A complete list of Working Papers on the last page.

To be presented at the Econometric Society European Meeting in Vienna, September 1977.

No. 14, 1977

RATES OF DEPRECIATION OF HUMAN CAPITAL DUE TO NONUSE

by

Siv Gustafsson

August, 1977

This is a preliminary paper. It is intended for private circulation, and should not be quoted or referred to in publications without permission of the author. Comments are welcome. An earlier version was presented at the Marstrand meeting of Scandinavian Economists, in June 1977. Valuable comments on the earlier version has been given by among others Göran Eriksson, John Hause, Anders Klevmarken and Jacob Mincer.

RATES OF DEPRECIATION OF HUMAN CAPITAL DUE TO NONUSE
by Siv Gustafsson

Abstract:

How important for success on the job is uninterrupted labor force participation? Data on labor force status for a 15 year period for individual salaried employees in Swedish Industry makes possible the estimation of the effect of years of experience and years of nonexperience on earnings. One result is that both women and men experience salary decreases by labor force interruptions. However, net investment during nonexperience years is found to be positive, women as well as men return to the labor market with a larger amount of human capital after the interruption than before the interruption.

RATES OF DEPRECIATION OF HUMAN CAPITAL DUE TO NONUSE

Introduction

The main line of thought of human capital theory is that education and skill aquisitions are regarded as investments in human beings that increase productivity. The theory has been applied to growth economics, to educational planning and to the distribution of personal incomes. This paper deals with an aspect of the distribution of personal incomes.

Human capital theory has been applied to a number of studies on the personal distribution of incomes in the United States. The influence of human capital on sex differentials in pay has been investigated in e g Oaxaca [1973], Malkiel and Malkiel [1973]. Data of actual years of experience and labor force participation have largely been lacking which has made it impossible to estimate the effect of labor force interruptions. However, in Mincer and Polachek [1974] earnings functions of women with interrupted labor force experience are analysed and estimated on data of work histories of women in the US labor force. Swedish salary data have been analysed by the human capital approach in Klevmarken [1972], in Klevmarken and Quigley [1976] and in Gustafsson [1976]. This study uses a set of data where labor force status is given for every year of a 15 years period which makes it possible to investigate the effect of labor force interruptions on earnings for men and women.

Earnings of an individual are explained by an earnings function where the amount of human capital accumulated by the individual and the rentals paid on the capital determines actual earnings of the individual. Human capital may depreciate from wearing off or obsolescense as is the case with physical capital. A person who has experienced periods of nonparticipation may have forgotten what was once learnt or what was once learnt may have become obsolete. Furthermore,during a period without labor force participation there is no possibility to make further investments in on the job training. Periods of nonparticipation in the labor force are thus expected to lead to lower salaries upon return for two reasons, namely depreciation and on the job investment possibilities forgone.

It is useful to know the size of depreciation rates and alternative rates of investment for a number of reasons. The costs of unvoluntary unemployment includes rates of depreciation and alternative rates of on the job investment not carried out. Such costs exist if women can not work because of lack of day-care for their children. Human capital of young graduates who do not find jobs may depreciate rather quickly. A society that can not make use of investments in human capital already carried out may lose much of its stock of human capital.

For the individual depreciation of human capital and forgone opportunities to make further investments mean smaller earnings. Labor market interruptions are probably more frequent and of a longer duration for women than for men, because women use more time for child care. If this is so earnings differentials between men and women are explained by the labor market interruptions.

The earnings function

To estimate the effect of labor force interruptions we use an earnings function which describes present earnings as a function of past time use.

The derivation of the earnings function is carried out in five steps. First it is shown how today's earnings is the return on the sum of all earlier investments. Second by disaggregating investment, gross investment and depreciation are identified. Third the relation between earnings capacity and actual earnings is stated.

Forth the earnings function is partitioned into periods of schooling, periods of labor market activity and inactive periods. The resulting earnings function is due to Jacob Mincer and shows today's earnings as a function of earlier allocation of time between education, labor market work and inactive periods. For further details on the derivation of the earnings function and the underlying assumptions the reader is advised to consult Mincer [1974].

Potential earnings or earnings capacity in year t is defined as earnings when no further investment is taking place and is written:

$$E_t = E_{t-1} + rC_{t-1} \qquad (1)$$

where E_{t-1} is earnings capacity in year t-1, C_{t-1} is the investment in year t-1, and r the rate of return on the investment. C_{t-1} may be conceived of as earnings forgone by allocating a certain amount of time to increasing earnings capacity instead of allocating all the time to directly productive work.

Let us measure investment rates k_t instead of money amounts (that is time equivalents of investments) since time is easier to measure. Let us define

$$k_t = \frac{C_t}{E_t}$$

by breaking out E_{t-1} and taking account of the definition of k_t

$$E_t = E_{t-1}(1+rk_{t-1}) \tag{2}$$

by recursion and successive substitution

$$E_t = E_0 \prod_{i=0}^{t-1} (1+rk_i) \tag{3}$$

as rk may be assumed to be a small figure $\ln(1+rk) \approx rk$ so[1)]

$$\ln E_t = \ln E_0 + r \sum_{i=0}^{t-1} k_i. \tag{4}$$

The expression (4) states that the log of present earnings capacity is the sum of the log of initial earnings capacity E_0 and the rate of return (r) on the sum of earlier investment rates (k_i).

Investment may be split into gross investment and depreciation by defining C_t^* as gross investment, δ_t as the depreciation rate in year t and k_t^* as the gross investment rate. Now from (1) follows:

$$E_t = E_{t-1} + rC_{t-1}^* - \delta_{t-1} E_{t-1} \tag{5}$$

dividing by E_{t-1} gives

$$\frac{E_t}{E_{t-1}} = 1 + rk_{t-1}^* - \delta_{t-1} = 1 + rk_{t-1} \tag{6}$$

therefore $rk_t = rk_t^* - \delta_t$. Inserting this into (4) gives:

$$\ln E_t = \ln E_0 + \sum_{i=0}^{t-1} (rk_i^* - \delta_i). \tag{7}$$

1) $\ln(1.01) = 0.010$ $\ln(1.05) = 0.049$ and $\ln(1.10) = 0.095$.

Expression (7) states that the log of earnings capacity in year t is the sum of the log of initial earnings E_0 and the sum of the return on gross investment minus the rate of depreciation in each period.

To see how earnings capacity is related to actual earnings we once again turn back to (1). Earnings capacity is defined as earnings in a year when no further investments are taking place. During most years some investment activity does take place. In order to obtain actual earnings Y_t in year t we only have to subtract the current investment C_t

$$Y_t = E_{t-1} + rC_{t-1} - C_t \tag{8}$$

Or expressing the same thing by rates of investment and depreciation and noting that the current investment will not depreciate before the next period gives:

$$Y_t = E_t(1-k_t) \tag{9}$$

which means that

$$\ln Y_t = \ln E_t + \ln(1-k_t) \tag{10}$$

Since $\ln E_t$ is given by (7) we have

$$\ln Y_t = \ln E_0 + \sum_{i=0}^{t-1} (rk_i^*-\delta_i) + \ln(1-k_t^*). \tag{11}$$

There are reasons to believe that investment rates, depreciation rates and rates of return to investment differ between periods of different time use of the individual. These parameters may be expected to differ between periods of schooling, periods of labor market activity and inactive periods.

Let us split the earnings function and write

$$\ln Y_t = \ln E_0 + \sum_S (r_S k_S^* - \delta_S) + \sum_X (r_X k_X^* - \delta_X) + \sum_{NX} (r_{NX} k_{NX}^* - \delta_{NX}) + \ln(1-k_t^*) \tag{13}$$

where S is years of schooling, X is years of experience and NX is the number of years of nonexperience.

Let us assume that depreciation rates are zero during schooling and that all available time is used investing. These assumptions give

$$\sum_S (r_S k^*_S - \delta_S) = r_S S \tag{14}$$

Likewise let us assume that depreciation rates do not differ due to the length of inactive periods. If investment rates are zero during such periods we will get an estimate of the rate of depreciation

$$\sum_{NX} (r_{NX} k^*_{NX} - \delta_{NX}) = -\delta_{NX}(NX) \tag{15}$$

To see what will happen with investment rates during years of labor force experience, let us for a moment assume that no inactive years exist and write years of potential experience PX and with the rates indexed p. If the investment rates decline with time we have

$$\sum_p (r_p k^*_p - \delta_p) = (r_p k^*_0 - \delta_p)PX - \frac{r_p k^*_0}{2T}(PX)^2 \tag{16}$$

where T is the length of working life.

If we identify the NX years out of the PX years since PX-NX=X.

Substituting (14, (15) and (16) into (13) gives

$$\ln Y_t = \ln E_0 + r_S S - \delta_{NX}(NX) + (r_p k^*_0 - \delta_p)X - \frac{r_p k^*_0}{2T} X^2 + \ln(1-k_t) \tag{17}$$

Equation (17) is the earnings function that we will try to estimate.

Data

The data are composed of a one in ten random sample of white-collar workers in the private sector of Sweden. The sample includes 32 287 individuals of which 23 366 are men and 8 921 are women.

Data were achieved by matching salary statistics of 1974 with a one in ten random sample of pension funds data for the Swedish population. The pension funds data make a time series of pension points "ATP" for every year from 1960-74 (see Eriksen [1973]). The pension funds data were matched on an individual basis with salary statistics collected by the Swedish Employer's Federation. Most white-collar workers in the Swedish private sector industry, retail trade and services, are covered by this set of data.

For each individual in the sample there is information on year of birth, sex, nationality, a time series of pension points "ATP" and cross sectional data for 1974 of monthly salary, education, occupation, normal number of working hours per week and the company related variables industry branch, size of the company and geographical location. Many of these variables have not been used for this paper.

Information on experience is calculated from the ATP score of the pension funds data. The ATP score of the pension funds data is calculated from the annual earnings of the individual and the "base amount".[1] The "base amount" is a deflator used for the tax system as well as for the pension system by Swedish authorities. Zero ATP score has been taken to mean nonparticipation in the labor market whereas positive ATP score has been taken to mean a year of labor force participation.

Education is recorded by type of education completed. The code comprises a level of education variable which has 7 steps. These are aggregated into compulsory schooling (1-2), secondary schooling (3-4) and university graduates (5-7).[2,3]

The distribution of the sample is shown in table 1. The table shows that whereas 61 % of the men had worked for the whole time period of 15 years this is true only for 25 % of the women. Men were older on the average than women, had more years of schooling and worked full time to a larger extent than women. Only full time workers are analyzed in this paper.

---

[1] The formula for translating annual earnings into ATP points is: $(y-b)/b=ATP$ where b is the base amount and y is annual earnings. ATP points are truncated from below by b and from above by 7.5b. The maximum score of ATP thus is 6.5. ATP are given by 3 digits in the data. The base amount b equaled 8 500 Sw. Crs in August 1974.

[2] Education is given by a 3-digit code the Swedish Educational Nomenclature (SUN). Although the SAF Salary Statistics do not differentiate between types of education shorter than 11 years the code comprises 200 different values in this set of data. Education has been coded 000 in most cases where employees have compulsory schooling because SAF has not bothered to collect educational information according to the SUN code on these people.

[3] Occupation is recorded according to the "Position Classification System for Salaried Employees", worked out in cooperation by the Employer and Employee organizations. The classification system is a 4-digit system where the first three digits give an occupation. The first 3 digits thus give the horizontal dimension distinguishing about 60 occupations. By the first digit occupations are grouped together in ten occupational fields. The 4-digit contains a vertical classification of jobs into job levels classifying jobs into 7 different degrees of difficulty.

Table 1 Distributions of male and female salaried employees in Swedish Industry in 1974

Education	Men	Women	Years of experience	Men	Women
University training	0.099	0.031	1	0.005	0.029
Secondary education	0.353	0.200	2	0.010	0.042
Compulsory schooling	0.548	0.769	3	0.014	0.043
	1.0	1.0	4	0.019	0.051
Age groups			5	0.024	0.065
-19	0.003	0.036	6	0.027	0.063
20-24	0.037	0.167	7	0.027	0.060
25-29	0.141	0.202	8	0.027	0.059
30-34	0.163	0.143	9	0.028	0.065
35-39	0.135	0.100	10	0.031	0.058
40-44	0.120	0.102	11	0.031	0.056
45-49	0.117	0.093	12	0.036	0.052
50-54	0.123	0.086	13	0.045	0.050
55-59	0.094	0.054	14	0.066	0.052
60-	0.067	0.017	15	0.610	0.255
	1.0	1.0		1.0	1.0

Definition of variables

According to equation (17) we want to regress the logaritm of monthly salary at time t (i.e. 1974) on years of schooling, years of nonexperience, years of experience and years of experience squared in the following manner

$$\ln SAL = \alpha + \beta_1 S + \beta_2 NX + \beta_3 X + \beta_4 X^2 + \varepsilon \tag{18}$$

In order to estimate (18) we want to know how the individual used his years before 1974. We want to identify the variables S, X and NX from information on age, years of positive earnings and education. There are two main problems.

The first one is that information on labor force status is given only for a 15 years period. Not knowing how many years of experience there are before the year of 1960 is a problem for older persons. Comparing the salaries of two women both 50 years old, with compulsory schooling and with 15 years of experience would give indecisive estimates of β_3 since one of the women may have worked continuously since the age of 16 and the other one may have been a housewife till the age of 35. This problem may be solved by splitting the sample into older persons and younger persons.

The second problem is to separate years of schooling from inactive years. This identification has to be carried out by means of information on type of education completed. Even if there is a normal graduation age for each education there is a dispersion around the mean. If a person has started to work earlier than the assumed age at graduation years of schooling would be overestimated. On the other hand if a person has started later than assumed some years taken as years of nonexperience may actually have been years of schooling. Assuming years of zero earnings to be NX years may be more secure for older persons than for younger persons. Years of zero earnings are more likely to have been spent in school in the twenties than in the thirties or at older ages.

The procedure to define the variables has been as follows:
We have the identities

$$\begin{aligned} &G + X + NX \equiv AGE \text{ and} \\ &S \equiv G - 7, \end{aligned} \tag{19}$$

where G is age at graduation and S is given by the fact that Swedish children start school at 7 years of age. G is not given by the data but has to be chosen according to the level of education completed by the individual. It has been chosen as follows:

$G = 16$ for compulsory schooling

$G \leq 19$ for secondary schooling (20)

$G \leq 25$ for university schooling

The weak inequalities have been chosen in order to avoid counting as a year of schooling if it is actually known by the data that a person has been working[1]. If for example a secondary school graduate has started to work at the age of 18 and this is covered by the observation period AGE − X = 18 then G is put 18. This means that the individual has two years of secondary training instead of three years. By this device we avoid negative NX.

For those individuals who are not older than G + 15 we have a more complete information than for older persons. In order to take advantage of this fact we split the sample into young persons and old persons according to the following criterion:

if

AGE − G = PX $\leq$ 15 the individual is labeled YOUNG,

and if (21)

AGE − G = PX > 15 the individual is labeled OLD.

For young people the variables S, X and NX are independantly determined given that we accept the definition of G. A year of zero earnings is counted as a year of schooling before the upper limit of G is reached. Only when AGE − X − 19 > 0 for a secondary school graduate a year of zero earnings is counted as an NX year. Since a correct specification of NX is crucial to the following arguments NX should rather be underestimated than overestimated.

For old people on the other hand we only know how many NX years there exist during the past 15 years period and not for the whole working life. Actual experience X is not known and we have to do with potential experience PX.

1 An earlier attempt to put G = 24 for young female university graduates resulted in a number of negative NX observations. Allowing G to vary resulted in a variation of S from a minimum of 9 years to a maximum of 18 years and a mean of 15.3 years.

Different specifications of the earnings function and the interpretation of the effect of nonexperience years on earnings

Regression results for the full sample of fulltime working women according to different specifications of the earnings function are given in table 2. A comparison shows that the inclusion of S almost does not affect the regression coefficients of NX, X and XSQ. This result means that years of schooling has an effect on salaries additive to the effect of the other variables as is assumed in specification (18). The variables included in the regression explain more of the individual variation of salaries for the group of young women (R^2 = .64) than for the group of old women (R^2 = .21). All regression coefficients are significant for the two groups.

For the group of young women salaries increase about 8 % for every successive year of experience whereas the increase for older women is less than 1.5 %. This result interpreted by human capital theory may mean that young women invest more than old women which is plausible since young women have more years left to collect the returns.

One result is that the coefficient of nonexperience is positive when X is the explanatory variable. This means that a young woman receives a higher salary upon return to work than she would have received next year of a continous labor market experience. The regression coefficient of non-experience years when PX is the explanatory variable is negative.

The different signs of the coefficients for NX are explained by the different specifications.

Suppose we have the two models:

$$\ln SAL = \alpha_1 + \beta_1 X + \beta_2 NX \tag{22}$$

$$\ln SAL = \alpha_2 + \beta_3 PX + \beta_4 NX \tag{23}$$

If we consider the salaries of two individuals both 28 years of age and with the same education but one has a continous work experience of 10 years whereas the other one has worked for only 6 out of the 10 years. The salaries of the two individuals written out by model (22) then are

Table 2. Different specifications of the earnings function.
All women.

Dependant variable: log of salaries per month. Sw. Crs, standard errors in parenthesis

	Young				Old	
Constant	6.778	7.466	7.426	6.689	7.529	7.960
S	0.0673 (0.0014)				0.0462 (0.0023)	
NX	0.0315 (0.0012)	0.0207 (0.0015)	-0.0195 (0.0016)	-0.0171 (0.0013)	-0.0203 (0.0103)	-0.0203 (0.0011)
X	0.0813 (0.0029)	0.0832 (0.0031)				
XSQ	-0.0025 (0.0002)	-0.0029 (0.0002)				
PX			0.0871 (0.0035)		0.0131 (0.0023)	0.0146 (0.0029)
PXSQ			-0.0027 (0.0021)		-0.0002 (0.0000)	-0.0003 (0.0000)
AGE				0.0488 (0.0006)		
S.E.E.	0.1429	0.1828	0.1830	0.1517	0.1746	0.1856
R^2	0.6471	0.4222	0.4213	0.6020	0.2114	0.1087
n	3656	3656	3656	3656	3089	3089

S = years of schooling.

NX = years of nonexperience.

X = years of experience during the period of observation (1960-1974).

XSQ = years of experience squared.

PX = potential number of years of experience.

PXSQ = PX squared.

S.E.E. = standard error of estimate.

R^2 = coefficient of determination.

n = number of individuals.

Young if PX $\leq$ 15.

Old if PX > 15.

$$\ln SAL = a_1 + b_1 10 + b_2 0$$
$$\ln SAL = a_1 + b_1 6 + b_2 4 \tag{22a}$$

The salaries for the same individuals written out by model (23) are

$$\ln SAL = a_2 + b_3 10 + b_4 0$$
$$\ln SAL = a_2 + b_3 10 + b_4(-4) \tag{23a}$$

The idea is illustrated in figure 1. Suppose that the first individual has continuous experience and has a salary that gives point A. Suppose the second individual has worked 6 years out of 10 potential years and the log of the salary of the second individual is at point B. This individual then earns more at the seventh year of experience than the first one did four years ago at point D. If point C instead is the log of the salary of the second individual after the four years of nonexperience salaries are lower because of the labor market interruption. The individual earns less if the seventh year of experience starts at age 24 than if it starts at age 28.

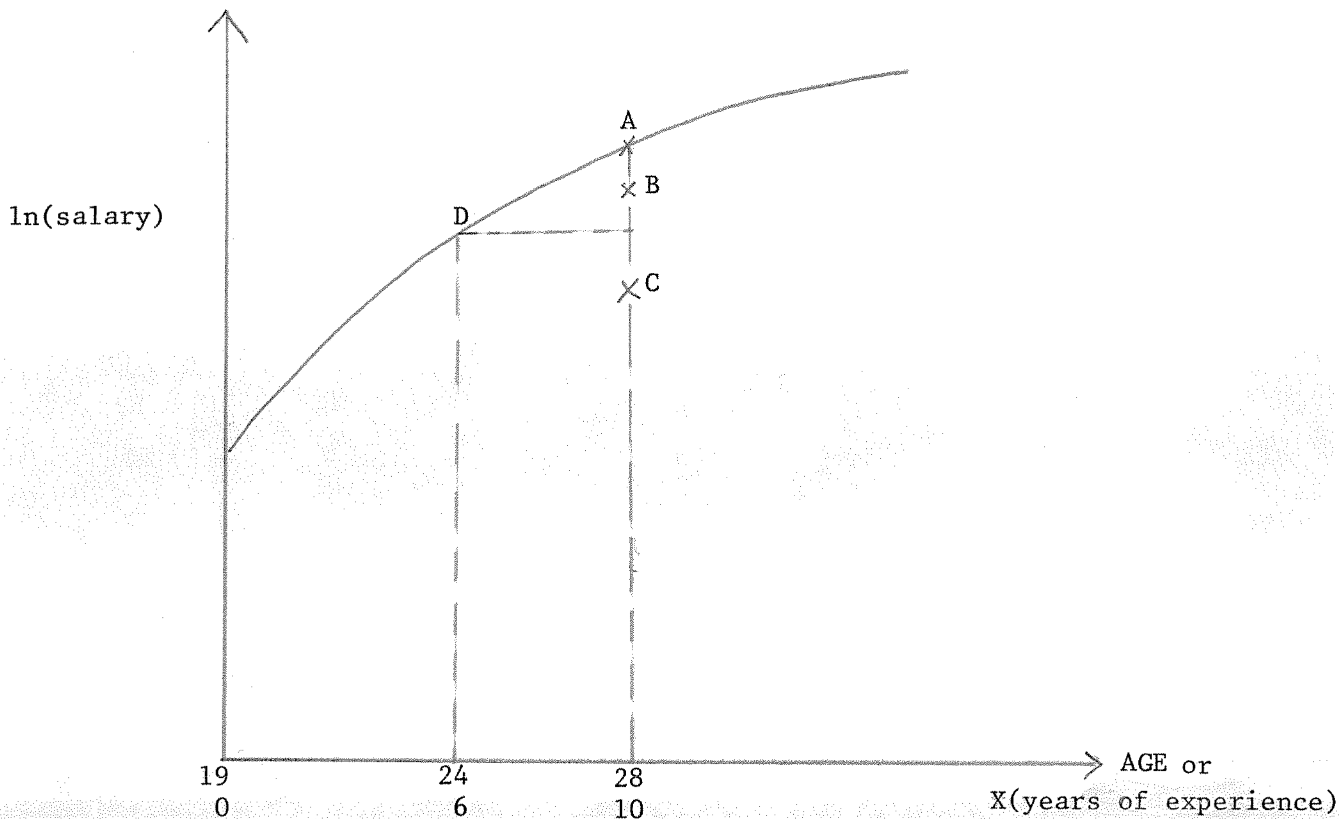
If regression model (22) is applied to data where salaries of persons with nonexperience years center around B the coefficient β_2 of NX will be positive, whereas if model (23) is applied to the same data the coefficient β_4 of NX will be negative.

On the other hand if salaries of persons with labor force interruptions center around C in figure 1 the coefficient of NX will be negative in model (22) as well as in model (23).

Negative signs on β_4 coefficients can not be interpreted as net depreciation of human capital due to nonuse. Negative β_4 only mean that years of experience has an effect on earnings. Such an effect on earnings is found in model (22) if the coefficient of X is larger than that of NX. Only negative coefficients β_2 of model (22) can be interpreted to mean that there has been net depreciation of human capital due to nonuse.

The results of table 2 illustrate the effect on the coefficient of NX of the different specifications of the earnings function. The coefficient of NX is changed from negative when the earnings function is specified with age or potential experience as an explanatory variable to positive when the earnings function is specified with actual experience as an explanatory variable.

Figure 1. The meaning of depreciation of human capital



ln(salary) = A if NX = 0

ln(salary) = B if NX = 4 → net appreciation of human capital during nonexperience years.

ln(salary) = C if NX = 4 → net depreciation of human capital during nonexperience years.

The effect on salaries of nonexperience years for different educational and sex groups

The general behaviour of the earnings function is maintained also when the sample is divided into different educational and sex groups (see tables 3 and 4). All significant regression coefficients of NX are positive for the specification where years of experience is the explanatory variable and negative where potential years of experience is the explanatory variable. All the coefficients of X and of PX are positive and larger in size for the group of young persons than for the group of old persons. All the squared experience terms are negative and highly significant. The included variables explain about half of the variance of individual salaries for the group of young persons and a small fraction for the group of old persons.

The effect of having had a few years of nonexperience lowers salaries compared to persons with no labor force interruptions for all the groups except for young men for whom years of nonexperience do not affect salaries considerably. This is seen by the fact that the coefficient of years of nonexperience is negative for all groups in table 3 except for young men. For young men the coefficients are not significantly different from zero.

None of the regressions shows a negative coefficient of NX when X is the explanatory variable, that is salaries are not affected by nonexperience years to appear like point C in figure 1. (See table 4). Going back to expression (13) it is clear that this does not mean that there is no depreciation it only means that investments during nonexperience years are larger in size than depreciation. Another way of stating this result is that the assumption leading to expression (15) above is invalid for salaried employees in the private sector of Sweden. In Mincer and Polachek [1974] where the earnings functions where of type (22) American women were shown to incur net depreciation from years of nonexperience. The results of this paper seem to be opposed to the findings for American earnings data. However, the American data had information on the time actually used for home work whereas in these Swedish data we only know which years were not used for labor market work.

The earnings functions are quite similar across educational groups. In Mincer and Polachek, rates of depreciation were shown to rise with the

Table 3. Earnings functions for separate sex and educational groups of salaried employees in Swedish industry

Dependant variable: log of salaries per month Sw.Crs. Standard errors in parenthesis.

	Young persons					
	Compulsory		Secondary		University	
	Men	Women	Men	Women	Men	Women
Constant	7.164	7.262	7.564	7.498	7.893	7.727
NX	0.0004	-0.0043	0.0048	-0.0127	0.0076	-0.0224
	(0.0032)	(0.0013)	(0.0036)	(0.0032)	(0.0063)	(0.0152)
PX	0.1308	0.1022	0.0953	0.0915	0.1157	0.1173
	(0.0114)	(0.0032)	(0.0099)	(0.0052)	(0.0066)	(0.0187)
PXSQ	-0.0039	-0.0034	-0.0026	-0.0029	-0.0037	-0.0048
	(0.0006)	(0.0002)	(0.0005)	(0.0003)	(0.0004)	(0.0012)
S.E.E.	0.1656	0.1304	0.1594	0.1499	0.2343	0.2237
R^2	0.5571	0.6290	0.4612	0.5802	0.4716	0.3929
n	529	2518	798	966	1618	172
	Old persons					
Constant	7.988	7.915	6.985	8.183	7.878	5.771
NX	-0.0175	-0.0199	-0.0166	-0.0235	-0.0228	-0.0104
	(0.0055)	(0.0011)	(0.0063)	(0.0026)	(0.0079)	(0.0168)
PX	0.0263	0.0145	0.0425	0.0104	0.0900	0.2064
	(0.0046)	(0.0029)	(0.0071)	(0.0089)	(0.0116)	(0.0772)
PXSQ	-0.0004	-0.0002	-0.0007	-0.0002	-0.0017	-0.0038
	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0002)	(0.0015)
S.E.E.	0.2434	0.1704	0.2571	0.1869	0.3185	0.2407
R^2	0.0281	0.1244	0.0459	0.1513	0.1388	0.2178
n	2 010	2592	1 251	466	657	31

Definition of variables, see note to table 2.

Table 4. Net effect of nonexperience years on salaries

Dependant variable: log of salaries per month Sw. Crs. Standard errors in parenthesis.

	Young persons					
	Compulsory		Secondary		University	
	Men	Women	Men	Women	Men	Women
Constant	7.196	7.370	7.125	6.883	6.889	7.027
S			0.0455 (0.0071)	0.0584 (0.0053)	0.0619 (0.0026)	0.0452 (0.0079)
NX	0.0561 (0.0037)	0.0386 (0.0014)	0.0406 (0.0078)	0.0189 (0.0031)	0.0206 (0.0056)	-0.0122 (0.0141)
X	0.1021 (0.0089)	0.0803 (0.0106)	0.0796 (0.0077)	0.0830 (0.0047)	0.1194 (0.0055)	0.1245
XSQ	-0.0029 (0.0005)	-0.0025 (0.0006)	-0.0018 (0.0004)	-0.0025 (0.0003)	-0.0037 (0.0003)	-0.0052 (0.0011)
S.E.E.	0.1680	0.1344	0.1557	0.1423	0.2023	0.2034
R^2	0.5441	0.6063	0.4868	0.6219	0.6061	0.5012
n	529	2 518	798	966	1 618	172

Definitions of variables see note to table 2. There is a variation in years of schooling for individuals in the same schooling group for secondary and university groups (see definition of variables above).

level of education. These data seem to show the same pattern because the difference between the coefficients of X and NX rise with the level of education. The alternative net investments not carried out during nonexperience years seem to rise with the level of education.

Male and female earnings functions do not differ very much. Salaries increase with years of experience at almost the same rate. For the group of young people (see table 4) there is a greater similarity between the sexes in the coefficients of X than in the coefficients of NX. This may be interpreted to mean that men have used more of their nonexperience years for investment activities than women have.

Implications of the effect of nonexperience years

It was pointed out in the introduction that society might lose from not being able to use human capital already invested in if human capital were to depreciate from nonuse. However, such a cost was not found to exist in these data. Women as well as men return to labor market with a larger amount of human capital after a labor market interruption than they had before. However, this does not mean that labor market interruptions are costless.

A significant cost lies in the fact that alternative on the job investments are not carried out. When considering e g the costs of supplying day care facilities for children these alternative investments which are the costs of <u>not</u> supplying day care have to be compared to the costs of supplying day care. The size of the costs of not supplying day care can be calculated by comparing life-time earnings of an uninterrupted career to life time earnings of an interrupted career. This paper shows that there exists a cost of this type. Estimating the size of this cost requires the calculation and comparison of life-time earnings.

One hypothesis put forward in the introduction was that women had more labor market interruptions then men. According to table 5 these data do not seem to confirm this hypothesis for young people. Young women employed in the private sector of Sweden seem to have used even less time out of the

Table 5. Mean values of variables

	Young			Old	
	PX	NX	X	PX	NX
Compulsory schooling					
Men	11.1	2.4	8.7	31.3	0.3
Women	8.4	1.9	6.5	29.0	1.9
Secondary Schooling					
Men	10.5	1.2	9.3	27.9	0.4
Women	7.4	0.8	6.6	26.9	2.2
University Schooling					
Men	8.3	0.3	8.0	24.7	0.4
Women	5.9	0.3	5.6	25.9	1.7

Table 6. Female to male salary differentials

	Not standardized	Standardized by mean values of: a) Men	b) Women
Young			
Compulsory	-0.2685	0.0181	-0.1594
Secondary	-0.289	-0.107	-0.150
University	-0.352	-0.165	-0.255
Old			
Compulsory	-0.259	-0.251	-0.235
Secondary	-0.346	-0.302	-0.291
University	-0.501	-0.573	-0.542

a) To be interpreted as what would happen the salary differentials if salaries of men were to behave according to the female salary function of table 3 for young and table 4 for old.

b) What would happen to the salary differential if salaries of women were to behave according to the male salary function of table 3 for young and table 4 for old.

labor market than young men. Nonexperience years have, however, been used for investment activities to a larger extent by men than by women as pointed out above. During the period of observation older women have used more years out of the labor market than older men.

Sex salary differentials are calculated in table 6. Salary differentials between men and women increase with the level of education which is consistent with earlier results (Gustafsson 1976). For young persons a standardization cuts the salary differential substantially, at least one third and at most to a differential in favour of women. The interpretations is of the result for young people with compulsory schooling is: if women had been able to use their time to investment activities to the same extent as men their salaries would have behaved the same way as male salaries. That is regression coefficients of NX and X would be identical to the male coefficients. The salary differential would be 13.6 %, that is antilog of (-0.159). If on the other hand young men had their salaries increased according to the female pattern, salaries would have turned to 1.8 % in favour of women.

For the older employees differences in the variables included in the regressions do not explain anything out of the sex salary differential. One explanation may be that women have more years of nonexperience prior to the observation period.

Another explanation may be different occupational choices. People probably get more specialized at higher ages and the transfer of human capital from one use to another is more infrequent. Calculations of the within occupational differences in the time use since graduation and its effect on the sex salary differential would give an answer to these questions.

REFERENCES

Eriksen, E.T., 1973, A Forecast Model for the Swedish Supplementary Pension Scheme (ATP), (in Swedish with a summary in English) Stockholm

Gustafsson, S., 1976, Determination and Structure of Salaries in the Government Sector of Sweden. The Industrial Institute for Economic and Social Research, (in Swedish with a summary in English) Stockholm

Klevmarken, A., 1972, Statistical Methods for the Analysis of Earnings Data. Industrial Institute for Economic and Social Research, Stockholm

Klevmarken, A. & Quigley, J., 1976, Age, Experience, Earnings and Investments in Human Capital. Journal of Political Economy, No 1, Feb 1976

Malkiel, B.G. & Malkiel, J.A., 1973, Male-Female Pay Differentials in Professional Employment. American Economic Review, Sept 1973

Mincer, J., 1974, Schooling, Experience and Earnings, NBER, New York

Mincer, J. & Polachek, S., 1974, Family Investments in Human Capital Earnings of Women. Journal of Political Economy, Part II, March/April 1974

Oaxaca, R., 1973, Male-Female Wage Differentials in urban Labor Markets. International Economic Review, Oct 1973

Polachek, S., 1976, Occupational Segregation: An Alternative Hypothesis. Journal of Contemporary Business, Winter 1976