



IJM
24,7

774

Returns to tenure, firm-specific human capital and worker heterogeneity

Paul Bingley

CCP and National Centre for Register-based Research,
University of Aarhus, Aarhus, Denmark, and

Niels Westergaard-Nielsen

CCP and Department of Economics, Aarhus School of Business,
Aarhus, Denmark

Keywords Human capital, Income, Contracts of employment

Abstract Workers with longer job tenure are paid more, on average, than those with shorter tenure. This paper re-opens the debate about whether individual financial returns to tenure are due to firm-specific human capital accumulation or sorting according to unobserved individual productivity heterogeneity. The paper constructs worker-firm employment histories 1964-1998 for all residents of Denmark and links this to wage and demographic information for all private sector workers 1980-1998. All firm closures are observed, and following Kletzer we exploit these exogenous worker displacements from larger firms to distinguish between firm-specific human capital and worker heterogeneity. Although the proportion of tenure returns due to firm-specific human capital is smaller than that found in the USA, it has increased from 10 per cent in 1980 to 30 per cent in 1998 in Denmark. This change coincides with decentralisation of the wage bargaining process and may be explained by the increased freedom to write individual contracts.

1. Introduction

In recent years there has been a growing interest in worker mobility and job stability in the labour market. OECD (1997) documents a growing sense of job insecurity in many member states and shows that tenure at the current employer has actually declined in some countries, while it is not found that it has increased in any country. Part of the decline is, however, due to a changed composition of workers and changed work patterns by age and gender as summarized by Farber (1999).

Worker turnover rates of about 19 per cent for manufacturing industry in the USA were reported by Davis and Haltiwanger (1999). Albæk and Sørensen (1998) in their work showed a similarly high turnover for Denmark. Other European countries seem to have lower turnover than Denmark (OECD, 1999). However, there is plenty of evidence that turnover is different between firms,



industries, worker groups and in many other dimensions. Werwatz *et al.* (1999) have shown that manufacturing is not the only industry with high turnover rates, and that some industries have average turnover rates that are almost 30 per cent higher than manufacturing, while others are lower. Turnover in many of these studies is shown to be cyclical. However, all these studies have been based on a relatively short time span where it has not been possible to study if there has been a trend in turnover.

This paper uses a new data source to construct uncensored measures of firm tenure for the Danish population of private sector workers. Our statistics show that the average tenure for men in the age group 31-50 has fallen from 6.33 years in 1980 to 5.49 in 1998. For women in the same age group the average tenure has increased from 5.05 to 5.45. The paper is organised as follows. Sections 2 and 3 describe the theoretical background, Section 4 describes the data and presents the basic statistics, and Section 5 estimates the returns to tenure.

2. Background

There are several reasons why tenure in Denmark may be lower than for other countries.

First, wage scales are probably among the most compressed of OECD countries. Compressed wages make it more difficult for an employer to give a good worker a higher wage in order to retain him/her. The only way a person on an individual basis can get a higher wage will be to move to a different employer with a higher mean wage. If this is a constraining factor, we will expect that returns to tenure are low and we will also expect that tenure is relatively short.

Second, employment protection is weak in Denmark, and similar to the level of the USA.

Third, unemployment insurance benefits are relatively high for low wage earners. And benefits can be obtained for a long period. Furthermore, there is almost no experience rating in the system.

Fourth, pension rights are organised along union lines rather than by employers.

All these factors pull in the direction of short tenure. The consequences of low tenure are low benefits for firms of training their workers. The risk is that people leave for a better-paid job in a different firm. Accordingly, the amount of firm-specific human capital is expected to be low. This may lead to lower returns to tenure compared with other countries. This itself is expected to have a negative effect on productivity. However, there are also benefits in the form of a more flexible workforce in the sense that it is easy to hire and fire people according to changes in demand. This increases productivity. Furthermore, greater flexibility gives faster access to new human capital and to taking over technology from other firms. It remains an empirical question whether this high flexibility has a net contribution to productivity or not.

Over the last two decades, a substantial change in the organisation of wage bargaining has taken place in Denmark and we should expect that it will affect returns to tenure. Until 1987 wage bargaining can be characterised as centralised, but with two levels. Furthermore, the system prior to 1987 was one of the fixed wage scales where experience in the trade or age and education were more important parameters than other individual characteristics. Despite this, the wage level has always differed between firms. A first step towards decentralized wage setting was taken in 1987, where bargaining was shifted down to the industry or firm level. However, wage bargaining was still restricted and has been described as coordinated within strict guidelines (Andersen *et al.*, 2001). These guidelines were finally abandoned in 1993 and many more contracts have since been negotiated at the firm level. This has started a process whereby more and more wages are individualized and more and more employees negotiate wages directly with their employer.

This development is described in Table I, where information on contracts with employers belonging to the Danish Employers Federation is described. Central bargaining means here that a wage has been fixed at national or industry-level. In other cases, the wage contract makes it possible to negotiate wages at the firm level, but it is not known to what extent this possibility is exploited. With this reservation, the table shows increasingly decentralized bargaining until 1993, where a new category, “personalised wage setting”, takes over. This covers decentralized bargaining, where the general contract does not even contain a wage guideline, which means that all wages have to be bargained directly between employer and employee.

If tenure at a specific employer plays a role we will expect that firms, after 1987 and especially after 1993, have a greater opportunity to reward tenure.

OECD (1997) presents a comparison of the ongoing tenure for its member countries. Data are based on labour force surveys and are thus individually self-reported tenure. These statistics show that Denmark with its average tenure of 7.9 years is placed together with the Anglo-Saxon countries. The OECD statistics show that Denmark is in the group of countries with the lowest fraction of those with more than ten years of tenure. It is also seen that the number for short tenure is very large in Denmark. Both features bring Denmark on a par with Australia, Czech Republic, Korea and the USA.

Table I.
The decentralisation of
private sector wage
bargaining 1989-2000
(percentages)

	1989	1991	1993	1995	1997	2000
Central bargaining	34	19	16	16	16	15
De-central bargaining possible	62	77	80	73	67	65
Personalized wage setting	4	4	4	11	17	20
Total	100	100	100	100	100	100

Source: Danish Employers Federation, DA, Arbejdsmarkedsrapport (2001)

3. Econometric approaches to estimating the returns to tenure

Measuring financial returns to tenure is not straightforward, because the periods workers will remain employed depend upon the wage in the current job compared to alternative wages. The theory of firm-specific human capital predicts that workers build up firm-specific capital in the current job, which they will lose if they leave. The theory also predicts that the wage will reflect the returns to tenure. Employers will be forced to give their employees a wage that is between the alternative wage and the value of their marginal product. If they give a wage below the outside offer, the worker will quit. This means that tenure will reflect the going level of wages. If wages do not increase sufficiently compared to alternative jobs, the person will quit and tenure will become shorter. Workers with longer tenure are more likely to have more specific capital than workers with less tenure. Furthermore, Farber (1999) suggests that firms with more specific capital involved will adopt more aggressive techniques for retaining their workers. The result will be that workers who have a comparative advantage in accumulating specific capital will tend to become employed by those firms. Lazear (1978) suggests that firms relying more on specific capital will have steeper wage profiles than firms relying less. This means that there will be a firm-specific element in the relation between wage and tenure. In our context, this should mean that the individualizing of wage scales should result in the increasing importance of the firm element. This is our first hypothesis.

Taking a search approach gives quite similar predictions. Here workers with relatively high wages are less likely to quit (Mortensen, 1986), because the probability of finding a job with a wage above the current level is smaller than the higher wage in the current job.

According to Farber (1999), the usual OLS estimate is a 2 per cent higher wage for each year with the same employer. But this is most likely upward biased because individual and job specific elements are positively correlated with tenure. Alternatively, Altonji and Shakotko (1987) used an IV estimator and found very small returns to tenure.

The literature now takes two approaches. One is based on data on those who continue their jobs and the other uses displaced workers. Both have their deficiencies. Topel (1991) estimates the return to tenure for stayers and takes that as an unbiased estimate of wage growth for all workers if they had not changed jobs. He finds a return to tenure between 0.025 and 0.03. The problem of using stayers is that these will tend to have higher returns than the average person. On the other hand, using displaced workers will introduce a negative bias, because those ending their jobs will possess, all else equal, less specific capital because firms want to retain as much of the specific capital as possible.

First, cross-section tenures may be correlated with fixed and unobserved productivity differences across workers – ability bias: the more able are also inclined to have more stable employment. Second, mobility (and hence tenure)

may be endogenous as suggested by models of search or matching in the labour market. These criticisms have in turn spawned a literature that attempts to estimate a return to tenure, net of these biases. One branch of this literature has used data on displaced workers.

If there is a return to firm-specific human capital, it will be lost when a person leaves his job and the salary in the subsequent job will be lower accordingly. Furthermore, it will be lowest for workers with high tenure, because they will lose the most. Addison and Portugal (1989) find support for this using the 1984 US Displaced Workers Survey (DWS). Estimation using displaced workers introduces the problem that their employers may have selected them to be laid off because they were low productivity individuals (Gibbons and Katz, 1991). Furthermore, individual heterogeneity may influence the wage level of the subsequent job. Thus, if tenure in the previous job is correlated with individual productivity, then a job loser with high tenure in the previous job will receive higher wages in his subsequent job. Kletzer (1989) considers the relationship between pre-displacement tenure and wage level in the new job as an indicator of the importance of individual heterogeneity. Using DWS data with workers whose employment is involuntarily terminated and who are not recalled, regressing post-displacement log real earnings on pre-displacement tenure (and controlling for age, gender, race, education and year) gives a small, but significantly positive coefficient on past tenure. Thus, Farber finds that ten years of tenure in the lost job is associated with about 6 per cent higher subsequent wage.

In order to distinguish between unobserved individual heterogeneity from the rate of return to firm-specific human capital, we run two regressions: in the first regression we draw a sample of employed workers who were separated in the previous year from firms that closed. Farber runs a regression of post-displacement log real earnings on pre-displacement tenure, controlling for year, education, age, gender and part-time status. This gives a significant tenure coefficient of 0.021 (with standard error 0.006). This coefficient on pre-displacement tenure in the post-displacement earnings function is interpreted as reflecting worker heterogeneity only. The coefficient on tenure in the first step is interpreted as reflecting the sum of individual heterogeneity and returns to firm-specific human capital. So the difference in coefficients represents the contribution of only firm-specific human capital. The implication of Farber's finding is that about 30 per cent of the estimated returns to tenure is due to heterogeneity and 70 per cent or 0.15 is due to firm-specific human capital.

More formally, the approach by Farber (1999) and Kletzer (1989) comprises two equations:

$$\text{wage}_{i,\text{pre-displ}} = \beta X_i + \gamma^* \text{tenure}_{i,\text{pre-displ}} + \mu_i \quad (1)$$

$$\text{wage}_{i,\text{pos-displ}} = \beta X_i + \dot{\gamma} \text{tenure}_{i,\text{pre-displ}} + \dot{\mu}_i \quad (2)$$

and a third calculation:

Returns to
tenure

$$\text{wage} - \text{diff}_i = (\gamma - \dot{\gamma}) * \text{tenure}_i \quad (3)$$

where X_i comprises a set of exogenous individual characteristics: education and age groups interacted with gender. The first equation contains return to firm-specific human capital and heterogeneity, while the second equation contains possible returns to pre-displacement tenure (i.e. comprising returns to general human capital acquired in the pre-displacement job) and returns to heterogeneity.

We should motivate our concern for heterogeneity bias including pre-displacement tenure in a post-displacement wage equation. The argument is that firm-specific human capital is not transferable across firms. Therefore, if pre-displacement tenure affects post-displacement wages, it must be proxying for an individual fixed effect – productive ability. The coefficient on pre-displacement tenure in the post-displacement wage equation is an estimate of the bias in the returns to tenure estimated by the cross-section pre-displacement wage equation. If tenure is significantly correlated with unobserved ability, and this is significantly correlated with unobserved ability in the post-displacement job, then tenure should be significant. If we subtract the post-displacement return from the pre-displacement return as an approximate correction for ability bias, we find the return to tenure, net of ability bias. It is important to re-state the implicit hypotheses of the estimation technique. Displacements are assumed exogenous and mobility is therefore uncorrelated with unobserved individual characteristics.

Compared to the samples used by Farber (1999) and Kletzer (1989), our data allow us to be more careful with the selection of individuals. Basically, DWS is self-reported and covers people who have become unemployed after they have been separated from their employer. Our sample covers both those who end up in unemployment, and those who get a new job right away. Furthermore, we have excluded all those who do not get a new job within a year because long-term unemployment is expected to result in a further reduction in the post displacement wage, which will bias the returns to tenure upward. DWS has self reported information on firm closures. It is likely that a number of border cases will be characterized as firm closures, though they may be plant closures or large reductions in staff. We have been cautious in this selection and deleted all persons where the whole firm did not close down. From other work on the same data (Frederiksen and Westergaard-Nielsen, 2002) we know that plant closures are often accompanied by re-allocation of employees to other units of multi-plant firms. Failing to exclude these cases would introduce an upward bias in the coefficient to pre-displacement tenure and subsequently a negative bias in the return to firm-specific human capital. The reason is that the re-allocated people will tend to get a wage that is based on their pre-displacement salary. Another issue is whether those affected by a firm closure are like other employees. The suspicion could be that those who leave

the firm before it closes are different from those who stay to the end. It could be that the workers with the highest return to tenure and those who will lose most stay to the end, or it could be that those staying to the end get a higher salary for staying. In both cases, we would expect an upward biased return to firm-specific human capital. Although we cannot avoid the latter problems, our sample consists of all those who have left the firm in the same calendar year as the closure happens. Alternatively, one could use a sample of people who have left the firm one year before closure, but that would be prone to the lemons argument as described by Gibbons and Katz (1991), and that again would lead to bias.

4. Data description

The data used in this study originate from two sources: the first is the *Statistics Denmark IDA (Integrated Database for Labour Market Research) Register*. IDA contains information on labour market conditions for persons and workplaces in Denmark over the years 1980-1998. These data originate from various administrative registers. The important feature of IDA is that it is possible to associate workplaces with the identity of all employees at a specific day in November (Leth-Sørensen, 1998). Employment histories in IDA are censored in 1980. We have augmented these data with information from contribution histories to a mandatory pension programme, ATP. ATP was established in 1964 and is a comprehensive pension system, where all employees have to pay contributions that are related to total hours of work. The employee pays one-third of the contribution, and the employer pays two-thirds. As a result, the ATP system has records for the total contribution for each employee at each employer. These records are subsequently used to construct continuous spells of tenure with each employer. Spells are not transformed to a full-time equivalent basis. This means that a part time spell that has lasted for four years is counted as four years irrespective of hours of work. Employers are defined by their employer identification number, which is changed if ownership changes in a strict legal sense. We have corrected for those cases where more than 50 per cent of all employees are taken over by the new legal employer. In these cases, tenure is said to be continuing. Similarly, if there are short breaks in the employment spell due to temporary lay-offs and maternity leaves, as long as the person continues with the old employer their spell is considered to be ongoing. Even after having taken these precautions in dealing with the administrative records, we will expect that survey based data tend to display longer spells of employment than register-based data, simply because people with high tenure may tend to exaggerate the real length of the spell and because our ID-filter after all will not catch all apparent, but fictive, changes of firm identity.

The matching of IDA and historical ATP data sets enables us to construct tenure for all employees since 1964. However, we only have the full set of

background characteristics from 1980 onwards, so we have limited the data set to those who were employed after 1980, but the ATP data enable us to observe all the ongoing employment spells in 1980 and to follow them back to 1964. As a result, tenure is censored at 17 years for this first group.

Figure 1 shows the distribution of tenure at the current employer for selected years, where all observations with tenure above 17 years are top-coded at 17. The years are selected so as to be the representative of different points in the business cycle. The number with tenure equal to one comprises those who terminate their employment before the second year and those who will have an ongoing spell of employment. Consequently, years with many hires will have more persons with tenure equal to one than other years.

Figures 1 and 2 show that the tenure distribution for men and women have the same profile and that the five selected tenure distributions are almost identical. The five curves do not differ much between different points of the cycle.

The other dimension is the fraction of workers with long tenure. Our statistics are for all the ongoing spells. We have first chosen to show how many have experienced at least 17 years of tenure, because 17 years is the longest

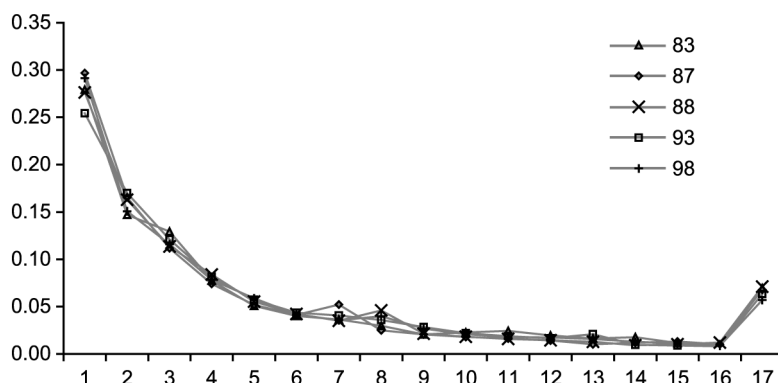


Figure 1.
Tenure distribution for
men, selected years, top
coded at 17

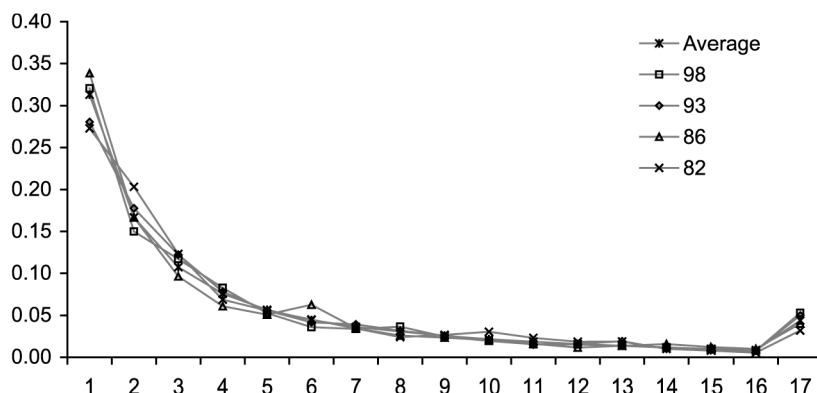


Figure 2.
Tenure distribution for
women, selected years,
top coded at 17

uncensored spell that can be shown in the data consistently over the period. Figure 3 shows that the proportion of people who stay for 17 years and more at the same workplace is only about 5 per cent for men and women together. It has been increasing for women and decreasing for men. The proportion of long tenure between 10 and 17 years has been almost the same for men and women and has been falling until 1990. A recent decline begins in 1997. From this we can conclude that the proportion of all persons in the private sector who stay ten years and more is only about 22 per cent for both genders, where it was around 28 per cent for men and 19 per cent for women in 1980. It is also remarkable that men have decreasing tenure, while women experience increasing tenure and that the two curves seem to meet around 15 per cent.

The total data set consists of 850,000 individual private sector employees and descriptive statistics are reported in Table II. The second panel shows numbers from our data that are comparable with the OECD statistics. In general, we find fewer observations with short tenure but also fewer with long tenure. This point is strengthened when limiting the analysis to prime-aged workers. The main reason for the difference is probably due to the fact that the OECD table is based on self-reports, whereas our statistics are based on register data, where we will neglect the very short spells. For the long spells, respondents might exaggerate the duration, where register data will be fairly accurate. The two types of data may also treat changes of firm identity differently, since respondents are more likely to discard changes of identity that were caused by mergers and acquisitions or change of ownership, whereas

	1980		1998	
	Mean	Std. dev.	Mean	Std. dev.
Log wage	4.607	0.527	4.792	0.546
Tenure	3.522	3.761	3.793	4.628
Male proportion	0.673	–	0.627	–
Age if male	31.797	12.732	34.978	12.649
Age if female	32.923	13.854	32.145	12.449
Overall age	32.061	13.140	33.918	12.646
Years of education				
7	0.204	–	0.074	–
8	0.052	–	0.044	–
9	0.113	–	0.117	–
10	0.164	–	0.165	–
11	0.076	–	0.050	–
12	0.312	–	0.269	–
14	0.023	–	0.068	–
15	0.023	–	0.033	–
16	0.003	–	0.013	–
17	0.006	–	0.022	–
18	0.002	–	0.008	–
Number of observations	3,604	–	4,706	–

Table II.
Descriptive statistics of
sample used in the
regressions, only for
1980 and 1998

register data tend to be more prone to such changes, though much care has been taken to eliminate spurious changes.

The upper lines in Figure 3 display the proportion with only one year of tenure. The proportions have been more or less the same for both genders since 1983 with an average of about 20 per cent. The time pattern shows hiring patterns reflecting the business cycle. Upswings produce a higher proportion with low tenure.

However, there appears to be large differences between age groups and the decline seen in long tenure may partly be explained by a different age and gender composition of the work force.

Table III shows different tenure levels for age groups. The longest tenure is found for the group of male aged 51-60 years. They have had the longest time to find a good match. Comparable figures are found for men aged 61-70, which at first may appear strange given the growing tendency to early retirement. The same age pattern is found among women. It is remarkable that the age structure of tenure for women looks very much like tenure for men in 1998.

Furthermore, it is noticeable that there has been a pronounced decline in tenure at the current employer for men of all ages except the youngest. The decline has been largest for two age groups of 31-50 and 51-60. The opposite effect has been dominating for women. Women above age 30 have increased their tenure. Women are still doing more part-time work than men, but they

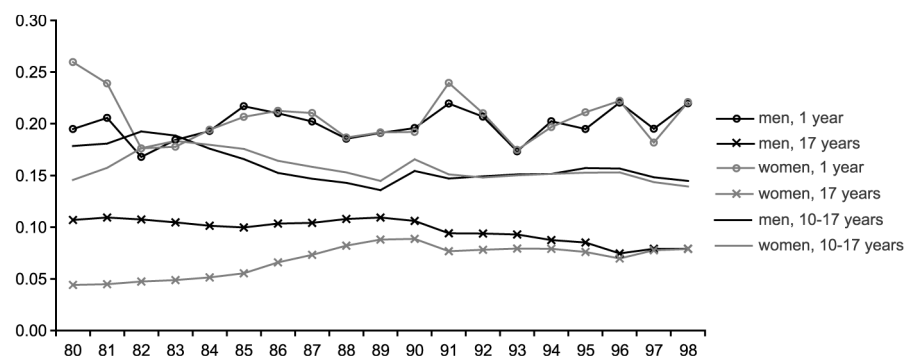


Figure 3.
The proportion of men
and women with low and
high tenure, 1980-1998

	15-18	19-30	31-50	51-60	61-70	Total
Men						
1980	1.27	2.98	6.34	8.38	7.67	5.13
1989	1.46	2.92	6.09	8.18	8.15	5.02
1998	1.47	2.78	5.49	7.43	7.17	4.87
Women						
1980	1.17	3.03	5.05	6.60	6.14	4.23
1989	1.43	2.78	5.94	7.63	7.98	4.64
1998	1.46	2.46	5.45	7.54	7.95	4.59

Table III.
Tenure at current
employer for age groups
and gender, 1980, 1989,
and 1998

stay equally long or even longer with the same employer. The age interval 19-30 is affected by extended maternity leave. The maternity leave itself will not affect our measure of tenure, but a program for extended maternity leave that took effect in 1993 might have had some effect on tenure for this age group.

Thus, we can conclude that the share of long tenures went down in the 1980s. The fraction having one year of tenure does not change much over the entire period. The difference between men and women disappears in the 1980s. The relative decline in tenure for men is partly masked by an increase of tenure for women as their labour market participation increased. This happened to a large extent during the 1980s. Other differences over time must therefore be the result of different compositions of the work force.

So far we have looked at demographic determinants of tenure. In Section 5 we will look at the influence of firm-related factors on tenure.

5. Explaining tenure and the returns to tenure

Firm differences in tenure

We have estimated the following equation for each person, i , using ordinary least squares.

$$\text{Tenure}_i = \text{age}_i * \text{gender}_i + \text{industry}_i + \varepsilon_i,$$

where industry_i are SIC-codes at different levels (9, 27, 53 and 111 categories) and ε_i is an error term. Furthermore, we have added one set of regressions without industry dummies and one set with a dummy variable for each of the 50,000 firms in the data. This is estimated on all employees and estimations are repeated for each of the 19 years, 1980-1998. Figure 4 shows the importance of heterogeneity in individual worker ongoing firm tenure over the business cycle. Each point is an $\bar{R}^2$ measure of goodness-of-fit from a separate and independent regression. Each line corresponds to a different grouping over the years (none, firm and various industry classifications). It is evident that all industry

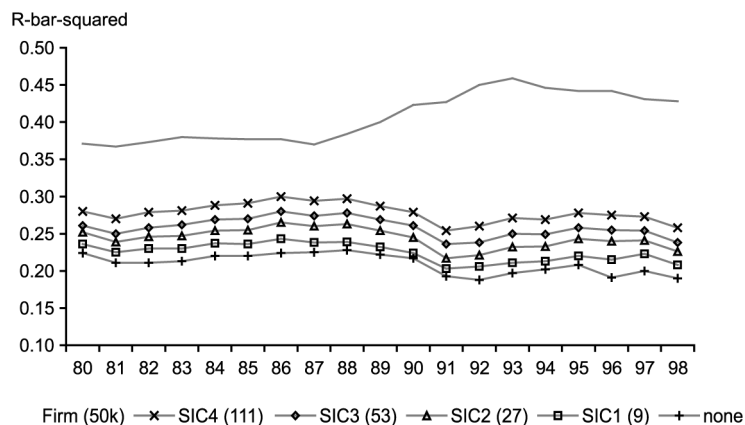


Figure 4.
Tenure heterogeneity

groupings follow a similar pattern with a small increase in heterogeneity starting in 1989. This is in contrast to the firm-wise grouping which shows markedly increased explanatory power over the 1990s beginning in 1988. Our main finding is that the firm element has a much stronger explanatory power than industry (at any level). We also find that the firm element is strengthened in the years 1989-1993 and that the industry element is weakened. This indicates that firms have got more influence on how long their employees stay in the firm than they used to have. Since wages are one determinant of how long people tend to stay in the same firm, this finding is consistent with our hypothesis concerning the effects of decentralisation of the wage bargaining process.

Firm-specific human capital

Wage equations are estimated on workers who have been involved in firm closures and have been re-employed the next year. Less than 3 per cent of our sample of displaced workers are not re-employed elsewhere some time in the following year. However, post-displacement wage observations may suffer from sample selection bias. This is an issue if selection into re-employment is related to pre-displacement tenure. In order to explore this possibility we ran a re-employment probit equation with pre-displacement tenure and other demographic variables on the right hand side. Tenure was found to be insignificant at the 5 per cent level, suggesting that selection into re-employment can be ignored in this dataset.

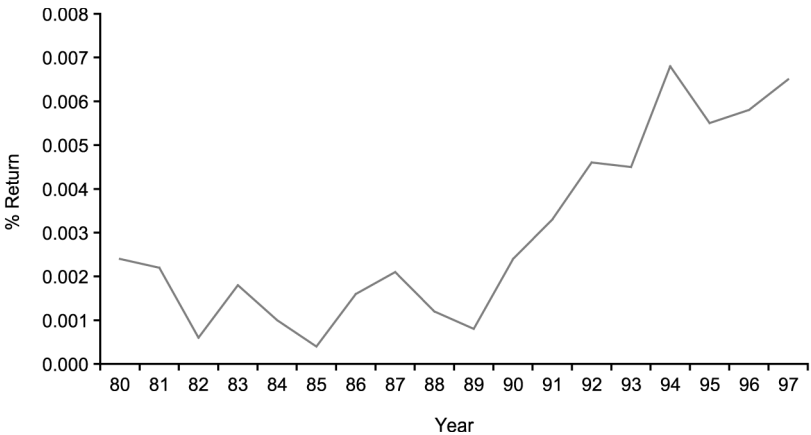
Estimations have been done separately for each of the 19 years. We have reported estimates in Table IV for 1980 and 1998. The difference between the two estimates measures the return to firm-specific human capital, and the remainder, which is persistent, is attributed to unobserved individual worker heterogeneity. While the returns to raw tenure average 2 per cent and are close to those found using similar simple techniques on US data (Farber, 1999), the returns firm-specific human capital in the latter part of the period constitute only about 30 per cent of those overall returns, compared to the US figure of 70 per cent from Farber (1999).

Figure 5 reports the estimated proportion of returns to tenure due to firm-specific human capital, for all years. It is remarkable that the return is very low until the beginning of the 1990s. It rises from 1991/92 and becomes about 30 per cent of the annual wage growth from the mid-1990s. This coincides with the decentralization and individualization of wage bargaining. The interpretation is that wages become less compressed and the new decentralized wage systems are gradually making it possible for firms to reward individual workers. This appears in the firm where they are working, but also in the post displacement firm. Under the old wage regime firms had to pay a wage that was related to union seniority and age, which meant that

Table IV.
Returns to tenure, 1980
and 1998

	1980				1998			
	Pre-displacement Coeff.	Std. err.	Post-displacement Coeff.	Std. err.	Pre-displacement Coeff.	Std. err.	Post-displacement Coeff.	Std. err.
Log wage								
Tenure	0.028	0.003	0.026	0.003	0.030	0.002	0.023	0.002
Male*age	0.060	0.008	0.056	0.007	0.068	0.006	0.064	0.006
Male*age2	−0.001	0.000	−0.001	0.000	−0.001	0.000	−0.001	0.000
Female*age	0.045	0.008	0.043	0.007	0.058	0.007	0.057	0.006
Female*age2	−0.001	0.000	−0.010	0.000	−0.001	0.000	−0.001	0.000
Educ7	−0.157	0.069	−0.108	0.058	−0.222	0.039	−0.209	0.037
8	−0.142	0.096	0.001	0.084	−0.270	0.065	−0.136	0.061
9	−0.095	0.081	−0.015	0.068	−0.121	0.043	−0.111	0.041
10	−0.191	0.074	−0.112	0.061	−0.161	0.032	−0.151	0.030
11	−0.009	0.074	0.028	0.061	−0.064	0.043	−0.128	0.055
12	−0.063	0.089	−0.028	0.055	−0.127	0.027	−0.098	0.024
14	−0.017	0.091	0.083	0.075	−0.047	0.037	0.044	0.034
15	0.169	0.170	0.156	0.077	0.095	0.048	0.170	0.046
16	−0.002	0.138	−0.102	0.152	0.109	0.073	0.115	0.067
17	0.411	0.279	0.231	0.114	0.153	0.057	0.292	0.053
18	−0.009	0.147	−0.144	0.253	0.092	0.088	0.310	0.105
Constant	3.713	0.147	3.847	0.127	3.694	0.147	3.755	0.107

Figure 5.
Returns to tenure
corrected for unobserved
heterogeneity



newcomers were paid the same as workers who had longer tenure, other things equal. After the reform, firms could pay a wage more in accordance with individual productivity. And since tenure is positively related to productivity for one or the other reason (firm-specific human capital and sorting) we will expect that the reform will actually have a clear influence on the return to tenure.

6. Summary and conclusions

Average tenure in Denmark is similar to that of the Anglo-Saxon countries and among the shortest in Europe. Nevertheless, there is a substantial dispersion in tenure across workers, and there are still about 22 per cent who stay ten years and more in a firm. Age and gender are the most important supply side factors, while the firm dimension seems to be much more important than industry (measured at any level), which indicates that firm-specific factors such as personnel policy and firm growth and decline matter. We find that the firm dimension increases in importance over time, consistent with decentralization of wage bargaining.

A small empirical literature has tried to measure the relative contributions of worker heterogeneity and firm-specific human capital in explaining the returns to tenure. Here we apply the ideas from this literature and obtain results in stark contrast with those found for the USA. While the (OLS) simple economic returns to tenure are similar at around 2 per cent, of that, at most 30 per cent is due to firm-specific human capital in Denmark. This is in contrast with the 70 per cent reported by Farber (1999) using US DWS. Furthermore, we find that the returns to tenure are increasing in Denmark during the 1990s. This is consistent with the decentralisation of wage bargaining and increasing importance in tenure-heterogeneity between the firms in recent years.

References

- Addison, J. and Portugal, P. (1989), "Job displacement, relative wage changes and the duration of unemployment", *Journal of Labor Economics*, Vol. 7 No. 3, pp. 281-302.
- Albæk, K. and Sørensen, B. (1998), "Worker flows and job flows in Danish manufacturing, 1980-1991", *Economic Journal*, Vol. 108, pp. 1750-71.
- Altonji, J. and Shakotko, R. (1987), "Do wages rise with job security?", *Review of Economic Studies*, Vol. 54, pp. 437-59.
- Andersen, T.M., Dalum, B., Linderøth, H., Smith, V. and Westergaard-Nielsen, N. (2001), *The Danish Economy, an International Perspective*, DJØF Publishing, Copenhagen.
- Davis, S. and Haltiwanger, J. (1999), "Gross job flows", in Ashenfelter, O. and Card, D. (Eds), *Handbook of Labor Economics*, Vol. 3, North-Holland, Amsterdam.
- Farber, H. (1999), "Mobility and stability: the dynamics of job change in labor markets", in Ashenfelter, O. and Card, D. (Eds), *Handbook of Labor Economics*, Vol. 3, North-Holland, Amsterdam.
- Frederiksen, A. and Westergaard-Nielsen, N. (2002), "Where did they go?", Centre for Labour Market and Social Research Working Paper 2002-11.
- Gibbons, R. and Katz, L. (1991), "Layoffs and lemons", *Journal of Labor Economics*, Vol. 9, pp. 351-80.
- Kletzer, L. (1989), "Returns to seniority after permanent job loss", *American Economic Review*, Vol. 79, pp. 536-43.
- Lazear, E. (1978), "Why is there mandatory retirement?", *Journal of Political Economy*, Vol. 87, pp. 1261-84.

Leth-Sørensen, S. (1998), "The IDA database: a longitudinal database of establishments and their employees", Statistics Denmark Working Paper 98, 5.

Mortensen, D. (1986), "Job search and labor market analysis", in Aschenfelter, O. and Layard, R. (Eds), *Handbook of Labor Economics*, Vol. 2, North Holland, Amsterdam, pp. 849-919.

OECD (1997), *Employment Outlook*, Paris.

OECD (1999), *Employment Outlook*, Paris.

Topel, R. (1991), "Specific capital, mobility and wages: wages rise with job seniority", *Journal of Political Economy*, Vol. 99, pp. 145-76.

Werwatz, A., Bingley, P., Eriksson, T. and Westergaard-Nielsen, N. (1999), "Beyond Manucentrism – some fresh facts about job and worker flows", CLS Working Paper 1999-09.

Further reading

Mortensen, D. (1978), "Specific capital and labor turnover", *Bell Journal of Economics*, Vol. 9, pp. 572-86.