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by

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Abstract:

The human capital model predicts that in equilibrium and in the absence of discrimination units of human capital possessed by individuals are paid the same rentals. This would hold also when comparing private and government sectors. Only nonpecuniary rewards such as better job security of fringe benefits would lead to acceptance of lower money payment. In Sweden salary differentials standardized for human capital variables are found to be in favour of private sector employment. This result contrasts with recent findings for the USA where the reverse was found.

PAY DIFFERENTIALS BETWEEN GOVERNMENT AND PRIVATE SECTOR EMPLOYEES IN SWEDEN

Introduction

The human capital model predicts that, in equilibrium and in the absence of discrimination, units of human capital are paid the same rentals.[1] Thus individuals who have accumulated the same amount of human capital are expected to be paid the same wages regardless of sex, race, locality, type of employer etc. By estimating earnings functions for men and women this proposition has been tested for sex differentials in pay by e g Oaxaca [1973] and Malkiel and Malkiel [1973]. The same proposition has now been tested for pay differentials between government and private sector employees for the USA by Smith [1976 a and 1976 b] and for Sweden by Gustafsson [1976].

Rentals paid on units of human capital may be either in monetary terms or more psychic kinds of rewards. If it is true that fringe benefits and job security are better in the Government sector than in the private sector these factors would call for somewhat larger money wages in the private sector.

The public sector in Sweden may be divided into the government sector, the county councils and the municipalities. In this study only the government sector is included and this sector should be compared with the Federal sector of the USA and perhaps part of the State sector.

Salary statistics for the government sector are collected by the Swedish Central Bureau of Statistics and for the private sector by the Swedish Employers' Confederation. Statistics cover the whole population of salaried employees. These data do not include wage earnings of blue collar workers, for whom separate statistics of wages and hours are collected, but are not employed in this study.

Both data sets group full-time workers according to age, education and sex and mean salary per month is given for all groups. Education is

1) The theory was developed by G Becker and J Mincer. Se e g Becker [1964], Mincer [1974].

recorded as the highest type of education completed. Thus the analysis is carried out on grouped data. The majority of salaried employees in both sectors have only completed compulsory schooling. The proportion of persons having completed only compulsory schooling is for men in the private sector 66 %, men in the government sector 68 %, women in the private sector 88 % and women in the government sector 71 %. The educational groupings are fairly comparable between the two sets of data.

The earnings variable is salary agreed upon per month. This variable is thus given per unit of time and it is not influenced by absence due to illness or overtime-working.

Only full-time workers are included in the study. In this paper data for 1971 are analysed. In 1971 there were 345 000 salaried employees in the government sector and 283 000 salaried employees in the private sector. In Gustafsson [1976] data for 1966 and changes that came about during the five year period are analysed as well.

The salary structures of the government and private sectors in Sweden

As mentioned above the data used in this study are given by groups according to sex, age and education completed. No approximation to years of experience and years of schooling was made. Instead a model with age groups and educational groups as explanatory variables was employed.[1] The model is written:

$$\ln y_{ij} = \mu + \sum_{i=1}^{n} \alpha_i ED_i + \sum_{j=1}^{n} \beta_j AGE_j + \varepsilon_{ij} \qquad (1)$$

where

y_{ij} = salary in Sw.Crs. for the i'th educational group and the j'th age group

μ = intercept

α_i = parameter giving the effect of education in the i'th educational group

ED_i = dummy = 1 in the i'th educational group, = 0 for all other educational groups

β_j = parameter giving the effect of age in the j'th age group

AGE_j = dummy = 1 in the j'th age group, = 0 for all other age groups

ε_{ij} = stochastic disturbance term for the k'th observation with expectancy zero.

The model is not, however, uniquely determined by (1) and the parameters cannot be uniquely estimated. In addition to (1) a restriction giving the norm of comparison is required.

[1] See Klevmarken [1972] for the statistical properties of the model.

The following restriction is chosen:

$\alpha_1 = 0$ and $\beta_1 = 0$. (2)

The data entering this regression model were cross tabulations according to 10 different educational groups and 9 age groups. The entry from each nonzero cell was used as an observation. Since data are grouped the method of estimations has been generalized least squares. Using numbers of individuals as weights

Results are given in table 1. Constants are interpreted as log of mean salary in the reference group that is compulsory schooling persons not more than 19 years of age. The difference between any two regression coefficients of education expresses the age standardized salary differential between the two educational groups. The coefficients are to be compared vertically. Thus private men with certificate of commerce earn 3 % more than private men with high school education if they are of the same age.[1] The difference between the age coefficients express the education standardized salary differential. Since the youngest age group is the reference group adding successive age coefficients gives the age-earnings curve standardized for educational differences. By using this model I do not take account of the possibility of interaction between age and education.

An inspection of the age group coefficients reveal that salaries increase with age for the four groups. By comparing the increase in salaries of successive age groups across the four groups of employees it is clear that

1. Age-earnings curves are steeper for men than for women. This is true for the private sector as well as for the government sector.

2. Age-earnings curves are steeper for the private sector than for the government sector. This is true for both men and women.

The first result means that salaries of women do not increase as much with age as salaries of men do. This may be interpreted by the human capital hypothesis to mean that women have invested less at a given age then men have or that they receive lower rentals on the same investments since women often have a smaller amount of years of experience at a given age than men have the first interpretation is very plausible[2].

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[1] See column 1 of table 1, 0.2343-0.2035=0.0308. And since $\ln(1+k) \approx k$, for small k, this difference is approximately equal to 3 %.

[2] Unfortunately the model used by Sharon Smith [1976b] does not show the age-earnings curve. Thus we do not know if the same pattern is true for the US. Smith's results show that years of experience increase salaries as much for men as for women, unpublished results by this author shows that the same thing is true for Swedish salaries.

Table 1 Government Private Salary Differentials in Sweden in 1971

(standard error in parenthesis)

	Private Men	Government Men	Private Women	Government Women
Dependent variable, log of salary per month .Sw Crs				
Constant (μ)	7.119	7.300	7.111	7.368
Education				
Compulsory schooling and other education not identified (α_0)	0.0	0.0	0.0	0.0
Lower technical education (α_1)	0.1141 (0.0520)	0.0234 (0.0239)	0.1656 (0.0525)	-0.1096 (0.0251)
Lower economic education (α_2)	0.2054 (0.0553)	0.0979 (0.0297)	0.1428 (0.0120)	-0.1233 (0.0891)
High school (α_3)	0.2035 (0.0803)	0.2232 (0.0480	0.1515 (0.1667)	-0.0206 (0.0217)
Certificate of Commerce (α_4)	0.2343 (0.0650)	0.0563 (0.2035)	0.1925 (0.0101)	-0.1115 (0.0513)
Certificate in engineering I (α_5)	0.2110 (0.0223)	0.1774 (0.0291)	0.2446 (0.0174	0.0492 (0.0729)
Certificate in engineering II (α_6)	0.2575 (0.0261)	0.2353 (0.0340)	0.2952 (0.0240)	0.1412 (0.0715)
Degree in engineering (α_7)	0.5736 (0.0406)	0.5380 (0.0363)	0.6151 (0.0506)	0.3865 (0.0832)
Degree in business and economics (α_8)	0.5526 (0.0818)	0.5097 (0.0762)	0.5338 (0.0620)	0.3768 (0.0809)
Other university degrees (α_9)	0.4476 (0.0646)	0.5004 (0.0164)	0.4986 (0.0241)	0.4114 (0.0109)
Age groups				
-19 (β_0)	0.0	0.0	0.0	0.0
20-24 (β_1)	0.5277 (0.0871)	0.3360 (0.0578)	0.3758 (0.0866)	0.2824 (0.0183)
25-29 (β_2)	0.7407 (0.0856)	0.4936 (0.0557)	0.5709 (0.0947)	0.4609 (0.0183)
30-34 (β_3)	0.9068 (0.0853)	0.6299 (0.0560)	0.6451 (0.0103)	0.5451 (0.0192)
35-39 (β_4)	1.0126 (0.0854)	0.7182 (0.0562)	0.6821 (0.0108)	0.5882 (0.0195)
40-44 (β_5)	1.0587 (0.0854)	0.7509 (0.0559)	0.7003 (0.0108)	0.5899 (0.0192)
45-49 (β_6)	1.0804 (0.0854)	0.7498 (0.0554)	0.7154 (0.0106)	0.5697 (0.0195)

Continuation

Table 1

	Private Men	Government Men	Private Women	Government Women
Age groups				
50-54 (β_7)	1.0792 (0.0855)	0.7577 (0.0555)	0.7334 (0.0111)	0.5685 (0.0201)
55- (β_8)	1.0286 (0.0849)	0.7788 (0.0553)	0.7010 (0.0117)	0.6101 (0.0194)
Number of observations	85	86	83	86
DF	67	68	65	68
R^2	0.934	0.965	0.997	0.985
Number of individuals	216 526	215 345	66 209	129 803

Method of estimation was generalized least squares, using numbers of individuals as weights.

One possible interpretation of the second result is that the employees of the government sector have more specific training in the Becker sense (see Becker [1964]) than private sector employees. In this case age-earnings curves of the private sector would start on a lower level than age-earnings curves of government sector employees. The private sector age-earnings curves would be steeper and cross the government sector age-earnings curves. For men there is some indication of this phenomenon in table 1. Intercepts are lower in the private sector than in the government sector and age-earnings curves cross.

Analyses of pay differentials

Pay differentials may be decomposed into a portion attributable to different age and education and a portion which is unexplained by the model. The unexplained differential is interpreted as the average differential prevailing when comparing employees of equal age and education. This kind of com putation requires the information given in table 1 and the distribution of employees over age and educational groups.

An estimate of the earnings that private workers would receive if the earnings function for government workers would prevail also for them is achieved by multiplying frequencies over age and educational groups of private workers by the regression coefficients of the earnings function of government workers. Since mean values of dummy variables are equal to the frequencies this is the same thing as multiplying regression coefficients by mean values of independant variables.

The computation may be written as follows:

$$\ln\hat{y}_p = \mu_g + \sum_i(\alpha_{gi}\overline{ED}_{pi}) + \sum_j(\beta_{gj}\overline{AGE}_{pj}) \qquad (3)$$

where $\overline{ED}_{pi}$ is the mean value of the educational group i that is the frequency of privately employed persons in the i'th educational group. Similarly $\overline{AGE}_{pj}$ is the frequency of private employees in age group j. Let us write frequencies of privately employed persons P and frequencies of government employees G. Expresson (3) may be written

$$\hat{\ln y}_p = \mu_g + \sum_i \alpha_i P_i + \sum_j \beta_j P_j \qquad (4)$$

The actual value of the log of the mean salary of private workers may similarly be written

$$\bar{\ln y}_p = \mu_p + \sum_i \alpha_i P_i + \sum_j \beta_j P_j \qquad (5)$$

The standardized differential is $\bar{\ln y}_p - \hat{\ln y}_p$. Equivalently you can ask what would happen to private sector salaries if the earnings function of the government sector would prevail for them. The standardization then is $\hat{\ln y}_g - \bar{\ln y}_g$.

The value of salaries that really would result if there were no differences between the two sectors must lie somewhere within the limits given by these two values.

Results are given in table 2. For men it does not matter very much if we use the government sector earnings function or the private sector earnings function. In both cases the result is that private sector salaries are about 11 % higher than government sector salaries if we compare persons with the same age and education.

For women the private-government sector comparison is ambiguous. Privately employed women earn on the average 19.8 % less than governmentally employed women. The decomposition of the differential gives opposite results if governmental sector regressions are used to that if private sector regressions are used. Privately employed women have substantially less education and are substantially younger on the average than governmentally employed women. If government sector regressions are used this difference in distribution accounts for more than the initial average differential so that privately employed women are seen to earn a premium over governmentally employed women. If private sector regressions are used the result is that there is a loss associated with being employed in the private sector.

An inspection of earnings functions separate educational of groups of women shows that for all educational groups except compulsory schooling age-earnings curves for women are on a higher level in the private sector than in the government sector. Thus for males of all types of education and for females with more than compulsory education salaries are higher in the private sector than in the government sector.

Table 2. Analysis of government-private pay differentials in Sweden

	Men	Women
$\ln\bar{y}_p$	8.1526	7.6649
$\ln\bar{y}_g$	8.0690	7.8729
$\ln\bar{y}_p - \ln\bar{y}_g$	0.0836	-0.2080
Not standardized differential $(\bar{y}_p/\bar{y}_g)$	8.7 %	-19.8 %
Private sector regressions:		
$\ln\hat{y}_g - \ln\bar{y}_g$	0.1042	-0.0902
Standardized differential $(\bar{y}_g^*/\bar{y}_g)$	11.0 %	-8.4 %
Government sector regressions:		
$\ln\bar{y}_p - \ln\hat{y}_p$	0.1061	0.2616
Standardized differential $(\bar{y}_p/\hat{y}_p)$	11.2 %	29.9 %

However, for the large group of females with compulsory and not identified education government pays more. This is to some extent explained by the fact that nonacademically trained teachers are included in the government group. Since this is an education longer than compulsing schooling, which is only present in the government sector, this fact would tend to raise salaries in the government sector. But this is not the only explanation. Comparisons done by occupation reported in Gustafsson [1976] show that for typists and other office personnel the government sector salary is higher than the private sector salary.

The same kind of decomposition but for the sex differential in salaries within the two sectors is given in table 3.

It is shown in table 3 that salary differentials between men and women were more than twice as large in the private sector as compared to salary differentials between men and women in the government sector. About half of the sex differentials in pay is explained by the mere fact that women were younger and had less education than men. Within the private sector the sex salary differential was 39.6 % and it would be reduced to 21.8 % if salaries were to behave according to the male salary regression. The same comparison within the government sector shows that female salaries were 17.9 % lower than male salaries. The standardization reduces the differential to 8.4 %.

Returns to private employment

A comparison like the one above where the differentials are decomposed does not take the time dimension into account. Human capital theory tells us that the present value of earnings is the relevant comparison statistic. In order to conclude that there is a return to privat employment in comparison to government employment the condition must prevail:

$$PV_p > PV_g \tag{6}$$

Thus we want to calculate:

$$PV_p - PV_g = \sum_{t=0}^{T} (Y_{pt} - Y_{gt})(1+r)^{-t} \tag{7}$$

where t = 0 is the first year of market work after graduation from school and t = T is retirement age.

Table 3 Analysis of Male-Female Pay Differentials in Sweden

	Private	Government
$\ln \bar{y}_m$	8.1526	8.0690
$\ln \bar{y}_f$	7.6649	7.8729
$\ln \bar{y}_f - \ln \bar{y}_m$	-0.4877	-0.1961
Not standardized differential$(\bar{y}_f/\bar{y}_m)$	39.6 %	17.9 %
Male regressions		
$\ln \bar{y}_f - \ln \hat{\bar{y}}_f$	-0.2463	-0.0872
Standardized differential$(\bar{y}_f/\hat{y}_f)$	21.8 %	8.4 %
Female Regressions		
$\ln \hat{y}_m - \ln \bar{y}_m$	-0.2868	-0.0848
Standardized differential$(\hat{y}_m/\bar{y}_m)$	25.0 %	8.1 %

Per cent figures are given in per cent of male salaries. Another grouping of the educational variable gives slightly different percentage figures (se Gustafsson [1976]).

If we are willing to accept that a single cross-section of earnings represents the life-time earnings of an individual the difference in life-time earnings between the private and governments sectors may be calculated. One cross section represents life-time real earnings only if we accept very restrictive assumptions. The only productivity increasing factor must be investment in human capital[1]. The model does not take account of investment in physical capital or technological change. But also as a human capital investment model this is a rude one because age instead of years of experience represents the accumulation of human capital over the life-time. Especially we do not know if some of the years t are years of zero earnings. This could easily be true for women.

Let us for a moment disregard all reservations and calculate present values of life-time earnings from model (3) and with numerical values estimated in table 1.

The starting salary for a person with compulsory schooling y_0 is given by $\exp^{\mu}$. The stream of earnings over lifetime under the assumption that the first years of labor market work is at age 16 and retirement age is at 65 is given by

$$\sum_{t=0}^{T} y_t = 4 \cdot \exp^{\mu} + 5 \cdot \exp^{\mu+\beta_1} + 5 \cdot \exp^{\mu+\beta_2} +,\ldots,+ 10 \exp^{\mu+\beta_8} \qquad (8)$$

The present value of this stream is given by

$$PV = \exp^{\mu} + \exp^{\mu}(1+r)^{-1} + \exp^{\mu}(1+r)^{-2},\ldots,\exp^{\mu+\beta_8}(1+r)^{-49} \qquad (9)$$

However, it is unnecessary to carry out those calculations in order to see that present values of lifetime earnings of men are larger in the private sector than in the government sector. Since the age-earnings curve is steeper for private employment than for government employment we only have to bother about the time dimension for those educational groups where starting salaries are lower in the private sector.

The starting salary of an educational group (i) is given by

$$\exp^{\mu+\alpha_i+\beta_j} \qquad j = 0 \text{ or } 1 \text{ or } 2 \qquad (10)$$

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[1] There are no price increases since data refer to one point in time.

The value of j for a specific educational group i depends on the age at graduation of the educational group. Only for the groups where work starts before the age of 20, there are cases of higher government salaries. This is seen by the fact that:

$$\mu_p + \alpha_{pi} + \beta_{pj} > \mu_g + \alpha_{gi} + \beta_{gj} \quad \text{for all j and i except j=0} \qquad (11)$$

For the group of compulsory schooling men there are 4 years of higher salaries in the government sector as compared to the private sector and a calculation of the internal rate of return according to (7) and (9) gives a value of r = .127 in favour of the private sector employment. An equivalent comparison may be carried out for women and the result is that only the reference group education has higher salaries in the government sector and that this is true only for working years before the age of 20.

Pay differentials in USA

Sharon Smith recently presented similar studies for the USA in two articles (1976 a and 1976 b). The data employed were census data for 1960 and 1970. These data give information on income per year and on hours worked which makes possible the computation of wages. The data do not separate white-collar workers from blue-collar workers. The first paper includes only federal and private workers whereas the second one includes also state and local government workers.

The statistical model is similar to the one employed in this work. A decomposition of the differential into the part explained by the model and the unexplained part is carried out by Smith [1976a]. It shows that federal workers earn a premium over private workers when differences in characteristics are accounted for. Private workers are paid wages 15-18 % lower than federal workers when differences in characteristics are accounted for. Dummies included in the second paper show that both male and female federal workers earn a premium over private workers. For females state and local government workers earn a premium over private workers whereas male state government and local government workers do not.

Salary setting and negotiations

Smith's main explanation to the findings for the USA is that the principle of setting federal wages and salaries "the comparability principle" contains an upward bias. The comparability principle is constructed to give equal pay for the same occupation in private and federal employment. This means that the level of salaries is set equal for comparable occupations in the two sectors. The upward bias introduced in constructing this principle is according to Smith [1976a] due to the fact that only 1/4 of all employees in the private sector enter the comparison. There are reasons to believe that this 1/4 contains the better paid part of the population.

Another explanation put forward by Smith is that the public employee unions are relatively stronger than the private employee unions. Thus the public employee unions suceed better in raising salaries for their members than do private employee unions. Smith's conclusion is that institutional factors explain the pay differential in favour of the public sector.

Swedish government employees are paid by fixed salary schemes and schedules as is the case in the USA. There does not exist an occupational classification across the government and private sectors. Salary statistics are collected and handled by different bodies which makes comparisons more difficult. During negotiations nevertheless comparisons between the two sectors are used as arguments but more often the comparison is on the increase in salaries rather than on the level of salaries.

Both the private and the government sectors are highly organized and central negotiations are carried out. The degree of organization is 70-100 % for the different suborganizations in both sectors. The Swedish Central Organization of Salaried Employees (TCO) is the top organization for both the private and the government sector employees. The employee party can be said to run the same wages policy in both sectors. On the employer part there is, however, a difference. Government as an employer has declared a larger preference of smaller pay differentials than is the case with the Swedish Employer's Confederation (SAF)[1]. From employer policies salary differentials within the private sector may be expected to be larger than salary differentials within the government sector. The data given in tables 1 to 3 above show that salary differentials really are smallar in the government sector.

[1]Note this difference between the two countries. Wereas the policy in the USA is for equal salaries the policy in Sweden has been that government as an employer shall be a "good example" for other employers by having smaller differentials.

Relevance of the institutional explanation

The institutional arrangement of the salary schedule can, however, not explain that units of human capital are paid different rentals in the two sectors. Salary schedules are fixed for positions and not for units of human capital. Negotiations are carried out for positions and groups of more narrowly defined occupations and not for units of human capital. If the salary of a position is to low and there is a lack of qualified persons applying for it, the result would be that qualifications demanded from applicants would tend to be lowered. Thus the amount of human capital possessed by the appointed person would be lower than the case where the salary was higher. Thus, units of human cpaital may be paid equal rentals regardless of institutional arrangements.

The explanation of the result in both the US and Swedish studies must depend on either of two factors.

1. There are other unmeasured rewards in the sector with lower money rentals e g better job security or fringe benefits
2. There is a disequilibrium situation so that units of human capital are paid different rentals.

Fringe benefits and job security have traditionally been better in government employment than in private employment in both countries. Thus results for Sweden are more in line with an equilibrium situation.[1]

1 The data sets in both studies include inhomogeneous groups. If separate regional markets exist geographical differences may exist. Regional differences are found to be almost negligible in the government sector of Sweden (see Gustafsson [1976]). Another source of difference between the two studies is the fact that the Swedish study includes only white-collar workers whereas the US study includes also blue collar workers. Thus, if blue collar workers are paid less than white-collar workers for equal units of human capital the fact that blue collar workers are in majority in private employment while they are in minority in federal employment would explain the result. However, a decomposition to major occupational groups carried out by Smith (forthcoming) shows that also blue collar workers earn a premium if federally employed.

REFERENCES

Becker, G S [1964], Human Capital. A Theoretical and Empirical Analysis with Special Reference to Education. New York.

Fogel, W and Lewin, D [1974], Wage Determination in the Public Sector, Industrial and Labor Relations Review.

Gustafsson, Siv [1976], Lönebildning och lönestruktur inom den statliga sektor, with a summary in English: Determination and Structure of of Salaries in the Government Sector of Sweden, Industriens Utredningsinstitut (IUI), Stockholm

Klevmarken, A [1972], Statistical Methods for the Analysis of Earnings Data, Industriens Utredningsinstitut (IUI), Stockholm

Malkiel, B G and Malkiel, J A [1973], Male-Female Pay Differentials in Professional Employment, American Economic Review.

Mincer, J [1974], Schooling, Experience and Earnings, New York.

Oaxaca, R [1973], Male-Female Wage Differentials in Urban Labor Markets, International Economic Review.

Smith Sharon, P [1976 a], Pay Differentials between Federal and Government and Private Sector Workers, Industrial and Labor Relations Review.

Smith Sharon, P [1976 b], Government Wage Differentials by Sex, The Journal of Human Resources.