Wage differences between women and men in academia

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WAGE DIFFERENCES BETWEEN WOMEN AND MEN IN ACADEMIA

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Introduction

Inequality of wages between women and men is a general phenomenon in industrialised countries. Data from the United Nations' statistical yearbooks over the past 25 years show, for instance, that the average hourly wage of women never exceeds nor equals that of men. The general impression is that wages are stuck at two thirds of what men receive (see Chatab 1986). These findings correspond with those of Roos and Treiman (1983) in their study of wage differences between women and men in nine industrialised countries.

Research has also been conducted into wage differences between women and men at the level of organisations. Among studies of academic institutions an investigation by Frank Fox (1981) shows that female staff incomes lag behind the incomes of their male colleagues. These differences can in part be traced back to the fact that academic titles, years of tenure and age yield less to women than to men. That these differences are scarcely noticed is due to the fact that women and men often work in different locations within universities.

Ferber, Loeb, and Lowry (1978), tried to relate wage differences between female and male university staff to a supposed lower turnout of research and publications, and found that women in the institution they studied did indeed publish less than men. But even where the rate of publication was the same, wage differences remained.

Johnson and Stafford (1975) concluded their research on academic careers with the observation that initially wage inequalities between men and women are reasonably small, but increase during the career. This they ascribe to the nature of women's careers, which are frequently interrupted or take the form of part-time jobs. One of the effects of this could be a decrease in the value of their acquired academic qualifications.

Halaby's contribution (1979) is of special interest to the discussion of wage differences between women and men in organisations. They raise the question of whether women's economic disadvantages are a direct result of wage discrimination – unequal pay for equal jobs – or an indirect result of rank discrimination. This latter fact seems to be the case when women with equal qualifications to men do not have the same chances of promotion as men. Rank discrimination seems more plausible because direct wage discrimination is prohibited by law. Unequal pay for unequal positions is, however, generally accepted in all parts of trade and industry, even if the unequal distribution of

women and men over these ranks is the result of discriminatory mechanisms. Halaby concludes that in the organisation he investigated, the existing segregation of ranks is a greater source of economic disadvantage for women than direct wage discrimination. Women appear to have less access to better-paid positions than men.

This conclusion corresponds with the results of research in a Dutch context. Schippers (1982) found that direct wage differences between the sexes are generally small. Wage discrimination does, however, occur in an indirect sense: women are paid lower wages than men when both possess equal productive potential.

The central question with which this article is concerned is whether differences between men and women in the Netherlands also occur at the level of a large university and, if so, how they ought to be interpreted. In approaching this question our point of departure will be the human capital theory. This theory starts from the assumption that there is equal payment for equal labour productivity, in terms of educational level and working experience. Since the question refers to possible wage differences between men and women, characteristics such as marital status, having or not having children and the proportion of working-hours per week will also be taken into account. Roos (1981) has coined the term "two careers hypothesis" which may be regarded as a specification of the human capital theory in this context.

The problem, and an outline of this article

During recent years research has been carried out into the positions and careers of female and male staff members of the Rijks Universiteit Utrecht (Utrecht State University), including both scientists and non-scientists (Van Doorne-Huiskes 1983; 1986). A major part of this study concerns wage differences between women and men.

The human capital theory and the two-careers hypothesis formulated by Roos suggest that wage differences might not be expected to occur between female and male staff of a large state-dependent institution, given the same job qualifications in terms of educational level, number of years of tenure and years of age and an equal marital status, having or not having children and the proportion of working hours per week. This expectation is reinforced by the way personnel management policies are implemented within Dutch governmental organisations. These policies do, after all, require strictly equal treatment of staff, regardless to colour, race, sex, sexual preferences, marital status, geographical or ethnic origin.

Should wage differences still occur, the question is when they come into being. Can wage differences already be found at the beginning of tenure or do they only come about in the course of a career? (cf. Markham et al. 1985). It is conceivable that both effects occur and are accumulated during a career (Polachek 1975).

The population analysed and the data characteristics are first described to see whether there are wage differences between women and men and if so when these differences occur. The income level of female and male staff together with possible differences between them are then discussed. The extent to which initial wage differences between women and men, where they occur, are reinforced during a career is described next. The article ends with a general summary of the most important results of the analysis.

Population and Data

The analyses described in the following paragraphs are based on two different data files. The first refers to a survey of income and other characteristics of scientific and non-scientific staff of Utrecht State University, made in 1982 (Van Doorne-Huiskes 1983). The second is a longitudinal file which contains data on careers of staff at the same institution. The most recent information on this file dates from the beginning of 1984 (Van Doorne-Huiskes 1986).

The first data file

Administrative data obtained from the Personnel Department of Utrecht State University were used in the survey of wage differences among university staff. Some of these data were made available from a computer file: gross monthly income, sex, age, number of years of tenure at USU, working hours per week and marital status.

The educational level of scientific staff was determined on the basis of whether or not a doctorate was held. Data on the educational level of non-scientific staff were collected by a second investigation of personnel records.[1]

The level of income is expressed gross, in Guilders (*f*) per month, standardised for a full working week. In determining the number of working days we created three categories: one from 10–49% of full working time, or less: 50–89%, and 90% or more.

Age was introduced as a continuous variable, i.e. expressed in number of years. The same applies to duration of tenure. We distinguished two marital status categories: single and married.

The analyses of differences in income concern the entire female scientific staff (n=509), a large random sample of male scientific staff (n=1058); and a random sample of female (n=188) and male (n=215) non-scientific staff.

The second data file

The second data file which forms the basis for career analyses, consists of longitudinal information. We created six sub-files from the administration of the USU Personnel Department: scientific staff, technical and laboratory staff and administrative and library staff; each subdivided into women and men. From these sub-files we drew random samples (total of n=726). These samples

included only tenured staff with more than 20 working hours a week, who took office between the 1st of January 1969 and the 15th of December 1979, born between 1939 and 1959.[2]

Full professors were not included in the sample of careers analysed since the number of female full professors was in fact very small thus reducing its comparative potential. "Hoofdmedewerker" (associate professor/senior lecturer) is the highest position in this sample. The consequences of this decision will be discussed later.

To determine the income level on appointment, we initially noted the scale and corresponding annual increment at which the staff member was originally contracted. Next using salary tables, we examined which level of gross full-time 1982-salary[3] would correspond to this level of income at appointment. The salaries are expressed in guilders per month. The educational level is recoded as in the first data file. Working experience before taking up a labour engagement at Utrecht State University was coded in years, as were the variables of age and years of tenure at USU.

Wage differences between female and male staff in 1983 (first data file)

Firstly we show the average values of the data used in the analysis (Table 1).

Table 1. Average values of variables.*

	scientist		*non-scientist*	
	female	*male*	*female*	*male*
Gross full-time monthly income	5062	6151	2659	3180
age	38.0	40.3	36.1	39.1
proportion of Ph.D.	0.13	0.35	n.a.	n.a.
educational level	18.0	18.0	11.9	11.6
years of tenure at USU	8.1	10.3	7.1	11.1
proportion of married persons	0.52	0.81	0.61	0.80
	(n=509)	(n=1058)	(n=188)	(n=215)

* See text for categories of the variables.

There are, of course, female and male members of staff who are not scientists but do hold degrees. However, we decided not to measure the characteristic of holding a doctorate for non-scientists, but to use the number of years spent in formal education. In retrospect it can be asked whether this decision was justifiable. The number of graduates among non-scientific staff is, however, very small.

Next we consider the extent to which differences in average income between women and men can be traced back to differences in scores on the independent variables themselves, or the extent these variations are attributable to non-specified independent variables. It was necessary to make the following calculation in order to arrive at a conclusion about this. Assuming that women and men will receive the same rewards for the "human capital" they invested, we can

calculate the estimated average income of men, on the basis of their scores on the independent variables, by inserting the mean scores of men on the independent variables in the regression equation of women. If the income estimated this way appears to be equal to what is earned in reality, then any difference in income between women and men could be entirely ascribed to such facts as men being in general older, having more annuity, a higher educational level or, that they comprise a larger number of married persons. However, if there is a difference in average income between women and men, despite this filling-out exercise, then this must be due to other factors. Such an unspecified difference is usually regarded as a consequence of "discrimination" in the literature. We will return to this question in the final section of the paper.

The basis for this theoretical experiment are two regression equations (Van Doorne-Huiskes 1983: 50, 59). In these regressions we calculated the "outputs" for different characteristics of female scientific staff and non-scientific staff (independent variables) in terms of a gross monthly income on a full-time basis.

scientific staff/females (n=509):

$$\text{Income} = 4342 + 76(\text{age}-38) + 81(\text{tenure}) + 580(\text{doctorate}) + 0(\text{married}) \quad (1)$$

non-scientific staff/females (n=188)

$$\text{Income} = 2341 + 9(\text{age}-36) + 95(\text{education}-12) + 4(\text{age}-36) * (\text{education}-12) + 46(\text{tenure}) + 168(\text{married}) \quad (2)$$

The independent variables used in these equations are those which contribute significantly to the estimation of average income of women as well as men. The only variable to which this does not apply is "marital status" of female non-scientific staff. Even though the regression coefficient takes on a value of ƒ168,– this does not seem to be significant.[4]

The percentages of variation explained between the two given equations are 65% and 51% respectively. This percentage strongly resembles Fox's (1981) findings for the United States. She found that 61% of the variations in women's incomes can be explained by so-called achievement variables: age, educational level, years of tenure at university.

The variable "age" in both equations and "educational level" in the second equation are expressed as deviation scores from their respective means. Thus the constant term can be interpreted as the average income of an "average" female staff member, in terms of age and educational level, at the beginning of tenure, single and – in the case of scientific staff – without a doctoral degree. We can add so many guilders to the estimated average monthly income at the time of the study (beginning of 1982) for each additional unit in the value of the independent variables, as expressed by the different regression coefficients.

In the equation for non-scientific female staff we used an interaction term of

Table 2. Differences in the average income between women and men for scientific and non-scientific staff, based on filling out the results of independent variables for the men in regression comparisons of the women.

	Scientific staff	*Non-scientific staff*
Income of males	6151	3180
Income of females	5062	2659
Difference	1089	521
Amounts per month which men would earn/loose compared to women (for each independent variable) based on differences in the results of women and men on independent variables.		
age	+175	+27
doctorate/level of education	+133	–29
interaction of age and level of education	n.a.	4
length of tenure	+178	184
marital status	0	216
total	468	394
actual wage difference	1089	521
'explained' difference	–486	–394
'unexplained' differences	603	127

"age" and "educational level". We may conclude from the significant contribution to the interaction term that there is no strictly linear relation between the independent variables used and the estimated level of income. The effect of ageing on the level of income appears to increase proportionally with the higher educational level.

If we return to our hypothetical calculation then Table 2 shows us the results of the filling-out exercise. Here the average results for male staff members on the independent variables are used to complete the regression equation for female scientific and non-scientific staff.

The same conclusion applies for both scientific and non-scientific staff. If men were rewarded in the same way as women for their human capital characteristics, they would in fact earn less than they do now. For scientific staff *f*603 of the average difference of *f*1089 per month cannot be explained by the specified independent variables. For non-scientific staff *f*127 out of *f*521 per month cannot be explained by the specified independent variables. In the next section we will consider whether the wage differences found were already in effect at the beginning of tenure. The possible development of wage differences during the course of a career will be examined.

Average income of female and male staff members at the time of appointment and the development of wage differences during a career (second data file)

Individual estimates will be made for each of the three categories of staff, concerning the level of income at the time of appointment and in 1984. The most important question here is whether the sex variable has an effect on income levels when human capital and two-career variables are kept constant. Using these estimates we may decide whether initial potential wage differences increased during employment at the USU.

Scientific staff

Only two variables seem to be significant for estimating the level of income at the time of appointment, for scientific staff: possession of a doctorate, and age. The sex variable does not count significantly. Table 3 shows the results of the regression equation.

Table 3. Estimate of the level of income at appointment of scientific staff (n=123).

Variables	*Regression on income level*	*t-value*
doctorate or not	805.7	3.651*
sex	-106.6	-1.061
age	124.8	8.679*
constant	775.9	

* significant on a .05 level, R^2=47%

Those with a doctorate on their appointment are paid *f*800,– gross extra income compared to those without. Each year of age means an average *f*125,– per month extra. The sex variable has a minus sign. In the code used here it means that being a woman has a negative effect on the level of income when appointed. This sex-effect is however, statistically insignificant.

If an estimate of average income in 1984 is made, then the sex variable seems to have a significant effect on first sight, when "tenure", "having a doctorate" and "income level at appointment" are kept constant. Women earn in general *f*156,– less per month than their male colleagues. When the variable "number of working days" is also introduced into the equation the significance disappears and so does the magnitude of the sex-effect (Table 4).

From Table 4 we can draw the conclusion, that differences in income between women and men among scientific staff, and thus differences in the positions achieved after 10 year's service, are mainly caused by working part-time. This fact contradicts the results of the "filling-out" exercise (Table 2). This contradiction is explained by the fact that we are dealing with data files of different composition. The first data file included full professors while they

Table 4. Estimate of the level of income of scientific staff in 1984 (n=123).

Variables	*Regression on income level*	*t-value*
years of tenure	149.5	9.539*
doctorate or not	336.9	3.345*
sex	–56.9	–0.595
income at appointment	0.6	10.488*
number of working days	4.7	2.268*
constant	941.9	

* significant on a .05 level, R^2=65%

were absent from the second. When the complete file of scientific staff is considered, full professors included (Table 2), in cases of equal formal qualifications there is still a large difference in reward between women and men. Thus a relatively larger number of men than women, with the same formal qualifications, are promoted to the position of full professor. There are also wage differences between women and men if we limit our analysis up to and including the position of associate professor/senior lecturer (Table 4). However, these differences are smaller and originate in working part-time.

Technical and laboratory staff

Four variables, including sex, appear to be significant when estimating the level of technical and laboratory staff income on appointment. Table 5 shows the results of regression analysis. Female technical and laboratory staff appear to earn *f*90,– less when they start their career than their male colleagues with the same characteristics (see Table 5). Variable working experience preceding employment by Utrecht State University does not seem to alter significantly the estimated first salary, if age is also taken into account in the equation. Table 6 provides a deeper understanding of the wage differences found.

Table 6 shows that the average wage difference between female and male technical and laboratory staff in 1984, with other characteristics held constant, increased from the time of appointment on. We can specify this increase,

Table 5. Estimate of the level of income at appointment of maintenance staff (n=168).

Variables	*Regression on income level*	*t-value*
education level	50.1	7.127*
age	51.3	10.610*
sex	–92.8	–2.149*
children (y/n)	180.8	3.128*
constant	506.1	

* significant on a .05 level, R^2=58%

Table 6. Estimate of the level of income during 1984 of maintenance and laboratory staff (n=168).

Variables	*Regression on income level*	*t-value*
age	–18.7	–2.227*
educational level	37.1	3.453*
sex	–249.2	–4.021*
children (y/n)	20.7	0.316
years of tenure	79.9	7.341*
income at appointment	0.88	8.742*
constant	418.1	

* significant on a .05 level, R^2=63%

starting from the difference at the time of appointment (*f*93), and multiply this number by the regression on the 1984 variable salary scale at appointment (0.88). The resulting figure is added to the difference found in 1984 (*f*249).[5] As a formula:

increased wage difference = 249 + (.88 * 93) = 331 (3)

Administrative and library staff

Three variables, including sex, seem to have a significant effect in estimating the level of income on appointment of administrative and library staff. Table 7 shows the results of the regression analysis.

Table 7. Estimate of the level of income at appointment of administrative and library staff (n=159).

Variables	*Regression on income level*	*t-value*
education level	140.2	10.288*
age	59.9	5.495*
sex	–179.0	2.233*
children (y/n)	171.4	1.694
constant	–702.2	

* significant on a .05 level, R^2=60%

The variable "children (y/n)" was introduced since it did have a significant effect for laboratory staff. This does not seem to apply to administrative and library staff. It appears that women earn less than men on average, at appointment (*f*179) even when they share the same characteristics. Table 8 shows a picture of the development of wage differences.

Average wage differences between female and male administrative and li-

Table 8. Estimate of the level of income during 1984 of administrative and library staff (n=159).

Variables	*Regression on income level*	*t-value*
age	–35.0	–2.906*
years of education	82.6	4.425*
years of tenure	103.7	6.125*
sex	–316.8	–3.420*
children (y/n)	230.9	2.436*
income at appointment	1.07	12.572*
constant	–148.0	

* significant on a .05 level, R^2=82%

brary staff also increased quite substantially during their career. This increase can be specified as follows:

increased wage difference = 317 + (1.07 * 179) = 509 (4)

Conclusions

It is impossible to speak of underpayment of female scientific staff at the time of appointment. Small differences in level of income, to the disadvantage of women, must be ascribed to the fact that fewer women than men held a doctorate at the time of their appointment. After ten years' employment wage differences had increased slightly. The regression analysis shows that this is primarily caused by working part-time. In terms of position, it means that those who work part-time have fewer opportunities for promotion than those who work full-time. Part-time workers, as everywhere, are primarily women.

It was mentioned before that full professors are not taken into account in the career analysis of scientific staff. They were omitted because the number of female full professors proved to be too small. Full professors were taken into account in the income analysis as shown in the first part of this article. In this analysis the wage differences between women and men are very clear (see Table 2). From this difference in result between both analyses, we must conclude that underpayment of women at the intermediate academic level, as far as it appears from the data at our disposal, does not assume grand proportions. This conclusion does not, however, take account of the under-representation of women in comparison with men on this level.

The situation becomes much more problematic where higher-ranking academic positions are concerned. Here women are seriously under-represented compared with men, even when formally they are equally qualified.

In the two categories of non-scientific staff, women are already underpaid compared with men at the time of appointment. These differences increase during the term of employment.

Summary

There is a general sense in which female capacities are underestimated, as compared with male, in the institution studied. This fact is not of course restricted to the single institution which was the subject of investigation. To gloss this underestimation as "discrimination" without further deliberation, would be an over-simplification. The reasons for women lagging behind men in rank (the factor to which wage differences are due) are complex. These differences are partly caused by the attitudes and choices of female staff members. At the same time these differences raise the issue of how much freedom of choice women have in a society where the division between unpaid and paid labour still coincides to a large degree with that between women and men. An important part these "unjust" differences in position can be ascribed to indirectly discriminatory effects of the customary rules and procedures of almost every labour organisation. The lack of systematic forms of career planning, for instance, has particularly negative effects on people in minor positions in all kinds of organisations. Women depend on these minor positions to a large degree. Where the organisation's educational policy stresses individual initiative, and possibilities of further education within a company are linked to present function, this tends to consolidate existing relations between men and women. The same applies to forms of internal recruitment.

The business culture of labour organisations also helps to explain why women lag behind men in the positions they achieve. Executives in governmental organisations, for example, use the principle of equal opportunity without recognising that staff in unequal starting positions are unlikely to receive fair and equal treatment. Initiatives to reduce inequalities between female and male staff, through a policy of affirmative action, are gaining momentum in a number of Dutch universities, It will (also) be interesting to follow these attempts and evaluate their significance from a scientific point of view.

NOTES

1. Using the Dutch Census Bureau's (1980) educational classification, we distinguish successively: basic level (primary school/remedial education, 6 years), minor level (MAVO, VWO until the third form, 9 years), intermediate level (VWO, intermediate training schools, 12 years), university education, non-graduates (15 years), semi-superior level non-university (16 years), superior level non-university (teaching qualifications for comprehensive schools and N-qualifications, business degree, military academy, 17 years), superior level university (18 years). In the analysis these levels are expressed in years. Successively the number of years of education is 6, 7, 9, 12, 15, 16, 17, and 18 years.
2. The data for career analysis are partly obtained from Utrecht State University Personnel Department, and partly through a written "questionnaire". This was used to obtain additional data on marital status, having children or not, positions held before the job at Utrecht State University and educational level. 726 staff members received an enquiry form.

Subtracting explicit refusals (52) and non respondents, a total of 478 staff members remained. The group of non-respondents showed no systematic divergence from the analysed sample. Data about careers and other important characteristics of these 478 staff members were subsequently collected by way of "salary forms". These forms contain information on income level at the time of appointment; income level for each year after that; the character of appointment (temporary or with tenure) and the number of working hours.

3. The level of salaries on appointment is standardised in this way and therefore susceptible to mutual comparison. The choice of the year 1982 is arbitrary. This was, however, the final year during which the salary tables were still based on the old BBRA-scales (Civil Service payment scales).
4. Being married or single has an effect on the average income level of male, non-scientific staff. Married men from this income category earn approximately *f*500,– more per month than their single male colleagues with the same qualifications. The same applies to scientific staff. The corresponding equations for men are as follows:

   scientific staff/males (n=1058)

   $$\text{income} = 5172 + 137(\text{age}-40) + 15(\text{tenure}) + 961(\text{doctorate}) + 576(\text{married}) \quad (5)$$

   non-scientific staff/males (n=215)

   $$\text{income} = 3157 + 40(\text{age}-39) + 175(\text{education}-12) + 6\,(\text{age}-39) * (\text{education}-12) + 2(\text{tenure}) + 524(\text{married}) \quad (6)$$

   The difference in returns on educational level between women and men is quite remarkable. Male staff with a doctorate earn an average monthly income which is *f*961,– higher than those without. For female scientific staff this is *f*580,– (see article). With non-scientific staff these amounts are (with one year of additional education compared to the average educational level of 12 years) respectively *f*175,– for males and *f*95,– for females (see article). Such differences must be due to women's lower position on the salary scale given the principle of equal payment for equal scales and annual increments, despite equal educational qualifications and age.
5. The monthly incomes earned on appointment and at the time of the 1984 survey can be compared by expressing them both in 1982 guilders. This was done by comparing income level at the time of appointment and that of the 1984 survey, to the income that one would have earned during 1982 if one had been working on the same level or been appointed on that level during that year. This procedure gives a real image of income developments as they occurred for women and men of the three staff-categories that were distinguished.

REFERENCES

Bielby, W.T. and J.N. Baron 1986 "Men and women at work: Sex segregation and statistical discrimination." *American Journal of Sociology* 91(4): 759–799.

Centraal Bureau voor de Statistiek 1980 *Standaard Onderwijs-indeling SOI 1978, Deel 1: Methodologische inleiding*. Voorburg.

Chatab, J. 1986 *Ongelijkheid tussen vrouwen en mannen; enkele internationale vergelijkingen*. MA Thesis, Department of Sociology, Utrecht State University.

Doorne-Huiskes, J. van 1983 *Posities van vrouwen en mannen aan de Rijksuniversiteit Utrecht*. Utrecht.

Doorne-Huiskes, J. van 1986 *Loopbanen van vrouwen en mannen: een analyse.* Utrecht.

Faia, M.A. 1977 "Discrimination and Exchange." *Pacific Sociological Review* 20(1): 3–20.

Ferber, M.A., J. Loeb and H.M. Lowry 1978 "The economic status of women faculty: A reappraisal." *Journal of Human Resources* 13(3): 385–401.

Frank Fox, M. 1981 "Sex, salary and achievement: Reward-dualism in academia." *Sociology of Education* 54(1): 71–84.

Halaby, Ch. N. 1979 "Job-specific sex differences in organizational reward attainment: Wage discrimination vs. rank segregation." *Social Forces* 58(1): 108–127.

Johnson, G.E. and F.P. Stafford 1975 "Women and the academic labor market." In: C.B. Lloyd (ed.), *Sex, discrimination and the division of labor.* New York.

Markham, W.T., S.J. South, Ch. M. Bonjean and J. Corder 1985 "Gender and opportunity in the federal bureaucracy." *American Journal of Sociology* 91(1): 129–150.

Perrucci, C. 1970 "Minority status and the pursuit of professional careers: Women in science and engineering." *Social Forces* 49: 245–259.

Polachek, S.W. 1975 "Discontinuous labor force participation and its effects on women's market earnings." In: C.B. Lloyd (ed.), *Sex, discrimination and the division of labor.* New York.

Reskin, B.F. 1978 "Scientific productivity, sex, and location in the institute of science." *American Journal of Sociology* 83(5): 1235–1243.

Roos, P. 1981 *Occupational segregation in industrial society: a twelve-nation comparison of gender and marital differences in occupational attainment.* Ph.D., University of California, Los Angeles.

Roos, P.A. and D.J. Treiman 1983 "Sex and earnings in industrial society: A nine-nation comparison." *American Journal of Sociology* 89: 612–650.

Schippers, J.J. 1982 "Beloningsdiscriminatie van de vrouw in Nederland." *Economisch Statistische Berichten* 5, mei 1982: 452–458.