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Abstract: We propose a measure of changes in individual pension entitlements resulting from a change of jobs, which is termed *potential portability gain*. This measure is used to study the impact of defined benefit occupational pensions on labour market mobility. We base our analysis on a descriptive overview of worker mobility between jobs in the Norwegian public and private sectors between 2001 and 2003. Estimation results indicate that the effect of pensions on the propensity to change jobs is either weak or non-existent. Furthermore, we regress both immediate wage changes and subsequent wage growth on the portability gain for job movers, and find no signs that gains or losses in pension entitlements are reflected in the new wage. Standard wage equations estimated separately for movers before and after the move support this result by giving the same coefficient for the portability gain. Results for earlier job change periods, 1997 – 1999 and 1999 – 2001, give the same results. This leads us to conclude that occupational pensions are of negligible importance for labour market mobility.

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1. Introduction

A feature of defined benefit (DB) occupational pensions is that changing jobs entails gains or losses (depending on the age at transition) in terms of overall pension entitlements. Inefficiencies may arise in the labour market if employees covered by DB pensions tend to change jobs more or less often than they would if pension entitlements were fully portable. This paper sheds light on the link between the non-portability of DB pensions and labour market mobility by addressing the following questions: (i) whether gains (losses) in pension entitlements are associated with a higher (lower) propensity to change jobs, and (ii) whether gains (losses) in pension entitlements are reflected in the new wages for those who do change jobs.

A literature going back to Lazear (e.g. Lazear and Moore (1984)) argues that the separation of the value of marginal product of labour and wages at any point in time may be in the interests of employers seeking to retain the services of employees who have accumulated both establishment specific and generic human capital.² Hence, a portion of the pay is delayed by transformation into a pension; see Ippolito (1987) for an early study.

In the public sector, civil service pension rights are typically not fully portable and labour flows between the public and private sectors carry a loss. The underlying reasoning here is that governments find it convenient, for reasons related to current budget balance, to delay part of the compensation of public officials.

On the other hand, the theory of labour market search stresses the role of labour market mobility in developing good matches of individuals and jobs. In this context, portability of pensions across countries, particularly within the EU, has caught attention. Fenge and Weizsäcker (2009) look at portability losses following cross country mobility and identify features of public pensions systems which create these losses.

² In earlier contributions Lazear also argues that in a setting with lifetime contracts, deferred compensation could be a way of minimizing the cost of inducing optimal effort from both younger and older workers (see e.g. Lazear (1981)). In such a setting, occupational pensions would be considered as an "extreme" form of deferred compensation, as a considerable amount of the total payment is being withheld until retirement.

The issues above raise the question of the extent to which defined benefit pension plans inhibit labour mobility. Although defined contribution (DC) plans are becoming more dominant in developed economies, DB plans are still very important in many public sectors, and also in the private sector in many countries. Even if these are often closed to new entrants, DB plans have been promised to workers entering retirement for decades to come.

Our analysis is based on a large sample of workers extracted from a unique source of linked employer-employee register data, providing demographic information and career histories of the entire Norwegian working-age population. In addition, annual balance sheets data of each company identify which companies are operating an occupational pension plan. We link the two data sources to identify labour flows between full time, full year jobs, with no spell of unemployment, long sick leave, disability, or receipt of social security in-between jobs. The observed job changes are therefore likely to be voluntary and not much contaminated by layoffs.

To study the impact of DB pensions on labour market mobility, we propose and calculate a measure of changes in individual pension entitlements resulting from a change of jobs, which is termed (*potential*) *portability gain*. This is defined as the increase (or decrease) in compensation rate, measured in terms of projected final wage. The potential portability gain varies with age, wage and tenure, and calculated values range from about -10 to about 15 percent of final wage for different groups of potential movers. Most workers are facing fairly moderate gains and losses (within the range of +/- 2 percent). Due to the complex rules for portability, which we apply in full detail, there is variation in portability gain which is not perfectly correlated with age, wage and tenure.

Using the potential portability gain as a proxy for the pension costs of changing jobs, we employ probit models to estimate job change propensity equations. The analysis makes use of a wide range of individual and firm specific characteristics, and reveals no signs of lock-in effects due to DB pensions.

Even if portability losses do not influence mobility as such, they could be compensated and thereby influence wages. To look at this, we first restrict attention to those who did actually change jobs during 2002 (the transitional year), we regress both

the immediate wage change and subsequent four-year wage growth on portability gain (and other controls). Again, there are no signs of any clear association between wages and portability gain. In a final check we estimate wage equations for movers with pension gain and rich set of controls, before and after the move. The pre-move wage equation should pick up non-compensatory, structural relationships between pension loss and wage, and the post-move equation should pick up also compensatory effects. However, the pension gain coefficients are nearly identical, indicating a lack of compensatory effects.

To check for robustness against demand side influences we estimate the models for two other periods (1997 - 1999 and 1999 - 2001). The three periods have falling, constant and rising unemployment, respectively. The results are largely the same. This leads us to suggest that occupational pensions are of limited importance for labour market mobility, contrary to what theoretical reasoning would suggest.

The paper is organized as follows: Section 2 gives an overview of the existing empirical literature on labour market mobility and pension portability, and explains how our contribution adds to the picture. This is followed by a brief description of the Norwegian pension system and the sources of portability gains and losses used in the analysis (Section 3). By means of a numerical illustration we show how the portability gain varies with age, wage, and values of parameter such as the future adjustment of the public pension. Section 4 describes data sources and the chosen sample, consisting of all full time workers observed in one job throughout 2001 and in one job (not necessarily the same) throughout 2003. We also discuss the definition of job change, related to statistical problems with identifying firms within multi-firm companies. With our chosen definition of job change, about 10% of the workers in our sample do change jobs at some point during 2002. Within-sector mobility is clearly dominating in both the private and in the public sector, but there is also a tendency to move from private enterprises without to enterprises with an OP. We also describe average wages and wage change for different groups of workers. Somewhat surprisingly, wage changes

over the period we look at do not appear to have any strong relationship to loss of pension coverage. This will be investigated in the econometric analyses.

Section 5 introduces the notion of “potential portability gain”, which is the numerical measure we propose for assessing the existence of lock-in effects due to occupational pensions. We start with the theoretical specification, before we move on to calculating the gains and losses for different groups of individuals in our sample.

Section 6 presents the results of an econometric model used to investigate the association between the potential portability gain and the propensity to change jobs. The analysis reveals no signs of lock-in effects due to DB pensions. Section 7 restricts attention to those who actually did change jobs and investigates whether actual portability gains and losses tend to be reflected in the wage in the new job. In Section 8 we estimate and compare wage equations for job movers before and after the move. The coefficients for pension gain are almost identical, and we argue that this too suggest a lack of compensation.

Throughout, we use three different job change periods, 1997 – 1999, 1999 – 2001 and 2001 – 2003. Again, there are no signs of any clear relation between wages and portability gains. Section 9 concludes.

2. The literature

Identification of any effect on labour market mobility of pension portability gains and losses is a challenging task, and this is reflected in the existing empirical literature. As pointed out by Gustman and Steinmeier (1993), tenure and quit propensities appear to vary between non-pension and pension jobs, and not to any great extent between DC and DB plans. In an econometric analysis of job changes, they find that the backloading component is of minor importance, whereas persons in pension covered jobs are in better positions, so their alternatives are less attractive and they have less to gain by moving. Gustman and Steinmeier also argue that the losses are relatively small and easily can be compensated by a wage increase. The mobility among pension covered workers was one third of that among non-pension covered, and of the difference of 14 percentage points, less than 1 was due to backloading and around 8 to the remaining compensation being high compared to their alternatives.

The major challenge related to the identification of mobility effects is that we observe only the option which was actually chosen: the new job for those who move

and maybe a changed compensation for those who stay. Pre-selection into pension covered jobs may result in unobserved and systematic differences in preferences and options between pension covered and non-covered workers. Pension covered workers may have higher productivity so they get a higher total compensation, and they may differ in preferences, by being for instance more forward looking and thus tending to prefer a package with a larger pension component. Separation of the effects of selection and incentives therefore becomes difficult.

The existing literature generally relies on estimating the job change options by imposing a correlation structure or by using instruments, sometimes from institutional changes or special features of pension systems.

Mealli and Pudney (1996) focus on the unobserved characteristics of pension covered workers by allowing for unobserved heterogeneity in a duration model with competing risks. They find substantially longer duration of pensionable jobs, but do not find evidence that selection is important. Hence they conclude (tentatively) that the pension coverage is the direct cause of lower mobility. However, they only distinguish between three types of jobs, pensionable, non-pensionable and other employment (mainly self-employment), without any further characteristics. Other characteristics with the pensionable job could therefore well be the cause of the results.

Rabe (2007) estimated alternative (also counterfactual) wages for movers and stayers in a switching regression approach, with geographical proximity to parents as an instrument, assuming that it affected mobility but not wages. There was no attempt to control for wage level or selection into pre-mobility pension coverage. Alternative wages are modelled and predicted, and there is no use of actual pre-mobility wages. Mobility is then estimated as a function of pension coverage or pension capital loss, both of which do significantly hinder mobility, as well as of the predicted wage difference between moving and staying. The latter was entered in terms of current wage without any attempt to construct life long variables, and was not significant.

Initial selection was tackled by Andrietti (2004) who used pension offer rates by industry, union coverage and firm size as instruments for pension coverage to take account of “stock sampling” in a hazard rate framework. On the other hand, he made no attempt to model post-mobility wage or pension coverage. Pension capital loss is not directly measured, but imputed as the typical private sector pension plan. The instrumenting removes the significance of the pension portability loss, and the author

suggests that the lower mobility among pension covered workers may be due to these being in better jobs (in addition to pension coverage). The results may be due to the lack of specification of alternatives inherent in the approach.

The unobserved characteristics of pension covered workers is the focus of Ippolito (2002), who uses voluntary pension contribution to distinguish “savers” from other types of workers. This proves more predictive of mobility behaviour and supports the notion that selection is more important than incentives in explaining quit behaviour.

Disney and Emmerson (2004) utilize a feature of the British occupational pension system, whereby workers may choose not to participate in the OP of the firm, but instead opt to take part in a system run by the state. Their findings indicate that there are indeed selection mechanisms at work, and the incentive effect is much less clear.

In this study we have chosen to rely on as few assumptions as possible when looking for an effect on mobility of pension portability gains and losses. Instead, we develop a measure termed “potential portability gain”, which is the change in pension entitlements incurred by a person moving to another firm with the same pension type and the same future wage trajectory. This measure circumvents the problem of identifying potential wage change and changes in pension entitlements from all potential job movements. The potential portability gain may be either positive or negative, depending on the age at transition.

The potential portability gain does not rely on actual job change alternatives and can be calculated for everyone, based on their current age, wage, tenure and pension coverage. We argue that the potential portability gain is influenced by tenure, age and wage, in a way that is unlikely to be exactly reflected in employer preferences and therefore not completely offset in a new job. Hence, the smaller the potential portability gain (or the larger the potential loss), the lower the probability of moving and the higher the new wage received by those who actually move. If there is a lock-in effect, we should find evidence of these two relationships.

3. The Norwegian pension system

A general feature of the Norwegian DB-based OP-system is that there are separate systems for the public and the private sector. The public sector OP is fully integrated with the (universal) public pension system and will give 66 % of final wage with 30

years of service. The private sector OP is supplementary to the public pension, but is usually designed to give a compensation which targets a given percentage of final wage (most often between 60 and 66 %) when taken together with the public pension. The requirement for full accrual is often 30 years of membership. In practice, the DB-based occupational pensions in the private sector are calculated as the difference between total pensions (as a fraction of the final wage) and a stipulated public pension. This stipulated public pension is calculated at the age of 67, based on the assumption that annual earnings over the working life have always been equal to the current wage in terms of public pension points. This means that the stipulated public pension may differ from the actual public pension, and that the actual compensation rate may differ from the target. It also means that changes in the public pension, for instance with respect to indexation, will give rise to changes in the occupational pension.

A newly hired individual in an enterprise with a pension plan will automatically enter into the plan, since these plans generally have to cover all employees in a given enterprise if contributions are to be tax preferred. Depending on the age at transition, the employee may or may not earn a full pension in the new enterprise. If a person moves from a private sector enterprise with an OP of DB type after at least one year of employment, the entitlements from the previous enterprise will be converted into a deferred entitlement. There are no further contributions, and the interest on the capital is quite low. It is converted into a pension at retirement, almost universally at the age of 67. This is what Ippolito (1987) calls quit pension, which we will denote QP. In the public sector, three years are required for a deferred pension, but shorter employment will count if the persons return to the public sector.

For an individual changing jobs, even if the sum of tenure in the initial and in the next enterprise is sufficiently high to fulfil the requirement for full accrual, the sum of QP and the pension from the new enterprise (NP) may not equal the pension she would have received from the old enterprise if she had chosen to stay (stay pension in the terms of Ippolito (1987), here denoted SP). The reason for this is the low return on the QP according to current rules. On the other hand, if the sum of years of accrual is large enough, there may be a gain in terms of pension benefits resulting from a change of jobs. If the person manages to achieve full accrual in the new job, any previous entitlements come on top of the benefits accumulated in the new job.

Portability loss is a fairly common feature of DB plans across countries, but the magnitude of the loss depends on the specific rules. Blake and Orszag (1998) give a thorough description of the British case. As for the case of Norway, the pensions are usually designed to add on to the public pension, and indexation of public pensions will therefore also matter for the portability loss.

To construct an illustrative example of how the three types of pensions depend on the values of different parameters, we compare pensions in two alternatives: staying in current job (SP) or moving to another private sector pension enterprise (QP+NP), both with 66 % compensation rate and with the same wage.³ In the numerical examples below we consider individuals with tenure from the age of 30 (age of entry into the pension programme of the current enterprise), and vary age at the time of potential transition. The wage is set at 500 000 NOK (about 50 % above average full time earnings). The parameters are chosen in accordance with a set of accounting recommendations for Norwegian firms in the relevant period. We assume an annual wage growth of 4.5 % and an annual adjustment of the Basic amount (G) at 4.25 %.⁴ The return on a QP is set at 65 % of the difference between the actual capital return in the insurance company which manages the firm's OP, and a deduction of 3 %. Still following the recommendations, the annual capital return is set at 5.75 %, which leaves $0.65 * (5.75 - 3) = 1.7875$ % in annual return on the QP until the age of 67. The recommended values are shaded in Table 1, and these are also the ones used in the econometric exercises in Sections 6 - 8. In Table 1 we have also shown alternatives where we vary the rate of growth in wages and in G to illustrate the impact of any variation in these parameters.

We measure pensions in terms of projected pensions starting at the age of 67, and compare alternative packages of final wage (projected to age 67) and pensions. We do not attempt to make these packages comparable by conversion into present values. This

³ Transitions out of pension coverage will of course imply that only the QP remains, and transitions from non-coverage to private sector coverage imply that the gain is NP.

⁴ The Basic amount is frequently referred to as G, and is a central feature of the public pension system in Norway. G is adjusted every year, with a nominal rate of growth varying between 2 and 14 % since it was introduced in 1967. For further details on G and on the public pension system in general, see e.g. Iskhakov (2008).

would have implied additional assumptions on longevity and other parameters, which we will not impose in this paper.

Not surprisingly, the difference between moving and staying increases with age at transition. A crucial age is 36, at which there is still time for full accrual in the new job, given the usual 30 years requirement and retirement at the age of 67. After that age, the loss on the QP becomes larger and will at some point not be compensated by the new pension. With the complex relationship between OP and the public pension, it is still possible to gain from a later transition, but the general pattern is that the loss increases with age. This is also illustrated in Section 5, where we calculate portability gains based on actual observations.

A positive mobility premium may occur if the change in G is high relative to the wage change (and to the return on the QP). The gap between the public pension (determined by the G) and the total pension then becomes small, which translates into a small contribution from the new enterprise. The QP is not affected by this. Consequently, it pays for the employee to move at higher ages.

In the opposite case, with a high wage change relative to the change in G, the gap between public pensions and total pensions increases. If the employee stays, the establishment has to cover the whole gap, whereas a new establishment has to cover only the gap for the part of the pension which accrues there. With 7 % wage change and 3 % increase in G, the pension loss is 24 % from a transition at age 50 and 5 % at age 40.

The public sector has its own rules concerning the system of occupational pensions. If a person moves out of the public sector with at least three years of tenure, she carries with her any pension entitlements, but the accrual requirement for a full pension increases from 30 to 40 years. Furthermore, the pension entitlement is fixed to the position which she left, without any compensation for normal advancement. This is important, since all public sector pensions are defined in terms of the final wage, with a compensation rate of 66 % at full accrual. A job change into the public sector is similar to a move into a private sector job, with 30 years required for full pension, which is then 66 % of final wage.

Table 1. Occupational pension in 1000 NOK with 66 % compensation for a person with tenure from age 30 and a wage of 500 000 NOK per year, 1.7875 % return on the QP. Move between private sector establishments at age 40 and 50.

	Annual G increase %								
	4.25%			7%			4.25%	7%	
	<i>SP</i>	<i>NP</i>	<i>QP</i>	<i>SP</i>	<i>NP</i>	<i>QP</i>	$\frac{NP + QP}{SP}$		
Wage growth	<i>Transition at age 40</i>								
4.5	482	433	64	266	239	64	1.03	1.13	
7	1304	1173	64	851	766	64	0.95	0.98	
	<i>Transition at age 50</i>								
4.5	287	163	105	184	104	105	0.93	1.24	
7	552	313	105	406	230	105	0.76	0.83	

4. Data and empirical overview

4.1. Data sources

We have two main sources of data. One is a set of register data, obtained from Statistics Norway and based on administrative registers. These cover the whole population over the period 1992 – 2007 and give demographic and labour market information for all residents. In particular, all job spells are identified separately with the wage received and the organizational number of the enterprise and of the establishment.

The second type of data is enterprise based financial information recorded by the authorities, for all enterprises. In the observation period, all pension entitlements with a magnitude of any significance were of the DB type. Enterprises with a DB pension plan for the employees have to set aside assets to cover pension liabilities. These assets are kept in legally separate entities (funds or contracts with an insurance company) in order to safeguard them against company failure. The contributions are usually made annually, based on estimates of pension liabilities and assets. By the end of each year when the annual accounts for the enterprise are made up, pension assets and liabilities are usually not identical, and under or over funding enters the balance.⁵ These data are available from 1992, and enable us to identify enterprises operating a DB pension plan. The magnitude of the pension balance itself is not informative in our context, the interesting thing is whether it occurs or not. The probability of exactly nil balance is negligible.

Since the register data does not contain information on pension plan participation, we use the enterprise number to link enterprise information, in particular OP status of the enterprise, to each employee. The OP regulations stipulate that if the pension contribution is not to be taxed as profit in the enterprise, a number of requirements must be met. Among these are the requirements that a pension plan has to cover all employees and that the compensation rate (the sum of public pension and OP

⁵ In the case of changes in regulations, any resulting under-funding may be smoothed for up to 20 years, so that only a part of this will affect cost and the balance sheet.

divided by the final wage) is non-increasing in wage (in practice it is constant). Therefore, these data sets allow us to divide the private sector enterprises into two sub-groups, the ones that offer OPs and the ones that do not, based on whether or not the reported pension liabilities are different from zero. We assume that a full time worker hired in an OP enterprise is covered by the enterprise's OP scheme.

The empirical overview in the following sections covers the period 2001 – 2003. We have also constructed the same data for the periods 1997 – 1999 and 1999 – 2001. The broad picture is the same, and these tables are included in Appendix 1.

4.2. The sample and identification of job changes

Given the rules of pension coverage, we focus on shifts between permanent full time jobs, and after limiting the sample to full time workers⁶ who held the same full time job throughout 2001, the sample is reduced to about one million employees (Table 2). In order to make sure that we have reliable information on full time jobs, we let 2002 be a transitional year and look at job changes from 2001 to 2003.⁷ Individuals moving out of the labour force are excluded, as we focus the analysis on direct job-to-job transitions (i.e. we exclude those that have been receiving disability pensions, unemployment benefits or social security benefits during the transitional year and those that have been participating in vocational rehabilitation). Starting from the one million full time, full year workers in 2001, this leaves us with 736 000 individuals who were in the same full time job in 2001 and 2003, or who changed between two full time jobs during 2002.

With the final restrictions that all private sector enterprises must be identified in the balance sheet data, so that their OP status is to be considered as known, and that we are able to attach to all individuals the most essential demographic characteristics⁸, we

⁶ Full time workers are identified on the basis of three criteria that are required to be fulfilled simultaneously: they are classified as full time workers, working at least 32 hours per week, and with a weekly salary of at least 500 NOK. The labour force in 2001 force was 2.3 million persons, including self-employed, part-time employed and unemployed.

⁷ We base the empirical overview on data for job change between 2001 and 2003. To check the importance of business cycles, we use also data on job change between 1997 and 1999 and between 1999 and 2001 in the econometric analyses.

⁸ Demographic information is available for all individuals registered as residents in Norway at some point during a given year.

are down to a group of about 603 000 individuals. Excluding those in the primary industries or in enterprises with a change in work force between -75 % and 75 %, we are left with 558 000 individuals on whom we focus in the analyses of job change.

With the same procedures, we obtain very similar numbers for 1997 – 1999 and 1999 – 2001, see the corresponding tables in Appendix 1.

Inclusion criteria	Number of enterprises*	Number of persons
All persons with employment in 2001	113697	2041613
- full time employment	95256	1503363
- throughout 2001	81062	1068218
- and throughout 2003		750009
- did not receive welfare benefits during 2002		735708
- working in enterprise with known OP status in 2001		693974
- and in 2003		679730
- demographic information available and age (2001) in [25,57]		603048
- not in primary industries and change in employment (2001) in [-75,75] %		557666

*Number of enterprises with at least one employee satisfying the respective inclusion criteria.

4.3. Job flows

In the following we use the term job change if the organizational number of the individual's enterprise and that of the establishment changes from 2001 to 2003. Enterprise is defined as in the Norwegian official statistics, see http://www.ssb.no/naeringsliv_en/. In the private sector, this is a legal unit and may comprise several establishments. In the public sector, it is an organizational unit. Enterprise level job changes are the most relevant in this setting, since pension plans are operated at the enterprise level and pension rights are unaffected by job changes between establishments within an enterprise. The additional requirement that there should also be a change of establishment is imposed to avoid counting mergers or

acquisitions as job changes. These are changes where we do not expect individual incentives to play a role, and where the employees will keep their OP entitlements.

Table 3. Number of enterprises and employees in different sectors

<i>Sector</i>	2001				2003			
	Enterprises		Employees		Enterprises		Employees	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Public	1667	3.58	197200	35.36	1912	3.97	198861	35.66
Private w/OP	5045	10.83	203335	36.46	5322	11.05	202627	36.33
Private wo/OP	39888	85.60	157131	28.18	40935	84.98	156178	28.01
Total	46600	100.00	557666	100.00	48169	100.00	557666	100.00

Among the 557666 full time employees in 2001 and 2003 a total of 7 % changed job from 2001 to 2003. The fraction is decreasing with age from 12 % among those under 30 to 5 % among those aged 50 - 57 (Table 4). There are no big differences between sectors, which may be because we have selected relatively stable workers to avoid mixing layoffs and voluntary job changes.

Table 4. Relative frequencies of movers by age groups

<i>Sector (2001)</i>	Full sample	Movers	<i>Age (2001)</i>			
			25-29	30-39	40-49	50-57
Public	197200	0.07	0.11	0.09	0.06	0.05
Private w/OP	203335	0.08	0.12	0.10	0.07	0.05
Private wo/OP	157131	0.07	0.12	0.09	0.06	0.04
All	557666	0.07	0.12	0.09	0.06	0.05

Except for those employed in the public sector in 2001, the relative frequency of movers is decreasing with years of tenure (Table 5). That mobility seems to be decreasing with time (i.e. with age and tenure) comes as no big surprise, and this finding fits well with predictions from the theoretical literature (see e.g. Topel and Ward (1992)).

Table 5. Relative frequencies of movers by years of tenure (end of 2001)						
	All	1-4	5-9	10-14	15-19	20+
<i>Sector (2001)</i>						
Public	0.07	0.08	0.05	0.04	0.07	0.09
Private w/OP	0.08	0.12	0.08	0.05	0.04	0.03
Private wo/OP	0.07	0.11	0.06	0.04	0.03	0.02
All	0.07	0.10	0.07	0.05	0.05	0.05

The frequency of job changes varies across educational groups, and the pattern is different for the three sectors, as can be seen from Table 6. In the private sectors mobility increases with age, while it varies less among those initially employed in the public sector.

Table 6. Relative frequencies of movers by educational groups

	All	Compulsory	Secondary	Bachelor	Master/PhD
<i>Sector (2001)</i>					
Public	0.07	0.07	0.07	0.06	0.08
Private w/OP	0.08	0.05	0.07	0.11	0.13
Private wo/OP	0.07	0.06	0.07	0.10	0.10
All	0.07	0.06	0.07	0.08	0.10

Table 7 describes the pattern of mobility between the three different sectors in our sample. Mobility seems to be mainly within each of the two main sectors, public and private. Since the public sector comprises slightly more than one third of all the employees covered here, viewing all jobs as potentially open (or open with the same probability) and assuming equal destination probabilities would imply that about two thirds of the moves from a public sector entity were to a private sector establishment. In reality, this ratio is only 19 %, with about equal destination probabilities to enterprises with and without OPs. Similarly, among the moves from a private sector enterprise with an occupational pension, only 12 % are to a public sector entity whereas equal destination probabilities would imply slightly more than one third. The mobility to private sector enterprises without an OP is more frequent, with 29 % of the moves compared to a “baseline” of slightly less than one third. For enterprises without an OP, there is an even lower mobility to the public sector, but the mobility to a private sector enterprise with an OP is considerably higher. Summing up, job changes are mainly within each of the three sectors, but there are also some moves between the two private sectors.

Table 7. Within- and between-sector mobility – movers

		<i>Sector (2003)</i>		
		Public	Private w/OP	Private wo/OP
<i>Sector (2001)</i>	All		%	
Public	13264	81	10	9
Private w/OP	16389	12	59	29
Private wo/OP	11627	10	29	61
All	41280	33	35	32

4.4 Wages, wage change and wage growth

In the following, we use the term wage change for the difference in wages between 2001 and 2003, which measures the immediate wage effect of the job change. From 2003 and for the next four years up to 2007, we use the term wage growth.

As can be seen from Table 8, average wages changed by 9.9 % from 2001 to 2003 in our sample, whereas the average of individual change rates was 11.4 %, indicating higher relative wage change for those with the lowest initial wages. Furthermore, the change in average wages was highest for those employed in the public sector in 2001, followed by the OP-covered private sector workers who did not change jobs. Among those employed in the private sector without OP in 2001, job changers experienced the highest wage change. Data from 1997 - 1999 and 1999 - 2001 give roughly the same picture.

Table 8. Average wages and wage change

	Number of employees	Average wage 2001	Average wage 2003	Change average wage	Average change rate
<i>Sector (2001)</i>					
<i>Full sample</i>					
Public	197200	317612	356097	12.12	12.72
Private w/OP	203335	375771	409426	8.96	10.54
Private wo/OP	157131	323894	351624	8.56	10.74
All	557666	340588	374281	9.89	11.36
<i>Movers</i>					
Public	13264	332359	378658	13.93	15.94
Private w/OP	16389	399028	424123	6.29	12.38
Private wo/OP	11627	332736	362262	8.87	15.89
All	41280	358934	392091	9.24	14.51
<i>Stayers</i>					
Public	183936	316549	354470	11.98	12.48
Private w/OP	186946	373732	408137	9.21	10.38
Private wo/OP	145504	323187	350774	8.54	10.32
All	516386	339121	372858	9.95	11.11

In Table 9 we focus exclusively on those who changed jobs between 2001 and 2003. The table provides measures of both average wages in 2001 and of changes in average wages between 2001 and 2003, conditional on the pair (*sector 2001, sector 2003*). As can be seen by combining Tables 8 and 9, private sector employees with an OP had the highest level of average wages in 2001, independently of whether they changed jobs or not, and among those who changed job, independently of where they ended up in 2003.

Looking further at the movers initially employed in the public sector, we observe the highest initial wages among those who moved to another public sector job or to a private sector enterprise with an OP. The latter group had highest wage increase.

Among those employed in a private sector enterprise with an OP, those with the highest initial wage moved to the public sector, thereby gaining more than those who moved to a private sector enterprise without an OP, but slightly less than those who stayed within the sector. Among those in a non-OP private sector enterprise, those with the highest wage were those who moved to an OP-enterprise, and these also gained the most in terms of wage change.

Table 9. Sector changes and average wages

	<i>Sector (2003)</i>		
	Public	Private w/OP	Private wo/OP
<i>Sector (2001)</i>		<i>Initial level*</i>	
Public	93	93	87
Private w/OP	117	112	106
Private wo/OP	91	97	91
	<i>Change average wage</i>		
Public	14.31	16.22	7.92
Private w/OP	6.99	7.56	3.21
Private wo/OP	7.55	14.25	6.42

*Average wage in 2001, relative to average wage for all job changers
(i.e. 358 934 = 100)

To sum up, we do not readily observe any wage compensation effect of losing pension entitlements, for instance by moving out from a private sector pension covered job. Rather, it seems that there are losers and winners, both in terms of wages and in terms of pensions.⁹ This calls for a more thorough analysis. Also, we have not yet looked at subsequent wage growth. These are both among the topics in the remainder of the paper.

⁹ There are some differences for the other periods, but not enough to present a very different picture.

5. A measure of potential portability gain

5.1. Theoretical specification

Our starting point is a simple model where we define a function for the decision of whether to change job at age a :

$$(1) M_a^* = W_a^N + P_a^N + Q_a - W_a^C - P_a^C$$

, where

W_a^N is the present value of the expected wage stream up to retirement resulting from a change of jobs at age a

$P_a^N = f^N(W_a^N)$ is the present value of the expected pension stream in the new job, which is assumed to be a function only of the present value of the new wage stream (although the actual calculation is more involved)

W_a^C is the present value of the expected wage stream up to retirement in the current job

$P_a^C = f^C(W_a^C)$ is the present value of the expected pension stream from the current job, and

Q_a is the present value of the quit pension from the current job.

The two functions $f^N(\cdot)$ and $f^C(\cdot)$ are not the same. In the current job, also previous earnings count for the pension, whereas in the new job only earnings from age a and onwards will count.

The job change indicator is

$$(2) M_a = 1 \text{ if } M_a^* > 0 \text{ else } M_a = 0$$

, and the probability of changing jobs is

$$P(M = 1) = P(W_a^N + P_a^N + Q_a > W_a^C + P_a^C)$$

To separate into what we assume are more and less observable variables and arrive at our potential portability gain, we define the cash wage increase from the job move as

$$(3) \Delta W_a = W_a^N - W_a^C$$

, and we express the pension in the new firm as follows;

$$(4) P_a^N = f^N(W_a^C) + f_\Delta^N(W_a^C, \Delta W)$$

The first term on the right hand side of (4) is the pension which would have come from a wage identical to the one in the current firm, and the second term is the extra pension due to a wage increase. The extra pension from the wage increase is a function both of the level and of the increase in wage. The probability of a change of jobs can then be expressed as

$$(5) \quad P[M = 1] = P[\Delta W_a + P_a^N + Q_a > P_a^C], \text{ or equivalently as}$$

$$(6) \quad P[M = 1] = P[\Delta W_a + f_{\Delta}^N(W_a^C, \Delta W) > P_a^C - Q_a - f^N(W_a^C)]$$

The left hand side of the inequality in (6) is observable only for those who move, and the discussion above along with the cited literature clearly show the problems with estimating non-realized alternatives. In contrast, with our data we are able to compute the right hand side for all individuals. This expression can be interpreted as the gain from staying in the current job, compared to changing to a new job with identical wage and wage growth. Both jobs are assumed kept until retirement. For more convenient use in the analyses, we define instead the gain from moving to a new job with identical wage compared to staying, and call this the potential portability gain (PPG):

$$(7) \quad PPG_a = Q_a + f^N(W_a^C) - P_a^C$$

and write equation (6) as

$$(8) \quad P[M = 1] = P[\Delta W_a + f_{\Delta}^N(W_a^C, \Delta W) + PPG_a > 0]$$

A change of jobs will then take place if the gain in wages plus the increase in pensions in the new job plus the portability gain is positive. If the portability gain is negative, the gain in wages and pensions will have to outweigh this for a change of jobs to be profitable.

Rather than trying to impute a complete set of alternatives for all individuals, which would imply making quite strong assumptions, we assume that the lower the PPG (the higher the portability loss), the less likely is a job change. We assume this to be the case without imposing any structure on the wage gain and the ensuing gain in the pension in the new job. The rationale is that factors like age, wage, firm tenure and the specificities of the pension system influence the PPG in ways that are unlikely to be completely compensated by a new employer. This would not be indicative of productivity in a way that would imply complete compensation in a competitive labour market.

We also want to make use of data on realized job changes. Given that a job change has taken place, our assumptions imply that

$$(9) -PPG_a < \Delta W_a + f_{\Delta}^N(W_a^C, \Delta W)$$

Here, a bargain has been struck, and it seems likely that the worker will have taken into account the PPG. Even if this is not valued the same way by prospective employees, it will have an effect on the worker's reservation wage. Hence, we expect the new wage to be higher for lower PPG (larger loss in terms of pension entitlements).

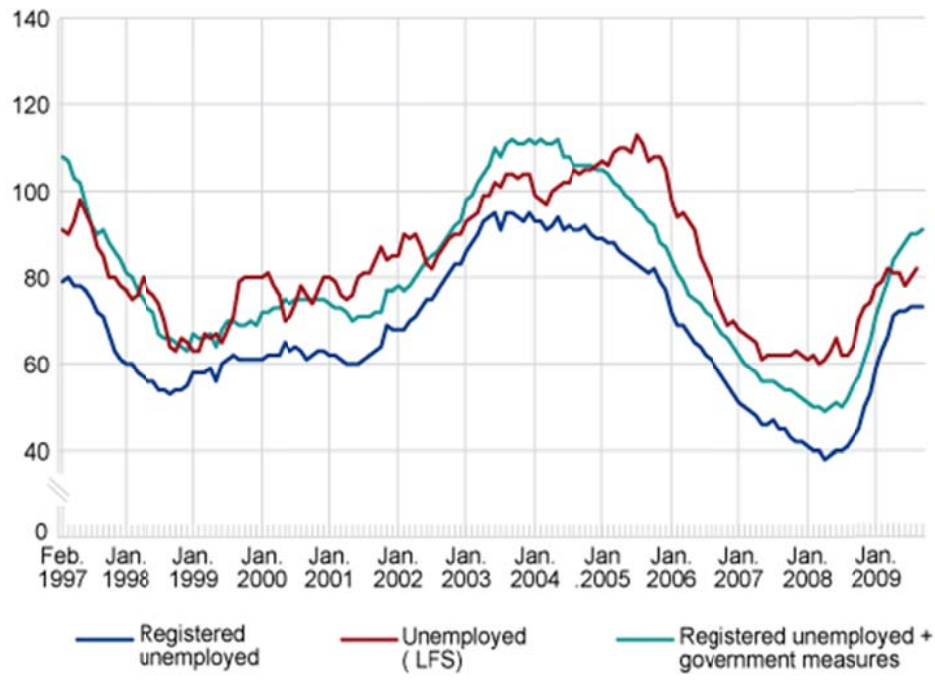
5.2. Empirical implementation

To keep the analysis transparent, we do not use present values in the empirical implementation, but split by age groups. The value of a wage change depends on the age at transition and the expected remaining number of years until retirement. This is because the number of years in which the new wage has effect influences both the value of the wage stream and the accrued pension entitlements, and because all values are assumed to be discounted. The value of a portability loss will therefore depend on the age at transition, even if the number of years in retirement may not vary too much. Therefore, we split the sample into age groups when we estimate, to allow for the impact of age in a flexible way.

To have comparable values of variables, we forecast wages to age 67 and also calculate the ensuing pension loss as the annual amount at that age. The rates of wage growth in the current and in the new job are assumed identical. We measure wages and pension gains relative to the forecasted pension in the current job. The potential portability gain can therefore be interpreted as the percentage points increase (or decrease) in the replacement rate, relative to forecasted wage in the current job.

Equations (8) and (9) are the basis for the models in Section 6, where we analyse the propensity to change jobs within the pension covered private sector, and in Section 7, where we analyse the impact of PPG on wages among movers. To take account of business cycle fluctuations, we estimate all models for three periods. In the first period, 1997 - 1999, unemployment was falling, in the second period, 1999 - 2001, it was fairly constant and in the third period, 2001 - 2003, unemployment was rising.

Unemployed (LFS), registered unemployed and registered unemployed plus government measures to promote employment. Seasonally adjusted figures, three-month moving average in 1 000. 1997-2009



Source: Statistics Norway, http://www.ssb.no/english/subjects/06/01/aku_en/

Figure 1 shows box plots¹⁰ of the potential gain for individuals who in 2001 were employed in a private sector enterprise with an OP, assuming this has a 66 % compensation rate¹¹, for a possible move to another job with the same pension (in the private or in the public sector¹²). From here and onwards we use the actual age and

¹⁰ The lower and upper hinges of the boxes indicate the 25th and 75th percentiles, respectively, and the horizontal lines cutting through the boxes indicate the median. The vertical lines below and above the boxes are called adjacent lines, and the markers on each end of the lines indicate lower and upper adjacent value, respectively. Adjacent values are calculated as defined in the Stata manual [G] Graphics. Outside values are indicated by dots.

¹¹ This is the most usual compensation rates, but we do not observe this for different enterprises and individuals.

¹² Note that our assumptions (of equal wage, wage growth and compensation rate in new and old job) imply that moving to a private sector OP covered job triggers the same change in entitlements as moving to the public sector, for any given individual initially employed in a private sector OP covered job.

wage of each individual in the sample, in contrast to the stylized calculations in Section 3.¹³

There is a range from a potential loss of about 10 percentage points (in terms of the pension replacement rate) to a gain of around 7 per cent. A substantial fraction of the sample gains or loses very little. One should keep in mind that these calculations all depend on persons staying on in their new job (with the same wage as in their initial job) until retirement.

Figure 2 plots the gain resulting from a move in the other direction, from the public sector and into a private sector pension covered job. Both figures show how the spread of potential portability gain varies with age, taking on only positive values for the younger part of the sample, and that the spread increases with age for this group. This is because the gain is positive for workers starting their new job no later than at the age of 37 (those below the age of 36 in 2001). These workers may still obtain a full pension in a new job (assuming the usual 30 years for full accrual) so that the QP from the initial job is a pure bonus. Starting from the age of 36 (in 2001) there is an increasing portability loss for those moving out from private sector pension jobs, since full accrual in the new job is no longer possible and the QP is increasingly insufficient to cover the difference between the pension from the current job, which would have given 66 % replacement rate, and the pension from the new job.

For those in public sector jobs, there is a potential gain for the majority in all age groups, although the gain is falling from age 36. Interestingly, the potential lock-in effect seems smaller in the public sector. The reason may be the lower wage level in the public sector. As described above, the OP tops up the public pension (NIS) and because the NIS is fairly flat, the OP loses importance with a lower wage. Therefore the PPG falls with wage and so does the lock-in effect.

The distribution of potential portability gains is further described for the subgroups in the analyses in Sections 6 and 7, along with its impact on the propensity to change jobs and on wage compensation.

¹³ Recall that the parameters used when calculating potential portability gains are those recommended by the Norwegian actuaries. The nominal rate of return on pension capital is 5.75 %, nominal wage growth is 4.5 % and the annual nominal adjustment of the basis amount in the National Insurance System is 4.25 %.

Figure 1. Potential portability gain by age (2001)

Initially employed in private sector w/OP, hypothetical move within sector/to public sector, n = 202,979

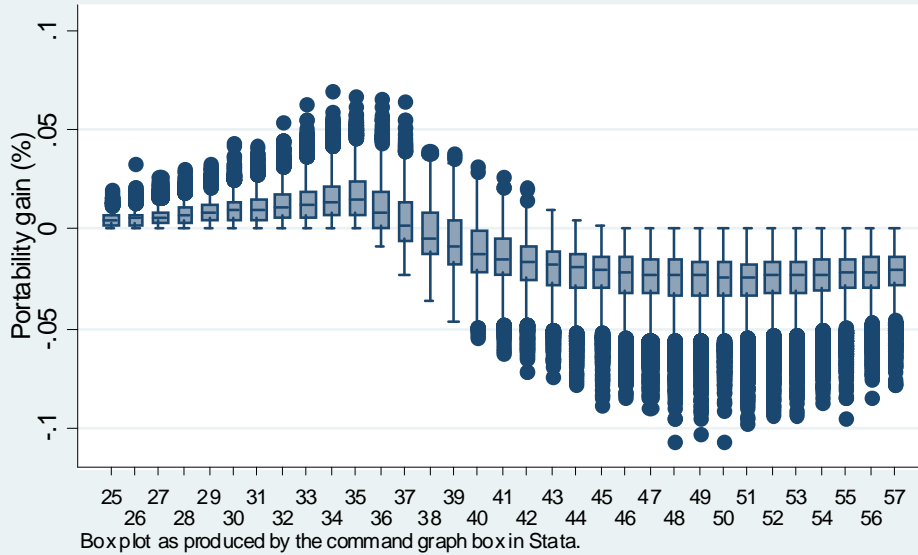
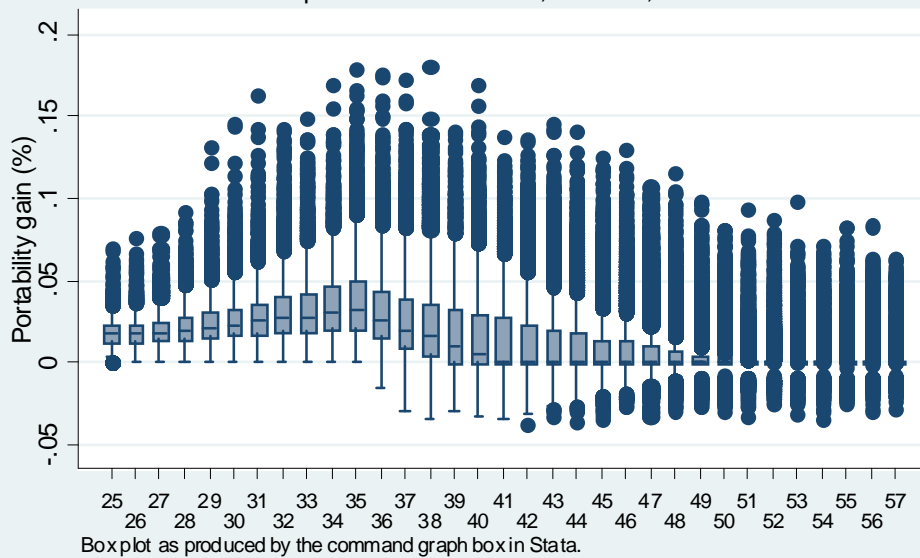


Figure 2. Potential portability gain by age (2001)

Initially employed in public sector, hypothetical move to private sector w/OP, n = 197,124



6. Determinants of leaving a job

6.1. The sample

In this section we consider the association between the propensity to change between two private sector pension covered jobs, and the potential portability gain. That is, we focus the analysis on a sub-sample consisting of individuals between 25 and 57 years in 2001, working in a private sector OP enterprise both in 2001 and in 2003. The rationale is that most job changes are intra-sectoral (see Table 5) and that a negative portability gain is an impediment against any job change. Since there are no portability gains associated with job changes within the public sector or within private sector non-pension jobs, we look only at those who leave a pension covered private sector job for another job of the same type. We include firms from all industries except the primary industries and those for which the industry is unknown, and all individuals except those for whom information on educational attainment is missing. Finally, we require the relative change of the number of employees during 2001 to lie within the range of +/- 75 percent. These restrictions leave us with a sample size of 183,681 individuals. The main variable of interest in this setting is the potential portability gain, which was defined in the previous section¹⁴.

6.2 Descriptive statistics

Before moving on to any sort of econometric analysis, it is instructive to have a glance at some descriptive statistics. Regular descriptive statistics are given in Table 10, while Table 11 provides simple correlations between some of the variables that are presumed to be relevant for the propensity to change jobs (namely age, tenure, potential portability gain, and (the log of) initial wage) and the observed frequency of movers. Correlations are computed for the full sample, and for two sub-samples.

¹⁴ i.e. as the increase (or decrease) in compensation rate resulting from a change of jobs between 2001 and 2003, measured in terms of projected final wage in the initial job, assuming a constant wage growth of 4.5%.

Table 10. Summary statistics

Variable	Mean	Std. dev.	Min.	Max.
Potential portability gain	-0.009	0.019	-0.106	0.07
Years of tenure (2001)	8.766	6.882	1	41
Age (2001)	41.866	8.910	25	57
lnWage (2001)	12.766	0.359	11.571	15.904
lnWage (2003)	12.850	0.367	11.573	16.102

Dummy variables

Variable	Mean	Variable	Mean
Mover	0.053	<i>Industry</i>	
Gender	0.754	Mining and quarrying	0.034
Sickness/maternity leave	0.174	Manufacturing	0.416
Immigrant	0.037	Electricity + Construction	0.056
Married (2001)	0.568	Wholesale and retail trade, ...	0.190
<i>Educational attainment</i>		Hotels and restaurants	0.010
Compulsory	0.106	Transport, storage and communication	0.084
Lower secondary	0.250	Financial intermediation	0.065
Higher secondary	0.383	Real estate and business activities	0.115
Bachelor level	0.187	Education + health and social work	0.014
Master and PhD level	0.074	Other services	0.018
<i>Region of residence</i>		<i>Change in employment</i>	
East	0.213	[-75%,-50%)	0.027
South	0.171	[-50%,-25%)	0.017
West	0.223	[-25%,0%)	0.447
Mid	0.113	0%	0.019
North	0.049	(0%,25%]	0.445
Oslo	0.215	(25%,50%]	0.037
Other areas	0.015	(50%,75%]	0.007

n = 183,681

Perhaps not surprisingly, years of tenure appears to be negatively related to the propensity to change jobs, and it is the single variable that is most closely related to the observed frequency of movers. This being noted, there are several features of the correlation matrices that indicate that a simple probit model (with the dependent variable being an indicator variable taking the value 1 if a change of jobs is recorded during 2002, and zero otherwise) would have a hard time giving clear cut conclusions about the impact of potential portability gain on labour market mobility.

We note that the partial correlation between mover and portability gain is positive for the full sample, negative for the younger sub-sample, and close to zero and non-significant for the older sub-sample. The correlations between potential portability gain and age/tenure are negative for all three samples.

Table 11. Correlation matrices					
	Mover	Age	Tenure	Port_gain	lnWage
<i>(i) The full sample (n = 189,041)</i>					
Mover	1				
Age	-0.0639*	1			
Tenure	-0.0810*	0.4305*	1		
Portability gain	0.0297*	-0.7156*	-0.2203*	1	
lnWage	0.0295*	0.1364*	0.0219*	-0.2796*	1
<i>(ii) Individuals under the age of 36 (n = 57,173)</i>					
Mover	1				
Age	-0.0059	1			
Tenure	-0.0654*	0.3389*	1		
Portability gain	-0.0412*	0.5277*	0.8435*	1	
lnWage	0.0251*	0.2856*	0.0352*	0.4501*	1
<i>(iii) Individuals above the age of 35 (n = 131,868)</i>					
Mover	1				
Age	-0.0466*	1			
Tenure	-0.0736*	0.2513*	1		
Portability gain	-0.0011	-0.5202*	-0.0475*	1	
lnWage	0.0442*	-0.0172*	-0.0436*	-0.3834*	1
* p < 0.01					

6.3. Portability gain and the propensity to change jobs

To take the analysis one step further, we estimate different probit models for the propensity to change jobs. In addition to the potential portability gain (defined in Section 4 and building on equation (8)), we control for a number of individual and firm specific characteristics; tenure, gender, highest level of completed education, age, the log of initial wage, marriage status, immigrant status, whether sickness or maternity leave benefits have been received during 2002 (the transitional year), region of residence, industry and the relative change in the number of employees during 2001.

Table 12 shows how the estimated coefficient for the portability gain variable is altered when some of the key explanatory variables are included in a step-wise manner.

The estimated coefficient is positive and significant when tenure, wage, age and the firm specific variables are left aside (Model I). When dummies for tenure are included (Model II), the coefficient loses more than 40% in magnitude, but is still positive and significant. Inclusion of the log of wage decreases the coefficient slightly (Model III), whereas it turns negative when age dummies are added (Model IV). The coefficients for tenure and age are precisely estimated, and remain fairly stable across specifications.

Inclusion of 10 industry dummies (Model V) makes the estimated coefficient for portability gain even more negative, but it is no longer significantly different from zero.¹⁵ Only one of the dummies for industry is (weakly) significant. Inclusion of 7 dummies for the relative change in the number of employees (Model VI) does not lead to any dramatic changes in the other estimates. All employment change dummies have the expected signs, and three of these are significantly different from the reference group (consisting of firms with reductions in the number of employees within the interval [-25%, 0%]). We take this as an indication that peer group effects are indeed of relevance for the propensity to change jobs.

Both the correlations in Table 11 and the estimated models in Table 12 indicate that there are important heterogeneities in the effects of potential portability gain on the propensity to change jobs. We have also argued that such a suspicion can be supported by economic theory – the presence of time discounting would have the implication that a given portability gain is valued differently for people of different ages. To allow for different effects for individuals belonging to different age groups, we estimate a version of Model VI, with tenure included as a linear term instead of as dummy variables and without age dummies, for six different age groups. Average marginal effects for the respective groups are given in Table 13 and 14.¹⁶

¹⁵ Statistical inference for Model V and Model VI is based on standard errors that are clustered on firms.

¹⁶ Average marginal effects from probit models are hard to compute when one or more of the explanatory variables are functions of other explanatory variables (see Bartus (2005)). To get around this problem we use residuals from linear regressions of portability gain on years of tenure and ln Wage instead of the portability gain variable itself when estimating the probit models. The probit coefficients are not altered by this procedure.

The estimated marginal effect of portability gain on the propensity to change jobs has the expected positive sign in four out of five cases, but is not significantly different from zero for any of the sub-samples. The average marginal effect is negative for the sub-sample consisting of individuals of age 35-39, but this is also the smallest in absolute value. Although imprecisely estimated, the average marginal effect of portability gain for individuals of age 40-44 indicates that an increase in the potential portability gain of one percentage point is associated with an increase in the propensity to change jobs by about 0.4 percentage points. This is higher than the marginal effect of tenure (-0.2 percentage points), but lower than the effect of receipt of sickness or maternity leave benefits (-1.3 percentage points). The relative frequency of movers for this age group is 5.1 percent.

What we have found in this section is either non-significant or negative marginal effects of potential portability gain on the propensity to change jobs. These results can be interpreted in (at least) two ways; i) as an indication that this particular framework is not well suited to separate the effect of tenure from the effect of increased/reduced pension entitlements, or ii) as evidence that the change in pension entitlements resulting from a change of jobs is of no great importance to individuals considering a change of jobs. Yet another possibility is that people do care about how pension entitlements are affected when they consider changing jobs, and that these changes are reflected in the wages for those who change jobs. This path is explored in the following section.

Table 12. Job change propensity equations (probit models)						
Parameter	Model I	Model II	Model III	Model IV	Model V	Model VI
PortabilityGain	3.132*** (0.264)	1.842*** (0.278)	1.801*** (0.289)	-1.267** (0.449)	-1.415 (1.056)	-1.548 (1.101)
Tenure						
5-9 years		-0.188*** (0.0119)	-0.188*** (0.0119)	-0.177*** (0.0120)	-0.179*** (0.0460)	-0.176*** (0.0448)
10-14 years		-0.328*** (0.0165)	-0.328*** (0.0165)	-0.302*** (0.0167)	-0.309*** (0.0672)	-0.298*** (0.0665)
15-19 years		-0.346*** (0.0199)	-0.346*** (0.0199)	-0.308*** (0.0204)	-0.310** (0.106)	-0.267** (0.0917)
≥ 20 years		-0.483*** (0.0223)	-0.483*** (0.0223)	-0.421*** (0.0232)	-0.421*** (0.0924)	-0.383** (0.0777)
lnWage			-0.00908 (0.0169)	-0.0188 (0.0171)	-0.0283 (0.0665)	-0.0454 (0.0686)
Age						
25-34				0.227*** (0.0230)	0.230*** (0.0470)	0.250*** (0.0485)
35-39				0.174*** (0.0212)	0.178*** (0.0353)	0.194*** (0.0372)
40-44				0.112*** (0.0172)	0.115*** (0.0246)	0.126*** (0.0254)
45-49				0.0537** (0.0175)	0.0527* (0.0208)	0.0558* (0.0220)
Industry					X	X
Emp. change						
[-75%,-50%)						0.864*** (0.0746)
[-50%,-25%)						0.445*** (0.108)
[-25%,0%)						Ref
0%						-0.122 (0.0978)
(0%,25%]						-0.159 (0.105)
(25%,50%]						-0.348*** (0.0887)
(50%,75%]						-0.160 (0.164)
Constant	-1.554*** (0.0162)	-1.429*** (0.0170)	-1.316*** (0.213)	-1.370*** (0.214)	-1.186 (0.842)	-1.070 (0.860)
pseudo R ²	0.026	0.038	0.038	0.039	0.044	0.073
Log likelihood	-36985.1	-36518.6	-36518.5	-36466.4	-36299.7	-35172.1
# of clusters					4547	4547

Standard errors in parentheses, clustered on firms for Model V and VI. Additional controls are dummies for gender, educational attainment, region of residence, receipt of sickness/maternity leave benefits, immigrant status and marriage status. * p < 0.05, ** p < 0.01, *** p < 0.001. N = 183,681.

Table 13. Job change propensity equation, average marginal effects from probit models					
Parameter	Sample I (25 - 34)	Sample II (35 - 39)	Sample III (40 - 44)	Sample IV (45 - 49)	Sample V (50 - 57)
Portability gain [†]	0.0652 (0.596)	-0.0325 (0.140)	0.413 (0.211)	0.334 (0.236)	0.0568 (0.308)
Years of tenure	-0.00424*** (0.00118)	-0.00277*** (0.000562)	-0.00242*** (0.000485)	-0.00180*** (0.000429)	-0.00109** (0.000366)
Sickness/maternity Leave	-0.00906** (0.00279)	-0.00645* (0.00301)	-0.0131*** (0.00347)	-0.00154 (0.00392)	-0.00426 (0.00266)
Region					
East	0.00108 (0.00992)	-0.00322 (0.0119)	0.00296 (0.0153)	0.00942 (0.0155)	0.00586 (0.0164)
South	-0.0135 (0.00108)	-0.00992 (-0.00322)	-0.0175* (0.00296)	-0.0139* (0.00942)	-0.0170** (0.00586)
West	Ref	Ref	Ref	Ref	Ref
Mid	-0.00884 (0.00698)	-0.0138 (0.00788)	-0.00324 (0.0117)	-0.00388 (0.0139)	-0.00425 (0.0118)
North	-0.0291*** (0.00783)	-0.0270*** (0.00717)	-0.0309*** (0.00661)	-0.0253*** (0.00675)	-0.0226*** (0.00640)
Oslo	0.00799 (0.00775)	0.0110 (0.00830)	0.0115 (0.00880)	0.0168 (0.0103)	0.0131 (0.0103)
Other areas	0.0903 (-0.00884)	0.0716 (-0.0138)	0.0990 (-0.00324)	0.0502 (-0.00388)	0.0638 (-0.00425)
Employment change					
[-75%,-50%)	0.141*** (0.0292)	0.174*** (0.0219)	0.175*** (0.0192)	0.185*** (0.0215)	0.163*** (0.0254)
[-50%,-25%)	0.0616** (0.0225)	0.0791** (0.0250)	0.0817** (0.0278)	0.0400 (0.0231)	0.0660* (0.0299)
[-25%,0%)	Ref	Ref	Ref	Ref	Ref
0%	-0.000323 (0.0151)	-0.0144 (0.0110)	-0.0119 (0.0123)	-0.0189 (0.00987)	-0.0147 (0.00758)
(0%,25%]	-0.0212** (0.00820)	-0.0204** (0.00776)	-0.0114 (0.0108)	-0.0104 (0.0102)	-0.00775 (0.0102)
(25%,50%]	-0.0353** (0.0109)	-0.0351*** (0.00711)	-0.0208* (0.00822)	-0.0292*** (0.00694)	-0.0167* (0.00710)
(50%,75%]	-0.0347* (0.0143)	-0.0116 (0.0184)	-0.0140 (0.0197)	-0.00151 (0.0223)	0.00454 (0.0205)
n	45,685	31,399	31,149	29,992	45,456
pseudo R ²	0.059	0.069	0.069	0.073	0.070
Log likelihood	-11269.8	-6616.0	-5879.3	-4899.9	-6409.7
# of clusters	3671	3516	3518	3465	3769

Standard errors in parentheses, clustered on firms. Additional controls are lnWage and dummies for gender, educational attainment, region of residence, immigrant status, marriage status and industry.

* (p<0.05), ** (p<0.01), *** (p<0.001)

[†]Residuals from linear regression of potential portability gain on years of tenure and lnWage.

Table 14. Average marginal effects of potential portability gain[†]

Age	n	Rel. freq. of movers	Mean(PortGain)	AME	[95% confidence interval]	
25-34	45,685	0.073	0.011	0.065	-1.1030	1.2337
35-39	31,399	0.060	0.005	-0.032	-0.3076	0.2427
40-44	31,149	0.051	-0.016	0.413	-0.0004	0.8263
45-49	29,992	0.043	-0.024	0.334	-0.1285	0.7966
50-57	45,456	0.035	-0.024	0.057	-0.5460	0.6597

[†]Residuals from linear regression of potential portability gain on years of tenure and lnWage.

7. Wage changes and pension gains associated with actual job changes

In this section we still look at only full time, full year workers, but limit the analysis further to those who actually do change jobs. We start with a description of the sample and an empirical overview before setting up and estimating the model. Focus is on the 2001 – 2003 job changers, but we have also run analyses on the 1997 – 1999 and 1999 – 2001 flows. Results for the largest flows, between private sector pension covered firms are given in Appendix 3, and we will comment on any differences in results. For the other flows, hardly any significant effects are found, but we report the 2001 – 2003 results below.

We observe the immediate wage change from 2001 to 2003 and the subsequent wage growth up to 2007. For the periods 1997 – 1999 and 1999 – 2001, the observed wage growth periods are 8 and 6 years, respectively.

7.1 The sample

We start with 41 280 movers between 2001 and 2003 (Table 7). Since we have no information on quits and layoffs, we disregard the 29 % of those in pension covered jobs who move into non-pension jobs, which we suspect contain a lot of layoffs. We also disregard the 11 627 who move from non-pension jobs, since these have no entitlements

to loose. Finally, the 81 % intra public sector job changers are excluded, since there is no entitlement loss for these.

Next, we exclude extreme observations which we suspect comprise layoffs and measurement errors. These are defined as wage change over the transitional year of less than - 20 % or more than 100 %, or a wage growth of the subsequent period up to 2007 of less than - 40 % or more than 300 %. This reduced the number of movers to 14 476.

The flows we look at for 2001 - 2003 are then 11061 job changes from private sector pension covered jobs into other private sector pension covered jobs and 1 772 moves into the public sector, and 1 643 job changes from the public sector into private sector pension covered jobs.

7.2 Descriptive statistics

The potential portability gain (or loss) defined and described in Section 5, is the loss of pension relative to the projected final wage, under the assumption of the same wage trajectory in the old and in the new job, starting at the wage level of the initial job. Hence, it can be interpreted as the increase or the decrease in the pension replacement rate. It is shown in Table 15 as PPG and is the sum of the QP and difference between the pension in the new job and the pension which would have come if the person stayed in the initial job, "direct loss" (PPG - QP). The results depend also on assumptions of growth in the basic amount in the NIS and capital gain for the private sector QPs, stated in Section 3 (Table 1).

Table 15 Wages and portability gains for job movers 2001 - 2003

<i>Age in 2001</i>	<i>Number of persons</i>	<i>Wage initial job (2001)</i>	<i>Relative wage increase 2001 - 2003</i>	<i>Relative</i>	<i>PPG</i>	<i>QP</i>	<i>PPG - QP</i>
				<i>wage growth 2003 - 2007</i>			
<i>Private OP - Private OP</i>							
25 - 29	1845	335609	0,141	0,318	0,006	0,006	0
30 - 35	2474	400632	0,096	0,323	0,012	0,012	0
36 - 41	2370	432333	0,071	0,303	-0,006	0,021	-0,027
42 - 47	1937	449029	0,056	0,262	-0,022	0,031	-0,054
48 - 54	1766	432103	0,031	0,218	-0,024	0,044	-0,068
55 - 57	669	424072	0,027	0,146	-0,019	0,055	-0,075
All	11061	411496	0,077	0,28	-0,007	0,024	-0,03
<i>Public - Private OP</i>							
25 - 29	253	292333	0,213	0,315	0,018	0,018	0
30 - 35	370	362149	0,133	0,316	0,031	0,031	0
36 - 41	391	378473	0,092	0,251	0,016	0,04	-0,024
42 - 47	291	374940	0,079	0,229	0,006	0,047	-0,041
48 - 54	263	366937	0,047	0,18	0,002	0,052	-0,05
55 - 57	75	369169	0,022	0,137	-0,001	0,049	-0,05
All	1643	358635	0,107	0,255	0,015	0,038	-0,023
<i>Private OP - Public</i>							
25 - 29	295	338710	0,129	0,339	0,006	0,006	0
30 - 35	420	394001	0,104	0,294	0,011	0,011	0
36 - 41	390	444936	0,106	0,259	-0,008	0,017	-0,025
42 - 47	356	493005	0,082	0,245	-0,021	0,022	-0,043
48 - 54	245	460537	0,084	0,201	-0,019	0,029	-0,048
55 - 57	66	449407	0,136	0,147	-0,015	0,033	-0,048
All	1772	427160	0,103	0,266	-0,006	0,017	-0,023

As can be seen from Table 15, the QP increases with age, but not enough to completely offset the direct loss of pension entitlements. Hence, a job change becomes less attractive in terms of pension loss with increasing age. There are, however, some sector differences.

The QP from the public sector is higher and the direct pension loss smaller than those from the private sector. For those who move from the public to the private sector, there is an average portability gain of 1.5 % falling with age from 3.1 % to -0.1 %. Hence, those who move from the public to the private sector will on average get a higher total pension than if they had stayed, before we take into account the wage change in the job move. It should be noted that all is measured relative to the final wage and that the link of the OP to the NIS, which has at fairly flat replacement rate over earnings, imply that the OP and also PPG is much lower for lower wages.

For the other two types of flows, between private sector jobs and from the private to the public sector, there is an average loss, but the same age pattern. For the youngest age groups there are (small) pension gains. For those who move between private sector OP firms, wages change on average by 7.7 per cent and then grow by 28 per cent from 2003 to 2007 (Table 15). For the other two flows, the average change is a little higher and the average four year growth a little less. In all three cases, the wage growth declines with age at transition, but the (immediate) wage change shows a less regular pattern across age groups.

7.3. Portability gain and wage compensation

The basic model

As discussed in Section 5, it seems reasonable to assume that a pension loss will be covered, at least partially. The regulations on occupational pensions are quite strict, so that the majority of all employees in any given OP enterprise have the same type of pension and any compensation is most likely to be in the form of a wage increase. Starting with inequality (9) and assuming equality for job movers (indifferent between moving and staying), we assume:

$$(10) \quad \Delta W_a + f_{\Delta}^N(W_a^C, \Delta W) = -PPG_a$$

The right hand side of the equation is the pension loss from a move between jobs with the same wage trajectory. This loss should be compensated by the two left hand terms. The first is the value of the increase in the wage stream up to retirement and the second term is the corresponding increase in pensions. They are both driven by the wage (trajectory) increase, but must be converted into present values in order to be compared. Conversion into present values would have to be based on discount rates.

Rather than do this, we just look for a positive (negative) relationship between pension losses (gains) and wage increases. Both are measured relative to the projected final wage in the current job. If the wage increase compensates part of the portability loss, we expect the estimated portability gain coefficients α_a in the equation below to be negative (although not minus 1). We have controlled for a number of other factors which might influence the degree of compensation and use cross effects control for the variation in effect of PPG by age:

$$\Delta W_{ia} = \sum_a \alpha_a PPG_{ia} * D_{ia} + \beta' X_{ia} + \gamma^I Z_{ja} + \gamma^D Z_{ka} + \varepsilon_{ia}$$

Variables are defined in the tables below. As indicated by the subscript a we let the effect of the pension loss vary by age groups to take into account the difference in the value of a wage increase up to retirement and discounting of pension benefits.

Firm effects

Persons leaving from the same firm might have traits in common. The firm may for instance have problems, motivating employees to seek other employment, even if they are not laid off. That might give them less time to search and therefore cause them to accept a lower wage. Similarly, there may common traits for person going to the same firm, which for instance may be in a recruiting phase and then bidding up wages.

We have also estimated models with firm level fixed and random effects. The random effect model is:

$$\Delta W_{ij} = \sum_{a=1}^6 \alpha_a PPG_i D_{ia} + \beta' X_i + \varepsilon_{ij}$$

where

PPG_i is the potential portability gain for person i

D_{ia} equals one if person i is in age group a and zero otherwise, with coefficients α_a which can vary with age group

X_i are the covariates: wage quartile, industry and education, with coefficient vector β

ε_{ia} is the error term.

Footscript j denotes the firm and footscript a denotes the six age groups. The error term structure is now

$$\varepsilon_{ij} = \xi_{ij} + \zeta_j$$

$$E[\xi_{ij}\xi_k] = E[\zeta_j\zeta_k] = 0$$

$$i \neq r \Rightarrow E[\xi_{ij}\xi_{rk}] = 0$$

$$E[\xi_{ij}\xi_{ij}] = \sigma^2$$

$$E[\zeta_i\zeta_i] = \sigma_1^2$$

The firm error term gives the same correlation between individuals in the same firm, but no correlation across firms. The variance-covariance matrix for the observations then becomes block-wise diagonal, with the first expression below giving the variances along the diagonal and the second the off-diagonal covariances in the block for each firm:

$$\begin{aligned} i = r, j = k &\Rightarrow E[\varepsilon_{ij}\varepsilon_{ij}] = E[\xi_{ij}\xi_{ij} + \zeta_{ij}\zeta_i + \zeta_i\zeta_{ij} + \zeta_i\zeta_i] \\ &= \sigma^2 + \sigma_1^2 \end{aligned}$$

$$\begin{aligned} i \neq r, j = k &\Rightarrow E[\varepsilon_{ij}\varepsilon_{rj}] = E[\xi_{ij}\xi_{rj} + \zeta_{ij}\zeta_j + \zeta_j\zeta_{rj} + \zeta_j\zeta_j] \\ &= \sigma_1^2 \end{aligned}$$

The fixed effect model is:

$$\Delta W_{ij} = \sum_{a=1}^6 \alpha_a PPG_i D_{ia} + \beta' X_i + \lambda_j + \varepsilon_i$$

where

$\lambda_j, j = 1, \dots, K$ are constant terms for the K firms

ε_i are the error terms which are all independent and have the same variance

Results

The largest flows are between private OP firms and we start by looking at these. People aged 35 in 2001 who change jobs will be 37 in 2003 and then have time to obtain a full pension in the new job with the usual 30 years of accrual and retirement at 67. That means that for persons up to age 35, the QP is a pure bonus and this gives a positive portability gain and a potential lock-in effect. The higher the QP, that larger the

portability gain. As can be seen from Table 15, PPG is highest for age group 30 – 35, and this should give people an incentive to postpone job changes until 36.

For the age groups above 35 in 2001, Table 16 shows that the OLS coefficients for wage change from initial to new job from 2001 to 2003 are either significantly positive or non-significant. With a total of 11 061 observations in all age groups, this hardly signifies any clear relationship and definitely not a wage compensation for a portability loss.

To see if there is a delayed compensation for a portability loss, Table 16 also gives the results of a regression of wage growth 2003 – 2007 on portability gain and a number of controls. For two of the age groups above 35, the coefficients are significantly negative. However, as shown in Table 17 below, this result disappears once we control for firm effects.

Table 16 Impact of PPG on relative wage change on transition 2001-3 and on relative wage growth 2003-7 between private pension covered jobs. 11061 observations

	<i>Wage change, average value 0.077, R squ 0.099</i>				<i>Wage growth, average value 0.278, R sq 0.437</i>			
	<i>Estimate</i>	<i>St error</i>	<i>t Value</i>	<i>Pr > t </i>	<i>Estimate</i>	<i>St error</i>	<i>t Value</i>	<i>Pr > t </i>
<i>PPG by age group (2001):</i>								
25 - 29	-0.841	0.952	-0.880	0.377	10.566	1.223	8.640	<.0001
30 - 35	-1.691	0.424	-3.990	<.0001	4.698	0.544	8.630	<.0001
36 - 41	0.548	0.341	1.610	0.108	-2.188	0.437	-5.000	<.0001
42 - 47	1.877	0.250	7.500	<.0001	-2.013	0.321	-6.260	<.0001
48 - 54	2.454	0.267	9.190	<.0001	0.112	0.343	0.330	0.743
55 - 57	3.088	0.485	6.370	<.0001	2.406	0.622	3.870	0.000
Male	0.035	0.004	9.520	<.0001	0.082	0.005	17.510	<.0001
Tenure in years	0.002	0.000	3.830	0.000	0.001	0.001	1.510	0.132
<i>Education</i>								
Compulsory	-0.006	0.016	-0.350	0.726	<i>0.037</i>	0.021	1.770	0.077
Higher	0.041	0.005	8.000	<.0001	0.117	0.007	17.890	<.0001
Doctoral degree	0.055	0.018	3.070	0.002	0.150	0.023	6.560	<.0001
Unknown	0.046	0.014	3.400	0.001	0.165	0.018	9.380	<.0001
Relative change in firm size 2001 - 2002	0.021	0.005	4.600	<.0001	<i>0.014</i>	0.006	2.420	0.015
Additional controls for industry at NACE level 1. Reference for education is upper secondary								
Estimates significant at 1 % level in bold, at 5 % level in italics								

Table 17 Impact of PPG on relative wage change on transitions 2001-3 and relative wage growth 2003-7 between private pension enterprises, with firm effects. 11 061 observations

	<i>Firm fixed effects:</i>		<i>Firm random effects:</i>	
	2001	2003	2001	2003
	<i>Wage change</i>			
<i>PPG by age group (2001)</i>	<i>Estimate</i>	<i>St error</i>	<i>t Value</i>	<i>Pr > t </i>
25 - 29	-1.5894	-2.2424	<i>-2.1024</i>	-2.5682
30 - 35	-0.4283	-0.4253	-0.3308	-0.3658
36 - 41	-0.4449	-0.0062	-0.1477	0.0382
42 - 47	0.3374	0.2492	0.4029	0.3870
48 - 54	0.9476	0.795046	0.8581	0.7568
55 - 57	1.0203	<i>0.9290</i>	1.1574	<i>0.9973</i>
	<i>Wage growth</i>			
25 - 29	4.556968	4.57968	4.6358	4.5963
30 - 35	1.2055048	0.947905	1.5196	1.48
36 - 41	0.0909519	0.394393	0.3984	0.3991
42 - 47	0.546541	0.555114	<i>0.7001</i>	<i>0.7056</i>
48 - 54	2.09099	2.08527	2.1892	2.2092
55 - 57	5.238534	5.26898	5.1189	5.2423
Additional controls for gender, tenure, wage group, industry and education				
Estimates significant at 1 % level in bold, at 5 % level in italics				

Tables 18 and 19 show similar results for flows into and out of the public sector. Here, none of the coefficients for age groups above 35 are significantly negative. The number of observations is smaller than for the intra private sector flows, but still around 1600.

Table 18 Impact of PPG on wage change on transition 2001-3 and on wage growth 2003-7, from public to private, 1643 observations

	<i>Wage change, average value 0.107, R sq 0.185</i>				<i>Wage growth, average value 0.255, R sq 0.466</i>			
	<i>Estimate</i>	<i>St error</i>	<i>t Value</i>	<i>Pr > t </i>	<i>Estimate</i>	<i>St error</i>	<i>t Value</i>	<i>Pr > t </i>
<i>PPG by age group (2001):</i>								
25 - 29	<i>1.900</i>	0.844	2.250	0.025	3.325	0.887	3.750	0.000
30 - 35	-0.047	0.443	-0.110	0.915	1.765	0.466	3.790	0.000
36 - 41	0.042	0.543	0.080	0.938	0.402	0.571	0.700	0.482
42 - 47	-0.098	0.978	-0.100	0.920	-0.025	1.029	-0.020	0.981
48 - 54	-1.132	1.858	-0.610	0.543	-1.177	1.953	-0.600	0.547
55 - 57	1.581	6.181	0.260	0.798	-2.066	6.498	-0.320	0.751
Male	0.043	0.010	4.200	<.0001	0.079	0.011	7.440	<.0001
Tenure in years	0.000	0.002	-0.090	0.928	0.003	0.002	1.660	0.098
<i>Education</i>								
Compulsory	0.083	0.050	1.670	0.096	0.054	0.053	1.030	0.305
Higher	0.090	0.014	6.210	<.0001	0.132	0.015	8.690	<.0001
Doctoral degree	0.189	0.029	6.450	<.0001	0.123	0.031	4.000	<.0001
Unknown	<i>0.100</i>	0.045	2.240	0.025	0.181	0.047	3.840	0.000
Relative change in firm size 2001 - 2002	-0.003	0.013	-0.250	0.802	<i>0.029</i>	0.013	2.190	0.029
Additional controls for industry at NACE level 1. Reference for education is upper secondary								
Estimates significant at 1 % level in bold, at 5 % level in italics								

Table 19 Impact of PPG on wage change on transition 2001-3 and on wage growth 2003-7, from private to public, 1772 observations								
	<i>Wage change, average value 0.103, R sq 0.207</i>				<i>Wage growth, average value 0.266, R sq 0.462</i>			
	<i>Estimate</i>	<i>St error</i>	<i>t value</i>	<i>Pr > t </i>	<i>Estimate</i>	<i>St error</i>	<i>t Value</i>	<i>Pr > t </i>
<i>PPG by age group (2001)</i>								
25 - 29	-6.031	3.064	-1.970	0.049	10.925	2.918	3.740	0.000
30 - 35	-5.068	1.442	-3.520	0.001	<i>3.407</i>	1.373	2.480	0.013
36 - 41	0.871	1.068	0.810	0.415	-1.461	1.018	-1.440	0.151
42 - 47	3.905	0.818	4.770	<.0001	-0.829	0.779	-1.060	0.288
48 - 54	4.291	1.045	4.110	<.0001	-0.021	0.995	-0.020	0.984
55 - 57	2.658	2.362	1.130	0.261	1.453	2.250	0.650	0.519
Male	0.042	0.011	3.740	0.000	0.073	0.011	6.890	<.0001
Tenure in years	0.001	0.002	0.580	0.560	0.001	0.002	0.730	0.465
<i>Education</i>								
Compulsory	0.000	0.074	0.000	0.999	-0.029	0.070	-0.410	0.678
Higher	0.056	0.018	3.160	0.002	0.118	0.017	6.960	<.0001
Doctoral degree	0.025	0.034	0.740	0.461	0.166	0.032	5.180	<.0001
Unknown	0.029	0.039	0.740	0.457	0.207	0.037	5.600	<.0001
Relative change in firm size 2001 - 2002	0.024	0.018	1.310	0.191	0.023	0.017	1.360	0.175
Additional controls for industry at NACE level 1. Reference for education is upper seco								
Estimates significant at 1 % level in bold, at 5 % level in italics								

We have also estimated on data for 1997 - 1999 and 1999 - 2001. The results are very similar, with no significantly negative coefficients for age groups above 35, and are shown in the appendix.

It might be the case that portability gains and losses are not regarded symmetrically. But even if that were the case, the split into age groups should control for that. In addition, we have also run wage regressions only for those with a potential portability loss, and the results were largely the same.

8. Placebo estimations of wage effects

In the preceding we have used variation in PPG to look for impacts on mobility. We have found no effect on the probability of changing jobs, or any wage compensation in the job change for the potential pension loss. The variation in PPG is driven by a combination of wage, age and tenure, and we expect this relationship to show up in a standard wage regression run before a job move. After a job move, we would expect any compensation to show up in terms of a different (smaller) coefficient for wages on PPG. Hence, any difference between two estimates should indicate compensation. As shown in Table 20, the estimates for PPG are practically identical and certainly not statistically different. This supports the conclusion that there is no wage compensation for a potential portability loss and indicative of no lock in effects.

Table 20 Impact of PPG on wage change on transitions 2001-3 and wage growth 2003-7 between private pension enterprises, with firm effects. 11 061 observations						
	<i>Log wage 2001, average value 14.0, R sq 0.595</i>			<i>Log wage 2003, average value 14.0, R sq 0.649</i>		
	<i>Estimate</i>	<i>St error</i>	<i>t value</i>	<i>Estimate</i>	<i>St error</i>	<i>t value</i>
Constant	15.567	0.022	718.410	15.769	0.021	763.740
PPG	-4.486	0.240	-18.730	-4.707	0.228	-20.620
Age in 2003	-0.038	0.001	-74.800	-0.042	0.000	-86.280
Male	-0.215	0.007	-30.230	-0.218	0.007	-32.250
Tenure up to 2003	-0.003	0.001	-5.460	-0.003	0.001	-5.200
<i>Education</i>						
Compulsory	-0.138	0.021	-6.550	-0.143	0.020	-7.110
Higher	0.242	0.007	32.990	0.238	0.007	34.070
Doctoral degree	0.496	0.023	21.320	0.500	0.022	22.570
Unknown	0.364	0.018	20.140	0.363	0.017	21.110
Additional controls for industry at NACE level 1. Reference for education is upper second						
Estimates significant at 1 % level in bold, at 5 % level in italics						

10. Conclusion

The picture emerging from this analysis is that there is no discernible lock-in effect of the occupational pension system in Norway, neither in the period 2001 - 2003 with rising unemployment, nor in the period 1997 - 1999 with falling unemployment or 1999 - 2001 with constant unemployment.

Under the assumption of continued work in a job with identical wage and pension after a job change, we define the potential portability gain from a job change as the change in percentage points of the projected pension replacement rate. We calculate this measure of portability gain for three types of flows; between private sector jobs with pension coverage, from private sector jobs with pension coverage to the public sector, and from the public sector to a private sector job with pension coverage. The gain from a job change is positive up to the age of 35, while it is possible to obtain a full pension in a new job (assuming the usual 30 years for full accrual) and the QP from the initial job is a pure bonus. After that age the portability gain is increasingly negative, since full accrual is not achievable in the new job and the QP is increasingly insufficient to cover the difference between the old and the new pension.

In the sample, the calculated PPG from the private sector is generally lower (higher loss) than from the public sector. This could be related to a generally higher wage in the private sector which tends to give a higher loss. Also, the rules are different, which could have the same effect. Whatever the reason, this gives on average less potential portability loss for public employees.

In the analysis of job change the sample consists of individuals who were in private sector jobs with pension coverage both in 2001 and in 2003. The variation in potential portability gain is from -10.6 % to 7 %. We estimate various specifications of a job change propensity equation on different sub-samples, and find no clear effects of potential portability gain on the propensity to change jobs.

In the wage analyses, we restrict attention to movers with a wage change from 2001 to 2003 between -20 % and 100 %, and with a subsequent four years wage growth between -40 % and 300 %. In this sample, the magnitude of the gain varies from -8.2 % to 12.6 %. Across five years age groups and the three types of flows described above, the average gain varies from - 2.4 % to 3.1 %. There are no clear signs of portability

gains and losses being reflected in immediate wage changes or in subsequent wage growth for movers.

All analyses have been run also on data for the periods 1997 - 1999 and 1999 - 2001, with quite similar results.

There might be several explanations for these results. First, potential job movers rely on perceptions of alternative compensation packages, in principle covering all remaining years until retirement. Since the magnitude of the portability gain is not too large (standard deviations of about +/- 2 % around group averages (type of flow and age group)), a perception of higher wage growth in the new job might easily outweigh the loss. It is therefore not unreasonable that we find no effect on labour market mobility, especially not when uncertainty is added to the picture. Even so, it is worth noting that there is no sign that the loss that would follow from a move into a job with the same wage is actually compensated, neither immediately nor over the next four years.

As for the data, there is of course a problem that we may have a mix of quits and layoffs. We have tried to reduce this problem by looking only at individuals moving between full time, full year pension covered jobs, and excluded persons with spells of unemployment or receipt of social security benefits during the transitional year. In particular, moves out from the public sector into a pension covered job should be voluntary.

If the results are to be taken at face value, in that there are no lock-in effects of the Norwegian DB system, then one can leave aside the concern about such occupational pensions reducing labour market mobility. Although we have not looked specifically at the movements between the private and the public sector, one might conclude that there must be other reasons for any lack of mobility between the two. As a final remark, we note that a lock-in effect may still arise in a situation where DB plans are generally closed to new entrants and where the alternative DC plans are less generous. The potential losses would then be higher than those observed in our data.

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Appendix 1 Descriptive tables and job change propensity equations for 1997 – 1999 and 1999 – 2001

Sample: 1997-1999

Table A2. The sample (97/99)

Inclusion criteria	Number of enterprises*	Number of persons
All persons with employment in 1997	114672	1914930
- full time employment	90794	1371651
- throughout 1997	76365	1015476
- and throughout 1999		776367
- did not receive welfare benefits during 1998		764164
- working in enterprise with known OP status in 1997		703761
- and in 1999		691394
- demographic information available and age (1997) in [25,57]		623927
- not in primary industries and change in employment (1997) in [-75,75] %		556988

*Number of enterprises with at least one employee satisfying the respective inclusion criteria.

Table A3. Number of enterprises and employees in different sectors

<i>Sector</i>	1997				1999			
	Enterprises		Employees		Enterprises		Employees	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Public	1730	4.17	230093	41.31	1596	3.70	231249	41.52
Private w/OP	2600	6.27	123543	22.18	4960	11.50	186279	33.44
Private wo/OP	37167	89.57	203352	36.51	36586	84.80	139460	25.04
Total	41497	100.00	556988	100.00	43142	100.00	556988	100.00

Table A4. Relative frequencies of movers by age groups

<i>Sector (1997)</i>	Full sample	Movers	<i>Age (1997)</i>			
			25-29	30-39	40-49	50-57
Public	230093	0.06	0.12	0.09	0.05	0.03
Private w/OP	123543	0.09	0.17	0.12	0.07	0.05
Private wo/OP	203352	0.09	0.16	0.12	0.07	0.04
All	556988	0.08	0.15	0.11	0.06	0.04

Table A5. Relative frequencies of movers by years of tenure (end of 1997)						
	All	1-4	5-9	10-14	15-19	20+
<i>Sector (1997)</i>						
Public	0.06	0.10	0.05	0.04	0.02	0.02
Private w/OP	0.09	0.14	0.09	0.07	0.04	0.03
Private wo/OP	0.09	0.13	0.08	0.06	0.04	0.03
All	0.08	0.12	0.07	0.05	0.03	0.03

Table A6. Relative frequencies of movers by educational groups					
	All	Compulsory	Secondary	Bachelor	Master/PhD
<i>Sector (1997)</i>					
Public	0.06	0.04	0.05	0.06	0.09
Private w/OP	0.09	0.05	0.08	0.14	0.16
Private wo/OP	0.09	0.07	0.09	0.13	0.14
All	0.08	0.06	0.07	0.09	0.11

Table A7. Within- and between-sector mobility – movers

		<i>Sector (1999)</i>		
		Public	Private w/OP	Private wo/OP
<i>Sector (1997)</i>	All		%	
Public	13458	74	15	12
Private w/OP	11234	15	56	29
Private wo/OP	18904	10	42	48
All	43596	31	37	32

Table A8. Average wages and wage change

	Number of employees	Average wage 1997	Average wage 1999	Change average wage	Average change rate
<i>Sector (1997)</i>					
<i>Full sample</i>					
Public	230093	261689	294844	12.67	13.65
Private w/OP	123543	307312	346181	12.65	13.25
Private wo/OP	203352	276857	311714	12.59	13.96
All	556988	277346	312390	12.64	13.68
<i>Movers</i>					
Public	13458	271410	314930	16.03	18.42
Private w/OP	11234	323291	368031	13.84	16.74
Private wo/OP	18904	285187	326134	14.36	18.46
All	43596	290753	333472	14.69	18.00
<i>Stayers</i>					
Public	216635	261085	293596	12.45	13.36
Private w/OP	112309	305714	343996	12.52	12.90
Private wo/OP	184448	276003	310236	12.40	13.50
All	513392	276208	310600	12.45	13.31

Table A9. Sector changes and average wages

<i>Sector (1997)</i>	<i>Sector (1999)</i>		
	Public	Private w/OP	Private wo/OP
	<i>Initial level*</i>		
Public	93	97	92
Private w/OP	105	113	110
Private wo/OP	93	104	94
	<i>Change average wage</i>		
Public	13.91	23.35	19.71
Private w/OP	10.49	16.58	9.96
Private wo/OP	12.90	17.90	11.22

*Average wage in 1997, relative to average wage for all job changers

(i.e. 290 753 = 100)

Sample: 1999-2001

Table B2. The sample (99/01)

Inclusion criteria	Number of enterprises*	Number of persons
All persons with employment in 1999	116463	2018347
- full time employment	94214	1469526
- throughout 1999	79416	1071222
- and throughout 2001		777313
- did not receive welfare benefits during 2000		761571
- working in enterprise with known OP status in 1999		704926
- and in 2001		690734
- demographic information available and age (1999) in [25,57]		621527
- not in primary industries and change in employment (1999) in [-75,75] %		567861

*Number of enterprises with at least one employee satisfying the respective inclusion criteria.

Table B3. Number of enterprises and employees in different sectors

Sector	1999				2001			
	Enterprises		Employees		Enterprises		Employees	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Public	1603	3.64	239353	42.15	1738	3.75	226210	39.84
Private w/OP	4598	10.43	180818	31.84	5273	11.37	200320	35.28
Private wo/OP	37893	85.94	147690	26.01	39376	84.89	141331	24.89
Total	44094	100.00	567861	100.00	46387	100.00	567861	100.00

Table B4. Relative frequencies of movers by age groups

	Full sample	Movers	<i>Age (1999)</i>			
			25-29	30-39	40-49	50-57
<i>Sector (1999)</i>						
Public	239353	0.07	0.14	0.10	0.06	0.04
Private w/OP	180818	0.09	0.16	0.12	0.07	0.05
Private wo/OP	147690	0.09	0.15	0.12	0.07	0.05
All	567861	0.08	0.15	0.11	0.07	0.04

Table B5. Relative frequencies of movers by years of tenure (end of 1999)

	All	1-4	5-9	10-14	15-19	20+
<i>Sector (1999)</i>						
Public	0.07	0.10	0.06	0.04	0.04	0.04
Private w/OP	0.09	0.14	0.08	0.05	0.05	0.03
Private wo/OP	0.09	0.13	0.08	0.06	0.05	0.03
All	0.08	0.12	0.07	0.05	0.04	0.03

Table B6. Relative frequencies of movers by educational groups

	All	Compulsory	Secondary	Bachelor	Master/PhD
<i>Sector (1999)</i>					
Public	0.07	0.05	0.08	0.06	0.08
Private w/OP	0.09	0.06	0.08	0.14	0.16
Private wo/OP	0.09	0.06	0.09	0.14	0.14
All	0.08	0.06	0.08	0.09	0.11

Table B7. Within- and between-sector mobility – movers

		<i>Sector (2001)</i>		
		Public	Private w/OP	Private wo/OP
<i>Sector (1999)</i>	All		%	
Public	16677	62	25	13
Private w/OP	16594	9	57	33
Private wo/OP	13828	7	37	56
All	47099	27	40	33

Table B8. Average wages and wage change

	Number of employees	Average wage 1999	Average wage 2001	Change average wage	Average change rate
<i>Sector (1999)</i>					
<i>Full sample</i>					
Public	239353	291963	324941	11.30	11.85
Private w/OP	180818	339353	375892	10.77	11.49
Private wo/OP	147690	299884	332460	10.86	12.57
All	567861	309113	343120	11.00	11.93
<i>Movers</i>					
Public	16677	295822	332295	12.33	15.29
Private w/OP	16594	358207	392669	9.62	12.86
Private wo/OP	13828	312224	345311	10.60	15.54
All	47099	322617	357387	10.78	14.51
<i>Stayers</i>					
Public	222676	291674	324390	11.22	11.60
Private w/OP	164224	337448	374196	10.89	11.35
Private wo/OP	133862	298609	331132	10.89	12.26
All	520762	307892	341830	11.02	11.69

Table B9. Sector changes and average wages

	<i>Sector (2001)</i>		
	Public	Private w/OP	Private wo/OP
<i>Sector (1999)</i>			<i>Initial level*</i>
Public	91	92	93
Private w/OP	105	113	109
Private wo/OP	90	102	94
			<i>Change average wage</i>
Public	11.14	15.15	12.52
Private w/OP	3.96	12.02	6.84
Private wo/OP	8.64	13.50	8.75

*Average wage in 1999, relative to average wage for all job changers
(i.e. 322 617 = 100)

Table A13. Job change propensity equation, average marginal effects from probit models: 1997-1999

Parameter	Sample I (25 – 34)	Sample II (35 – 39)	Sample III (40 – 44)	Sample IV (45 – 49)	Sample V (50 – 57)
Portability gain [†]	1.057* (0.435)	0.577*** (0.162)	-0.122 (0.299)	-0.569 (0.358)	-0.430 (0.281)
Years of tenure	-0.00365*** (0.000799)	-0.00322*** (0.000529)	-0.00317*** (0.000538)	-0.00219*** (0.000458)	-0.00225*** (0.000517)
Sickness/maternity leave	-0.0146*** (0.00295)	-0.0116** (0.00395)	-0.000193 (0.00661)	-0.0153*** (0.00388)	0.000932 (0.00396)
Region					
East	Ref	Ref	Ref	Ref	Ref
South	-0.0140 (0.00820)	-0.00587 (0.0126)	-0.0107 (0.0134)	-0.0186* (0.00919)	-0.0242** (0.00934)
West	0.00692 (0.0157)	0.0141 (0.0215)	0.00694 (0.0231)	-0.00514 (0.0173)	-0.00716 (0.0199)
Mid	-0.0154 (0.00843)	-0.0106 (0.0103)	-0.0118 (0.0113)	-0.0173 (0.00916)	-0.0198* (0.00989)
North	-0.0182 (0.00957)	-0.0358*** (0.00807)	-0.0295** (0.00980)	-0.0249** (0.00947)	-0.0339*** (0.00772)
Oslo	0.000335 (0.00773)	0.00782 (0.0105)	0.0104 (0.0147)	-0.000802 (0.0118)	-0.00108 (0.0147)
Other areas	-0.0140 (0.00820)	-0.00587 (0.0126)	-0.0107 (0.0134)	-0.0186* (0.00919)	-0.0242** (0.00934)
Employment change					
[-75%,-50%)	Ref	Ref	Ref	Ref	Ref
[-50%,-25%)	0.0320 (0.0796)	-0.0675 (0.0895)	-0.00587 (0.0976)	-0.0923 (0.0923)	-0.173* (0.0770)
[-25%,0%)	-0.108** (0.0380)	-0.162** (0.0496)	-0.106* (0.0537)	-0.165** (0.0508)	-0.264*** (0.0365)
0%	-0.118*** (0.0355)	-0.181*** (0.0431)	-0.150*** (0.0314)	-0.205*** (0.0257)	-0.301*** (0.0213)
(0%,25%]	-0.136*** (0.0298)	-0.200*** (0.0291)	-0.149*** (0.0291)	-0.204*** (0.0262)	-0.294*** (0.0232)
(25%,50%]	-0.130*** (0.0327)	-0.187*** (0.0390)	-0.156*** (0.0263)	-0.197*** (0.0304)	-0.301*** (0.0217)
(50%,75%]	-0.122*** (0.0371)	-0.183*** (0.0470)	-0.127** (0.0455)	-0.166** (0.0569)	-0.271*** (0.0408)
n	26,061	18,026	18,489	18,699	25,925
pseudo R ²	0.072	0.074	0.080	0.092	0.100
Log likelihood	-7485.3	-4140.7	-3559.2	-3013.1	-3439.7
# of clusters	1628	1482	1518	1528	1572

Standard errors in parentheses, clustered on firms. Additional controls are lnWage and dummies for gender, educational attainment, region of residence, immigrant status, marriage status and industry.

* (p<0.05), ** (p<0.01), *** (p<0.001)

[†]Residuals from linear regression of potential portability gain on years of tenure and lnWage.

Table B13. Job change propensity equation, average marginal effects from probit models: 1999-2001

Parameter	Sample I (25 - 34)	Sample II (35 - 39)	Sample III (40 - 44)	Sample IV (45 - 49)	Sample V (50 - 57)
Portability gain [†]	0.621 (0.478)	0.149 (0.115)	0.811** (0.310)	0.708* (0.303)	0.375 (0.347)
Years of tenure	-0.00463*** (0.000871)	-0.00379*** (0.000611)	-0.00368*** (0.000809)	-0.00145** (0.000533)	-0.00155** (0.000570)
Sickness/maternity leave	-0.00681** (0.00248)	-0.00777* (0.00334)	-0.0101* (0.00401)	-0.00687 (0.00403)	-0.00745** (0.00245)
Region					
East	Ref	Ref	Ref	Ref	Ref
South	0.0000228 (0.00487)	-0.00325 (0.00642)	-0.00604 (0.00670)	-0.000385 (0.00657)	-0.00557 (0.00473)
West	0.0171 (0.00898)	0.0113 (0.0110)	0.0206 (0.0157)	0.0232 (0.0158)	0.0149 (0.0149)
Mid	0.0127 (0.00882)	0.00275 (0.00806)	0.0213 (0.0118)	0.00813 (0.00846)	0.0178 (0.0100)
North	-0.0110* (0.00553)	-0.0170** (0.00649)	-0.0139 (0.00795)	-0.00436 (0.00947)	0.000874 (0.00932)
Oslo	0.0332*** (0.00915)	0.0299** (0.00963)	0.0360** (0.0116)	0.0460*** (0.0136)	0.0384** (0.0142)
Other areas	0.0287 (0.0213)	-0.0166 (0.0125)	-0.0162 (0.0124)	-0.0162 (0.0125)	-0.0148 (0.00845)
Employment change					
[-75%,-50%)	Ref	Ref	Ref	Ref	Ref
[-50%,-25%)	-0.0816 (0.0483)	-0.0826 (0.0814)	-0.0972 (0.0730)	-0.119 (0.0759)	-0.239*** (0.0565)
[-25%,0%)	-0.153*** (0.0323)	-0.204*** (0.0341)	-0.219*** (0.0316)	-0.246*** (0.0304)	-0.327*** (0.0268)
0%	-0.168*** (0.0317)	-0.240*** (0.0192)	-0.226*** (0.0326)	-0.269*** (0.0248)	-0.327*** (0.0302)
(0%,25%]	-0.164*** (0.0322)	-0.218*** (0.0281)	-0.231*** (0.0276)	-0.256*** (0.0275)	-0.335*** (0.0266)
(25%,50%]	-0.142*** (0.0367)	-0.191*** (0.0423)	-0.222*** (0.0345)	-0.233*** (0.0388)	-0.334*** (0.0297)
(50%,75%]	-0.144*** (0.0368)	-0.168** (0.0518)	-0.155* (0.0628)	-0.231*** (0.0433)	-0.327*** (0.0343)
n	41,533	27,472	27,744	26,720	40,441
pseudo R ²	0.067	0.081	0.086	0.080	0.090
Log likelihood	-11474.8	-6139.1	-5357.3	-4292.0	-5679.2
# of clusters	3353	3028	3090	3071	3301

Standard errors in parentheses, clustered on firms. Additional controls are lnWage and dummies for gender, educational attainment, region of residence, immigrant status, marriage status and industry.

* (p<0.05), ** (p<0.01), *** (p<0.001)

[†]Residuals from linear regression of potential portability gain on years of tenure and lnWage.

Appendix 2 Wage effects 1997 - 1999 and 1999 - 2001

	Wage change 1997 - 1999								
	<i>Priv - priv</i>			<i>Pub - priv</i>			<i>Priv - pub</i>		
	<i>Estimate</i>	<i>St error</i>	<i>Pr > t </i>	<i>Estimate</i>	<i>St error</i>	<i>Pr > t </i>	<i>Estimate</i>	<i>St error</i>	<i>Pr > t </i>
<i>PPG by age group (2001):</i>									
25 - 29	-1,347	1,195	0,260	0,409	0,549	0,456	3,190	2,280	0,162
30 - 35	-1,846	0,508	0,000	-1,007	0,299	0,001	-1,227	0,965	0,203
36 - 41	0,823	0,459	0,073	-0,363	0,409	0,375	1,138	0,698	0,103
42 - 47	2,327	0,349	<.0001	-1,290	0,879	0,142	2,034	0,568	0,000
48 - 54	2,595	0,400	<.0001	-1,353	2,313	0,559	1,918	0,590	0,001
55 - 57	5,843	1,436	<.0001	-87,812	111,474	0,431	-1,254	4,967	0,801
Male	0,057	0,006	<.0001	0,078	0,009	<.0001	0,050	0,008	<.0001
Tenure in years	-0,002	0,001	0,010	-0,002	0,002	0,137	-0,002	0,001	0,159
<i>Education</i>									
Compulsory	0,061	0,025	0,016	0,013	0,042	0,749	0,009	0,033	0,792
Bachelor/Master	0,093	0,007	<.0001	0,148	0,012	<.0001	0,075	0,011	<.0001
Doctoral degree	0,113	0,029	0,000	0,225	0,023	<.0001	0,135	0,039	0,001
Unknown	0,123	0,018	<.0001	0,142	0,038	0,000	0,156	0,034	<.0001
Relative change in firm size									
2001 - 2002	-0,005	0,002	0,019	0,000	0,006	0,987	-0,019	0,003	<.0001
	Wage growth 1997 - 2007								
<i>PPG by age group (2001):</i>									
25 - 29	7,465	2,058	0,000	1,652	0,798	0,039	16,183	3,970	<.0001
30 - 35	1,587	0,875	0,070	1,388	0,435	0,001	2,181	1,680	0,194
36 - 41	-1,378	0,789	0,081	1,317	0,595	0,027	0,120	1,216	0,922
42 - 47	1,438	0,601	0,017	1,326	1,278	0,300	1,181	0,990	0,233
48 - 54	2,292	0,689	0,001	2,215	3,361	0,510	2,041	1,027	0,047
55 - 57	7,328	2,472	0,003	-15,538	161,986	0,924	7,773	8,650	0,369
Male	0,117	0,010	<.0001	0,121	0,012	<.0001	0,115	0,014	<.0001
Tenure in years	0,002	0,001	0,067	-0,006	0,002	0,018	0,000	0,002	0,875
<i>Education</i>									
Compulsory	0,013	0,044	0,759	0,085	0,061	0,165	0,114	0,058	0,050
Bachelor/Master	0,124	0,012	<.0001	0,130	0,018	<.0001	0,092	0,019	<.0001
Doctoral degree	0,136	0,050	0,007	0,140	0,033	<.0001	0,056	0,068	0,414
Unknown	0,223	0,032	<.0001	0,091	0,055	0,099	0,219	0,059	0,000
Relative change in firm size									
2001 - 2002	0,006	0,004	0,137	0,007	0,009	0,412	0,007	0,005	0,192

Additional controls for industry at NACE level 1. Reference for education is upper secondary
 Estimates significant at 1 % level in bold, at 5 % level in italics

	Wage change 1999 - 2001								
	<i>Priv - priv</i>			<i>Pub - priv</i>			<i>Priv - pub</i>		
<i>PPG by age group (2001):</i>	<i>Estimate</i>	<i>St error</i>	<i>Pr > t </i>	<i>Estimate</i>	<i>St error</i>	<i>Pr > t </i>	<i>Estimate</i>	<i>St error</i>	<i>Pr > t </i>
25 - 29	2,834	0,898	0,002	0,340	0,739	0,645	1,846	2,387	0,440
30 - 35	-0,226	0,370	0,542	-0,266	0,447	0,553	0,014	1,063	0,990
36 - 41	<i>0,787</i>	0,311	0,011	-0,718	0,537	0,182	0,953	0,717	0,184
42 - 47	1,477	0,229	<.0001	-1,005	1,166	0,389	2,378	0,569	<.0001
48 - 54	2,021	0,235	<.0001	-6,293	2,629	0,017	2,502	0,624	<.0001
55 - 57	3,278	0,571	<.0001	-53,182	24,736	0,032	1,334	1,867	0,475
Male	0,036	0,004	<.0001	0,042	0,010	<.0001	0,084	0,008	<.0001
Tenure in years	-0,001	0,000	0,002	0,002	0,002	0,351	0,000	0,001	0,967
<i>Education</i>									
Compulsory	0,013	0,016	0,396	0,004	0,066	0,957	-0,032	0,041	0,432
Higher	0,057	0,005	<.0001	0,128	0,015	<.0001	0,020	0,011	0,075
Doctoral degree	0,097	0,015	<.0001	0,269	0,027	<.0001	0,010	0,037	0,786
Unknown	0,111	0,013	<.0001	0,140	0,041	0,001	0,047	0,037	0,208
Relative change in firm size 2001 - 2002	0,006	0,005	0,191	0,007	0,010	0,515	0,021	0,012	0,070
				Wage growth 2001 - 2007					
<i>PPG by age group (2001):</i>									
25 - 29	12,965	1,656	<.0001	3,996	1,118	0,000	12,401	3,395	0,000
30 - 35	4,652	0,683	<.0001	2,640	0,677	<.0001	3,726	1,512	0,014
36 - 41	-2,025	0,573	0,000	0,671	0,812	0,409	-0,196	1,020	0,848
42 - 47	-0,046	0,422	0,913	1,205	1,763	0,494	0,702	0,809	0,386
48 - 54	1,172	0,434	0,007	1,698	3,975	0,669	<i>1,104</i>	0,887	0,214
55 - 57	2,577	1,052	0,014	9,518	37,406	0,799	7,726	2,656	0,004
Male	0,109	0,007	<.0001	0,115	0,015	<.0001	0,105	0,012	<.0001
Tenure in years	0,002	0,001	0,050	-0,004	0,003	0,208	0,001	0,002	0,752
<i>Education</i>									
Compulsory	0,034	0,029	0,237	0,016	0,101	0,875	0,068	0,058	0,243
Higher	0,119	0,009	<.0001	0,140	0,023	<.0001	0,083	0,016	<.0001
Doctoral degree	0,097	0,028	0,000	0,169	0,041	<.0001	0,041	0,052	0,435
Unknown	0,198	0,024	<.0001	0,146	0,063	0,020	0,073	0,053	0,168
Relative change in firm size 2001 - 2002	0,010	0,008	0,232	-0,003	0,015	0,846	0,015	0,017	0,360
Additional controls for industry at NACE level 1. Reference for education is upper secondary									
Estimates significant at 1 % level in bold, at 5 % level in italics									

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