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EDUCATION, EXPERIENCE AND EARNINGS IN FINLAND

Empirical evidence from a cross section of individuals

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ABSTRACT: The primary purpose of the present study is to test empirically the impact of human capital on earnings dispersion in Finland. This is done by regressing extended human capital earnings functions on labour force survey data for 1987. The estimation results point to comparatively high marginal rates of return to formal schooling but to fairly modest earnings effects of both general experience and seniority. The estimation results further reveal a strong, positive relation between earnings and formal on-the-job training, some of which is evidently specific. These findings are clearly supportive of the human capital interpretation of earnings determination. This study is the first report of a larger research project investigating individual earnings differentials in Finland.

KEY WORDS: human capital, earnings differentials

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TIIVISTELMÄ: Tässä tutkimuksessa esitetään empiirisiä tuloksia ensisijaisesti inhimillisen pääoman merkityksestä palkkaerojen selittäjänä Suomessa. Tutkimuksessa estimoidaan laajennettuja inhimillisen pääoman teoriaan perustuvia palkkayhtälöitä, joihin eri koulutus- ja työkokemusmuuttujien lisäksi on lisätty muita henkilökohtaisia ominaisuuksia kuten myös työpaikkaan liittyviä erikoispiirteitä kuvaavia muuttujia. Aineistona käytetään Tilastokeskuksen työvoimatiedustelua vuodelta 1987. Tutkimustulokset viittaavat suhteellisen korkeaan muodollisen koulutuksen tuottoon. Työnantajien kustantaman henkilöstökoulutuksen vaikutus työntekijöiden palkkakehitykseen näyttää niinikään olevan varsin merkittävää. Sen sijaan työkokemuksen palkkaa lisäävä vaikutus on estimointituloksien mukaan hyvin vaatimatonta. Miesten ja naisten välillä on kuitenkin varteenotettavia eroja. Tutkimus on osa laajempaa projektia, josta on myöhemmin tarkoitus julkaista muita erillisiä raportteja.

AVAINSANOJA: inhimillinen pääoma, palkkaeroja

1. INTRODUCTION

The past few decades have produced a vast theoretical and empirical literature on interpersonal earnings differences (e.g. Willis (1986), Siebert (1990)). The original stimulus for this development was provided by Mincer, who in 1974 launched an empirical specification of the earnings function that is now widely referred to as the standard human capital earnings function. This basic human capital model of earnings determination postulates a simple linear relation between the natural logarithm of earnings and the human capital productivity proxies of years of schooling and labour force experience. No attempts are made to explain existing individual differences in education and post-school investment levels. Instead, the observed stocks of accumulated human capital are assumed to be exogenously determined. This conventional human capital approach to cross-sectional earnings functions is also adopted in the present study.

Specifically, extended versions of the standard human capital earnings function are estimated using cross-sectional micro data from the Finnish labour force survey for 1987. The strength of the data base is that it allows earnings differences in Finland to be analysed to an extent that has not been possible before. The actual estimating data are restricted to employed wage and salary earners at the age 16 to 64, leaving a total of 3895 observations. The gender aspect is counted for in two different ways: with gender appearing as an explanatory variable, on the one hand, and with separate estimations for each gender, on the other. All regressions are estimated using sample selection procedures to allow for the possibility of a selectivity bias problem influencing the estimation results.

There is so far very little empirical evidence on earnings determination for Finland based on individual data. In particular, the importance of interpersonal education and training differences as determinants of earnings dispersion is still a more or less unexplored research field. The human capital aspect will, as a consequence, receive most stress in the estimations, although attention is also paid to other personal and job-related characteristics that can be expected to contribute to the explanation of observed earnings differentials. The estimation results are discussed in detail in Section 3, while the underlying earnings model and data are presented in Section 2. Section 4 gives some concluding remarks.

2. MODEL SPECIFICATION AND DATA

The starting-point of the empirical analysis is an extended version of the quadratic[1] human capital earnings function developed by Mincer (1974). In particular, the natural logarithm of individual earnings (lnEARN) is regressed on a vector (X) of explanatory variables that captures the impact of the human capital productivity proxies of formal schooling and labour force experience as well as of other potential personal and job-related characteristics. The log earnings of the ith individual are then given by

$$(1)\quad \ln EARN_i = X_i\alpha + \varepsilon_i \qquad , \varepsilon_i \sim N(0,\sigma^2)$$

where α is a vector of parameters to be estimated and ϵ is a disturbance term.

Under the usual least squares assumptions, the disturbance term in the earnings model is randomly distributed among the population, with an expected value equal to zero. However, in the survey data used in the present study, the sample individuals recorded as being in employment are not randomly selected from the entire population. Instead, they represent persons who were employed during the week of the questionnaire, excluding all individuals who, because of self-selected or forced choice, were not in employment at that particular time. Given that this produces a non-negligible sample selectivity bias, estimation of earnings equations for employees using ordinary least squares techniques results in inconsistent parameter estimates (e.g. Maddala, 1983).

Adjustment for potential selectivity bias influencing the estimation results is done by estimating the earnings function in (1) in combination with a selection function of the probit type explaining the probability of the ith sample individual being employed.[2] The selection function in this two-equation model, classified as a "Type 2" Tobit model by Amemiya (1984), may be written in the general form

$$(2)\quad W_i^* = Y_i\beta + \mu_i$$

where Y is a vector of explanatory variables, β is a vector of unknown parameters, and μ is a disturbance term that in the case of selectivity bias is correlated with the disturbance term (ϵ) in the earnings function. The dependent variable (W^*) in the selection equation is unobservable, but it has a dichotomous observable realization W (employed or not), which is related to W^* as follows:

$$W_i = 1 \qquad iff \;\; W^* > 0$$
$$W_i = 0 \qquad otherwise$$

Hence, the dependent variable (lnEARN) in the earnings regression is not observed unless $W^* > 0$, implying that the observed sample of EARN is censored. The conditional expectation of the earnings equation may then be written

$$(3)\quad E(\ln EARN_i \mid W_i = 1) = X_i\alpha + E(\varepsilon_i \mid W_i = 1) = X_i\alpha + E(\varepsilon_i \mid \mu_i < Y_i\beta)$$

By assuming that ϵ and μ follow a bivariate normal distribution $N(0,0,1,1,\rho_{\varepsilon\mu})$ with zero means, unit variances, and correlation coefficient $\rho_{\varepsilon\mu}$, a standard selectivity bias correction of the earnings equation can be done

$$(4)\quad E(\ln EARN_i \mid W_i = 1) = X_i\alpha - \rho_{\varepsilon\mu}\sigma_\varepsilon \frac{\phi(Y_i\beta)}{\Phi(Y_i\beta)} = X_i\alpha + \rho_{\varepsilon\mu}\sigma_\varepsilon\lambda$$

where σ_ϵ is the standard error of the disturbance term in the earnings equation and $\phi(\cdot)$ and $\Phi(\cdot)$ are, respectively, the density function and the distribution function of the standard normal. The earnings equation in (4) is estimated within the LIMDEP framework using maximum likelihood estimation of the procedure discussed in Heckman (1979) and Greene (1981). More exactly, in order to obtain both consistent and efficient estimates, the equations in (1) and (2) are re-estimated jointly, whereby the final values from the Heckman two-stage procedure are used as starting-values for the maximum likelihood method of estimating α, β, σ_ϵ, and $\rho_{\varepsilon\mu}$.

The probability of being employed is explained in terms of a set of personal characteristics containing age and indicators for gender, educational level, marital status, family size, and location of residence. In line with the theory of human capital, the observed earnings variance is assumed to reflect differences in the employees' formal education and labour market experience. It may, however, be questioned whether it is appropriate to have schooling entering the earnings function in a linear form, that is to force the returns to varying years of schooling to be the same. Apart from this possible mis-specification of the schooling variable, there is also another potential source of error involved. In particular, the employed data merely comprise information on the highest single education completed by each sample individual. Thus a stereotype key would have to be used in order to turn this information into years of full-time schooling. There is strong reason to believe that this transformation method influences the estimates obtained. An alternative approach is therefore adopted in the following. More exactly, the continuous schooling variable is replaced by a separate indicator for each education completed, whereby the coefficient on each degree dummy provides an approximate estimate of the percentage change in earnings, ceteris paribus, from having acquired the degree.

In addition to human capital-related variables, the earnings equation is also supplemented with a set of personal and job characteristics which may be expected to correlate with the working history of the individual. In part, this represents a simple way of trying to control for possible measurement errors in the respondent's self-reported total years of work experience. Thus if, for example, periods of unemployment, layoffs or temporary withdrawal from the labour market are not properly counted for, the estimated return to experience will presumedly be biased downward. In view of this, the empirical earnings equation is completed with indicator variables reflecting the marital status, family size, location of residence, employment status, and working conditions of the sample individuals.

The earnings model is estimated with gender appearing as an explanatory variable, on the one hand, and separately for each gender, on the other. The inclusion of a simple indicator for gender captures the effect on the overall structure of earnings of the ith individual being a women, but it restricts the earnings effects of all the other variables to be the same across male and female employees. In fact, often a clear distinction between genders is seen to be needed, dictated mainly by issues of sex discrimination and the usually segmented work experience profile of women.

The econometric specifications of the human capital earnings function are estimated using cross-sectional micro data from the labour force survey for 1987 conducted by the Central Statistical Office of Finland. The data set is unique in the sense that 1987 is the first year for which Finnish labour force survey data have been supplemented with income data from the tax rolls. Moreover, the survey comprises information of vital importance in human capital earnings analysis not available in, for instance, Finnish population census data. However, a fundamental shortcoming of the data base is that it is not panel data; the survey sample varies from one year to another. The labour force survey covers a sample of some 9000 individuals, representing the entire population aged 15-64 years as stratified according to sex, age and region. When the data are restricted to employed wage and salary earners at the age 16 to 64 and sorted out with respect to missing or incomplete information on crucial variables, the sample of employees retained in the actual estimating data shrinks to covering a total of 3895 individuals.

Because of data limitations and shortcomings, the specification of the earnings variable and the relevant human capital variables represents a rather critical step of the empirical analysis. The dependent variable is chosen to be average before-tax hourly earnings in order to allow for interpersonal differences in weekly working hours and in months worked. This approach also makes the earnings of full-time and part-time employees comparable.

Ideally, earnings differentials should be related to the actual schooling differences which generate them. The employed data set does not allow this, however; as noted earlier, the available register data on formal schooling merely show the highest single education completed by each individual. There is a total of eight levels of education, which are represented by six schooling indicators in the estimations.

A notable advantage of the data set is that it provides self-reported information on the person's total years of labour market experience and his or her years with the current employer, i.e. seniority (tenure). The reported years of work experience have been checked against the person's age and transformed years of formal schooling plus 7 (the age of school start in Finland). Any inconsistencies between reported total work experience and seniority have also been eliminated, the datum being that people generally remember their years with the present employer better than their total work experience.

A summary of definitions of all the variables employed in the subsequent empirical analysis is given in Table A of Appendix. The male and female employees in the estimating data are described in terms of these variables in Table B of Appendix.[3]

3. ESTIMATION RESULTS

Earnings effects of education and experience

The regression results obtained from estimating the extended human capital model specification outlined in the preceding section on labour force survey data using maximum likelihood techniques are displayed in Table 1. The table also reports the corresponding gender-specific estimation results.[4] The probit estimates, which are given in Table C of Appendix, succeed in correctly predicting employment for close to 90 per cent of the sample employees.

The parameter estimates of the educational level dummies suggest that the effect of education on earnings is on average increasing with the level of education. But the estimated growth rate of earnings is by no means smooth; first, it varies quite substantially depending on the level of education concerned and secondly, it differs markedly between the two genders. These trends, which stand out more clearly in Figure 1, point to highly varying economic incentives to continue in formal education. Accordingly, the widely-used linear schooling variable would be a less appropriate proxy to use in the estimations.

For women, a most conspicuous disincentive seems to occur immediately at the beginning of their educational "career". Specifically, the statistically insignificant difference between the estimated return to completed basic education and graduation from LOWER VOCATIONAL and professional education suggests that women with completed lower vocational education tend to have no relative income advantage over women with basic education only.[5] Compared to this, graduation from UPPER VOCATIONAL and professional education has a substantial marginal product: acquiring a degree at this level, with other things held constant, would raise the earnings of women by one-fifth on average. Acquisition of higher education degrees would also have a positive but more moderate effect on female earnings. The female estimates thus show a clear pattern of decreasing marginal rates of return to education. This pattern is further strengthened when account is taken of the highly varying length

Table 1. Estimation results for the extended human capital earnings equation estimated jointly and by gender[1]

Variable	All obs.	Women	Men
CONSTANT	3.43376**	3.29904**	3.34538**
	(.03305)	(.05012)	(.04956)
LOWER VOCATIONAL	0.05741**	0.00275	0.10951**
	(.01480)	(.02159)	(.01985)
UPPER VOCATIONAL	0.24116**	0.20233**	0.27223**
	(.01595)	(.02384)	(.02218)
SHORT NON-UNIV	0.42183**	0.36246**	0.47473**
	(.02328)	(.03284)	(.03260)
UNDER-GRADUATE	0.51340**	0.51299**	0.46074**
	(.03827)	(.04849)	(.06517)
GRADUATE	0.62222**	0.61480**	0.62364**
	(.02431)	(.04278)	(.03107)
EXP	0.01538**	0.01371**	0.01925**
	(.00234)	(.00340)	(.00341)
EXP^2	-0.00019**	-0.00018*	-0.00028**
	(.00006)	(.00009)	(.00009)
WOM	-0.20060**	-	-
	(.01139)		
MARRIED	0.02052	-0.01713	0.06371**
	(.01421)	(.01915)	(.02269)
CHILD$^{0-6}$	0.01655	0.03630*	-0.01171
	(.01339)	(.01749)	(.02062)
CHILD$^{7-17}$	0.02661*	0.00476	0.05099**
	(.01298)	(.01817)	(.01835)
TEMPEMPL	0.02669*	0.07841**	-0.06813**
	(.01552)	(.02045)	(.02528)
PART-TIME	0.27261**	0.28400**	0.17853**
	(.01625)	(.01962)	(.03459)
PIECE-RATE	0.03254*	-0.02483	0.06141**
	(.01876)	(.03172)	(.02412)
NODAYWORK	0.08729**	0.12759**	0.04876**
	(.01156)	(.01560)	(.01770)
UNEMPL	-0.06362**	-0.04495*	-0.06876**
	(.01564)	(.02180)	(.02319)

Table 1. (cont.)

Variable	All obs.	Women	Men
CAPITAL	0.12149**	0.11099**	0.13232**
	(.01231)	(.01855)	(.01680)
SIGMA(ϵ)	0.30911**	0.30851**	0.30112**
	(.00236)	(.00313)	(.00337)
RHO(ϵ,μ)	-0.08943	-0.07430	0.03886
	(.06902)	(.09700)	(.12943)
Log-Likelihood	-3719.0	-2069.2	-1543.0
Number of obs.	3895	1987	1908

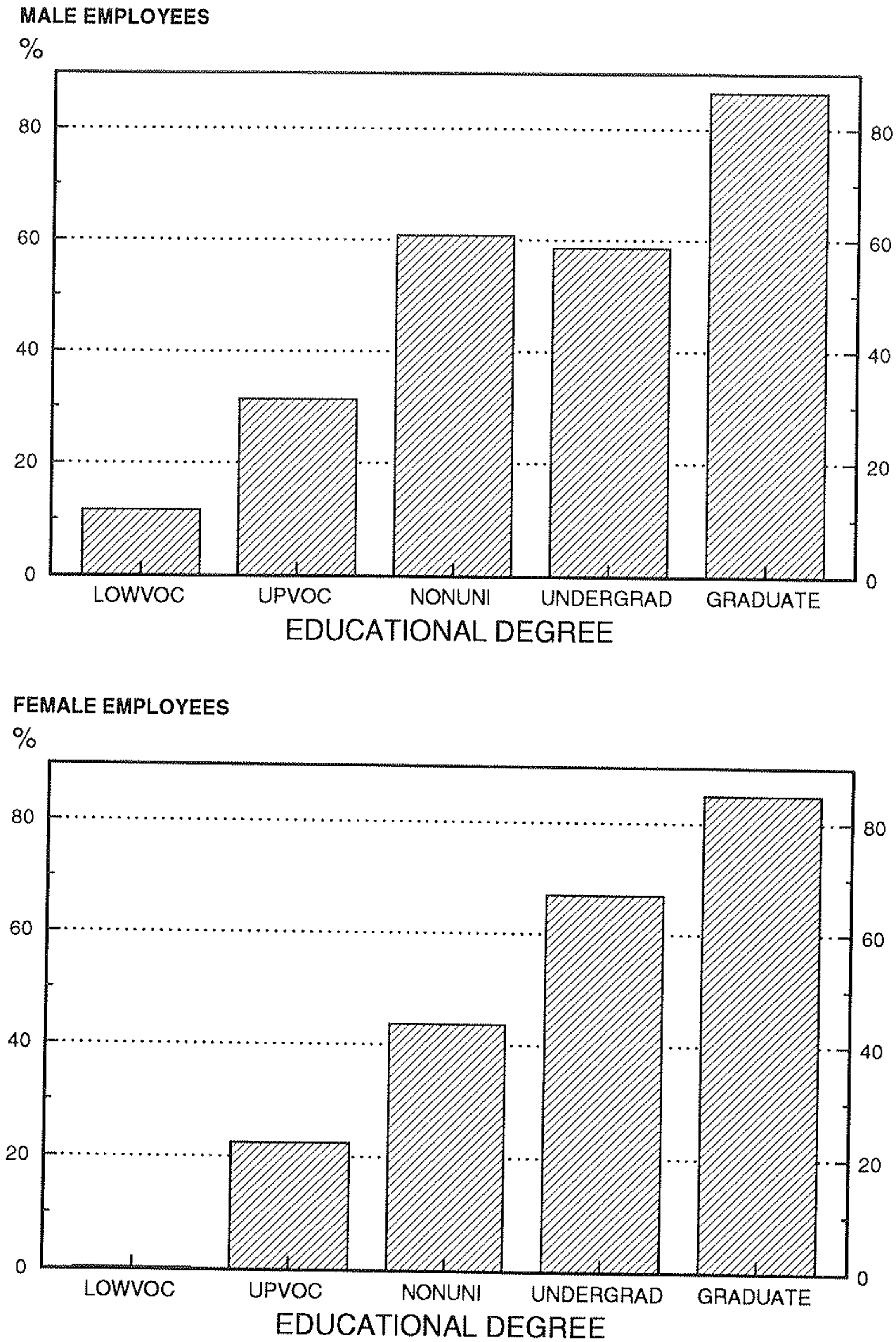
[1] Standard errors are given in parentheses below the estimates. Maximum likelihood estimates corrected for selectivity bias, where SIGMA(ϵ) is the standard error of the disturbance term in the earnings equation and RHO(ϵ,μ) measures the correlation between the error term (ϵ) in the earnings equation and the error term (μ) in the probit equation. The probit estimates are reported in Table C of Appendix.
The omitted educational level variable is BASIC = primary education (about 9 years or less). A simple Chow test based on estimation results obtained using the Heckman procedure suggests that the hypothesis of the parameter estimates being equal for male and female employees can be rejected at a 0.1 % risk level.

** Denotes significant estimate at a 1 % risk level.
* Denotes significant estimate at a 5 % risk level.

of education behind each degree.

For men, on the other hand, the steadily growing trend in the marginal rate of return to education is dramatically interrupted by a negligible effect on earnings from acquiring an UNDERGRADUATE university degree instead of a non-university higher education degree (SHORT NON-UNIV). A plausible explanation to this outcome is the past years' favourable labour market situation of adb-personnel and engineers, whose degrees are ranged under the lowest level of higher education (CSO, 1991). For the same reason, the undergraduate level stands out as the only educational level at which the estimated return is clearly higher for women than for men. However, this finding does not affect to any notable extent the average rate of return to schooling for men because of the small relative share of this

Figure 1. Estimated return to different levels of education compared with the return to basic education



Source: Table 1

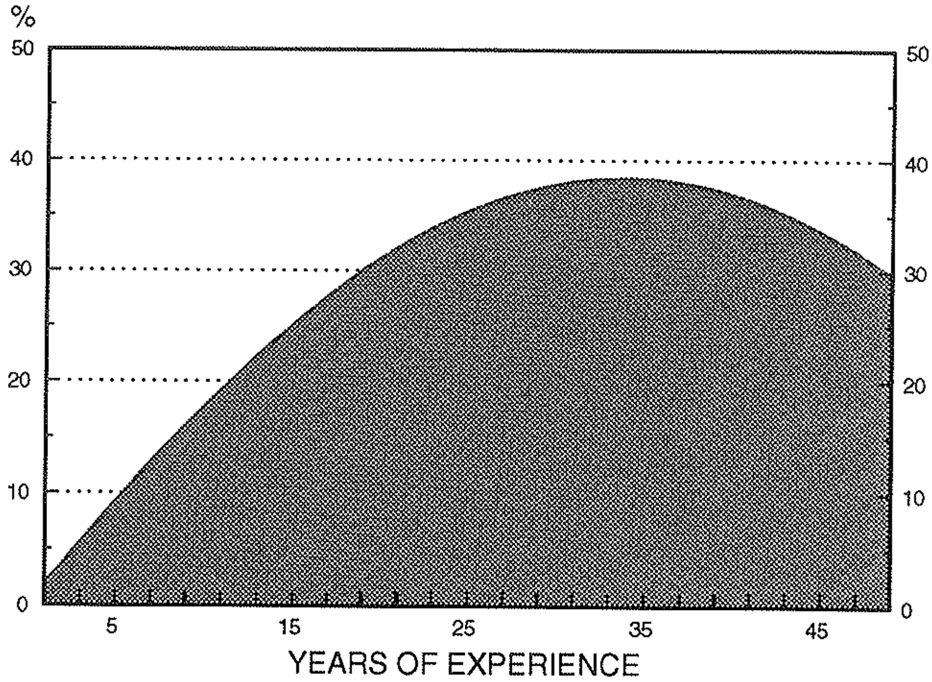
educational group. Instead, the statistically insignificant return to the acquisition of lower vocational and professional education for women obviously offers a major explanation of the overall lower return to education for women.[6]

The parameter estimates on the experience variables are mostly highly significant and have the a priori expected signs, thereby pointing to an upward-sloping concave experience-earnings profile for both genders. Assuming that the cross-sectional coefficients for experience capture the dynamics of changes in earnings over the individual's life cycle, the magnitudes of the estimates indicate that earnings growth starts at the beginning of working life from some 1.9 per cent for the typical male employee and from roughly 1.4 per cent for the typical female employee, implying a slight difference in the average growth rate in earnings between men and women entering the labour market. Earnings growth decreases thereafter continuously, albeit fairly slowly; when evaluated at the sample mean level of experience, the average annual growth in hourly earnings amounts to some 1.2 per cent for men and to about 0.9 per cent for women, and reaches zero only after more than three decades in the labour market, turning thereafter negative until retirement.

More exactly, a maximum of some 38½ per cent cumulative growth[7] in male hourly earnings is reached after 34 years of work experience, while the cumulative growth in female hourly earnings peaks at roughly 30 per cent after 38 years in the labour market. Generally speaking, the crucial difference in the experience-earnings profiles of the two genders thus lies in a substantially flatter profile for women, resulting in a notably smaller total influence of experience on female earnings (Figures 2-3). All in all, then, an employee with the average number of years of schooling would reach a maximum in hourly earnings in his or her mid-fifties. However, this late peak does not exclude the possibility of an earlier peak in annual earnings if there is a tendency for annual hours worked to fall off well before the peak in hourly earnings.

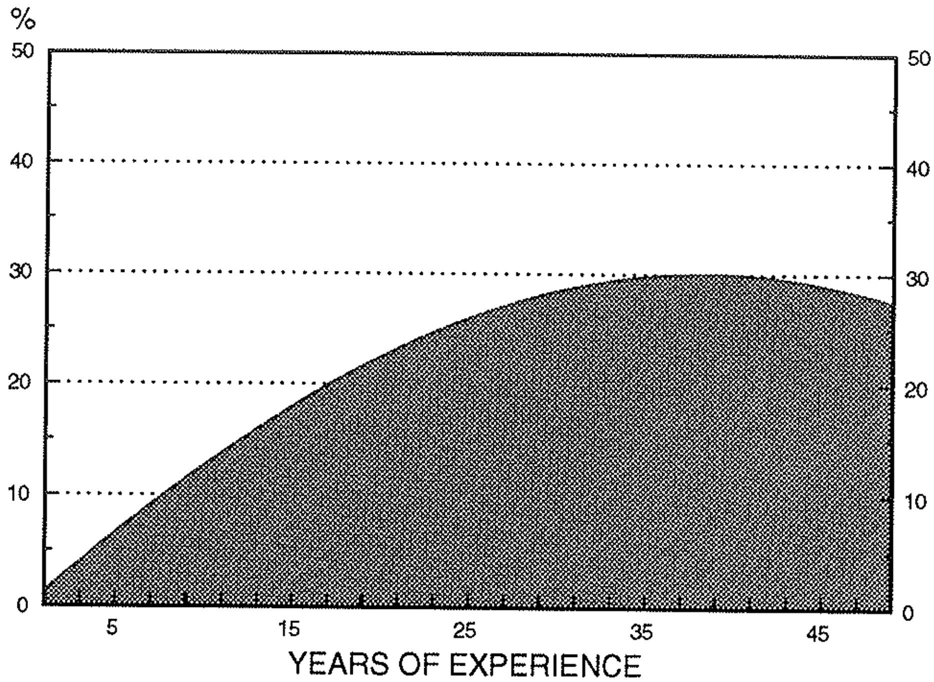
The coefficient on the indicator for women (WOM) implies that the standardized hourly earnings differential between men and women amounted to over 20 per cent in 1987. Furthermore, married men

Figure 2. Average cumulative growth (%) in male hourly earnings attributable to different number of years of work experience since labour market entrance



Source: Table 1

Figure 3. Average cumulative growth (%) in female hourly earnings attributable to different number of years of work experience since labour market entrance



Source: Table 1

have on average nearly 7 per cent higher hourly earnings than unmarried men, whereas for women, marriage turns out to have no statistically significant earnings effect. Family size, on the other hand, seems to have a small positive effect on both male and female earnings. The estimation results further suggest that women in temporary employment (TEMPEMPL) have about 8 per cent higher hourly earnings than women with a permanent job. Contrary to this, temporary employment implies notably lower earnings for men. Table 1 also points to a considerable income advantage of part-time employees (PART-TIME). The remarkable "wage premium" obtained for temporarily employed females as well as for persons in part-time employment is most likely due in part to measurement errors and in part to the distinct distribution of these two employee categories across critical personal and job characteristics, which may involve some degree of self-selection (cf. Asplund, 1992a). However, the small share of the two categories in the whole sample of employees indicates that the coefficients for the temporary and part-time employment variables should be interpreted with caution.

The estimation results also point to a significant income advantage of male employees covered by some other compensation system than wages/salaries paid on a monthly, weekly or hourly basis (PIECE-RATE). For women, such extraordinary compensation systems imply a small, if any, income disadvantage. As is to be expected, hourly earnings in regular day-time work are typically lower than those paid in jobs implementing irregular working-time schemes (NODAYWORK). Furthermore, the regression results support the hypothesis that periods of unemployment or layoffs generally imply a negative earnings effect (UNEMPL). It is also not surprising that earnings levels tend to be substantially higher within the capital region (CAPITAL). Finally, there seems to be no statistically significant correlation between the error term in the probit equation (μ) and the error term in the earnings equation (ϵ). In other words, the hourly earnings observed among employees do not exceed significantly the population mean that would be observed should non-participant individuals enter the labour market. This holds for both genders.

Seniority effects on earnings

The relationship between seniority and earnings has in recent decades received much attention in theoretical and empirical analyses of earnings determination and job mobility. A strong, positive effect of job seniority accumulation on earnings growth has been reported in empirical studies by, among others, Bartel & Borjas (1981), Borjas (1981), Mincer & Jovanovic (1981), and Mincer (1986,1988,1989).

The most prominent explanation of this important link between seniority and earnings is offered by the theory of specific human capital, according to which earnings growth with job seniority is attributable to the employee's acquisition of more specific skills and higher productivity.[8] The years of experience with the same employer are then assumed to reflect the specific human capital acquired by the employee. Hence, a widely-used approach within the human capital framework to assessing empirically the influence on earnings growth of investment in specific capital is to simply introduce into the standard human capital earnings function the employee's length of employment with the current employer, i.e. his or her seniority (tenure). As in the case of general experience, the positive association between earnings and seniority is expected to diminish as seniority increases. The seniority effect added to the earnings function is therefore commonly given a quadratic specification.

When incorporating both total work experience and seniority in the human capital earnings function, the coefficient on experience is to be interpreted as an estimate of the growth in market earnings due to the individual's investment in general human capital, while the coefficient on seniority provides an estimate of earnings growth due to the individual's investment in specific human capital. Accordingly, summing up the coefficients on experience and seniority yields a proxy for the earnings effect of total work experience.

The regression results obtained from estimating the extended human capital earnings specification augmented with a seniority variable and its square (SEN_i, SEN_i^2) are displayed in Table 2. Comparison of Tables 1 and 2 reveals that the introduction of

Table 2. Estimation results for the seniority earnings equation estimated jointly and by gender[1]

Variable	All obs.	Women	Men
CONSTANT	3.42281** (.03354)	3.30027** (.05035)	3.35201** (.05041)
LOWER VOCATIONAL	0.05812** (.01503)	0.00471 (.02184)	0.10734** (.02042)
UPPER VOCATIONAL	0.23886** (.01603)	0.19626** (.02394)	0.26821** (.02248)
SHORT NON-UNIV	0.41984** (.02334)	0.35847** (.03285)	0.46975** (.03280)
UNDER-GRADUATE	0.51462** (.03808)	0.51548** (.04868)	0.45457** (.06437)
GRADUATE	0.62118** (.02428)	0.61756** (.04271)	0.61656** (.03115)
EXP	0.01232** (.00247)	0.00863** (.00365)	0.01630** (.00362)
EXP^2	-0.00020** (.00006)	-0.00015 (.00010)	-0.00027** (.00009)
SEN	0.00586** (.00226)	0.00739* (.00325)	0.00394 (.00312)
SEN^2	-0.000003 (.00008)	-0.00001 (.00013)	0.00001 (.00011)
WOM	-0.20283** (.01144)	-	-
MARRIED	0.02200 (.01438)	-0.01900 (.01901)	0.06521** (.02324)
$CHILD^{0-6}$	0.01705 (.01352)	0.03619* (.01765)	-0.01412 (.02090)
$CHILD^{7-17}$	0.03022* (.01307)	0.00954 (.01813)	0.05263** (.01867)
TEMPEMPL	0.03969** (.01557)	0.09529** (.02030)	-0.05679* (.02546)
PART-TIME	0.28020** (.01619)	0.29781** (.01933)	0.18243** (.03470)
PIECE-RATE	0.03673* (.01874)	-0.02368 (.03093)	0.06601** (.02468)

Table 2. (cont.)

Variable	All obs.	Women	Men
NODAYWORK	0.08528**	0.13173**	0.04121*
	(.01179)	(.01557)	(.01859)
UNEMPL	-0.04192**	-0.02501	-0.05046*
	(.01611)	(.02213)	(.02416)
CAPITAL	0.13170**	0.11994**	0.14255**
	(.01238)	(.01848)	(.01724)
SIGMA(ϵ)	0.30702**	0.30511**	0.30037**
	(.00221)	(.00325)	(.00334)
RHO(ϵ,μ)	-0.06123	-0.09807	0.00913
	(.07154)	(.09587)	(.12832)
Log-Likelihood	-3667.1	-2036.5	-1521.1
Number of obs.	3847	1974	1873

[1] For notes, see Table 1.
** Denotes significant estimate at a 1 % risk level.
* Denotes significant estimate at a 5 % risk level.

variables capturing possible earnings effects of investment in specific capital reduces the absolute size of the linear general experience term from 1.5 to 1.2 per cent for the full sample, from 1.4 to 0.9 per cent for women, and from 1.9 to 1.6 per cent for men. Because of the strong, positive correlation between experience and seniority, this is also the expected direction of the effect.

The coefficient of the linear seniority variable turns out to be significant only in the full sample and female earnings regressions, whereas the coefficient on seniority squared is throughout statistically insignificant. Hence, the earnings effect of seniority does not seem to have an upward-sloping concave profile; for both genders, the hourly earnings per year of employment with the same employer tend to grow at a constant but moderate rate.[9] The period of recovery from an initial earnings loss may, as a consequence, be fairly long.

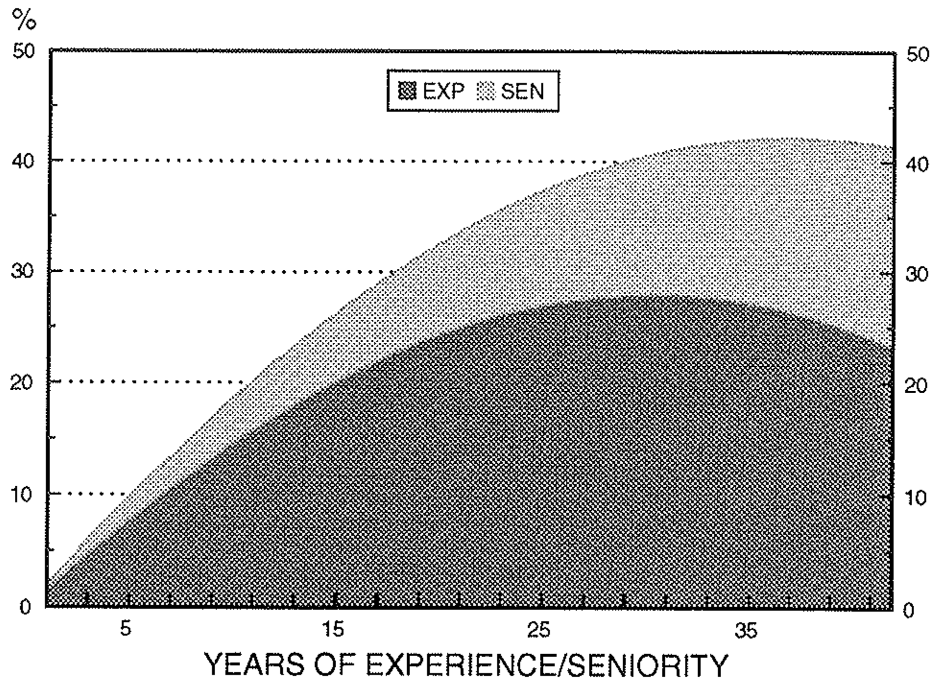
But despite an overall weak earnings effect, earnings growth due to seniority differs quite markedly between genders.

Specifically, the coefficients suggest that, other things unchanged, the first 10 years of current seniority are associated with an increase in earnings of about 7½ per cent for the typical female employee, but of only some 4 per cent, if any, for the typical male employee. These "lower bound" estimates indicate that, on average, female employees would lose much more because of forgone specific capital than their male counterparts if their employment relationship were to terminate for exogenous reasons. The stronger impact of seniority on female earnings is also reflected by the fact that seniority accounts for nearly a half of the initial earnings effect of total work experience. The importance of seniority for the determination of male earnings is much smaller; it accounts for, at most, one-fifth of the initial earnings effect of total labour force experience. When giving the earnings effects of general experience and seniority a conventional human capital interpretation, female employees thus tend to acquire a considerable amount of specific skills, while male employees seem to acquire mainly general skills, i.e. skills which are by definition transferable between employers.

In order to further illuminate the simultaneous earnings effects of seniority and general experience, earnings profiles of men and women are calculated from the estimates in Table 2. These profiles are portrayed in Figures 4 and 5. The two fields showing the estimated earnings growth attributable to, respectively, general experience and seniority give, when taken together, a proxy of the earnings effect of total work experience for a hypothetical individual staying with the same employer up to 42 years (sample maximum of seniority).

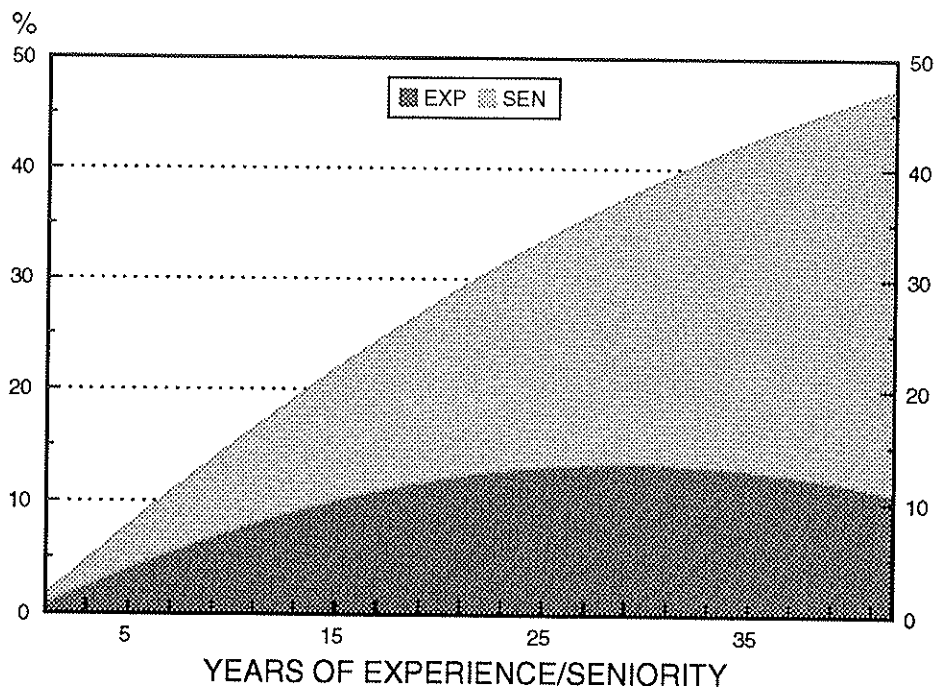
However, the human capital interpretation of longer length of employment at the same employer as resulting in more accumulated specific capital and thus in higher productivity and earnings indicates that a positive return to seniority may capture either a return to specific training or job duration, or both. In fact, it has been argued that the estimated effect of seniority is simply the result of inconsistent estimates produced by unobserved heterogeneity across individuals and job matches.[10] Unfortunately, the data used in the present study do not allow a distinction between the theoretical explanations of the effect of seniority on earnings growth. Instead, following e.g. Brown

Figure 4. Male earnings profiles for general experience and seniority



Source: Table 2

Figure 5. Female earnings profiles for general experience and seniority



Source: Table 2

(1989) and Mincer (1988,1989), an attempt is made to capture at least part of the correlation between specific training and job duration by supplementing the seniority earnings specification with survey information on the occurrence of formal on-the-job training.

This is done in two different ways: first, by introducing an indicator (OJT) for employees who have attended formal on-the-job training courses during the survey year, and second, by adding a variable capturing the earnings effect of days in training during that year (OJTDAYS). The gender-specific regression results corresponding to these two specifications of the on-the-job training variable are displayed in columns 2-3 of Tables 3 and 4. For ease of exposition, the tables only report the estimated coefficients for the human capital variables. The estimates of the other explanatory variables are very close to their counterparts in Table 2.

The inclusion of formal OJT in the earnings model indicates that the seniority variable can now be taken to reflect earnings growth attributable to informal OJT and/or to factors that may cause earnings to increase independent of productivity growth. However, as can be seen from Tables 3 and 4, the estimated main effects of seniority differ trivially. But on the other hand, the small drop in the estimates due to the introduction of formal OJT is hardly surprising in view of the overall moderate seniority effect on earnings growth.

The tables further display a strong, positive relation between earnings growth and training, suggesting that productivity growth is important in shaping earnings profiles, as indicated by the human capital model. Moreover, the effect on earnings of formal OJT is found to be much stronger for male employees than for female employees. Male employees having attended formal training courses had on average some 10 per cent higher hourly earnings than those having received no formal training during the survey year. The relative earnings advantage of formally trained female employees was less than 5 per cent. The weaker overall earnings effect of formal training among women is also reflected by the estimated coefficients for the training days variable.

Table 3. Estimation results for various specifications of the seniority earnings equation estimated for men[1]

Variable	(1)	(2)	(3)	(4)
LOWER VOCATIONAL	0.10734** (.02042)	0.09939** (.02033)	0.10254** (.02030)	0.09713** (.02031)
UPPER VOCATIONAL	0.26821** (.02248)	0.23650** (.02256)	0.24159** (.02252)	0.23829** (.02250)
SHORT NON-UNIV	0.46975** (.03280)	0.43104** (.03308)	0.43659** (.03255)	0.43549** (.03300)
UNDER-GRADUATE	0.45457** (.06437)	0.41464** (.06254)	0.41131** (.06424)	0.41603** (.06307)
GRADUATE	0.61656** (.03115)	0.57090** (.03225)	0.57500** (.03157)	0.57346** (.03210)
EXP	0.01630** (.00362)	0.01590** (.00358)	0.01659** (.00358)	-
EXP^2	-0.00027** (.00009)	-0.00026** (.00009)	-0.00027** (.00009)	-
PREEXP	-	-	-	0.01643** (.00392)
$PREEXP^2$	-	-	-	-0.00024* (.00011)
SEN	0.00394 (.00312)	0.00298 (.00310)	0.00306 (.00310)	0.01851** (.00424)
SEN^2	0.00001 (.00011)	0.00002 (.00011)	0.00003 (.00011)	-0.00022* (.00013)
PREEXP·SEN	-	-	-	-0.00052** (.00020)
OJT	-	0.09662** (.01652)	-	0.09801** (.01657)
OJTDAYS	-	-	0.01220** (.00183)	-
$OJTDAYS^2$	-	-	-0.00016** (.00002)	-
MOVE	-	-	-	-0.05496* (.02555)
Log-Likeli.	-1521.1	-1502.4	-1501.9	-1499.3

[1] For notes, see Table 1. The estimates of the other explanatory variables are close to their counterparts in Table 2 and are therefore not reported in the table.
** Denotes significant estimate at a 1 % risk level.
* Denotes significant estimate at a 5 % risk level.

Table 4. Estimation results for various specifications of the seniority earnings equation estimated for women[1]

Variable	(1)	(2)	(3)	(4)
LOWER VOCATIONAL	0.00471 (.02184)	0.00236 (.02184)	0.00292 (.02175)	0.00619 (.02182)
UPPER VOCATIONAL	0.19626** (.02394)	0.18693** (.02397)	0.18425** (.02392)	0.18950** (.02406)
SHORT NON-UNIV	0.35847** (.03285)	0.34124** (.03271)	0.33917** (.03241)	0.34659** (.03294)
UNDER-GRADUATE	0.51548** (.04868)	0.49952** (.04878)	0.49083** (.04940)	0.50648** (.04871)
GRADUATE	0.61756** (.04271)	0.59898** (.04253)	0.58896** (.04241)	0.60688** (.04259)
EXP	0.00863** (.00365)	0.00826* (.00365)	0.00797* (.00363)	-
EXP^2	-0.00015 (.00010)	-0.00014 (.00010)	-0.00013 (.00010)	-
PREEXP	-	-	-	0.01063** (.00416)
$PREEXP^2$	-	-	-	-0.00019 (.00013)
SEN	0.00739* (.00325)	0.00715* (.00326)	0.00713* (.00327)	0.01571** (.00418)
SEN^2	0.00001 (.00013)	0.00002 (.00013)	0.00002 (.00013)	-0.00013 (.00014)
PREEXP·SEN	-	-	-	-0.00029 (.00021)
OJT	-	0.04672** (.01864)	-	0.04625** (.01872)
OJTDAYS	-	-	0.01089** (.00368)	-
$OJTDAYS^2$	-	-	-0.00018 (.00014)	-
MOVE	-	-	-	-0.05589** (.02418)
Log-Likeli.	-2036.5	-2031.8	-2026.2	-2028.9

[1] For notes, see Table 1. The estimates of the other explanatory variables are close to their counterparts in Table 2 and are therefore not reported in the table.
** Denotes significant estimate at a 1 % risk level.
* Denotes significant estimate at a 5 % risk level.

An attempt to approach the aforementioned heterogeneity bias problem is also made by modifying the earnings equation with respect to the employee's work history and by adding information on prior mobility. Specifically, the earnings function is transformed to make a distinction between two labour market segments: one corresponding to current job experience (SEN) and the other to all previous labour force experience (PREEXP). The reason for restricting the analysis to two segments only is the data set employed, which merely provides information on the employee's total work experience and length of employment with the current employer. Past mobility is, in turn, simply defined as change of employer at least once since labour force entry; i.e., the dummy proxy for mobility (MOVE) takes a value of one if the employee's total number of years in the labour market exceeds the years with the present employer, and a value of zero otherwise. The gender-specific estimates corresponding to the segmented human capital earnings equation are reported in column 4 of Tables 3 and 4.

As shown in the tables, the coefficient on the interaction term, PREEXP•SEN, has throughout a negative sign but is significantly different from zero for male employees only, indicating that their initial investment ratio at the current employer is on average a decreasing function of the experience acquired on previous jobs. The strong, negative relation between previous experience and initial training investments in the current job observed for male employees simultaneously supports the hypothesis that jobs started at higher ages involve less training mainly because of the shorter remaining payoff period. No such association seems to exist for female employees.

There is also a possibility to test whether the rate of return to human investments undertaken at the current job really exceeds the rate of return to training received in previous jobs, as would be expected if the training is specific and therefore non-transferable across jobs. Following Holmlund (1984), such specificity of accumulated human capital requires two conditions to be fulfilled. First, the coefficient of the seniority variable has to exceed the coefficient for previous experience. This seems to roughly hold for both genders. Secondly, the absolute value of the coefficient on seniority squared has to exceed the absolute value of the coefficient on previous experience squared. The estimates obtained on the squared terms do not seem to fulfil this condition. Hence, if we are inclined to accept the simplifying assumption that job mobility does not affect to any large extent the individual's investment behaviour over the life cycle, the estimates on the experience variables suggest that the rate of return differential between training inside and outside the current job is small or negligible for both genders. Put differently, skills acquired on the job generally seem to be highly transferable, indicating that job changes do not tend to reduce significantly the value of the experience acquired at the job.

Finally, the coefficient on the turnover variable suggests that for both genders, mobility on the labour market tends to shift the earnings profile downwards by some 5½ per cent on average. This finding may, in turn, be linked to the question of the specificity of skills acquired through formal OJT. Unfortunately, the survey data comprise no information on that issue. But in view of the fact that the reported training refers to "any professional or trade union training provided within the the framework of a structured course that is partly or wholly sponsored by the employer", it is definitely not to be characterized as entirely employer- or firm-specific. Instead, comparison of the absolute magnitudes of the coefficients for the MOVE and OJT variables suggests that part of the training can be classified as industry-specific and/or occupation-specific and is consequently lost only when the employee moves to another industrial sector or changes occupation.

It may, though, be questioned whether it is appropriate to treat participation in formal OJT programmes as an exogenous variable, that is to assume that the trainees are selected in a random manner. Suppose that those who went through these programmes would, had they not received OJT, nonetheless have had higher earnings than their non-participating counterparts. In that case, an exogenous OJT variable would give an upward-biased estimate of the actual earnings effect of formal OJT.[11] There is, however, also a possibility that the estimated on-the-job training coefficients understate the actual earnings effect. This will occur if the full return to training is not received during the training, i.e. survey, year.

4. CONCLUDING REMARKS

Generally speaking, the estimates for the human capital variables point, when compared with estimates obtained for other industrialized countries, to an "average-level" direct rate of return to formal schooling and to a fairly low increase in earnings per year of total work experience and of employment with the same employer, i.e. seniority. However, comparisons should be made with great caution not least because of fundamental differences in populations underlying the survey samples as well as in definitions of variables. In particular, the estimated earnings effects reported in the present paper are gross-of-taxes and do not account for the costs of schooling and interpersonal ability differences.

But the returns to education estimated for Finland may, nevertheless, be regarded as remarkably high in view of the fairly low rate of return to education that has generally been found to characterize the Nordic countries. In fact, also when a Nordic classification of education is used instead of the Finnish one, the estimated overall return to education is still significantly higher in Finland compared with the other Nordic countries (Asplund et al., 1991). But at the same time, the average increase in earnings per year of work experience turns out to be relatively low in Finland also in a Nordic perspective, which may be interpreted as indicative of insufficient possibilities of labour market training and/or other productivity improving measures.

There also seem to be noteworthy differences in the rate of return to human capital between the two genders. Both the return to schooling and the increase in earnings from each year of general labour market experience are clearly lower for female employees. Another notable difference between genders is the moderate but still more important role of seniority in the determination of female earnings. But the estimation results also seem to suggest that the earnings effect of seniority for women is due mainly to a good employee-employer relationship and not to the accumulation of specific skills. For male employees, on the other hand, growth in productivity with general experience tends to be the dominant explanation for the overall effect of experience on earnings, accompanied with a strong, positive effect of participation in formal training programmes. This lends without doubt support to the human capital theory.

But in assessing the reported estimation results, due allowance should be made for the fact that the estimations are based on cross-sectional data for one year only. In other words, the estimated coefficients are to be interpreted as short-term estimates. As pointed out by Willis (1986), the actual earnings growth of members of cohorts may be quite different from that indicated by cross-sectional estimates if there have been clear changes in the rate of productivity growth or in the earnings structure by age and education. Unfortunately, the stability of the reported estimates cannot be examined because the labour force survey data available for years prior to 1987 do not comprise income data. It is comfortable, though, to note that results obtained for the other Nordic countries suggest that the return to human capital has been remarkably constant during the 1980s.

Footnotes:

1. It has occasionally been argued that the widely-used quadratic specification of the human capital earnings function tends to underestimate earnings growth for young employees (Welch, 1979). Following Murphy & Welch (1990), also a quartic specification for the experience-earnings profile was tried, but this approach did not yield reasonable estimation results.

2. As pointed out by Maddala (1983), it would be most important not only to test for the existence of sample selection bias but to also analyse the actual earnings effects of self-selection, i.e. the effects for the alternative, unobserved choice. The stumbling-block, however, is that the data seldom allow this.

3. See Asplund (1992a), for a detailed presentation of the underlying data, definitions of variables used, and estimation results for alternative definitions of critical variables.

4. It is to be noted that in interpreting the coefficients of included explanatory variables, continuous variables provide directly the earnings effect of, say, an additional year of human capital accumulation, whereas dummy estimates indicate the differential effect of being in a particular group as compared with the reference group. Moreover, only if the percentage change is small enough will the estimated coefficient measure the actual percentage change in earnings from having/aquiring the characteristic for which the variable stands, other things being unchanged. In the case of larger percentage changes, the actual earnings effect is given by the antilog of the parameter estimate. In the present paper, the estimated effects on earnings are throughout re-interpreted in this way.

5. Yet, although there are no pecuniary advantages in acquiring a lower vocational or professional degree, completion of that degree may nonetheless stand out as a good in itself or lead to a job with greater job satisfaction.

6. The average rate of return to an additional year of schooling beyond completed basic education - other relevant factors being held unchanged - is estimated at about 9 per cent for men and at slightly more than 8 per cent for women, giving an average of some 9 per cent for all employees. Hence, the marginal return to above-primary education is on average nearly 1 percentage point lower for women than for men. These estimation results are reported in Asplund (1992a). Because of the fairly high estimated returns to education, attempts were made to capture, by means of the single cross-section of individuals available, possible age-related differences in the returns due not least to variation in the supply of educated labour over the past decades. However, the schooling coefficients estimated for different cohorts revealed no significant differences between the point estimates relative to the standard errors.

7. The cumulative earnings effect of labour market experience measures total percentage additions to earnings due to experience from zero experience to given years of experience.

8. There are, however, also more recent, competing theories of compensation and productivity offering alternative explanations for the empirically observed positive earnings effect of seniority. See the survey in e.g. Parson (1986).

9. The full sample linear seniority variable has a coefficient of 0.00596 with a standard error of 0.00091 when seniority squared is excluded. The corresponding female coefficient amounts to 0.00775 with a standard error of 0.00145, whereas the corresponding male coefficient is 0.00434 with a standard error of 0.00114.
Attempts were also made to capture early-seniority effects on earnings by adding to the seniority earnings equation a dummy variable to indicate the employee's first year with the current employer. For male employees, this term has a coefficient of 0.04154 with a standard error of 0.02435. For female employees, the corresponding coefficient is 0.14412 with a standard error of 0.02372. However, the interpretation of the estimates is unclear because they are based on annual earnings data that may combine earnings associated with the current employment relationship with earnings from employment with previous employers during that same year. Hence, the estimates evidently reflect some combination of mobility or labour market entry effects and seniority effects. According to Brown (1989), they might also capture non-quadratic earnings effects that do not fit into a quadratic specification of seniority.

10. For a brief review of recent empirical evidence, see e.g. Asplund (1992b) and the literature referred to.

11. If the data of the present study were used in order to treat OJT as endogenous, the training effect would not be identified; the same set of explanatory variables obviously affects both the participation in training programmes and the earnings equation.

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APPENDIX

Table A. Summary of definitions of included variables

Variable	Definition
EARN	Average hourly earnings (in FIM) calculated from the before-tax annual wage/salary income recorded in the tax rolls and an estimated amount of annual normal working hours.
ln EARN	Natural logarithm of EARN.
BASIC	Indicator for persons with basic education only (about 9 years or less).
LOWER VOCATIONAL	Indicator for persons with completed lower-level of upper secondary education (about 10-11 years).
UPPER VOCATIONAL	Indicator for persons with completed upper-level of upper secondary education (about 12 years).
SHORT NON-UNIV	Indicator for persons with completed lowest level of higher education (about 13-14 years).
UNDERGRADUATE	Indicator for persons with completed undergraduate university education (about 15 years).
GRADUATE	Indicator for persons with completed graduate university education (more than 16 years).
EXP	Self-reported total years of labour market experience.
SEN	Seniority, i.e. self-reported years with the present employer.
PREEXP	Years of experience with previous employers calculated as PREEXP = EXP - SEN.
WOM,MALE	Indicators for gender.
AGE	Physical age of the individual.
MARRIED	Indicator for married persons and singles living together.
$CHILD^{0-17}$	Indicator for children aged 0 to 17 living at home.
$CHILD^{0-6}$	Indicator for children aged 0 to 6 living at home.
$CHILD^{7-17}$	Indicator for children aged 7 to 17 living at home.
SOUTH	Indicator for residence in the southern parts of Finland (Uudenmaan lääni, Turun- ja Porin lääni, Ahvenanmaa, Hämeen lääni, and Kymen lääni).
CAPITAL	Indicator for residence within the capital region (the region of Helsinki).
TEMPEMPL	Indicator for persons who self-reportedly are in temporary employment.

PART-TIME	Indicator for persons who self-reportedly are in part-time employment.
PIECE-RATE	Indicator for persons who are not being paid per hour, week, or month.
NODAYWORK	Indicator for persons who are not in regular day-time work.
UNEMPL	Indicator for persons who have been temporarily unemployed or laid off during the year.
OJT	Indicator for persons who self-reportedly have received employer-sponsored formal on-the-job-training during the survey year.
OJTDAYS	Self-reported total number of days in formal on-the-job training during the survey year.
MOVE	Indicator for job mobility proxied by MOVE = 1 if EXP > SEN.

Table B. Sample mean characteristics of all employees retained in the actual estimating data and separately for male and female employees

Variable	All obs. Mean	Women Mean	Men Mean
EARN	44.82	40.80	49.00
ln EARN	3.72	3.63	3.81
BASIC (1,0)	0.3605	0.3674	0.3532
LOWER VOCATIONAL (1,0)	0.3083	0.2823	0.3354
UPPER VOCATIONAL (1,0)	0.2000	0.2174	0.1819
SHORT NON-UNIV (1,0)	0.0565	0.0604	0.0524
UNDERGRADUATE (1,0)	0.0257	0.0352	0.0157
GRADUATE (1,0)	0.0490	0.0372	0.0613
EXP	16.78	16.14	17.46
EXP^2	388.85	356.83	422.19
SEN	8.92	8.60	9.26
SEN^2	149.11	139.40	159.34
PREEXP	7.85	7.51	8.21
$PREEXP^2$	123.09	110.99	135.84
AGE	37.17	37.72	36.60
WOM (1,0)	0.5101	-	-
MARRIED (1,0)	0.7366	0.7313	0.7421
$CHILD^{0-17}$ (1,0)	0.4875	0.4947	0.4801
$CHILD^{0-6}$ (1,0)	0.2334	0.2094	0.2584
$CHILD^{7-17}$ (1,0)	0.3499	0.3694	0.3297
SOUTH (1,0)	0.6644	0.6784	0.6499
CAPITAL (1,0)	0.1946	0.2074	0.1813
TEMPEMPL (1,0)	0.0973	0.1188	0.0749
PART-TIME (1,0)	0.0370	0.0609	0.0121
PIECE-RATE (1,0)	0.0901	0.0649	0.1164
NODAYWORK (1,0)	0.2401	0.2486	0.2311
UNEMPL (1,0)	0.1027	0.0981	0.1074
MOVE (1,0)	0.8614	0.8556	0.8676
OJT (1,0)	0.3671	0.3770	0.3569
OJTDAYS*	6.60	5.72	7.57
Number of obs.	3895	1987	1908

* Average number of days in employer-sponsored formal on-the-job training for those who have received training during the survey year.

Source: Labour Force Survey for 1987

Table C. Maximum likelihood estimates of the selection (probit) equation explaining the probability of being in employment[1]

Variable	All obs.	Women	Men
CONSTANT	-5.93550**	-5.45579**	-6.71548**
	(.54883)	(.76199)	(.82981)
AGE	0.37792**	0.33677**	0.47329**
	(.04712)	(.06514)	(.07214)
AGE^2	-0.00576**	-0.00438**	-0.00864**
	(.00125)	(.00171)	(.00193)
AGE^3	0.00001	0.000001	0.00004*
	(.00001)	(.000014)	(.00002)
MARRIED	0.28802**	0.08376	0.56403**
	(.04887)	(.06522)	(.07948)
$CHILD^{0-17}$	0.00971	-0.18392**	0.34189**
	(.05440)	(.06861)	(.09295)
SOUTH	0.38344**	0.39830**	0.35321**
	(.03927)	(.05256)	(.06114)
BASIC	-0.31403**	-0.32664**	-0.29308**
	(.04231)	(.05737)	(.06486)
MALE	0.23448**	-	-
	(.04100)		
No. of obs.	6018	3193	2825
Prob(W=1), %[2]	89.5	88.5	89.2

[1] Standard errors are given in parentheses below the estimates.
[2] Percentage share of correctly predicted (probit) employment.
** Denotes significant estimate at a 1 % risk level.
* Denotes significant estimate at a 5-% risk level.

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