in the 1970s but remained largely unchanged in the 1980s. For a review of Finnish evidence, see Asplund (1999).

3. See e.g. Asplund and Persson (2000).

4. Evidence for Finland on the effect of fringe benefits is provided in e.g. Asplund (1993) and Granqvist (1998).

5. For detailed information on the LFS and the variables used in the current analysis, see e.g. Asplund (1993).

6. The reason for undertaking the sensitivity tests for the year 1993 and not for the most recent year available, 1995, is that the information content of the 1995 LFS differs in some crucial dimensions from that of previous surveys. Most importantly, the 1995 LFS does not allow hourly wages to be calculated in an equally detailed way as previous surveys do. Furthermore, some of the key variables used for the sensitivity tests are simply missing from the 1995 LFS.

7. $(e^{0.09} - 1) * 100 \approx 9.4$

8. The difference in the years-of-schooling coefficients estimated for men and women was statistically insignificant for 1991, 1993 and 1995.

9. See e.g. Asplund and Lilja (2000).

10. Moreover, interacting regional variables with the years-of-schooling variable revealed no significant variation in average returns to education across regions.

11. Unfortunately this information has no longer been collected in the 1995 LFS.

12. Experiments with specifications including both age and actual experience (both given the exponential shape) produced statistically insignificant coefficients for the age variables for both men and women, for which reason these estimation results are not displayed.

13. The use of actual instead of potential work experience leaves the educational dummy coefficients roughly unchanged. The work experience estimates, in turn, are almost identical to those reported in Table 3 above. The estimation results obtained when using actual work experience are therefore not shown.

14. More detailed results can be found in e.g. Asplund (1998a).

15. More detailed results are reported in Asplund (2000).

16. See further Asplund (1998b).

17. This is certainly the case for Finland (see Asplund, 1993).

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Appendix Table A1. Private versus public sector, returns to educational degrees, 1993

	MEN IN FULL-TIME EMPLOYMENT		WOMEN, ALL (+ part-time dummy)	
	Private sector	Public sector	Private sector	Public sector
BASIC EDUCATION	0	0	0	0
LOWER SECONDARY *(10-11 years)*	0.0451[i] (.0276)	0.0647[i] (.0356)	0.0110[i] (.0299)	0.1026 (.0325)
UPPER SECONDARY *(12 years)*	0.2475 (.0353)	0.1921 (.0393)	0.1417 (.0371)	0.1688 (.0346)
SHORT NON-UNIV. *(13-14 years)*	0.3554 (.0545)	0.3049 (.0705)	0.3751 (.0748)	0.4151 (.0435)
BA-LEVEL *(15 years)*	0.4713 (.0955)	0.3607 (.0743)	0.4857 (.0816)	0.5039 (.0594)
MA-LEVEL OR MORE *(16 years +)*	0.6789 (.0557)	0.6191 (.0447)	0.6583 (.0741)	0.6451 (.0469)
R^2 adj.	0.3438	0.4668	0.166	0.3604
No of obs.	832	343	677	659

Notes: [i] indicates that the estimate is insignificant at the 5% level. Standard errors below the estimates.