



Gender and differences in career paths and wages among university researchers in Denmark¹

By

Kamma Langberg²
and Ebbe Krogh Graversen³

The Danish Centre for Studies in Research and Research Policy

Keywords: University researchers, R&D, Mobility, Wage, Career paths, Gender

JEL Classification: I23, J24, J31, J45, J62

Working Paper 2008/2

Published by:

The Danish Centre for Studies in Research and Research Policy

Faculty of Social Sciences, University of Aarhus

Finlandsgade 4 – DK – 8200 Aarhus N - Denmark

ISBN: 978-87-91527-50-0

¹ An earlier version of this paper was presented at the “Gender in the Academic Profession” work shop, Aarhus School of Business, University of Aarhus, September 17th - 18th 2007.

² Corresponding author. Email: kl@cfa.au.dk

³ Email: ekg@cfa.au.dk

Table of contents

Abstract.....	3
1. Introduction	3
2. Theoretical propositions on mobility and discrimination	4
3. The Danish pipeline for university researchers	7
4. Salary structure among Danish university researchers.....	10
5. Conclusions.....	16
Appendix: Data and statistical methods.....	17
References.....	18

Abstract

University researchers are core knowledge workers in society and often in focus in analyses of the efficiency in national knowledge systems. Here, it is often assumed that university researchers' career paths follow a 'pipeline' or a tenure track system where wage packages in general are key motivators for job changes in an efficient national knowledge system. However, it is also usually assumed that gender and age has an impact on salary, contradicting the efficiency hypothesis. The paper analyses and tests the three assumptions using a unique wage register that covers all university researchers in Denmark over several years. It is found that the university sector has a large in- and out-flow of researchers and that the salary mainly depends on the job position and not age or gender. However, it is also found that gender effects are present in the university job promotion structure.

1. Introduction

A modern National Innovation System or National Knowledge System highly depends on efficient knowledge production, diffusion, assimilation or absorption as well as distribution in society. Universities in Europe have been the main public knowledge producer of basic knowledge for decades. In recent years there has been an increasing demand for faster dissemination of the produced knowledge to society, i.e., firms and parts of the public sector. Consequently, new university acts as well as other changes have been introduced in many countries inclusive Denmark (Strehl et al. 2007 among others).

In Denmark, one of those changes was a new wage system for researchers implemented in the public sector in the 1990's. One of the aims has been to increase the knowledge diffusion in form of researcher mobility between the private and public research sectors. This recent change contradicts agreements and expectations among unions, researchers and research environments of a straight tenure track system⁴ at the universities, where it has been used to give or signal a certain minimum level of job security in form of fixed term contracts.

In the present paper, the labour market for university researchers is analysed to determine whether the university researchers (still) have a tenure track system, whether there is gender discrimination in promotion to academic job positions, in wages and in mobility rates, and whether there (still) is a segmented labour market with wage incentives between segments but not within segments.

The management at the universities⁵ has changed focus towards an increasing use of motivation through wage incentives as part of a general trend among managers in the Danish public sector. Although salaries are partly dependent on a centrally negotiated minimum wage, the major part of the actual salary is still determined by the job position at the universities. From an efficiency point of view, it can be argued that this change in management focus may make a difference in incentives.

The present analysis will investigate whether this change in management objectives has made a significant difference in employee behaviour. The paper analyses determinants of career and job mobility paths among university researchers and differences in wage levels using unique public register data from the Government Sector Salary Register, GSSR.

⁴ The European tenure track systems differ from country to country.

⁵ All Danish universities are publicly owned.

However, a segmented labour market for university researchers combined with wage motivation rewards can provide "job-locks" that has economy-wide implications for knowledge transfers among high-skilled knowledge workers in the public as well as private sectors. Wage increases often motivate voluntary job search and job mobility, but the university research sector is officially characterised by a tenure track system with many strategic 'temporary' employment, i.e. post doc positions, so that temporary lower wages can occur in some cases (Bøgh Andersen et al 2006 among others). In such a case, the knowledge system is not as efficient as it could be.

One result of the empirical analysis in the present paper is, that the expected direct career path or pipeline from assistant professor to associate professor, i.e., a closed tenure track system does not exist in Denmark. A large number of researchers enter the Danish university sector at associate or full professor level without former employment in the Government research sector (in the previous 6 years), i.e. come from research institutions in other countries, R&D departments in the private sector or from non-research jobs. This indicates a relative high interaction with other (research) environments.

A second result, partly supporting the findings of gender related barriers by Cohen (1993) and in Denmark by Verner (2007), is that gender or family obligations has some impact on the inflow to the research sector, i.e., creating gender specific career paths when sectors outside the universities are taken into account.

A third result is that researchers are motivated by more than their wages, i.e., multiple motivation factors exist, leaving space for a more nuanced incentive structure for high-skilled knowledge workers than just wage rewards (Frey and Jegen 2001, Langberg 1999).

2. Theoretical propositions on mobility and discrimination

The labour market for university researcher is somewhat specialised in a similar manner as segmented labour markets. It is internal and as well as external segmented: internally by the job positions hierarchy for professors and externally such that there is a market for the researchers and another for the non researcher. When or if this is the dominating case, then a clear tenure track system is visible. Otherwise, if the tenure track system is not dominating, then an open system with significant knowledge in- and outflow occurs, allowing a (more) efficient knowledge system.

Another point is that a production of PhD's in excess of the open job positions at the universities will result in an outflow at the PhD level and a tenure track system for the remaining researchers.⁶ If an externally segmented labour market exists for these people, no inflow mobility occurs to the university sector and most mobility in the university sector is internal or between universities solely. If this is the case an Ivory Tower system is in play.

Several analyses show significant gender specific differences within the research communities all over Europe (European Commission 2006). These differences could be due to discrimination within the research sector as well as in general in the entire knowledge system.

***Proposition 1: Tenure track:** There exists a dominating tenure track system among the researchers in the university sector.*

***Proposition 2: Ivory tower:** There is an outflow of researchers above the Ph.D. level, but no inflow of researchers from outside into the university sector.*

***Proposition 3: Discrimination:** There is no identifiable gender or age barrier for researcher mobility in the university sector.*

Job mobility can be either voluntary or involuntary. Basically, job mobility is a function of individual as well as systemic determinants. Here, three theoretical models of job mobility are used to describe the university researcher mobility and the corresponding reward⁷ if any (see Hachen 1990). Finally, the theory of motivation crowding out is used as explanation if or when the three models fail to explain the observed mobility patterns.

The tenure track system or pipeline is characterised by a combined push and pull system. At the first two levels, PhD-student and assistant professor/ post doc, the job positions are time limited thereby pushing or forcing job mobility. At the other two levels, associate and full professor, the positions in Denmark are seldom time limited and thereby attractive due to this aspect of job security.⁸ Hence, a first test on the pipeline system is whether the assistant professors continue

⁶ Excess supply of PhDs relative to open positions at universities is, as in many other countries, also the case in Denmark in recent years. In Denmark it is assumed that some of those will find employment in the private sector, since 2/3 of all research jobs are found in the private sector.

⁷ In the **reward-resource** model workers maximize their wages conditional of their own resources by moving to better jobs. Hence, job mobility is a function of own resources relative to job rewards, i.e. education, experience, job position and wages. The mobility is mainly employee initiated, i.e. voluntary. In the **limited opportunity** model, differences in mobility patterns are caused by macro-societal determinants, i.e. gender, family or age barriers. In the **vacancy competition** model, job mobility is explained by organisational and industrial determinants, i.e. type of labour market or industry structure. For example, segmented or closed labour markets are expected to experience lower mobility rates.

⁸ There are a few exceptions called MSO professors, which is time limited professorships with specific duties involved.

their employment in the university sector or not. A second test is whether associate professors continue to full professorship at the universities or leave.

If the pipeline is leaking, i.e., there is an outflow of researchers from the university sector and hence not a straight tenure track system for all researchers, the university sector must be seen as an open active part of the National Innovation System or even the Global Innovation System. This mobility involves a high-level knowledge transfer or diffusion that contradicts the “old fashion” thought of universities as ivory towers of knowledge with no interaction to society. However, the inflow of researchers to the university sector is even more important, since this indicates an interaction with society opposed to a one-way knowledge delivery.

A test on inflow is whether the full professors have been associate professors within the system before they become full professors or come from other sectors⁹. Actual job position obviously determines the researcher’s reward or salary, such that full professors by default have a higher salary than assistant professors. However, there may be some incentives as well as barriers for the shift between positions that cannot be explained by these state dependent minimum wage levels.

The reward resource model indicates a voluntary shift towards the best-paid position. Due to limited numbers of professorships, it is not always possible inside the university sector so some researchers may leave the sector in order to increase their job rewards. Among researchers in the university sector, the limited opportunity model indicates differences in the mobility patterns due to gender, age or family compositions. An example is that mobility to a higher position may depend on gender or family composition (children, job opportunities for ‘the significant other’). The segmented university sector labour market with state dependence may also decrease the job mobility for some researchers that are “locked” in their present position.

The incentive models give some explanations why wage increases and rewards in general not always follow job mobility. Several authors have empirically documented a less than full-scale effect of wages on labour productivity and job mobility and especially that wage increases or rewards depend on how they are interpreted among the workers. Knowing that researchers are often dedicated to their field of study, this kind of motivation may have a higher influence on researchers’ career paths and their job mobility than wages, i.e. low or no wage effect on job

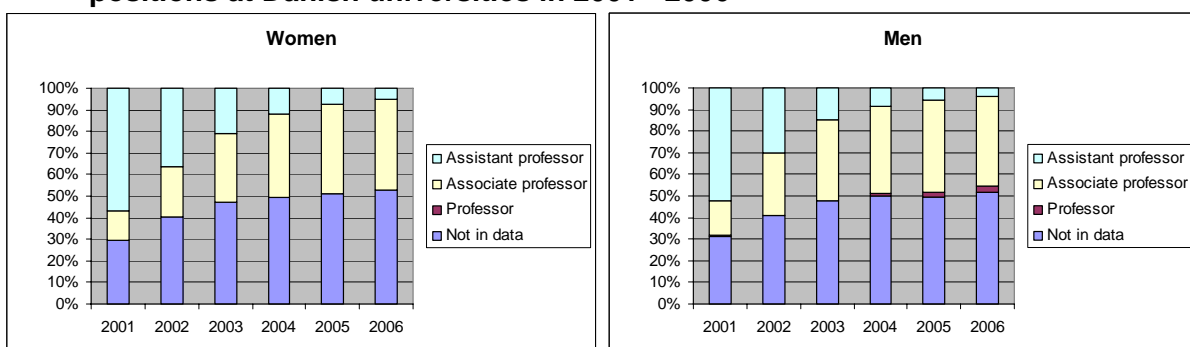
mobility rates among researchers. In Denmark it was found that Danish holders of doctoral degrees, that work as researchers, value “Creativity and innovativeness of work” and “Large degree of independence” as more important than “Well paid job” for their choice of career (Langberg et al 2007).

3. The Danish pipeline for university researchers

If a tenure track system exists it should be expected that the majority of the assistant professors will stay at the university or at least within the university system in the long run. The normal time-range for an assistant professor or post doc in Denmark is 3 years. Similarly, some post docs and assistant professors will leave Denmark for a position in another country for a period and then return after some years. To investigate the propositions of a tenure track system, a dataset with all researchers at 7 universities in the period 2000 - 2006 were constructed.¹⁰

The results from this panel shown in figure 1 shows that a small number of the male assistant professors/post doc move quickly from the positions as assistant professors/post doc in 2000 to positions as full professors in 2006. But the main result is that it is not the general case that researchers at the assistant professor level stay at the universities. 30 percent are not found in the data in 2001, some are returning the following year, but the final result is that 50 percent of all individuals at this level (assistant professors and post doc) are not found in the data in 2006, i.e. are employed somewhere else.

Figure 1. Assistant professors and post doc at Danish universities in 2000 and their positions at Danish universities in 2001 - 2006

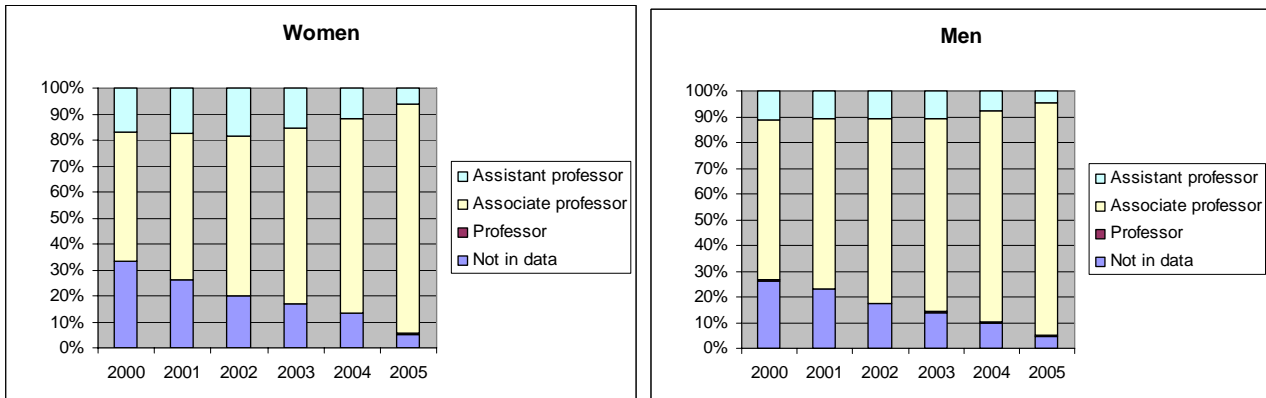


⁹ In Denmark the official language is Danish, and Danish is the principal language at the Danish universities. Hence, it is often required that applicants for associate or full professorship have some knowledge of Danish. The Danish university system is therefore relatively closed compared with other systems.

¹⁰ See the Appendix.

If the number of assistant professors hired in the system exceeds the number of associate professor positions available this could explain the results. But as seen in figure 2 this is not the case, since a large proportion of the associate professors were not promoted from another position at the universities, i.e. they came from other positions and were not in the data base with university employees.

Figure 2. Associate professors in 2006 and their positions at Danish universities in 2000-2005



The gender differences found in figure 2 and 3 are mainly due to the fact that the average age for female and male associate professors differs largely. There is a large group of male associate professors in the upper age group aged above 54 years (as seen in figure 4). As also seen in figure 3, even at the full professor level a significant inflow to the Danish universities was found in the empirical data.

Figure 3. Full professors at Danish universities in 2006 and their positions in 2000-2005

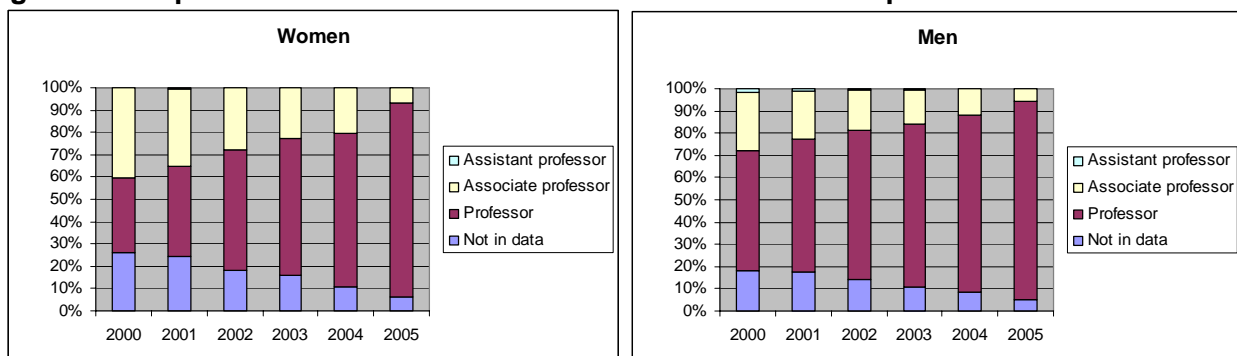
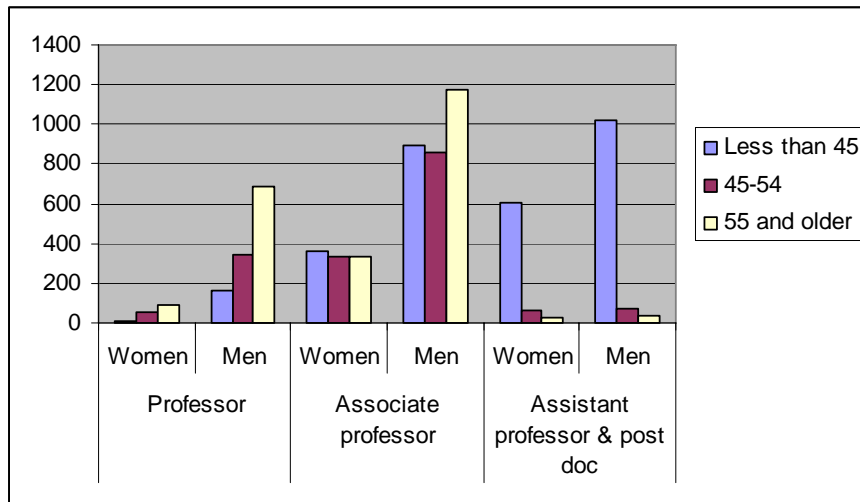


Figure 4 shows the distribution of university researchers by position, gender and age group at the Danish universities. The group of full professors is relatively small compared to the group of associate professors, a fact that is also the case in other European countries such as Germany

and Austria. It is also found that the relative numbers of female researchers decrease with the level of position, i.e. the percentage of women among full professors is smaller than among associate professors and the percentage of women among associate professors is smaller than among assistant professors. This is also found in other EU countries (European Commission 2006).

Figure 4. Distribution of university researchers in Denmark, 2006, by position, gender and age



A significant share of younger researchers reported in a survey from 2005, that they fear international competition when they apply for associate professorships, i.e. tries to be promoted from assistant to associate professor, and that the openness of the Danish university system causes major problems for researchers educated in Denmark (Langberg et al 2005). Hence, there seems to be a lack of certain specific (internationalisation) competences resulting in lower success rates in promotion among the Danish educated applicants.

In the same analyses, a small gender difference in the probabilities of promotion was found significant, but gender had a different impact depending on the main field of science, i.e. interaction effects were found. This points to the assumption that gender differences in the university system is found present in the promotion structure - and that this structure differs within fields of science. However, the data used in this paper do not include information on fields of science so it is not pursued further.

It seems that the successful applicants among the group 'not in data' are men coming from abroad. This observed in-flow to the Danish university sector at all levels have an impact on the percentage of women at the different levels, since the percentage of women among the researchers that enter

the Danish universities are lower than the percentage of women among the researchers inside the system that applies for promotion (Langberg 2005). The gender skewness among the associate professors in Denmark will therefore continue to be present as long as men from abroad dominate the share of applicants for open positions in Denmark and presumably as long as men dominate the international research community.

4. Salary structure among Danish university researchers

All employees in the public sector with a Master degree will the first few career years (from Master degree year and approximately 5 years forward) have an automatic annual salary increase built into the general salary system. However, all associate and full professors will be above the top level in this automatic scale. Beside the automatic scale, a number of standard additions based on job position are added to the salaries. This constitutes a minimum wage system within each job position.

The salary system within the public sector in Denmark was changed in 1997. Before the change, the salary depended on educational level, job position and experience (years at the labour market). After the change, salary may also depend on other issues such as rewards for extraordinary efforts, i.e., for university researchers extra additions and bonuses based on other qualifications (e.g. specific 'expert' knowledge), performance (e.g. publications) and functions (e.g. project managers).¹¹ Some people expected that the new salary system would increase differences in salary between male and female researchers, since men were expected to apply more often for extras. Some age differences were also expected since older researchers were expected more often to have responsibilities as project managers etc.

The core variables in the following empirical analyses are therefore job position, gender, and age as explanatory (exogenous) variables and salary as the explained (endogenous) variable. To investigate the effect of mobility, different mobility measures are also included as exogenous variables.

Table 1 shows the average gross salary variation among university researchers in Denmark in 2006. The differences in salary between age groups and men and women are relatively small and the major differences in salary, as expected, is found between persons in different job positions.

¹¹ Due to technical matters regarding 'part time' employees, spurious observations and 'out of category' employees, these researchers are removed from the analysis (see also the Appendix).

Table 1. Average gross salary variation among university researchers in Denmark 2006. By position, gender and age. Indexed.

Position	Gender	Age group			All
		Less than 45	45-54	55 and older	
Full professor	Female	150	152	152	100
	Male	153	155	154	
Associate professor	Female	114	121	122	
	Male	117	124	124	
Assistant professor & post doc	Female	100	101	102	
	Male	100	101	105	

Note: Index 100 for All Assistant professors corresponds approximately to an annual gross salary on 58500 EUR in 2006. There are so few in this category aged above 45 that these persons do not influence the overall average, i.e. index equals 100 for assistant professors aged below 45 as well as for all assistant professors.

Estimation of salary differences dependent of position, age and gender in 2006

In model 1, the researchers' salary depends on position, age and gender. If the unexplained share of the salary, i.e. salary are caused by unobserved characteristics, are high, it might support the results in Bøgh Andersen et al (2006) that salary also depends on various rewards that are uncorrelated with gender or age.

Model 1:

$$\text{Salary in 2006} = f(\text{job position, age, and gender})$$

Because the different job positions have different minimum wages, it is expected that job position will have a very large impact. As seen in table 2 this is the case since job position has the far largest F-value, i.e. the most important factor. More interesting, there are also small gender, age and age-position interaction effects that reflect the differences seen in table 1.

The model can explain 72.3% of the variation in observed salary, which leaves considerable space for incentive based salary, i.e. there exist a reward system that does not correlate with gender, age or position in Denmark.

Table 2. ANOVA-table for Model 1. Salary in 2006 as a function of job position, age, and gender

Explanatory variable	DF	Type III SS	Mean Square	F Value	Pr > F
Gender	1	71572481406	71572481406	36.83	<.0001
Position 2006	2	1,41E+20	7,03E+19	3617.53	<.0001
Age group	2	1,18476E+11	59237981719	30.49	<.0001
Position * age group	4	1,07569E+11	26892217584	13.84	<.0001
R-Square	0.723				

Note: Since the model is estimated on the total population F- and p-values are only used to show the relatively importance. See Appendix for further explanations.

Estimation of salary differences among full professors in 2006 dependent on mobility from 2004 to 2006

The relation between mobility and salary is in focus in the next model. The mobility variable in the models is measured as job mobility from 2004 to 2006. In 2004, the list of institutions includes other government research institutions than universities where the list in 2006 only includes universities. The researcher can move voluntarily or involuntarily. Almost all associate and full professors that move from one university to another are assumed to move voluntarily, since their contracts very rarely are fixed (time limited). Therefore, focus in model 2 is on full professors in 2006 assuming all mobility is voluntary (and incentive driven).

Model 2:

Salary for full professors in 2006 =f(job mobility, age and gender)

Table 3 shows (as figure 3 also showed) a considerable inflow of professors since more than 5 % of the full professors in 2006 have entered the university system from outside the Danish public research system during the two-year period. However, the major part consists of associate professors/senior researchers within the system that became full professors (19.2%). As expected, the horizontal job mobility among the full professors is low. As in model 1, model 2 estimates the salary, but this time as a function of job mobility, age and gender and only for full professors in 2006.

Table 3. Mobility rates from 2004 to 2006 among full professors in 2006. Definition of the job mobility measure used in model 2

Type of mobility		Frequency	Percent
Full professor in 2004 and in 2006 but changed department, i.e. horizontal mobility	place_mob	12	1.5
Promotion to a full professorship in 2006 from associate professor in 2004 at the same university, i.e. vertical mobility	up_mob	140	17.6
Change of department as well as position, i.e. vertical as well as horizontal mobility	up_place_mob	13	1.6
Full professor in 2006 but not registered as researcher in the public sector in 2004, i.e. moved into the university sector either from abroad, from the private sector or from a non-research job in the public sector. ¹	in_mob	45	5.7
Neither horizontal or vertical mobility	no_mob	585	73.6
Total		795	100

Note 1: It is rare that a person enter from a non-research job to a full professorship.

The results of the model, shown in table 4, highly indicate that job mobility matters since the F-value is large where gender and age-group have very low F-values (and large p-values) indicating

that gender and age do not have any significant effect. However, the model only explains 6 % of the variation in salary among the full professors in 2006, i.e. there is unobserved characteristics that explains the remaining 94 % of the variation in salary.

The estimated effects of mobility showed that 'place_mob' (se definition in table 3) full professors have the largest salary, followed by the 'up_place_mob' and 'no_mob' full professors. 'Up_mob' full professors and 'in_mob' full professors have the smallest salary (close to the minimum wage at this job position level).

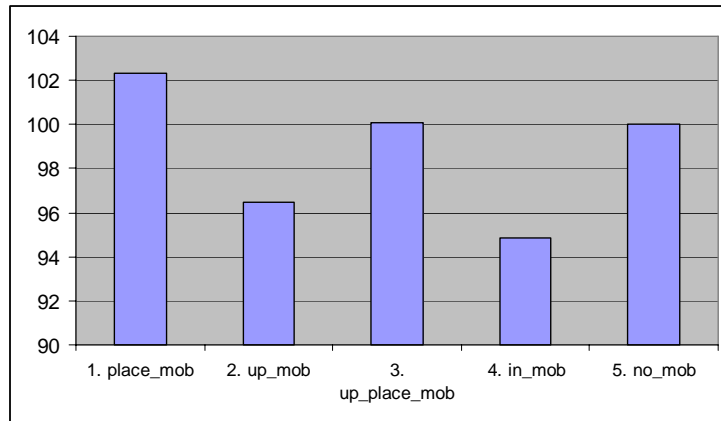
Table 4. ANOVA table for Model 2. Full professor salary in 2006 as a function of job mobility, age, and gender

Explanatory variable	DF	Type III SS	Mean Square	F Value	Pr > F
Mobility	4	1,07602E+11	26900470977	10.78	<.0001
Gender	1	3045157529.1	3045157529.1	1.22	0.2697
Age group	2	6014069905.1	3007034952.6	1.20	0.3003
R-Square	0.057				

Note: Since the model is estimated on the total population F- and p-values are only used to show the relative importance. See Appendix for further explanations.

The analyses above do not include information on the actual change in salary from 2004 to 2006, i.e. some of the changes may be explained by a simple levelling up effect. As seen in figure 5, the largest effects were, as expected, found among 'up_mob' and 'up_place_mob' with 'up_place_mob' as the largest. It was also found that the sum of the estimated effect of 'up_mob' and 'place_mob' was almost equal to the estimated effect of 'up_place_mob', indicating that horizontal as well as vertical mobility have separate significant effects on salary.

Figure 5. Average salary for full professors in Denmark in 2006 dependent of form of mobility from 2004. Index 100=no mobility

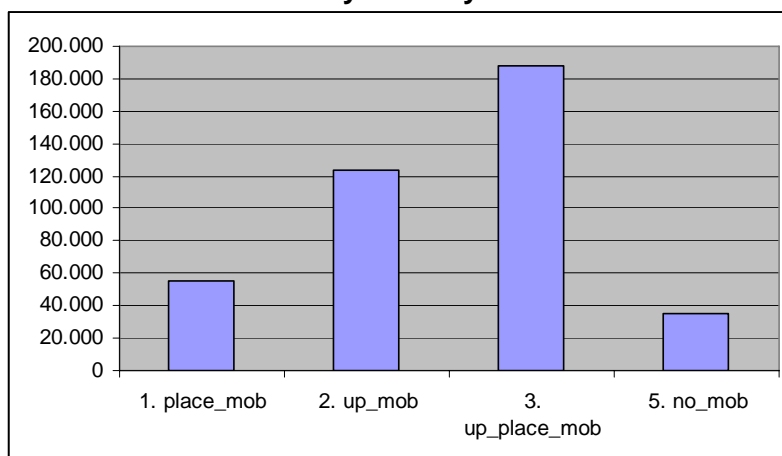


Model 3:

Difference in salary for full professors in 2006 and 2004=f(mobility, age, gender)

The analysis of the actual difference in salary from 2004 to 2006 among the full professors in 2006 in a similar model showed that the type of mobility as the only significant explanatory variable explains 33 % of the change in salary between 2004 and 2006. The result is seen in figure 6. As expected a very large difference was found in the group that were promoted from associate to full professor - this can be explained by the change in the guaranteed minimum wage. But surprisingly there was a rather small difference between the no_mob and the place_mob, this indicated that other factors that salary is most important when these researchers changes job.

Figure 6. Average differences in salary for 2004 and 2006, for individuals that were full professors in Denmark in 2006 by mobility. In DDK



Note: Salary for 'in_mob's are unknown in 2004.

The largest group of researchers within the Danish universities are the **associate** professors. The mobility among them is also an important explanatory factor in the next model.

Table 5. Mobility rates from 2004 to 2006 among associate professors in 2004. Definition of the job mobility measure used in model 4.

Type of mobility		Frequency	Percent
Associate professor in 2004 and in 2006 but changed department, i.e. horizontal mobility	place_mob	36	1.04
Promotion to a full professorship in 2006 from associate professor in 2004 at the same university, i.e. vertical mobility	up_mob	140	4.04
Change of department as well as position, i.e. vertical as well as horizontal mobility	up_place_mob	12	0.35
Associate professor in 2004 but not registered as researcher in the public sector in 2006, i.e. moved out of the university sector either from abroad, from the private sector or from a non-research job in the public sector.	out_mob	344	9.93
Neither horizontal or vertical mobility	no_mob	2933	84.65
Total		3465	100.00

As seen in table 5 almost 10 percent of the associate professors in Denmark leave the public research sector. Only a minor share of these researchers left because of age, i.e. pension.

Model 4:

Difference in salary for associate professors in 2006 and 2004=f(mobility, age, gender)

Against our expectations, no gender effect was found. As for the full professors above an effect from mobility type was found. Again, the model could only explain 6 % of the total variation.

However, as expected a very large difference was found for the group that were promoted from associate to full professor - due to the changes in the minimum wage, i.e. the same pattern as found above. Again, a rather small difference between the no_mob and the place_mob was found, indicating that other factors than salary is important when researchers changes job.

Since promotion seems to have the largest effect on salary, the probability for promotion was analysed more detailed. Extras & bonuses are in some case given to associate professors with full professor qualifications to compensate for the limited number of full professor jobs inside Denmark. Therefore, model 5 included information on extras & bonuses beside gender and age.

Model 5:

The probability of being (promotion associate professor, 2004 -> full professor, 2006) =
f(extras and bonuses in 2004, gender, age)

Also in this model, it was found that gender did not have a notable or significant effect, but that age and extras did have a significant effect on the differences in promotion probability, see table 6.

Table 6. Probability of promotion from associate professor in 2004 to full professor in 2006 in the university sector. By age and 'extras'

	Probability for being promoted
Age Group	
Less than 45 years	0.082
45-54 years	0.056
55 years and older	0.019
Extras on top of minimum wages	
No extras	0.032
Extras	0.073
All	0.048

5. Conclusions

In the study of the Danish university sector it was found that the expected direct career path or 'pipeline' from assistant professor to full professor, i.e., a dominating tenure track system did not exist in the Danish university system, since a large amount of younger researchers left the universities and a large group of associate and full professors arrive from the private sector and from abroad. In addition, evidence was found that an 'Ivory Tower' classical university system is not present in Denmark. Further, the analyses did not support the findings of gender related barriers (discrimination) within the Danish university system. Evidence of persistent gender skewness among the researchers was found due to a major inflow of male researchers at the associate professor level. Further, an age effect was found showing that younger associate professors have a larger probability for promotion than older.

Since the overall wage differences within job position groups was rather small, the data support that more than simply wages seems to motivate researchers. But the data do support that the most important factor with regard to salary is the job position, i.e., that the guaranteed minimum wages determine the major part of the salary level among university researchers. All together, this shows that the Danish university system is (partly) open to the surrounding society and that knowledge can pass from one sector to another via individual mobility.

Appendix: Data and statistical methods

Data

The data are extracted from the Government Sector Salary Register, GSSR (in Danish ISOLA), for the period 2000 to 2006 from the 2nd quarters in the analysis. All Danish university researchers are included in GSSR. The dataset used includes information on employees at universities, government research institutes, state museums, archives and libraries. The total salaries used in the analysis are the yearly salaries inclusive payment to pension funds.

All researchers found at the universities, government research institutes, state museums, archives and libraries are included in the dataset.

A number of 'part time' professors are included in the data but excluded from the analyses: if a Swedish professor gives a lecture at a Danish university, she will occur in the data as 'professor' but with a very low income. Clinical professors are partly paid by universities and partly by university hospitals. Since university hospitals in Denmark are regulated together with other hospitals by the regions, the hospital payroll is not a part of the data. Therefore, the clinical professors are excluded from the analysis.

Some persons might occur with a high income because they move from one Danish university to another and in a short period will be in GSSR with a double income. Therefore, the data is 'trimmed': based on the knowledge of minimum wages within different categories 'part time' researchers are removed together with 1 % in the top of the distribution.

Some older professors are employed as 'public servants' with special rights that involves a guaranteed state pension and they do not pay to a pension fund via the salary system. Consequently, their salaries seem 'low' compared to others; they are also removed from the analysis. The reduced population used in the analyses of salary is 5741 persons in 2006.

Since the Technical University and the Agricultural University have traditional bounds to some large Government Research Institutes (which 1.1. 2007 were fusioned into universities) they were not included in the analyses of in- and out-flow of the universities, two universities were not a part of the university sector in 2000 they were also excluded from that analysis. The analyses of in- and outflow is based on university researchers within seven universities. This population consists of 11964 persons.

Statistical methods

Since the data consist of the total population (and not of a sample) of full-time-employed university researchers that are covered by the wage-system, we do not have any uncertainty of mean-values or variances due to sample size or sampling-procedure, consequently the differences presented are 'true' differences. However, we have used statistical measures as F- and p-values when analyzing the data and presenting the model in order to keep the description simple, since F- and p-values gives a description of differences that are uncorrelated to the scale of the data.

All models are reduced until all p-values were below 0.05, i.e., the differences are of some interest. The starting model includes all interaction effects. The model used is a simple OLS model estimated by SAS-GLM.

References

- Bøgh Andersen L., Bøtcher Jacobsen, C; Møller, A.L. & Pallesen, T (2006) Arbejder forskere 'just for the money'? (In Danish) *Politica*, Vol. 38, no. 4.
- Cohen L. (1993). Balancing work and family in the historical profession. *Journal of Women's History*, Vol. 4.
- Dwyer R. (2004). Downward Earnings Mobility after Voluntary Employer Exits. *Work and Occupations*, Vol. 31, no. 1.
- European Commission (2006) *She Figures. Women and Science Statistic and Indicators*.
- Frey B. and R. Jegen. (2001). Motivation Crowding Theory. *Journal of Economic Surveys*, Vol. 15, no. 5.
- Hachen D. (1990). Three Models of Job Mobility in Labor Markets. *Work and Occupations*, Vol. 17, no. 3.
- Langberg K (1999) Procesnytte (Process utility) PhD dissertation.
- Langberg K. ed. (2005) *Adjunkter på danske universiteter* (in Danish) CFA-report 2005/3. www.cfa.au.dk.
- Langberg K. (2006) Chapter 3 in *Women in Scientific careers. Unleashing the potential*. OECD.
- Langberg, K; Ladefoged, S & Graversen, E.K. (2007) Ph.d.-uddannedes karrierevalg og veje. www.forskningsanalyse.dk/PhD/KUF/KUFrapport.pdf.
- Strehl, F.; Kerpler, J., Reisinger, S. & Kalatschen, M. (2007) *Funding systems and their Effects on Higher Education Systems - International Report*. Education Working Paper No. 6. OECD.
- Verner, M (2007) Unpublished work shop paper on Gender Differences in Academia Careers.