AKF

# Wage Gaps
# and
# Mobility out of the Public Sector

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# Preface

The purpose of this memo is to explain, why increasing wage differences between sectors over careers (the private sector being the high-wage sector) can go hand in hand with diminishing mobility out of the public sector – while individual wage differences between sectors prove to be an important factor for the mobility decision.

The analyses are based on AKF, Institute of Local Government Studies' Longitudinal Register of Social Processes, based on registers in Statistics Denmark. Head of Division in Statistics Denmark, Otto Andersen, was in charge of the establishment of the very comprehensive register-based data set.

The project has been carried out by Senior Researcher Anders Holm, now at the University of Copenhagen, and Research Assistant Beatrice Schindler Rangvid, who has been the main researcher of the study. Economics Student Niels Madsen has assisted. Director of Research Hans Hummelgaard is responsible for the project.

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Hans Hummelgaard
January 2001

# Contents

# 1 Introduction and Summary

Few public employees change between the public and the private sector, although the mean wage gap between these sectors is increasing over careers.

In a competitive environment with perfectly functioning markets and homogeneous labour, wages would be the same for all workers in all sectors. However, in the real world, neither jobs nor workers are homogeneous. Workers differ in their »human capital« with respect to education, experience and ability. Jobs differ with respect to earnings and non-wage benefits like e.g. working hours and compatibility of working life and family life. But still, given a significantly higher wage level in the private sector compared with the public sector, mobility from the public sector to the private sector is puzzlingly low. This puzzle is the main topic to be explored in our study.

First we estimate the individual wage gap at each point of time of a person's presence on the labour market. Then we include the estimated wage gap between sectors into a multinomial logit model of mobility out of the public sector to see if wage differentials have any impact on mobility between sectors. The contribution of our paper is that we are able to explain why increasing wage differences between sectors over careers (the private sector being the high-wage sector) can go hand in hand with diminishing mobility out of the public sector – while individual wage differences between sectors prove to be an important factor for the mobility decision.

Our focus is slightly different from other contributions, as we are not interested in analysing – at least not explicitly – *why* people choose to become public sector employees in the first place.[1] Given that a person at present is employed in the public sector, we analyse the determinants of the mobility choice, i.e. staying in the public sector versus seeking a job in the

private sector.

In the analysis of mobility between the public and the private sectors we have divided the private sector into two: the so-called home-market part and the export part of the private sector.[2] The reason for dividing the private sector into two is that the home-market sector is not exposed to international competition in the same way as the export sector is, and therefore wage formation in these two private sub-sectors may differ.

The changing opportunities are modelled as a function of sector specific experience, which the individual accumulates only in her/his employment sector as well as general experience. The potential wages that must be compared at every point of time are therefore the wage level in the employment sector (including the wage surplus that emanates from both general working experience *and* the accumulated sector experience in this sector) on the one hand, and the potential wage in the other sectors (where only general experience is remunerated, as no sector experience is acquired) on the other hand. The higher the wage bonus due to accumulated sector specific experience in the employment sector, the higher the general wage level has to be in the competing sector in order to attract labour with a long tenure in the employment sector.

Our estimations for alternative sector wages show that the wage advantage from changing from the »low-wage« public sector to the »high-wage« private sectors is decreasing from some point of time in one's career due to the remuneration of sector-specific knowledge in the occupational sector where the worker has a long tenure. Therefore, for more experienced public workers there might be no wage incentives which could induce them to seek a job in the private sector.

Empirically it also turns out that, given wage differentials allow for sector-specific remuneration, there actually seems to be a significant wage flexibility, also when a number of important variables have been corrected for, such as education, labour-market experience, duration effects and labour-market conditions. That is, individuals employed in the public sector have a higher probability of shifting to the private sector, the higher the expected wage differential.

Thus, our approach to calculate wage differentials is different to most other studies on sector choice and mobility, e.g. Bedi (1998), Gaag and Vijverberg (1998) and Hartog and Oosterbeek (1993).

According to our methodology, Bedi (1998) uses an inappropriate wage gap concept, because he compares the conditional wage of a public sector worker with the conditional wage of a private employee with the same characteristics. However, if variables, unobserved in the wage formation model and hence not conditioned on, differ for people over sectors, the potential private sector wage is *not* equal to the conditional private sector wage. This wage must be calculated conditional on her/his choice of being a *public* employee, not a private employee.

In another study (Gaag and Vijverberg, 1998) it is not explained at all how the wage gap used in this study is constructed. Hartog and Oosterbeek (1993) use the appropriate wage gap concept, but they only estimate on general experience, not on sector experience. Their results are therefore not comparable to ours.

Summarizing, our analysis indicates that the increasing wage differential and decreasing mobility between the public and the private sector can – at least partly – be explained by the importance of sector-specific experience in the wage equation, something the previous literature has not focussed upon. Correcting expected wages for the importance of sector-specific experience we find a significant impact from wage differentials on the mobility between sectors, which we were led to reject just looking at the relationship between mobility and general experience.

A final question for further research is why individuals choose to become publicly employed in the first place. Such research will give insight into how individuals weight wages compared to other benefits from working in a specific sector.

## Notes

1. We, though, indirectly incorporate the sector choice decision in our estimation of the wage gap, which in turn is included as an explanatory variable in the mobility model.

2. In section 2 we explain how this division is implemented.

# 2 Mobility between Sectors

In this chapter we illustrate the apparent paradox of an increasing wage gap between the public and the private labour markets over careers simultaneously with decreasing mobility between the two sectors. We do this by showing the observed relationship between wages, mobility and labour-market experience on the Danish labour market using data for the period 1983 to1996.

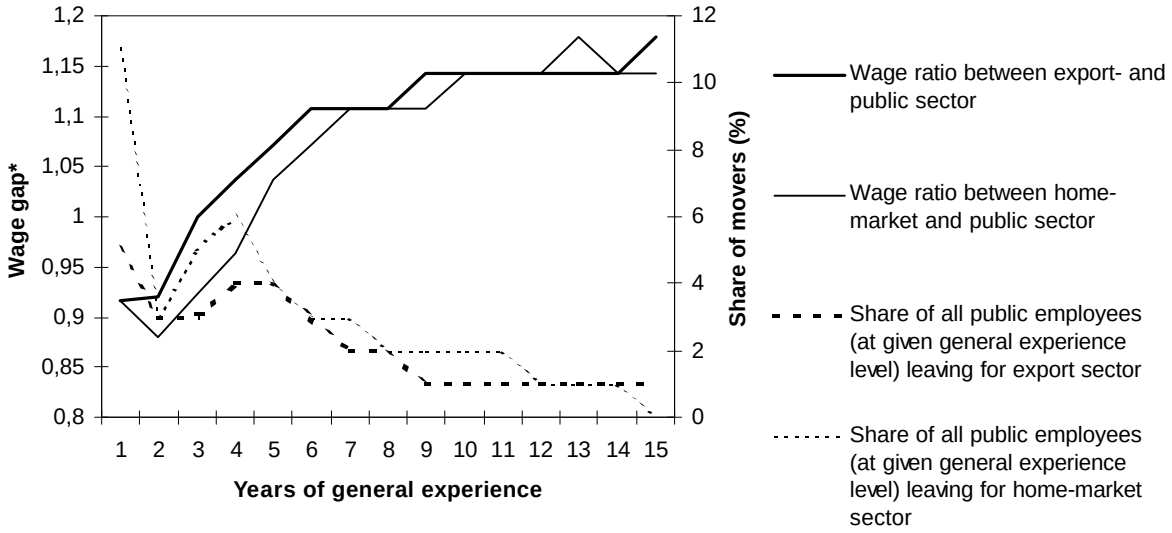
In particular, we study the mobility between the public sector and two different parts of the private labour market, the private home-market sector and the private export sector.[1]

Figure 2.1 shows the development of both the sector wage gap (left axis) and the share of workers leaving the public sector with a certain amount of general experience on the labour market (right axis).

It is evident that while the wage gap between private and public employment is increasing with general experience, mobility out of the public sector is decreasing. This poses the question of why public sector workers apparently do exactly the opposite of what economic theory predicts (remember that the private sector is the one which pays higher wages). The reported wage gaps are the ratios of export and home-market sector wages to public sector earnings respectively (using mean wages from the sample – deflated by the yearly average increase in the sample wages).[2] While the wage for new-comers initially is higher in the public sector, the wage increase is steeper in the private sector, and thus private wages end up being higher after some years. Generally, mobility out of the public sector is low; the share of public sector workers (with a given experience) leaving the sector in favour of one of the private sectors never exceeds 12%, and the share is radically decreasing with general experience. Moreover, as figure 2.1 indicates, mobility from the public sector to the other sectors is decreas-

ing with increasing seniority on the labour market.

Figure 2.1 Wage gaps and mobility over careers (1983-1996)




** Ratio of private to public sector wages. DKK, corrected for inflation and changes in productivity*

Source: The data come from a random sample of 10% of the entire population drawn from administrative files, see chapter 3.

In figure A1.1 in appendix 1 we show hazard rates for leaving the public sector by type of education. For all types of education there is a clear negative duration dependence. This is especially so for the unskilled and the technical educated. We shall return to the significance of type of education on the mobility out of the public sector in chapter 5.

## Notes

1. We have made this division of the private labour market, because we a priori expect mobility between the private home-market sector and the public sector to be higher than between the public sector and the private export sector. We expect this because wage formation in the home-market sector might be less influenced by competition than the export sector, and hence wage formation in the home-market sector might have similarities with wage formation on the public labour-market sector. We also regard jobs in the public sector and the private home-market sector to be more similar than jobs in the public sector and the private export sector. Effectively, the private export sector corresponds to agriculture and manufacturing, whereas the private home market sector corresponds to services and retail business.

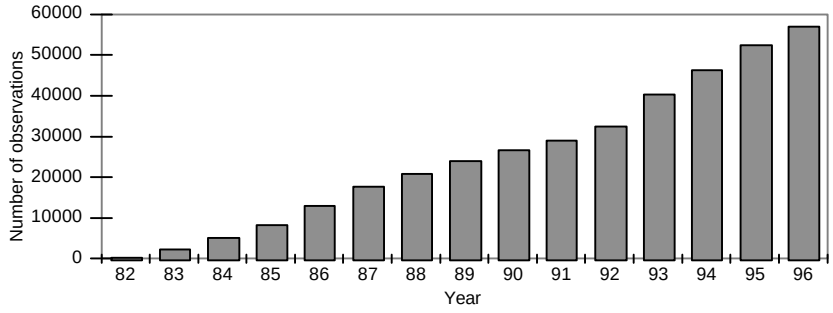
2. The figure does not control for the different gender and educational composition in the sectors. As the public sector employs more women (who typically are paid less than men), but also more well-educated labour, the bias can go in both directions.

# 3 Data

Our study is based on micro data merged from Danish administrative registers. Table A1.3 in appendix 1 describes the variables used for the analysis, and table A1.4 provides summary statistics. There are more details in appendix 2. The sample period covers the years 1983-1996 and contains information on 10% of the Danish population – about 450,000 persons per year. The mere size of the sample enables us to shed light on some aspects, which could not have been analysed with common sample sizes, e.g. differentiating between general experience and sector experience and the subdivision into 16 educational groups. Data quality is generally high. There is, though, some uncertainty concerning the variable for hourly wages (see appendix 2).

The sample employed in this study only contains observations for people who began their working life in 1982 or later. This is due to the construction of our variable for sector-specific experience, which is constructed from data of people's employment sector. We only observe the employment sector for the year 1981 and onwards. For people with a work history longer than this, the variable on sector-specific experience would be truncated. We therefore choose only to look at new entrants on the labour market. We lose one year (1981) because we need a lag for the construction of the mobility variable (see figure 3.1).

Figure 3.1 Number of observations for each year




Source: The data come from a random sample of 10% of the entire population drawn from administrative files.

The variable for sector-specific experience counts years of uninterrupted employment in a sector. For example, a person employed in the export sector, then shifting to the public sector and going back to the export sector later, is assumed to have foregone all previously obtained experience specific to the export sector. This may be quite a strong assumption in the case where the person has been away from a sector for one or two years only. Though, any other way to construct this variable would be more complicated. In any case, it would not be clear where to »draw the line«, i.e. after how many years of absenteeism from a sector one can be assumed to have lost sector experience.[1]

The way we have constructed our education dummy variables, they do not only measure the length of education, but enable us to differentiate between different lines of education of the same length, see table A1.2, appendix 1.[2] This table also gives examples of the 16 different educational groups.

The humanities typically include teaching at all levels (including taking care of preschool children), while the predominant subgroup in social education is economists. Technical education includes technicians and engineers, whereas »other« mainly covers medical training at various levels (doctors, (old people's) nurses). The »unskilled« cannot be subdivided into lines of education.

## Notes

1. The most »proper« thing to do would probably be some form of depreciation for each year away from the sector, which is possible with our data. But this would be cumbersome and, still, quite arbitrary.

2. The abbreviations shown in table A1.3, appendix 1 will be used throughout the remaining of the paper.

# 4 Wage Gaps

In chapter 2 we saw the puzzling facts of decreasing sectoral mobility and increasing wage differentials as functions of labour-market experience. In order to try to explain this in an economic context we will introduce two different types of labour-market experience. One type of experience which is accumulated only in the current type of occupation, sector-specific experience, and a more general type of experience accumulated irrespective of the type of sector of occupation.

In chapter 5 we use estimates of individual wage differentials by sectors of occupation, given particular values of sector-specific and general experience to study the importance of these wage differentials on sectoral mobility. Hence the model in this chapter will be used to predict wages, not only for the observed sector of occupation, but also the two alternative sectors for each respondent.

When estimating wages for different sectors, the impact of sample selectivity bias on analyses of intergroup earnings differentials is a well-known problem (Heckman, 1979). One type of bias emanates from the fact that the groups of workers we observe in each sector are not random samples of the population, but selected samples of individuals, who are assumed to have chosen their sector of employment by maximizing utility to which the wage gives an important contribution. Estimation of intergroup earnings with Ordinary Least Squares (OLS) may produce biassed parameter estimates if the variables affecting the choice of employment sector and earnings are correlated. Various studies show that disregarding the selection process due to sector choice causes serious bias in the estimated coefficients (Hartog & Oosterbeek, 1993; Bedi, 1998; Bardasi & Monfardini, 1997; Lassibille, 1998 and Gaag & Vijverberg, 1998).

Below we show how this problem is dealt with in this analysis. However,

first we shall shortly discuss two other potential sources of bias.

The first of these two other types is selectivity bias, which is due to labour-force participation. Some individuals are outside the labour force for some period of time, perhaps as a result of their labour-market characteristics. If dropping out of the labour force and perhaps reentering employment in different sectors is not happening at random, a sample of employed individuals is not a random sample of the population. However, various studies indicate that the problem is not present in Danish data, which we use (Pedersen et al., 1990 and Naur et al., 1994). This is probably due to the high participation rate of women on the Danish labour market, and hence we ignore this type of bias in our analysis.

The second potential source of bias is due to a violation of the assumption of exogeneity of education as an explanatory variable. An important predictor for the choice of employment sector is education. Almost all studies in the literature show that education has a strong positive effect on the probability of working in the public sector. However, specific occupations in both sectors require specific types of education. It is therefore likely that individuals choose their education simultaneously with deciding in what sector to seek employment after completing their education. Dustmann and Soest (1998) find that exogeneity of education in the selection equation is strongly rejected in German data, but that *differences* in wage differentials, which is what we study, are rather robust with respect to the assumption of exogeneity of the education level. We thus disregard the problem of selection into education in the estimation of wage gaps in our study.

In summary, we discussed three types of causes of bias in our analysis of wages and experience, non-random selection into sectors, non-random selection into the labour market and non-random selection into different educations. In our analysis we only deal with the first type of selection bias because the literature suggests that the two other types of bias only present a minor or no cause for concern in our data.

We now return to the discussion of how to handle non-random selection into different sectors, given choice of education and given labour force participation. In the literature there are various ways of handling the selection process in the wage equations being suggested. When only cross-section data are at hand, selection is usually modelled by including a sector choice equation into the wage equation estimation. This can be done either

by retrieving a so-called selection factor (Heckmann's lambda) from the sector choice equation which then in turn is included in the wage equation, see Hoffnar & Greene (1996), Lassibille (1998) or Bardasi & Monfardini (1997), or by estimating the equations simultaneously as an endogenous switching regression model, Hartog & Oosterbeek (1993), Bedi (1998) or Gaag & Vijverberg (1998).

To our knowledge, the only studies which employ a panel data estimator to take account of selection bias, use Danish register data (Pedersen et al., 1990 and Naur & Smith, 1996). As will be shown in section 4.1, the selection process can be modelled as a fixed effects estimation, when panel data are available. Generally, we follow a method first employed in Pedersen et al. (1990) and later refined in Naur & Smith (1996), but we use a slightly modified version to avoid biassed parameters due to collinearity between time dummies and linear experience variables.

## 4.1 Model

In our study we use the standard Mincer human capital earnings function, where earnings are a function of education and labour force experience. Formally, we estimate the following human capital model

$$\ln w_{jit} = \alpha_j + X_{ijt}\beta_j + Z_i\gamma_j + u_{ijt} \qquad (4.1)$$

where j = 1,2,3 indicates either the public sector or one of the two private sectors and where $u_{it}$ is *iid N(0,ó²)*. *X* are time-variant variables (like age[1], general experience, sector-specific experience and their squares and cubes[2]), *Z* is a vector of time-invariant variables (15 education dummies – »unskilled« is the reference category) and  is a common constant.

Note that we must estimate (4.1) for each of the three different sectors, the public sector, the private home-market sector and the private export sector to be able to compare wage differentials by sectors.

As mentioned above, estimation of (4.1) for a specific sector on a sample of workers employed in this sector leads to problems of selectivity bias as wages are only observed in the employment sector. The employment sector

cannot be assumed to be chosen randomly, but is usually the result of utility maximisation. Thus, observations for one or the other sector are not sampled randomly. The usual way to get around this problem is to estimate a structural model, where the selection equation is specified. The system of equations (in a two-sector version, for simplicity, i.e. *j = 1,2*) looks like:

$$\ln w_{ijt} = \alpha_j + X_{ijt}\beta_j + Z_i\gamma_j + u_{ijt} \tag{4.2}$$

$$J(t) = \begin{cases} 1 \text{ if } Q_{it}\pi + v_{it} \geq 0 \\ 0 \text{ if } Q_{it}\pi + v_{it} < 0 \end{cases} \tag{4.3}$$

where (4.2) is the wage equation from above and (4.3) is a sector choice equation, where the probability of being in one sector depends on a set of variables, $Q_{it}$, influencing the utility of being in this sector. If the wage equation is estimated separately, ignoring the selection effect, this might lead to biassed parameters. Hence the system must be estimated jointly by switching regression or by the Heckman two-step procedure with inclusion of a sample selection correction (usually called Heckman's lambda), $\lambda_{i1t} = \frac{\phi(Q_{it}\pi)}{1-\Phi(Q_{it}\pi)}; \lambda_{10t} = \frac{\phi(Q_{it}\pi)}{\Phi(Q_{it}\pi)}$ in the wage equation.[3] The wage equation with an inclusion of Heckman's lambda is then the following:

$$\ln w_{ijt} = \alpha_j + X_{ijt}\beta_j + Z_i\gamma_j + \lambda_{ijt}\delta_j + u_{ijt} \tag{4.4}$$

However, assuming that the sector decision is time invariant, i.e. $\lambda_{ijt} = \lambda_{ij} \forall t$, we can absorb the sample selection corrections into a term capturing unobserved characteristics that vary between persons, but not over time, an individual fixed effect, $\acute{a}_{ij}$. This leads to the specification of the fixed effects model, where the fixed effect includes the sample selection corrections which are assumed time invariant as well as a correction for the presence of unobserved variables which are constant over time, i.e. the individual mean of the error term from (4.4). The wage equation is then:

$$\ln w_{ijt} = \alpha_{ij} + X_{ijt}\beta_j + Z_i\gamma_j + u_{ijt} \tag{4.5}$$

where $á_{ij}$ is the time-invariant individual-specific term.

If some of the unobserved variables (motivation, ability, etc.) and selection terms reflected in the fixed effect are correlated with the observed variables, failure to take this into account leads to bias in the estimated parameters of the model. In terms of the model, the problem is that $E(a_{ij}|X_{ijt}) \neq 0, E(a_{ij}|Z_i) \neq 0$. In order to avoid the bias resulting from a possible correlation of the fixed effects with the observed explanatory variables of the model, the traditional fixed effects transformation is made

$$\ln w_{jit} - \overline{\ln w_{ij.}} = a_{ij} + \left(X_{ijt} - \bar{X}_{ij.}\right)b_j + e_{ijt} - \bar{e}_{ij.} \qquad (4.6)$$

This transformation eliminates the time-invariant variables such as the individual means ($á_{ij}$) and the status variables, $Z_i$ (education). These coefficients will be recovered in the second step. However, as we need to predict wages in our study of mobility between sectors, we need estimates of $á_{ij}$ and $ã_j$.

In this paper, we follow the approach used in Pedersen et al. (1990) and Naur and Smith (1996) insofar as we estimate the time-varying variables in a within regression (4.6). As the time-constant regressors are wiped out by the within transformation, we recover these coefficients in a second step.

Unlike the cited studies, we have deflated wages in a way, so we can exclude any remaining time effects.[4] We have thus got rid of the rather tedious task of estimating both time dummies and time-varying linear regressors.[5] Unlike in Pedersen et al. (1990), we do not only estimate wages for workers in the sector, where the person is employed (i.e. where we can observe the wage), but we also predict hypothetical wages workers could expect to earn if they were employed in other sectors. We need to do so, because we want to estimate the wage difference a worker faces when deciding in which sector to be employed. Unfortunately, we can only estimate a worker's »ability« (the individual fixed effect) in the sector, where the worker is actually employed. We overcome this problem by assuming that the worker's ability is identical for all sectors.[6] This is in line with the findings in Dustmann & Soest (1998). Moreover, we have preliminary results from a switching regression indicating a positive correlation between wages between sectors, thus supporting the idea of uniform individual effects across sectors.

The solution to our model involves two steps:

*Step 1:* Getting consistent estimates for $\hat{a}_j$. The within equation (4.6) is estimated first. The effects of the status variables (education) are captured in the residual and are retrieved in step 2.

*Step 2:* Estimation of individually fixed effects ($á_{ij}$) and coefficients for $Z_i$. We now go back to (4.6) to estimate the still missing coefficients for $Z_i$ and $á_{ij}$). We proceed as shown in Pedersen et al. (1990) by calculating the average residual in the wage function for each person:

$$\tilde{d}_{ij} = \ln\overline{w}_{ij.} - \overline{X}_{ij.}\tilde{b}_j$$

We can thus estimate the missing coefficients by regressing the remaining variables in (4.6) on the mean residual:[7]

$$\tilde{d}_{ij} = n_j + Z_{ij.}g_j + \overline{e}_{ij.},$$

where $í_j$ is a sector and gender-specific constant.

## 4.2 The Results from the Fixed Effects Estimation

In this section we provide results from estimating the wage equation model using the methodology discussed in the previous section. This methodology also enables us to use the estimates here to calculate wage differentials for individuals by sectors and use these differentials in a model of sectoral mobility.

Table 4.1 shows regression coefficients for males and females for the public sector. The explained variable is the logarithm of wage. The results for the private sectors are shown in table A1.5, appendix 1.

Table 4.1 Ln wages for the public sector, fixed effects regression

| Coefficients | | Public sector | | | |
|---|---|---|---|---|---|
| | | Male | | Female | |
| Intercept | | 2.849* | (0.004) | 2.176* | (0.003) |
| Age | | 0.032* | (0.003) | 0.083* | (0.003) |
| $Age^2$ | | -0.001* | (0.000) | -0.002* | (0.000) |
| $Age^3$ | | 0.000* | (0.000) | 0.000* | (0.000) |
| General exp. | | 0.038* | (0.003) | 0.061* | (0.002) |
| General $exp.^2$ | | -0.004* | (0.000) | -0.006* | (0.000) |
| General $exp.^3$ | | 0.000* | (0.000) | 0.000* | (0.000) |
| Sector exp. | | 0.020* | (0.002) | 0.045* | (0.002) |
| Sector $exp.^2$ | | -0.003* | (0.000) | -0.006* | (0.000) |
| Sector $exp.^3$ | | 0.000* | (0.000) | 0.000* | (0.000) |
| Education | | | | | |
| Skilled | soc | 0.019 | (0.014) | 0.069* | (0.007) |
| | tec | 0.010 | (0.008) | -0.033* | (0.006) |
| | oth | -0.042 | (0.033) | 0.037* | (0.008) |
| Short college | hum | 0.066* | (0.016) | 0.138* | (0.006) |
| | soc | 0.357* | (0.085) | 0.134 | (0.104) |
| | tec | 0.180* | (0.018) | 0.212 | (0.030) |
| | oth | 0.065* | (0.159) | 0.132* | (0.024) |
| Long college | hum | 0.162* | (0.011) | 0.240* | (0.008) |
| | soc | 0.238* | (0.025) | 0.236* | (0.018) |
| | tec | 0.262* | (0.019) | 0.232* | (0.034) |
| | oth | 0.157* | (0.034) | 0.261* | (0.010) |
| University | hum | 0.309* | (0.013) | 0.426* | (0.012) |
| | soc | 0.353* | (0.012) | 0.383* | (0.014) |
| | tec | 0.346* | (0.011) | 0.368* | (0.017) |
| | oth | 0.573* | (0.012) | 0.571* | (0.015) |
| Number of observations | | 34,298/6,846 | | 75,266/16,250 | |
| $R^2$ | | 0.06/0.36 | | 0.13/0.24 | |

Source: The data come from a random sample of 10% of the entire population drawn from administrative files.

Note: Standard errors in parentheses. An asterisk (*) denotes significance at the 0.001 level. The first number of observations and the first $R^2$ reported, above the dash, refers to the first step in the estimation procedure in section 4.1 and the following number of observations and the second $R^2$ reported to the second step.

Generally, the coefficients have the expected sign.[8] The hourly wage is rising at a declining rate in both experience variables. There is also a significant effect from age, over and above that of experience. Given that experi-

ence is included in the model age reflects other factors than experience. Age may capture the variation of some missing variables, e.g. the effect of the higher starting age on the labour market of higher educated individuals[9] or it may capture measurement error in the variables capturing labour-market experience. Finally, age may also capture an age dependent health effect.

### 4.2.1 Estimated Wage Gaps

We will now calculate estimated wage gaps, which will be included in the model of mobility between sectors discussed in chapter 5. We calculate the »relative« wage gap, i.e. we express the private sector wage as a percentage of the person's public sector wage. When we examine mobility, the estimated model (4.6) induces an untraditional concept of constructing the wage gap.

The model assumes that the worker only accumulates sector experience for the present working sector. When shifting employment sector, he therefore gets no enumeration for the accumulated sector-specific experience from the sector he is leaving when his wage is determined in the new employment sector. Thus, when comparing the short-run wage differentials between sectors, we compare the wage in the present employment sector, inclusive of remuneration for accumulated sector experience in this sector, with the wage for an entrant to an alternative sector, where only general experience is remunerated at the time of shifting sector.

As an example, imagine a worker with a ten-year labour market experience, who has spent all ten years in the public sector. If this worker was to shift to e.g. the private home-market sector he will get enumerated for ten years, but only according to the coefficients for the polynomial for general experience, and he will get no effect from the sector-specific polynomial, as he has no sector-specific experience in the private home-market sector. He thus has to weigh the higher enumeration to general experience in the private home-market sector[10] against the loss of sector-specific experience from the public sector.

Calculating wages by taking into account that one cannot transfer the sector-specific experience obtained in one sector to the other sector, we can hence show that while switching to the export sector might be attractive in the beginning of the career, it might be much better to stay in the sector, where all sector-specific experience is obtained by then, later in ones career.

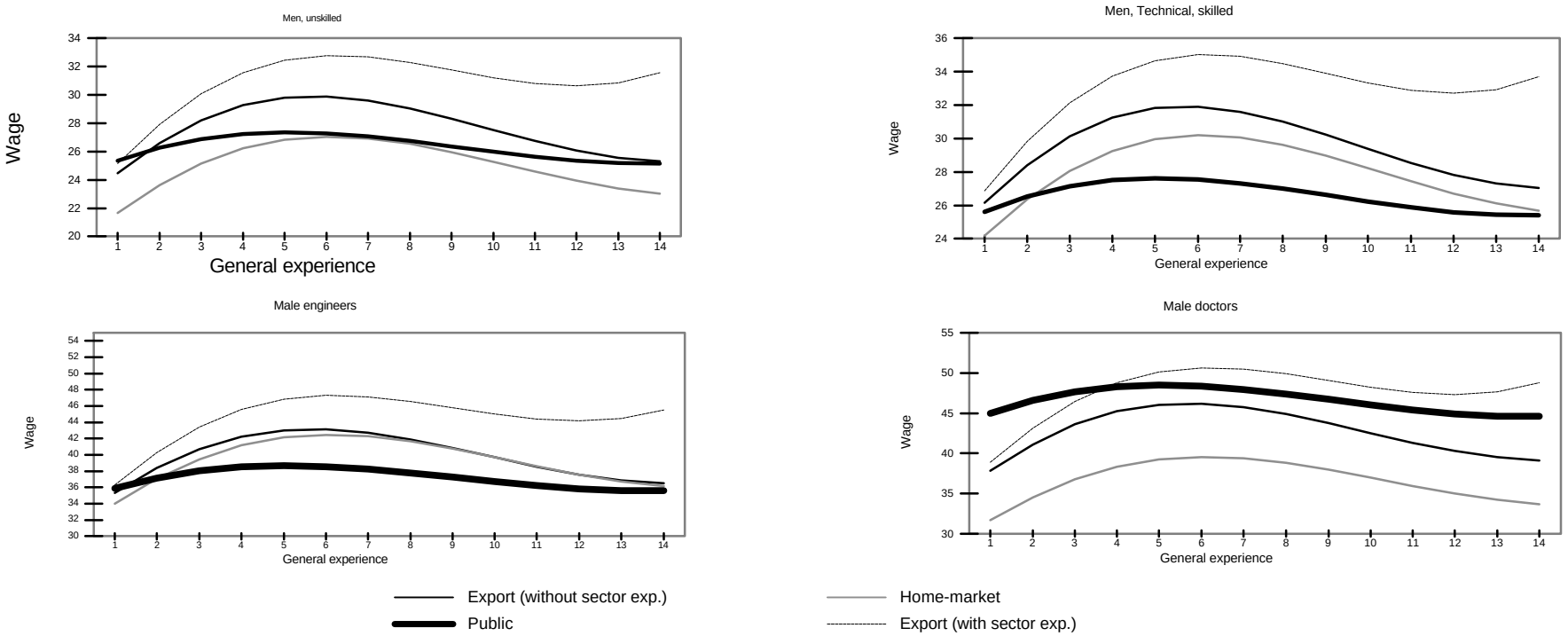
This concept of constructing the wage gap is one of this paper's main contributions.

As far as we know, sector-specific knowledge has not been used this way to look at the wage gap profile in sector choice before. Bedi (1998) uses the wage gap between sectors to explain sector choice, but he compares wages calculated with the *same* amount of accumulated sector experience in both sectors. Therefore, given significant effects of sector-specific experience, he can only shed light on the choice, a worker faces in the *beginning* of his career (i.e. »if he had had a career in the export sector instead of in the public sector, his wages would now have been xx DKK«). Our concept differs, as we can calculate *at any given point of time* of a worker's career, what the alternative wage of switching to the export sector would be, because we can determine enumeration from both the general experience as well as the sector-specific experience, which is lost when changing sector.

We now look at the estimated wage profile over a public worker's career, using the model presented in the previous section. We do so separately for males and females and for all our 16 educational groups, defined in regressions in the previous chapter. It is a common feature for most of these groups that the alternative export sector wage is higher than their wage in the public sector at an early stage of their career (but usually not in the very beginning). Over time, this advantage decreases and at some point of time it becomes more favourable to stay in the public sector. There are two reasons for that. First, at some point of time, the wage value of accumulated sector experience becomes of such a size that it outperforms the generally higher wage level in the export sector. Second, wages in the export sector rise steeply in the beginning of the career, but also show a greater decline later on in ones career.

In figure 4.1 we show the »synthetic« wage profiles for men from four selected educational groups (i) unskilled, (ii) technically skilled, (iii) university engineers and (iv) doctors.

Figure 4.1 Wage profiles for selected type of workers




Source: The data come from a random sample of 10% of the entire population drawn from administrative files.

The line labelled »public« gives the wage in the public sector, assuming that the worker never leaves the public sector. The lines labelled »export (without sector experience)« and »home market« give at every point of the career the hypothetical starting wage in the export and home-market sector respectively for a public sector worker with a given general experience from the public sector, but no specific experience in the alternative sector. The line labelled »export (with sector experience)« gives the wage in the export sector for a »lifetime export sector worker«.[11] This is the alternative export sector wage, which is used in other studies of sector choice (Bedi, 1998). As it is evident from the figure, the wage gap between the export and the public sector calculated according to Bedi (1998) »behaves« in a completely different way from ours, as it does not decline with seniority.

For the unskilled worker the starting wage is slightly higher in the public sector, but already after three or four years of work, it will be an attractive alternative to change to the export sector (but not to the home-market sector). This immediate wage advantage when changing sector prevails for the following 8-10 years, but then vanishes. In contrast to that, for technically skilled men, the wage advantage with respect to the export sector continues to exist also after a long period on the labour market (but it is decreasing).

The wage profile for engineers shows similar characteristics as those for unskilled men, but for engineers, a job in the home-market sector is almost just as attractive as an export job. One of the more unusual profiles is that for doctors a change to one of the private sectors never becomes a real alternative. This pattern is characteristic of typical »public sector professions«. The wage profiles for different educations show the same wage development pattern; they just differ in the relative wage levels. The pattern of the wage gap is always the same: the private-public wage gap increases up to a certain point in ones career and then decreases. This may explain why mobility decreases over ones career: the wage advantage of shifting to another sector decreases, too.

Finally, note that the shape of the wage profiles is, by construction, the same for all educational groups. This is so, because we have only estimated common age and experience polynomials for all educational groups. It remains for future research to investigate whether there are differences in profiles by educational groups.

## Notes

1. As including age terms apart from experience terms leads to a significant improvement of the model fit, we add age (and age squared and cubed) as regressors.

2. We include not only the squares of the variables, but also the cubes in order to allow for a more flexible estimation of the wage curves. We have tried with the squares alone, but the characteristics of our sample (relative many observations with short general experience) led to a rather steep fall of wages for workers with long general experience. Including the cubes of the variables, we allow for a steep rise of wages in the beginning of a career, simultaneously, with a more moderate development in wages for older workers.

3. Note that in this analysis we assume one period utility maximization. In a more general framework one should allow individuals to be looking ahead, also taking into account expected values of future wages in the different sectors, conditional on current decisions.

4. Wages are deflated with the mean yearly sample increase in wages. This might pose a problem, as the sample has increasing seniority by construction, as we follow cohorts entering from 1982 and onwards. However, we get similar results using aggregated statistics for price and productivity changes.

5. This is what Pedersen et al. (1990) and Naur & Smith (1996) try to do, by exclusively including time-dummies in the within-regression and thereby postponing the estimation of the linear time-varying regressors till step 2. This is rather complicated, because the time-dummy coefficients in the first step become too large, as they also explain variation due to the submitted linear experience variables (with which they are correlated). In the second step, where the residuals of the within-estimation are regressed on the linear experience variables, there is not much variation left to be explained by the experience variables (as a great part is already explained by the time dummies). The experience coefficients are seriously biassed downwards. That is no problem in Pedersen et al. (1990), as they are only interested in estimating wages, not in getting each single coefficient right. However, we particularly need to estimate the experience coefficients correctly, because their relative size is of great importance for estimating wage gaps in our study.

6. This is quite a strong assumption, but probably one that does not bias our estimates in the wrong direction. We look at public sector workers and assume that their ability is the same in the export sector. Probably, their ability is rather smaller in the export sector. (This could be a reason why they have chosen public sector employment in the first place.) By assuming that the ability of a public sector worker is the same in the export sector, we probably overstate alternative export sector wages. Note, however, this is only problematic when calculating the wage gap level: wage differentials over careers are unaffected.

7. Note that we get by rewriting (4.5) and taking individual means:

$$\overline{\ln w_{i.}} - \bar{X}_{i.}\tilde{b} = (a + a_i) + \bar{Z}_i g + \bar{e}_{i.}$$

where the left-hand side is the above calculated mean residual, $\tilde{d}_{i.}$.

8. A few education coefficients for vocational education are negative, meaning that wages are lower than for persons without formal education. Normally, we would expect people with a longer education to be remunerated accordingly. In the case of skilled females, earlier results (Tranæs & Groes, 1986), however, seem to be in accordance with the results in table 4.1. The reason behind the insignificance of skilled males could be that many skilled males have unskilled positions in the public sector, see Tranæs and Groes (1986).

9. If this is the case, the dummy coefficients on education may be biassed downwards. But, as our main objective is prediction of wages, and not the estimation of the exact size of the time-invariant coefficients, this is a minor problem.

10. The coefficients for general experience imply a larger enumeration for general experience, in the private home-market sector, see table A1.5, appendix 1, compared to the enumeration in the public sector.

11. The corresponding line for the home-market sector is suppressed for clarity of the figures.

# 5 A Model of the Duration of Stay in the Public Sector

In this chapter we introduce a model of mobility between sectors. The motivation for this chapter is to test whether there is wage flexibility between the public labour market and the two different private labour markets presented in this paper. In the previous chapters we saw that the immediate differences between wages in the three sectors were much smaller or zero, once sector-specific experience was accounted for. The remaining question is therefore whether individuals currently employed in each of the three sectors do respond to differences in wage opportunities given particular values of sector-specific and general experience or whether the wage mechanism on the labour market has no effect.

We restrict ourselves to look at those publicly employed. This is because wage-related mobility out of the public sector might be of special interest to policy makers. If there is no wage mobility for the public employees, it indicates severe problems for wage adjustment on labour markets, such as the Danish, where one third of the labour supply is publicly employed and covering an even lager share of the educated parts of the labour market, see table A1.1, appendix 1.

To investigate mobility from the public sector into the two private sectors, we examine whether there is correlation between the expected wage differential by sectors and the exit rates out of the public sector.

The model we propose for this analysis is a multinomial logit model, see e.g. Fahrmeir & Tutz (1994), modelling the transitions from the public sector into the two private sectors. The model captures the effect of the wage differential and some other explanatory variables on the transition rates into the two private sectors.

Let each of the three sectors be indexed by $r = 1; 2; 3$, where e.g. the private export sector could be *1*, the private home-market sector *2*, and the

public sector *3*. Let the utility of occupying sector *r* at year *t*, conditional on being in the public sector at *t - 1*, be given by:

$$\tilde{U}_{rt} = \tilde{b}_{0r} + x_{t-1}\tilde{b}_r + w_{rt-1}g + \tilde{e}_{rt}$$

*r = 1,2,3; t = 0,1,...* , where $x_{t-1}$ is now a vector of explanatory variables affecting the utility in sector *r* at time *t*. Note that $x_{t-1}$ has distinct effects on the utility in each sector, as there are sector-specific regression coefficients $\tilde{b}_r$ . The variables included in $x_{t-1}$ could be gender, duration of stay in the public sector (which by our terminology, see chapter 3, is sector-specific experience in the public sector), general experience and education. These variables could reflect non-monetary benefits from each sector, e.g. that individuals with university degrees have very challenging jobs in the public sector, something that, perhaps, is not so much the case in each of the private sectors.

On the other hand, we expect the utility of money, i.e. wages, to be uniform over sectors. That is the utility of one DKK paid in the public sector is the same as one paid in each of the private sectors. Hence, there is a common coefficient entering each of the three utility functions to the wage, $w_{rt}$, paid in each sector at time *t*. Note that as these wages are unobserved, except for the choice of the public sector, we must replace it by the expected values, obtained by using the wage equations estimated in chapter 4, when estimating the model. Finally, the $\tilde{e}_{rt}$'s are random variables capturing the effect of unobserved variables.

As $\tilde{u}_{rt}$ is only indirectly measured by choice of sector, we cannot identify parameters for the absolute values of utility in all three choices, but only parameters capturing the relative utility of choices. Therefore, as it is usual for multinomial models, we look at differences in utilities:

$$u_{rt} = b_{0r} + x_t b_r + (w_{rt} - w_{3t})g + e_{rt}$$

where $b_r = \tilde{b}_r - \tilde{b}_3, e_{rt} = \tilde{e}_{rt} - \tilde{e}_{3t}$ , *r = 1,2,3*. Hence $b_3 = 0; e_{3t} = 0$. Now, let choice of sector be given as the sector yielding the highest utility:

$$Y_t = r \Leftrightarrow \tilde{U}_{rt} = \max_{j=1,2,3} \tilde{U}_{jt}$$

where $Y_t$ is a discrete variable, taking the values 1, 2 and 3 capturing the

choice of sector. Now:

$$P(Y_t = r) = P(U_r - U_1 \geq 0, \ldots, U_r - U_3 \geq 0)$$

and by assuming *iid* extreme value noise terms and some integration, see Fahrmeir & Tutz (1994), we get the familiar multinomial probability model of choosing the r'th sector at time *t* given being employed in the public sector at *t-1*:

$$P(Y_t = r) = \frac{\exp(\alpha_{rt})}{\sum_{s=1}^{s=3} \exp(\alpha_{rt})} = \frac{\exp(u_{rt})}{1 + \sum_{s=1}^{s=2} \exp(u_{st})} \qquad (5.1)$$

*r = 1,2,3*. The log-likelihood corresponding to the model for a sample of publicly employed workers is obtained by assuming conditional independence over time[1] for $u_{rt}$, *r = 1,2,3; t = 0,1,...* . Then, contributions for each individual for all points of time this individual appears in the data can be obtained as the sum of log's of (5.1) over all time specific contributions for that individual. Next, we sum up all individual contributions to obtain the overall log-likelihood function.

Being a generalised linear model, the log-likelihood has a unique maximum in the parameters and can be maximised using iterative weighted least squares which are equivalent to Newton-Raphton maximisation, see Fahrmeir & Tutz (1994). In the next section we present results for the proposed model.

## 5.1 Results for the Model of Duration of Stay in the Public Sector

In this section we present estimation results from the model of sector choice, conditional on current employment in the public sector. The model should test whether there is wage flexibility on the public labour market, i.e. how much individuals employed in the public sector respond to wage differentials to other sectors on the labour market. As also sector-specific characteristics might affect the utility of sector choice we include age,

sector-specific experience as well as educational dummies as explanatory variables.

The wage equations in the previous section indicated that for many individuals there is little scope in moving sector once some sector-specific experience is accumulated. Apparently this means that in practice not many individuals change sector in our data. Therefore, it has only been possible to estimate transitions for males and for males and females together, while separate estimations for females have been impossible due to too few observed transitions. Similarly, the number of educational dummies had to be limited. We have chosen to group the single lines of education according to length of education. We thus keep five education dummies, the unskilled still being the reference category. The estimation results are presented in table 5.1.

Generally, it is remarkable how stable the parameters are in the two different estimations. Hence, in the following we shall comment only on the results from mixed genders and look only at the results for males alone, when there are important deviations from the mixed results. In this respect we note that women generally have a much lower exit rate out of the public sector than men. This might be due to differences in occupation within the public sector, i.e. men might have jobs in the public sector more similar to jobs in the private sector and hence it might be easier for them to change sector with less change in job or occupation compared with women.

From the table we see that age has a negative effect on the transition from the public sector to both private sectors. The negative effect of age may have many causes, one being that older workers have less remaining time on the labour market, and hence there is less perspective, from an employer’s point of view, in investing in training in a new job for older workers. Hence older workers in the public sector get less job offers than younger workers.

Table 5.1 Result for the multinomial model of sectorial choice

| Variable | Males | | All | |
|---|---|---|---|---|
| Public→export | | | | |
| Constant | 6.6103 | (0.3590)** | 5.0579 | (0.5208)** |
| Female | | - | -0.9765 | (0.1032)** |
| Age | -0.4154 | (0.0143)** | -0.3545 | (0.0203)** |
| Duration of stay in public sector | -0.1876 | (0.0256)** | -0.0449 | (0.0410) |
| Unemployment | 0.1232 | (0.0251)** | 0.0904 | (0.0394)* |
| Change in unemployment | -0.0140 | (0.0025)** | -0.0111 | (0.0040)** |
| General experience | 0.3147 | (0.0184)** | 0.2480 | (0.0293)** |
| Skilled | -0.7023 | (0.0772)** | -0.0993 | (0.1228) |
| Short college | -1.1410 | (0.1494)** | -0.7323 | (0.2020)** |
| Long college | -0.8184 | (0.1260)** | -0.6253 | (0.2014)** |
| University degree | -0.4643 | (0.1349)** | -0.0719 | (0.2318) |
| Public→home market | | | | |
| Constant | 4.4234 | (0.3350)** | 3.8065 | (0.4165)** |
| Female | | - | -0.8134 | (0.0895)** |
| Age | -0.2084 | (0.0111)** | -0.2111 | (0.0132)** |
| Duration of stay in public sector | 0.1380 | (0.0239)** | 0.2214 | (0.0361)** |
| Unemployment | 0.0907 | (0.0231)** | 0.0785 | (0.3319) |
| Change in unemployment | -0.0113 | (0.0026)** | -0.0108 | (0.0037)** |
| General experience | -0.0031 | (0.0156) | 0.0363 | (0.0236) |
| Skilled | -1.0293 | (0.0840)** | -0.5687 | (0.1157)** |
| Short college | -3.0405 | (0.1655)** | -3.1248 | (0.2222)** |
| Long college | -3.2355 | (0.1380)** | -2.9328 | (0.1978)** |
| University degree | -1.5974 | (0.1159)** | -0.7359 | (0.1707)** |
| Common parameters | | | | |
| Wage differential | 0.5655 | (0.0137)** | 0.5522 | (0.0193)** |
| Employment differential | 0.0245 | (0.0091)* | 0.0222 | (0.0139) |
| Sample size | | 29891 | | 22355 |

Source: The data come from a random sample of 10% of the entire population drawn from administrative files.

Note: * indicates significance at a 5% level, ** at a 1% level.

Age has a larger coefficient in the exit rates into the private export sector than into the home-market sector. Duration of stay in the public sector has a positive and strongly significant effect on the transition out of the public sector and into the private home-market sector, but a reverse though insignificant effect on the transition into the private export sector. This might indicate that jobs in the public and in the private home-market sector, in

general, are more similar than jobs in the private export sector. This seems reasonable as many jobs in the private service sector, a sub-sector of the private home-market sector, are similar to jobs in public administration, which constitutes a large fraction of jobs in the public sector. These results are quite interesting, because it seems that the decreasing share of movers from the public service sector and into the private home-market sector, see figure 2.1, can be explained by our transition model in this section, hence also by decreasing wage differentials for individuals with increasing sector-specific experience.

The general unemployment rate on the labour market has a somewhat puzzling effect. It has a positive effect on transitions into both private sectors, although it is not very significant for the transitions for both genders. The reason for the estimated positive effect might be due to collinearity with changes in the unemployment rate, which is more significant. This variable has the expected sign. The larger the increase in unemployment the lower the transition rates to both private sectors. This must be due to the fact that employment in the private sector in general follows business cycles, whereas this is not the case for the public sector. Even though the wage effect of the business cycle is captured by the wage variable in the model, there might be an effect on transition rates over and above wages, as job offers in the private sector might also be affected by business cycles.

General labour-market experience has a significant positive effect on the transition into the private export sector, but no significant effect on the transition into the private home-market sector. This is to be expected as specific experience (duration of stay) had a positive effect on transitions into the more similar home-market sector, whereas general experience helps in getting jobs in the private export sector.

For most educations transition into both private sectors is lower compared with unskilled workers. This might be because individuals with an education have better jobs in the public sector compared to the private sector, than the unskilled have, over and above what is captured by the expected wage differential or because measurement error in the wage differential is correlated with education. The latter could be the case due to the fact that many individuals with education have pension schemes paid by the employer. These pension schemes are not included in the observed wages and hence not systematically part of the estimated wage differential.

Finally, at the bottom of the table we find the effect of the wage differential between the public sector and the two private sectors. We see that the wage differential has the expected sign and is highly significant. The larger the wage in either of the two private sectors, the higher the transition rate into that particular sector. Wage differentials are not that large for many groups on the labour market once sector-specific experience is taken into account, but if there is an expected wage gain from moving to one of the two private sectors, this has a large impact on the transition rate out of the public sector. Thus there seems to be significant wage flexibility.

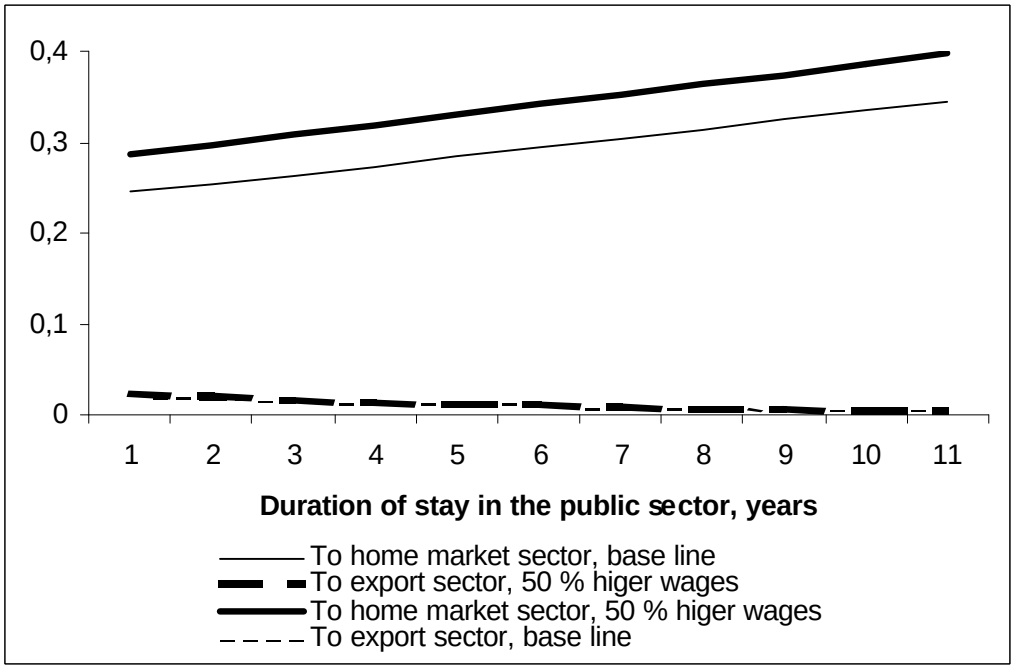
In order to avoid the results being affected by trends or cyclical movement among the three sectors we have also included a variable capturing the differences between the net numbers of new jobs in the three sectors. This variable is significant indicating that when the number of new jobs grows faster in one of the two private sectors, there is a larger transition rate out of the public sector and vice versa.

To illustrate how the estimated model predicts transitions out of the public sector and how changes in wages, according to the model, might affect these transitions we show figure 5.1 and 5.2. The first figure shows the transition probabilities for an unskilled male, who enters the labour market at the age of 25 as he accumulates his first 11 years of sector-specific experience in the public sector. In the base-line case we assume a 7% unemployment rate and a 0% change in the unemployment rate. We also assume zero employment differential between the three sectors, that is, we show transition probabilities assuming the same growth rates in all three sectors in the model.

In the base-line case we assume no wage differential between the three sectors.

In the alternative case we assume a 50% higher wage in each of the private sectors, compared with the public sector. This is not unrealistic according to table A1.4.

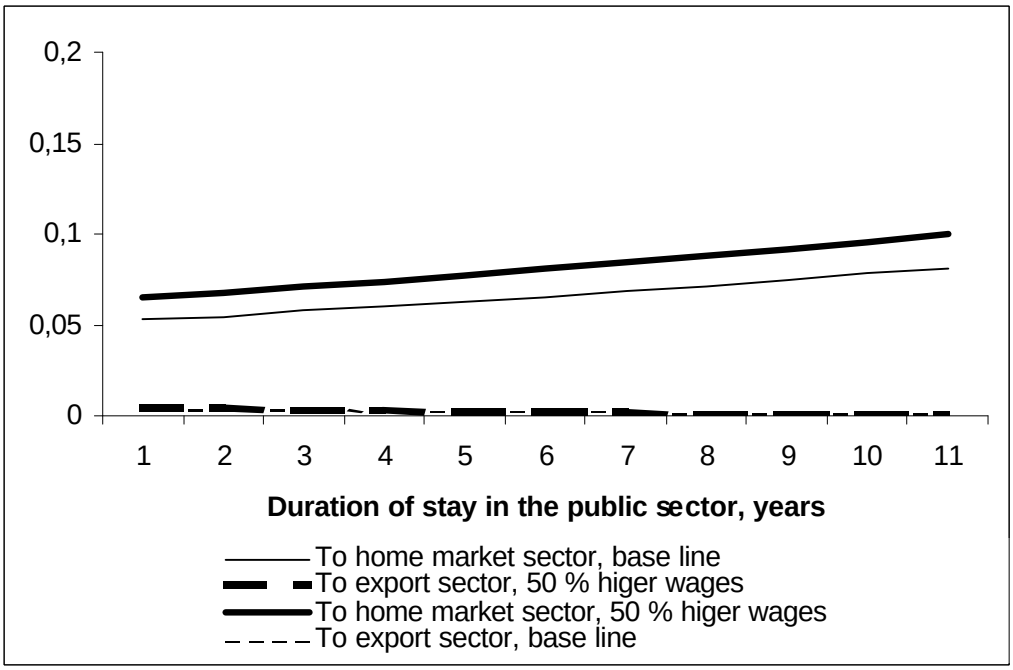
Figure 5.1 Propensity to switch for unskilled men (model prediction)




Note: The base line refers to the case where there is no wage gap between the three sectors. The alternative refers to the case where there are 50% higher wages in both the private export and home-market sectors compared with the public sector.

Figure 5.2 is identical to figure 5.1 except that we now make the predictions for a person with a university degree who is assumed to enter the labour market at the age of 30 rather than at the age of 25 for the unskilled person.

Figure 5.2 Propensity to switch for men with university degrees (model prediction)




Note: The base line refers to the case where there is no wage gap between the three sectors. The alternative refers to the case where there are 50% higher wages in both the private export and home-market sectors compared to the public sector.

Both figures have a number of striking features.

First, we find that in both figures the probability of moving from the public sector to the private home-market sector is increasing with increasing experience, whereas it is decreasing for the probability of moving to the export sector. This is a consequence of the combined effect of the coefficients of age, duration of stay in the public sector (sector-specific experience) and general experience. As long as the individual stays occupied in the public sector, each of these variables increases by the same amount, hence it is the combined effect that determines the shape of the transition probabilities by duration of stay in the public sector.

Secondly, we find that in both figures there is a large difference between the probability of moving to the home-market sector and to the export sector. It is far more likely for both unskilled as well as university graduates to move to the home market sector, rather than to the export sector. This could be due to the fact that jobs in the public sector and in the home-market sector are more similar than jobs in the these two sectors combined

and compared with the export sector.

Third, the probability of moving at all is much lower for university graduates than for unskilled workers. This is a consequence of the large negative coefficients for university graduates and this has been discussed previously.

Finally, we find a marked effect on the transition probability from wages being 50% larger in the home-market sector than compared with wages in the public sector. This effect is less clear in the transition to the export sector. This is, however, due to the low overall transition probability towards this sector.

Anyway, one might wonder why the effect of a large wage differential between the public and the home-market sector does not have a more overwhelming effect than it appears to have in the figures. There could be several reasons for this. First, there might be some measurement errors in the estimated wages, primarily due to the fact that we do not include employer paid pension schemes in our estimated wages. Such schemes are much more pronounced in the public sector than in any of the private sectors. Hence, wage differentials are not as large as we measure them to be, and this might bias the coefficient of the wage differential downwards. Secondly, we imagine that many individuals who have opted for the public sector as the starting point of their carrier have done this for other reasons than obtaining a certain wage. Hence, the limited wage effect could be due to selection bias.[2] Finally, we assume wage mobility to be driven by short-run wage differentials. However, if individuals change occupation according to optimizing both present as well as discounted future wages we should expect the coefficient for the wage differential in our model of mobility to be downward biassed. However, as long as present and future wages in the same sector are positively correlated, a model for the estimated movement between sectors according to present wage differentials will still give the same qualitative conclusion on the importance of wage differentials between sectors as would a model allowing for optimization over time.

Hence, our finding of a significant wage differential still contributes towards establishing evidence of economic behaviour on the labour market.

## Notes

1. This might seem inappropriate as it is quite natural to imagine that there is both correlation between choices as well as correlation over time, due to omission of significant explanatory variables in the model. However, controlling for such unobserved heterogeneity requires repeated spells of duration of stay in the same sector for several individuals. This is only available for a limited number of individuals in the data set and hence controlling for unobserved heterogeneity is not attempted here.

2. However, we still find it interesting to observe the wage mobility between the sectors, given first sectoral choice, as our analysis then highlights the scope of wage policy for those already on the labour market.

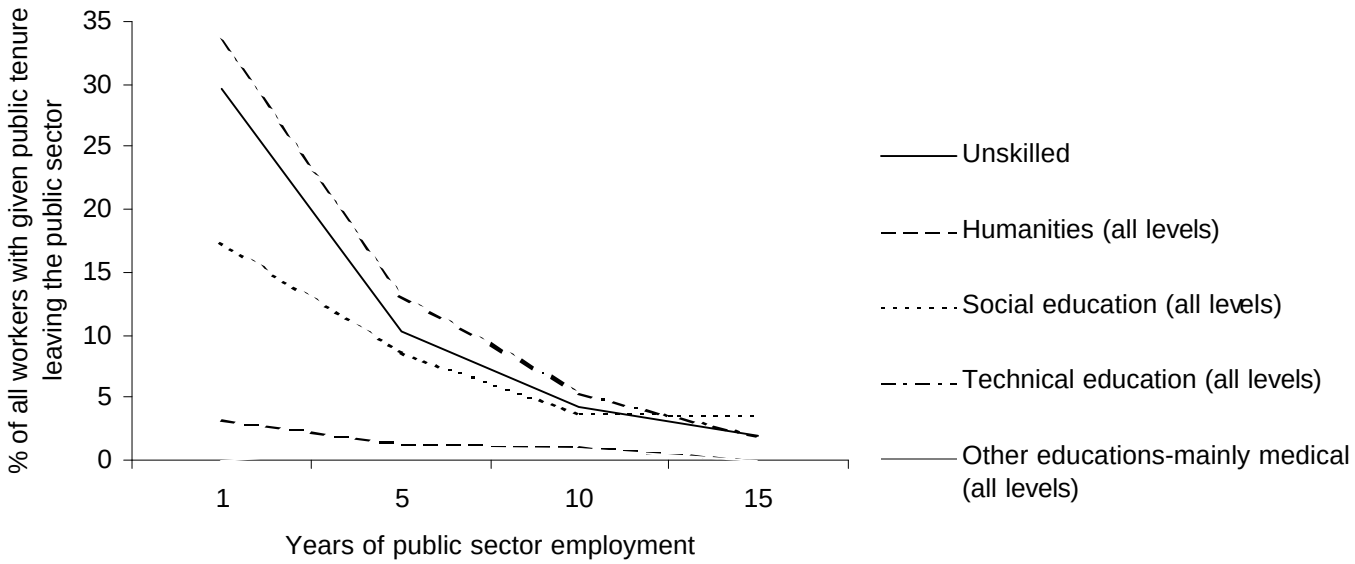
# Appendix 1

## Supplementary Figure and Tables

In this appendix we show some supplementary figures and tables that underline the analysis in the report.

In figure A1.1 we show hazard rates out of the public sector, that is the number of publicly employees who leave after a certain number of years of employment. In the figure we show hazard rates by type of education.

Figure A1.1 Percentage of public employed leaving the sector during the year




From the figure we see that the share of employees in the public sector who leaves with one year of experience is much larger than the share who leaves with five years of experience, which again is larger than the share who

leaves with 10 and 15 years of experience.

In table A1.1 we show the allocation of labour or employment in the three different sectors in our study. The allocation is shown by length and type of education.

Table A1.1 Allocation of labour, 1996

| | Export sector | Home-market sector | Public sector |
|---|---|---|---|
| By length of education (%) (see table A1.2) | | | |
| Unskilled | 33 | 27 | 23 |
| Skilled | 51 | 55 | 33 |
| Short college | 6 | 5 | 13 |
| Long college | 7 | 8 | 22 |
| University degree | 3 | 6 | 9 |
| All | 100 | 100 | 100 |
| By line of education (%) (see table A1.2) | | | |
| Unskilled | 33 | 27 | 23 |
| Humanities | 2 | 2 | 23 |
| Social | 19 | 31 | 18 |
| Technical | 45 | 39 | 20 |
| Others (mainly medical) | 1 | 1 | 16 |
| All | 100 | 100 | 100 |
| Number of observations | 42,320 | 43,167 | 50,607 |

Source: The data come from a random sample of 10% of the entire population drawn from administrative files.

In table A1.2 we show in more detail the underlying definitions on the different types of education by length of education.

Table A1.2 Examples of education

| Length | Line | Typical profession |
|---|---|---|
| Skilled | Social<br>Technical<br>Other | Clerk, typist, shop-worker<br>Plumber, blacksmith, bricklayer, carpenter<br>Assistant nurse, pediatrist, dental surgery assistant |
| Short college | Humanistic<br>Social<br>Technical<br>Other | Kindergarten teacher, social education worker, craftsman<br>Economist (short college education)<br>Technician, electrician, police officer<br>Laboratory technician, assistant dispenser, dental hygienist |
| Long college | Humanistic<br>Social<br>Technical<br>Other | Teacher (primary to secondary level), journalist, librarian<br>Economist (long college education)<br>Engineer (long college education)<br>Nurse, midwife, health visitor, physiotherapist |
| University | Humanistic<br>Social<br>Technical<br>Other | Teacher (upper secondary level)<br>Economist, MA<br>Engineer (university education)<br>Doctor, dentist, pharmacist |

In table A1.3 we show in more detail the variables in our analysis.

Table A1.3 Explanation of variables

| Code | | Description |
|---|---|---|
| ln(wage)<br>age<br>sec<br>gen | | Log of hourly earnings (deflated with general sample increase in wages)<br>Age<br>Years of continuous tenure in present employment sector<br>Years of general experience on the labour market |
| Unskilled | | Unskilled; reference category for education dummies |
| Skilled | soc<br>tec<br>oth | Dummy; 1 if skilled in social sciences<br>Dummy; 1 if technically skilled<br>Dummy; 1 if other (skilled) education (mainly medical) |
| Short college | hum<br>soc<br>tec<br>oth | Dummy; 1 if short college education in humanities<br>Dummy; 1 if short college education in social sciences<br>Dummy; 1 if short college technical education<br>Dummy; 1 if other short college education (mainly medical) |
| Long college | hum<br>soc<br>tec<br>oth | Dummy; 1 if long college education in humanities<br>Dummy; 1 if long college education in social sciences<br>Dummy; 1 if long college technical education<br>Dummy; 1 if long college education (mainly medical) |
| University | hum<br>soc<br>tec<br>oth | Dummy; 1 if university education in humanities<br>Dummy; 1 if university education in social sciences<br>Dummy; 1 if university technical education<br>Dummy; 1 if other university education (mainly medical) |

In table A1.4 we show some summary statistics on the variables in the analysis. These statistics are shown by sector of employment and gender.

Table A1.4 Descriptive statistics on the wage data set

| | | Export sector | | Home-market sector | | Public sector | |
|---|---|---|---|---|---|---|---|
| | | Male | Female | Male | Female | Male | Female |
| Observations | | 79,003 | 37,969 | 79,320 | 58,181 | 38,369 | 82,236 |
| ln(wage) | | 3.37 | 2.82 | 3.28 | 3.22 | 3.40 | 3.23 |
| Age | | 26.9 | 28.2 | 26.6 | 27.0 | 30.0 | 31.3 |
| Sector experience | | 3.1 | 3.0 | 3.3 | 3.4 | 3.6 | 3.3 |
| General experience | | 6.7 | 6.4 | 6.3 | 6.0 | 6.7 | 7.0 |
| Education (0/1) | | | | | | | |
| Unskilled | | 0.37 | 0.31 | 0.31 | 0.31 | 0.31 | 0.32 |
| Skilled | soc | 0.12 | 0.27 | 0.17 | 0.38 | 0.07 | 0.15 |
| | tec | 0.33 | 0.26 | 0.29 | 0.18 | 0.18 | 0.09 |
| | oth | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.06 |
| Short college | hum | 0.00 | 0.03 | 0.00 | 0.02 | 0.03 | 0.11 |
| | soc | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| | tec | 0.05 | 0.02 | 0.03 | 0.01 | 0.04 | 0.01 |
| | oth | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 |
| Long college | hum | 0.00 | 0.03 | 0.01 | 0.02 | 0.08 | 0.07 |
| | soc | 0.02 | 0.02 | 0.04 | 0.02 | 0.01 | 0.01 |
| | tec | 0.06 | 0.01 | 0.05 | 0.01 | 0.03 | 0.00 |
| | oth | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.10 |
| University | hum | 0.00 | 0.01 | 0.01 | 0.01 | 0.05 | 0.02 |
| | soc | 0.01 | 0.01 | 0.03 | 0.02 | 0.05 | 0.02 |
| | tec | 0.03 | 0.01 | 0.05 | 0.01 | 0.07 | 0.01 |
| | oth | 0.00 | 0.01 | 0.00 | 0.00 | 0.05 | 0.02 |

Source: The data come from a random sample of 10% of the entire population drawn from administrative files.

In table A1.5 we show estimation results for the wage equations for the two private sectors in our study. Hence these tables correspond to the similar table for estimation results for the wage equation in table 4.1 in chapter 4.

Table A1.5 ln wages for the private sectors, fixed effects regression

| Coefficients | | Export sector | | | | Home-market sector | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Male | | Female | | Male | | Female | |
| Intercept | | 1.048 | (0.002) | 1.431 | (0.004) | 0.585 | (0.003) | 1.785 | (0.003) |
| Age | | 0.154 | (0.004) | 0.129 | (0.005) | 0.187 | (0.004) | 0.085 | (0.004) |
| $Age^2$ | | -0.003 | (0.004) | -0.003 | (0.000) | -0.004 | (0.000) | -0.002 | (0.000) |
| $Age^3$ | | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) |
| General exp. | | 0.103 | (0.003) | 0.142 | (0.004) | 0.106 | (0.002) | 0.148 | (0.003) |
| General $exp.^2$ | | -0.014 | (0.000) | -0.018 | (0.000) | -0.012 | (0.000) | -0.018 | (0.000) |
| General $exp.^3$ | | 0.000 | (0.000) | 0.001 | (0.000) | 0.000 | (0.000) | 0.001 | (0.000) |
| Sector exp. | | 0.031 | (0.002) | 0.044 | (0.003) | 0.048 | (0.002) | 0.039 | (0.002) |
| Sector $exp.^2$ | | -0.004 | (0.000) | -0.005 | (0.000) | -0.007 | (0.000) | -0.005 | (0.000) |
| Sector $exp.^3$ | | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) |
| Education | | | | | | | | | |
| Skilled | soc | 0.083 | (0.007) | 0.014* | (0.007) | 0.092 | (0.008) | 0.059 | (0.005) |
| | tec | 0.066 | (0.004) | -0.076 | (0.006) | 0.110 | (0.005) | 0.022 | (0.005) |
| | oth | 0.158* | (0.158) | 0.153 | (0.031) | -0.006* | (0.097) | 0.152 | (0.031) |
| Short college | hum | 0.176* | (0.054) | 0.210 | (0.017) | 0.258 | (0.051) | 0.310 | (0.017) |
| | soc | 0.099* | (0.032) | 0.036* | (0.030) | 0.244 | (0.043) | 0.134 | (0.033) |
| | tec | 0.134 | (0.009) | 0.052* | (0.022) | 0.250 | (0.014) | 0.133 | (0.024) |
| | oth | 0.261 | (0.112) | 0.114 | (0.033) | 0.276* | (0.257) | 0.074* | (0.028) |
| Long college | hum | 0.127 | (0.038) | 0.102 | (0.016) | 0.310 | (0.028) | 0.260 | (0.016) |
| | soc | 0.326 | (0.015) | 0.222 | (0.023) | 0.361 | (0.015) | 0.271 | (0.018) |
| | tec | 0.281 | (0.008) | 0.289 | (0.025) | 0.395 | (0.010) | 0.372 | (0.024) |
| | oth | 0.260 | (0.129) | 0.309 | (0.041) | 0.364* | (0.181) | 0.430 | (0.052) |
| University | hum | 0.218 | (0.039) | 0.346 | (0.034) | 0.286 | (0.027) | 0.405 | (0.023) |
| | soc | 0.357 | (0.016) | 0.352 | (0.029) | 0.424 | (0.012) | 0.405 | (0.015) |
| | tec | 0.367 | (0.011) | 0.418 | (0.028) | 0.451 | (0.010) | 0.448 | (0.017) |
| | oth | 0.436 | (0.040) | 0.436 | (0.032) | 0.380 | (0.062) | 0.465 | (0.036) |
| Number of obs. | | 71,982/16,917 | | 33,674/7,970 | | 71,961/16,031 | | 52,483/11,258 | |
| $R^2$ | | 0.28/0.15 | | 0.31/0.15 | | 0.39/0.23 | | 0.34/0.19 | |

Source: The data come from a random sample of 10% of the entire population drawn from administrative files.

Note: An asterisk (*) denotes insignificance at the 0.001 level.

In table A1.6 we show some descriptive statistics on the mobility among the different sectors. We show the average value of the different variables for each type of mobility in each of the three sectors. These three types of mobility are either to move to one of the two other sectors or to stay in the present sector. For instance, for the public sector we show average values of the variables in the analysis for those who move to the private export sector, those who move to the private home-market sector and those who stay in the public sector.

Table A1.6 Descriptive statistics on the mobility data

| Variable | | Male | | | Female | | |
|---|---|---|---|---|---|---|---|
| | | 3→1 | 3→2 | 3→3 | 3→1 | 3→2 | 3→3 |
| Age | | 25.7 | 26.9 | 31.3 | 26.9 | 27.3 | 32.3 |
| General experience | | 6.3 | 6.4 | 7.6 | 6.3 | 6.2 | 7.8 |
| Sector experience | | 1.8 | 2.0 | 3.6 | 2.1 | 2.1 | 3.3 |
| ln (wage gap) | | | | | | | |
| **S** between the public and the export sector | | 0.02 | 0.56 | 0.43 | -0.35 | -0.32 | -1.84 |
| **S** between the public and the home-market sector | | -0.68 | -0.29 | -0.97 | -0.56 | -0.55 | -1.31 |
| Unskilled | | 0.29 | 0.25 | 0.27 | 0.23 | 0.22 | 0.26 |
| Skilled | soc | 0.12 | 0.15 | 0.07 | 0.33 | 0.38 | 0.18 |
| | tec | 0.37 | 0.31 | 0.17 | 0.22 | 0.18 | 0.09 |
| | oth | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 | 0.06 |
| Short college | hum | 0.00 | 0.00 | 0.03 | 0.02 | 0.02 | 0.11 |
| | soc | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 |
| | tec | 0.05 | 0.04 | 0.05 | 0.03 | 0.02 | 0.01 |
| | oth | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.01 |
| Long college | hum | 0.01 | 0.02 | 0.10 | 0.03 | 0.02 | 0.08 |
| | soc | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 |
| | tec | 0.05 | 0.04 | 0.03 | 0.01 | 0.01 | 0.00 |
| | oth | 0.00 | 0.00 | 0.01 | 0.03 | 0.02 | 0.11 |
| University | hum | 0.00 | 0.01 | 0.05 | 0.01 | 0.01 | 0.03 |
| | soc | 0.02 | 0.05 | 0.06 | 0.00 | 0.03 | 0.02 |
| | tec | 0.05 | 0.09 | 0.07 | 0.01 | 0.03 | 0.01 |
| | oth | 0.01 | 0.01 | 0.06 | 0.01 | 0.01 | 0.02 |
| Number of observations | | 1,361 (4.4%) | 1,357 (4.5%) | 27,218 (91.1%) | 753 (1.2%) | 1,191 (2.0%) | 58,750 (96.8%) |

Source: The data come from a random sample of 10% of the entire population drawn from administrative files.

Note: The symbol 3→1 signifies a shift from the public to the export sector; similarly, 3→2 from the public to the home-market sector and 3→3 for staying in the public sector from one year to the next.

# Appendix 2

## Register Data

In this memo we have used data based on administrative registers compiled from Statistics Denmark. Register data have various advantages over the usually employed survey data because the data are provided continuously on a yearly basis for all individuals in the sample and the data quality is generally very high (i.e. minimal attrition problems). The weakest point of the register data employed is that the data do not contain an exact measure of working hours.

Apart from the restrictions cited in section 3.1, other restrictions on the data set are: (i) self-employed are excluded, (ii) persons with less than full-time employment during the whole observed year are excluded (because of measurement problems of hourly wages), (iii) observations with missing information on either the employment sector or education are excluded and (iv) the hourly wage must be of a »reasonable size« (up to 500 DKK in 1980-prices). The final data set contains information on about 94,000 individuals, on average observed for four years. All in all there are thus more than 375,000 observations. The wage estimation, though, is performed on only 340,000 observations, because the within transformation requires at least two observations per person.

The variable for general experience (*gen*) measures the accumulated work experience since entering the labour market as a wage earner. The variable is constructed from information on the Danish Labour Market Supplementary Pension Fund (ATP). This register counts so-called pension-points, which is a stepwise linear function of hours worked in a given period. The variable for hourly wages (ln(*wage*)) is constructed from these pension-points as well, because it is a measure for the hours worked over a year. From the register for income tax return, we have information on the

yearly labour income which we divide by the hours worked according to the pension-points in order to get hourly wages. The way we have restricted the sample to full-time work, we have excluded the most unreliable observations on hourly wages which are those on part-time work. But still, overtime work will not be reflected in a rising amount of pension-points and thus our variable for hours worked will not rise due to overtime work. The problem is that the yearly income reported on the income tax return will rise due to payed overtime work. This will artificially blow up our measure for hourly wages for persons with overtime work.

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# Sammenfatning

## Løngab og mobilitet ud af den offentlige sektor

*af Beatrice Schindler Rangvid, Anders Holm og Hans Hummelgaard, Januar 2001*

For offentligt ansatte vokser løngabet til den private sektor, jo længere man har været ansat inden for det offentlige. Samtidig falder antallet af offentligt ansatte, som skifter job til den private sektor. Dette paradoks er emnet for denne rapport.

Mobiliteten ud af den offentlige sektor er således højest for de nyansatte, omend det højest er 12% af denne gruppe, som forlader den offentlige sektor i løbet af et år. Andelen er markant lavere for folk med blot få års anciennitet, og for ansatte med 15 års anciennitet skifter under 1% til et job i den private sektor på trods af, at lønningerne her i gennemsnit er 15-20% højere. Mobiliteten afhænger meget af uddannelse, således at ufaglærte og personer med en teknisk uddannelse i højere grad skifter end personer med en humanistisk uddannelse (fx lærere og pædagoger). For alle uddannelsesgrupper gælder dog, at det er få med mange års anciennitet, som flytter.

Umiddelbart ser al økonomisk teori om arbejdskraftens bevægelighed ud til at falde til jorden, når man betragter de offentligt ansattes adfærd på arbejdsmarkedet. Ifølge teorien skulle et stort antal strømme væk fra den offentlige sektor, så længe der kan tjenes mere i den private sektor. Spørgsmålet er, om lønnen overhovedet har betydning for mobiliteten på arbejdsmarkedet. At svare på dette spørgsmål har krævet dyberegående undersøgelser, da lønstatistikkerne og tallene for mobiliteten ikke i sig selv kan give det rigtige svar.

I den økonomiske teori er antagelsen, at lønnens størrelse bl.a. afhænger af erhvervserfaringen. Men i stedet for blot at se på sammenhængen mellem løn og erhvervserfaring i almindelighed er erhvervserfaringen i dette projekt som noget nyt opdelt i erhvervserfaring optjent i det offentlige og erhvervserfaring optjent på det private arbejdsmarked. Herved ses det tydeligt, at det betyder meget for aflønningen, om man er beskæftiget på det arbejdsmarked, hvor man hovedsageligt har sin erhvervserfaring, eller om man er endt et andet sted. Det vil sige, at fx den skolelærer, der hele sit arbejdsliv har været beskæftiget inden for skolevæsenet, faktisk vil få mere end svært ved at finde et job på det private arbejdsmarked, der matcher den løn, der fås i det nuværende job. Det tilsvarende gælder naturligvis for sælgeren i den private sektor, der efter nogle års anciennitet som sælger vil have svært ved at finde en stilling i den offentlige sektor, som matcher hans nuværende løn. Det skyldes ikke kun den generelle forskel i lønniveauet, men også fordi den erfaring, som sælgeren har opbygget, ikke fuldt ud kan udnyttes i det offentlige. Selv om der findes stillinger i det offentlige, der lønmæssigt modsvarer hans nuværende stilling, har han ikke kvalifikationerne til at få dem.

Det er der måske ikke meget nyt i, da det ikke på forhånd kan forventes, at erfaring inden for ét erhverv kan flyttes til et andet og udnyttes optimalt. Men det betyder dog, at den lønforskel, man ud fra statistikkerne kan konstatere mellem den offentlige og den private sektor ikke – ifølge vore analyser – i realiteten er nær så stor, som man umiddelbart skulle tro. De færreste ansatte vil efter nogle års ansættelse kunne få en stilling i en anden sektor, som matcher deres nuværende løn.

Men hvad så med de lærere og humanister, der ifølge debatterne i tidens løb har fundet vej til den private sektor? Hertil kan siges, at det for det første ikke er mange, og for det andet er der overvejende tale om nyuddannede eller folk med få års erhvervserfaring, som derfor ikke vil have nogen væsentlig sektorspecifik erhvervserfaring, der vil »gå tabt« ved et skift til den private sektor.

Når man regner med de korrekte lønforskelle mellem det private og det offentlige arbejdsmarked – altså tager hensyn til, hvor ancienniteten er optjent, viser det sig, at lønforskelle faktisk giver anledning til mobilitet mellem den offentlige og den private sektor. Det vil sige, at hvis den 45-årige skolelærer får et gunstigt løntilbud fra den private sektor, sker det

ganske ofte, at han skifter job og erhverv. Løntilbudet kommer bare sjældent, fordi lærerens kvalifikationer i betydelig grad er bundet til skoleverdenen.

Og det er præcist derfor, at vi kan observere, at det generelle løngab mellem den offentlige sektor og den private kan vokse, jo mere anciennitet man opnår samtidig med, at mobiliteten mellem de to sektorer falder.

Specielt i årene med et betydeligt underskud på betalingsbalancen og ledighed var mange bekymrede for, at den veluddannede arbejdskraft i den offentlige sektor ikke kunne trækkes over i eksporterhvervene for derved at være med til at styrke deres konkurrenceevne. I dag kan bekymringen nærmere gå på, om der er tilstrækkelig fleksibilitet på arbejdsmarkedet til at løse flaskehalsproblemer i såvel den private som offentlige sektor, selv om der betales højere og højere lønninger i de flaskehalsramte sektorer.

Denne rapport viser, at det er muligt at flytte arbejdskraft mellem fx den offentlige og private sektor, hvis der kan tilbydes de ansatte højere løn end den, de har i deres nuværende stilling. Men det sker som sagt sjældent. Hvis der skal ændres på dette, kan der principielt være flere muligheder. Offentlig støtte til efteruddannelsesaktiviteter vil kunne bidrage til, at der i højere grad iværksættes efter- og videreuddannelsesaktiviteter med henblik på, at allerede ansatte kan tilegne sig de relevante kvalifikationer inden for de »betrængte« sektorer. Der vil givetvis også skulle gives kompensation for den arbejdstid, der anvendes til uddannelsen, hvis mobiliteten skal øges i et større omfang. En anden mulighed vil være i højere grad at tilskynde til, at unge vælger de uddannelser, der sigter på de erhverv og områder, hvor der især skønnes at være særligt behov for arbejdskraft.

Den sidste mulighed vil givetvis være den samfundsmæssigt billigste, men det er også en løsning, der kun har en ringe virkning på kort sigt, idet det i givet fald tager en længere årrække, inden antallet med en given uddannelse kan øges betydeligt i et bestemt erhverv.