Starting wages and the return to seniority: firm strategies towards unskilled labour market entrants[1]

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Abstract:

This paper examines how initial wages and return to tenure are determined for unskilled labour market entrants. Do firms apply different strategies, and are starting wages and return to tenure negatively correlated, as suggested by several microeconomic theories?

For this purpose I analyse the role of individual and firm effects in the determination of initial wages, and wage growth in the first job held by labour market entrants. By utilizing data consisting of several wage observations within each job and several job observations within each firm, I estimate a mixed fixed effect random coefficient model which enables me to identify observed and unobserved firm-specific effects in both the level and growth of wages.

The empirical findings, which are based on Hausman-Taylor estimates of the return to tenure in a multilevel model, show that even after accounting for a wide range of observed individual effects, as well as for the personnel composition and the industry and size of the firm, unobserved firm-specific effects still remain important in explaining wages among labour market entrants. I find support for the conventional theories: firms employ different wage setting schemes with either high starting wages and low wage growth or low starting wages and high wage growth, and firms apply the same wage strategy towards unskilled and skilled labour market entrants.

JEL Classifications: J24, J31, J41, J44.

Key words: Unskilled workers, starting wages, return to seniority, firm behaviour, linked employer-employee data

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1 Introduction

When an unskilled individual enters the labour market for the first time, he has no formal means to signal his ability, and consequently the hiring firm has very little information on his potential productivity. A short glance at the distribution of starting wages among unskilled labour market entrants shows, however, that starting wages among seemingly identical individuals vary significantly. Even after accounting for the few observed characteristics that vary for these labour market entrants, such as gender and age, the entry wage distribution is still relatively wide. This finding suggests that some of the explanation should be contributed to the employer; hence, different employers apply different wage strategies when hiring unskilled employees. If this is the case, the strategy of the entry wages is likely to coincide with the strategy of the wage-tenure profile, as suggested by several microeconomic wage theories. Whereas a vast literature has been dealing with establishing a firm-specific wage premium, and another branch of the literature has been looking at firm-specific wage growth, only very little research has been concerned with the relation between starting wages and wage growth, and the possibility that this relation might be firm-specific. By exploiting a unique data set with wage information in the first job for both skilled and unskilled labour market entrants, I am able to analyse this relation among workers with least work experience and least informal training prior to entering the job. This enables me to answer the following questions: What is the relationship between starting wages and return to seniority on the job and firm levels, and how is this relation affected by the characteristics of the employing firm? Is there a trade-off between the entry wage and the wage growth, such that firms tending to offer low starting wages, in return, tend to offer steeper wage profiles? Or is it the case that firms with steep wage profiles also tend to offer higher entry wages? Does this relation differ for skilled and unskilled workers, and if it does, what might explain this difference? Do firms adopt different compensation policies for their skilled and unskilled entrants, or are unskilled

workers sorted into one type of firm, and skilled workers into another type? What characterizes different firms with different wage strategies, and does the firm-specific wage setting go beyond observed characteristics of the firm, that is, can unobserved firm-specific effects explain wages beyond the part explained by industry, firm size and personnel composition?

In the following section I describe the background and the motivation for this paper: the theoretical models explaining firm-specific wage setting, previous empirical findings, and a short note on the institutional settings of the Danish labour market. In Section 3, I turn to describing the methodology applied to answering the questions of the paper. Section 4 presents data and sampling technique. In Section 5, the starting wages are analysed, and Section 6 presents the empirical findings on the wage profiles and the starting wage-wage growth relation. Finally, I summarise and conclude in Section 7.

2 Background

2.1 Wage theories

Several microeconomic theories point to factors within the firm that might affect wage setting for unskilled workers.

Human capital theory (building on Becker (1975)) predicts that workers pay part of on-the-job training by accepting lower starting wages and then in return achieve a higher wage growth due to the human capital gained by the training.[2] Thus, firms seeking to attract high-ability workers offer low starting wages and steep wage profiles compared to firms attracting low-ability workers. In the **sorting model**, as described by e.g. Guasch and Weiss (1980), firms that seek to attract high-ability workers offer steep wage schemes, i.e., these firms pay newly hired workers less than their expected marginal product, and after a monitoring

[2] See e.g. Barron et al. (1989)

period or a test the workers who pass will receive a pre-determined wage above their market-clearing wage. In the **theory of deferred wages** (Lazear (1981)), the wage-tenure profile arises because deferred compensation is used as an incentive device, i.e., paying below the workers' marginal product at the beginning of the relation and above the marginal product later, will affect workers' effort and performance positively. The prospect of higher wages in the future will induce workers to perform higher effort in the present. According to Lazear (1981), firms might terminate the contract before the wages increase above the marginal product, but this behaviour will result in a bad reputation for the firm. A natural implication of this theory is that firms, which for various reasons have a high worker turnover, will offer flatter wage schemes.

According to these theories, a low starting wage is associated with a high return to seniority, and different firms choose different compensation structures with respect to these two factors.

The theories presented above are mainly concerned with the entire wage formation within the firm, but the general wage level will also affect the starting wage. In this context, the **efficiency wage theory** (Shapiro and Stiglitz (1984)) can be and has been used to explain wage level differences between firms (see e.g. Krueger and Summers (1988)). This theory suggests that the optimal wages the firms will pay in many cases exceed the market clearing wage and often will be affected by other factors than those directly affecting the utility of the worker. Several authors have provided different reasons for above-market-clearing wages, some of which are: 1) Firms seek to lower turnover costs. If turnover is a decreasing function in wages, then increasing wages might decrease the overall labour cost. 2) Firms seek to increase productivity. If a worker receives wages above his opportunity wage, his value of the job increases. This will increase the worker's effort or decrease his propensity to shirk in order to decrease the likelihood of loosing his job. 3) Firms seek to attract better workers. By offering higher wages, firms will be able to attract a larger and better pool of workers.

Table 1.1. Starting wage and wage growth predictions for different theories on wages.

	Human capital theory (on-the-job training)		**Sorting theory**		**Deferred wage theory**		**Efficiency theory**	
Firm type	High degree of on-the-job training	Low degree of on-the-job training	Attract and keep high-ability workers	Quality of employees less important	Low turnover firm	High turnover firm	Important to attract and keep high-ability workers	Quality of employees less important
Starting wage	< marg. product.	= marg. product.	< marg. product.	= marg. product.	< marg. product.	= marg. product.	> marg. product.	= marg. product.
Wage growth	High, due to high product. increase	Low, due to low product. increase	> product. increase	= product. increase	> product. increase	= product. increase	= product. increase	= product. increase

Clearly, the efficiency wage theory's predictions concerning the starting wage go in the opposite direction of the other theories presented. Thus, the sorting theory predicts that firms try to attract high-ability workers by offering steep wage curves but low starting wages, whereas the efficiency wage theory predicts that the same firm will offer higher wages, throughout. As a matter of fact, the efficiency wage theory might be at play at the same time as e.g. the human capital theory or the deferred wages theory. Thus, firms offering an efficiency wage premium might also have a high amount of on-the-job training. Since the human capital theory predicts the wage growth to be higher in firms with a lot on-the-job training, and the efficiency wage theory predicts a high level of the starting wage in firms with a wage premium, the combination of the two will allow for firms with both high starting wage and high wage growth. For this reason, we may not observe the predicted negative relation between the starting wage and the wage growth.

2.2 Previous findings

Only few previous studies have dealt with the relation between starting wages and the wage growth. One of these is Lillard (1999), which analyses person-job-specific time-series wages taking account of job turnover heterogeneity. He

estimates the correlation between initial wages and the job tenure slope, and he finds a negative correlation, i.e., jobs with low starting wages tend to have higher return to tenure. He does not, however, include firm-specific effects, that is, he does not allow firms to have different compensation structures. This is, on the other hand, done by Abowd et al. (1999) in their comprehensive work on employer and employee effects on wages. Here, they both deal with firm-specific initial wages and firm-specific tenure slopes, and they find that they are negatively correlated. They do, however, not go into details about the characteristics of the different types of firms. Studies by Hu (2003) and Barron et al. (1987) have been looking at firm-size effects on starting wages and tenure profiles, and both find clear indications that firm size matters for firms' wage structures. However, they do not link tenure profiles to initial wages, and the only firm effect they consider is firm size. None of these studies focus on the low educated. In a recent study, Dustmann and Meghir (2005) analyse experience and seniority effects on wages within the context of a model where firms may offer different combinations of starting wages and firm-specific human capital development. They split the analysis into skilled and unskilled workers, and they find positive returns to experience and firm tenure for skilled workers, and small or insignificant returns to experience but substantial returns to tenure for unskilled workers.

2.3 Wage setting in the Danish labour market

The Danish labour market is characterized by a clear division of responsibility between the government and the social partners in relation to labour market policy. Wages and other working conditions are primarily regulated through collective agreements negotiated by workers' and employers' organisations, at the industry or branch level. These agreements allow, to a large extent, for flexibility at the company level. The collective agreements cover around 85% of all employees, but over the last 20 years, the social partners have decentralised

most of the bargaining to the firm level. This process has lead to the fact that around 85% of workers in the DA/LO-area[3] negotiate their wages at the firm level and only 15% have all of their wages negotiated at the central level (i.e. between the various industry level organisations which are members of DA and their trade union counterparts). For 65% of workers, only a minimum wage tariff is negotiated at the central level, and for 20% of workers there is no minimum wage tariff rate at all.[4] Even though the different agreements are reached at the industry or firm level, some regulations apply to the entire labour market. One is that workers below 18 are paid significantly lower wages than those above 18. The motivation for this regulation is to give the young individuals an incentive to take up an education, and this is clearly expected to affect starting wages as well as wage growth for this group.

Despite the development towards a more decentralised wage setting, the institutional factors of the Danish labour market may affect the result of the present paper. The predictions that the relation between starting wages and wage growth will be negative on the firm level, might turn out only to hold on a more aggregated level, such as the industry. Moreover, since the collective agreements tend to be more prevalent in the unskilled labour market, this effect may be stronger among unskilled labour market entrants.

3 Methodology

3.1 The entry wages

To take a closer look at the relatively large variation found in starting wages among labour market entrants, I estimate a starting wage equation:

[3] This is the part of the labour market covered by collective agreements between the two biggest partners, Confederation of Danish Employers, DA, and The Danish Confederation of Trade Unions, LO. This area corresponds to approximately 45% of employees in the private sector.

[4] See Jensen and Larsen (2005).

$$w_{ij0} = X_{i0}\beta_1 + Z_{j0}\beta_2 + P_{j0}\beta_3 + u_{j0} + v_{i0} + e_{ji0} \quad (3.1)$$

where X is a vector of observed individual characteristics, Z is a vector of observed firm characteristics, P_{j0} is the local labour market conditions measured at the municipality of the firm, and u_{j0} and v_{i0} are unobserved firm and individual effects.

For unskilled labour market entrants, two observed individual characteristics may affect initial wages. These are: age and unemployment experience prior to the first job. I expect that initial wages will increase with age, since general human capital increases with age, whereas the effect of the rate of unemployment prior to the first job can go in two opposite directions. A high rate of unemployment indicates a long search period (see Jovanovic (1979)), and this might be due to either low ability of the job searcher tending to lower the offer rate and thereby decrease initial wages, or it might be due to high reservation wages, which will tend to increase initial wages. Thus, net effect is ambiguous. Furthermore, for less obvious reasons (except for discrimination) the starting wages may depend on gender. Finally, for skilled individuals the level of education is an additional factor expected to affect the initial wage. Thus, in the vector of individual specific covariates, X_i, I include age, gender the aggregated amount of unemployment experienced prior to the first job, and for skilled entrants the educational level.

After having controlled for individual effects, the next step is to consider the other side of the labour market, i.e., the firms employing the labour market entrants. Can some of the differences in starting wages be explained by differences in strategies of the employing firms? And can differences in strategies in turn be explained by observed characteristics of the firm? In order to shed light on these questions, I include one-digit industry codes, firm size and some variables describing the labour force composition in the vector of firm-specific covariates, Z_j. Furthermore, the local labour market conditions may explain some of the remaining variance in the starting wages. I therefore include the local unemployment rates and the size of the municipality where the firm is

located as additional explanatory variables, P_{jt}. Finally, individual as well as firm-specific unobserved effects may explain differences in the initial wages in the first job. Since each individual only experiences one first job, the individual effect cannot be identified. Instead, a firm-specific random effect can be estimated and this effect will include unobserved individual effects to the extent that individuals with the same unobserved characteristics are sorted into the firm. Hence, the estimated model is:

$$w_{ij0} = X_{i0}\beta_1 + Z_{j0}\beta_2 + P_{j0}\beta_3 + \mu_{j0} + \varepsilon_{ji0} \tag{3.2}$$

As point of departure, equation (3.2) is estimated separately for each skill group. To analyse if firms that offer higher starting wages for skilled labour market entrants also offer higher starting wages for unskilled entrants, I also estimate a random intercept model with skill-specific intercepts, which are allowed to be correlated. Hence:

$$w_{ij0} = X_{ji0}\beta_1 + Z_{j0}\beta_2 + P_{j0}\beta_3 + S_{ji}\beta_4 + \boldsymbol{\mu}_{j0}S_{ji} + \varepsilon_{ji0} \tag{3.3}$$

where S_{ji} is a vector of different skill groups, $\boldsymbol{\mu}_{j0}$ is a vector of firm- and skill-specific random terms, and free correlation between the $\boldsymbol{\mu}_{j0}$ is allowed.

3.2 Return to tenure and the entry wage-wage growth relation

Next, I turn to analyse three aspects of wage formation within the first job, that is, initial wages, wage growth and the relation between the two.

Assume that the wage of individual *i* in his first job, *ji*, in firm *j* at time *t* is determined by the following equation:

$$w_{jit} = \beta_1 T_{jit} + \beta_2 X_{ijt} + \beta_3 Z_{jt} + \varepsilon_{jit} \tag{3.4}$$

where w_{jit} is the log hourly wage rate, T_{jit} is a function of tenure[5], X_{jit} is a vector of individual characteristics, Z_{jt} is a vector of firm characteristics and ε_{jit} is the residual term. Now, assume that the residual term can be specified as

[5] In the present analysis $T_{jit} = \left(tenure_{jit}, tenure_{jit}^2\right)$

$$\varepsilon_{jit} = u_{Tj} T_{jit} + u_{0j} + \mu_i + a_{jit} + v_{jit} \tag{3.5}$$

where, a_{jt} is an unobserved component of wages due to a specific job match, $u_j = \left(u_{0j}, u_{Tj}\right) \sim N\left(0, \Sigma\right)$ are firm-specific random factors affecting both wage level and wage growth and they are assumed to be bivariate normal distributed, μ_i is the unobserved individual-specific wage component, and v_{jit} is a random error term. Clearly, in a model of wages in the first job, it is not possible to distinguish the individual-specific effect from the match-specific effect. I therefore define $\alpha_{jit} = a_{jit} + \mu_i$. By inserting (3.5) in (3.4) we obtain a multilevel random coefficient model with both random firm and job effects,

$$w_{jit} = \left(\beta_1 + u_{Tj}\right) T_{jit} + \beta_2 X_{ijt} + \beta_3 Z_{jt} + u_{0j} + \alpha_{jit} + v_{jit} \tag{3.6}$$

The main purpose of this paper is to estimate the return to tenure and how this factor varies between firms, and specifically how it is related to the firm-specific starting wage. Since we are looking at the first job for labour market entrants, return to tenure and return to work experience cannot be distinguished, so in this context return to tenure equals total within-job wage growth, including return to work experience.

The three first theories presented in Section 2 (human capital, sorting and deferred wages) capture the same predictions concerning starting wages and wage growth, namely that 1) different firms offer different starting wages to similar workers, 2) different firms offer different wage-tenure paths, and 3) starting wages are negatively correlated with wage growth on the firm level. Related to equation (3.6) this implies that 1) β_3 and u_{0j} should be significant different from zero, with β_3 representing observed firm specific differences in starting wages, whereas u_{0j} represent unobserved firm specific differences; 2) u_{Tj} should be significantly different from zero; and 3) the correlation between u_{Tj} and u_{0j} should be negative. For all three theories the difference in starting wages are offset by differences in wage growth to make the expected wages equal. In the efficiency wage theory, on the other hand, a high entry wage may be

followed by an average wage growth, resulting in firm-specific differences in expected wages for similar workers. Therefore, it seems feasible to tests the efficiency wage theory against the other three theories by testing whether wage growth for similar workers differ and whether a negative correlation between starting wages and wage growth can be found. However, as mentioned earlier, the efficiency theory does not exclude any of the other theories, thus a firm might offer a wage premium such that the expected wage is above the alternative wage, and at the same time offer a steep wage curve with starting wages equal or below the alternative starting wage. So by testing whether the expected wages are equal for similar workers with different starting wages it should be possible to test if the efficiency wage theory can be ruled out. It is however not possible to measure the expected wages through out the job span because it would require that all jobs could be followed from start to end and that none of the jobs are terminated unforeseen. Hence, the purpose of this paper, to test the hypothesis that different firms offer different wage schemes to similar workers and that starting wages and wage growths are negatively correlated, enables me to possibly confirm the hypotheses from three of the theories, whereas it is not within the scope of this paper to test the efficiency wage theory.

An endogeneity problem may, however, arise if u_{0j}, α_{jit} or v_{jit} in (3.6) are correlated with tenure (or work experience), resulting in biased estimates of β_1. There are several reasons why the error terms are likely to be correlated with tenure, of which the following seem to be the most important. First, tenure might be correlated with the error terms in (3.6) through the match-specific term. Altonji and Shakotko (1987) argue that workers in jobs with a high match quality, i.e., with a high a_{jit} are less likely to quit, since better matches induce higher wages and employees with higher wages will be less likely to quit, resulting in a positive correlation between a_{jit} and T_{jit}. Topel (1991), on the other hand, argues that workers are more likely to move to a new job if the wage of the new job is high enough to cover mobility costs and costs of lost tenure, and

hence job-movers or workers with low tenure will tend to have higher wages. In the present study, where only wages in the first job are analysed, this relation is not relevant.

Second, tenure might be correlated with the error term in (3.4) through the individual-specific term, μ_i. This is the case if workers with higher unobserved ability, who also are likely to have higher wages, either will tend to be less or more mobile. It is, however, unclear whether high-ability workers will tend to be less or more mobile than other workers. On one hand, they may be less mobile because they are less likely to be laid off, but on the other hand they may be more mobile because they are more likely to get a better outside offer. Finally, the error term in (1.1) may be correlated with tenure through the firm-specific term, u_j. This is the case if firms with a wage premium have a lower worker turnover, as predicted by efficiency wage theory. Abowd et al. (1999) and Bronars and Famulari (1997) have, among others, established a positive correlation between a firm specific wage premium and tenure, and moreover Bronars and Famulari find a positive relation between tenure and firm-specific wage growth.

3.2.1 Previous literature

Different procedures have been applied to deal with the endogeneity problem of the tenure variable. The two pioneering papers in this context, Altonji and Shakotko (1987) (henceforth, AS) and Topel (1991) apply two different strategies. AS's approach is to adopt an instrumental variable using the difference from the within-job average of tenure as an instrument for tenure. This approach relies on the assumption that the match-specific effect, a_{jit}, is constant within jobs, i.e., $a_{jit} = a_{ji}$, which implies that the instrument will be orthogonal to the error terms in (3.5),

$$\sum \left(T_{jit} - \bar{T}_{ji} \right) \left(a_{ji} + u_j + \mu_i \right) = 0 , \tag{3.7}$$

and is therefore a valid instrument. This approach has, however, two downsides. First, it does not deal with the potential bias in the return to experience, which

eventually will cause a bias in the return to tenure. AS recognize this problem and suggest a modification in the procedure for estimation of β_1. Second, if the match-specific effects are not constant, they may be correlated with the instrument, which will lead to a bias in the estimated return to tenure.

Topel (1991) uses a two-step method, where a first-difference estimate of wage growth within jobs gives an unbiased estimate of the joint return to tenure and experience in the first step:

$$w_{jit} - w_{jit-1} = b_1 + b_2 + \left(\varepsilon_{jit} - \varepsilon_{jit-1}\right) \tag{3.8}$$

where $b_1 + b_2 = \beta_1$ covers the combined return to tenure and experience. In the second step, an estimate of return to experience is estimated using wages and work experience at the beginning of the job:

$$w_{0jit} = X_{0jit} b_2 + \varepsilon_{jit} \tag{3.9}$$

One drawback with Topel's method is that the sample used in his first stage regression only includes job-stayers and consequently will consist of better jobs and better job-holders. If better jobs tend to have higher wage growth, this will result in an upward biased estimate of β_1.

Neither Topel nor AS considers the case where wages are depending on a firm-specific component, such as u_j.

Most studies since AS (1987) and Topel (1991) have dealt with the problem of endogeneity of tenure by using either AS or Topel's methods, or something closely related to them (see e.g., Connolly and Gottshalk (2000), Bronars and Famulari (1997), Altonji and Williams (1997), Barth (1997)). A few studies have, however, followed other paths. Lillard (1999) estimates a model where the wage equation is estimated simultaneously with the job mobility. Buchinsky et al. (2005) take another route and estimate a structural model with wage simultaneously estimated with participation and mobility equations. For the purpose of this paper, where the wage structure of the first job is of special interest, the estimation of job mobility, per se, is less interesting, and these types of models are beyond the scope of this paper.

3.3 Estimation strategy

The estimation method applied in the present paper draws from the literature on multilevel models. In multilevel models, the researcher has to be very careful in treating the problem with endogenous variables. Following Ebbes et al. (2004) (EBW), I investigate the different potential biases that arise when tenure is correlated with different levels of the error term. I end up using the Hausman-Taylor estimator (Hausman and Taylor (1981)), which resembles the method applied by AS.

First, let me modify model (3.6), so that it does not include the random coefficient u_{Tj}. Hereby the model resembles model (1) in EBW[6]

$$w_{jit} = \beta_1 T_{jit} + \beta_2 X_{ijt} + \beta_3 Z_{jt} + u_{0j} + \alpha_{ji} + v_{jit} \tag{3.10}$$

Model (3.10) differs from the model presented in EBW since it covers 3 levels, whereas EBW's model only covers 2 levels. Thus in the present model, level 1 covers the *jit*-level and level-1 independence equals $T_{jit} v_{jit}$ independence, level 2 covers the *ji*-level and level-2 independence equals $T_{jit} \alpha_{ji}$ independence, and finally level 3 covers the *j*-level and level-3 independence equals $T_{jit} u_{0j}$ independence. Within the context of EWB, higher level independencies resemble level-2 independence.

As mentioned above, the problem in estimating this model using conventional estimation techniques for multilevel data arises because T_{jit} may be correlated with u_{0j} or α_{ji} or both. It turns out that the bias arising from level 1 correlations differs from the bias arising from level 2 or higher levels correlations, and that the solutions consequently differ, too.

The T_{jit} dependency problems in the present model are assumed to run through level 2 and level 3, and these types of dependencies can be tested using Mundlak's approach. Mundlak (1978) suggests inclusion of group means as

[6] Ebbes et al. (2004) conclude that the same reasoning applies to a random coefficient model.

explanatory variables in (3.10), based on the assumptions that $\alpha_{ji} = \overline{T}_{ji}\delta + \varsigma_{ji}$ and $u_j = \overline{\overline{T}}_j \pi + \xi_j$. Modelling these dependencies explicitly allows for an unbiased random-effect estimate of β_1, regardless of independence between T_{jit} and α_{ji} or u_j. The disadvantage of this method is, however, that it does not yield unbiased estimates of the higher level effects, i.e. in this model β_2 and, what is worse, of the standard deviations of the group-specific intercepts, i.e. $\sigma^2_{\alpha_{ji}}$, $\sigma^2_{u_j}$ and $\rho_{u_{0j}u_{Tj}}$. The Mundlak method is, however, appropriate for testing any potential higher level dependencies. Since the estimate of u_j is not unbiased when the Mundlak group means are included in a random coefficient multilevel setting, the Mundlak approach is less appropriate for the present purpose. As a solution, Hausman and Taylor (1981) have suggested an estimator that consistently and efficiently estimates both level 1 and level 2 parameters. The estimator does, however, assume independence between the endogenous variable and the idiosyncratic error v_{jit} from (3.10).

The estimator is essentially an IV estimator using internal instruments in a random effect model. Rewrite (3.10) following the model in Stata (2005):

$$w_{jit} = \beta_1 T_{jit} + \beta_2 X_{1ijt} + \beta_3 Z_{1jt} + \beta_4 X_{2ij} + \beta_5 Z_{2j} + \beta_6 U_{ji} + a_{ji} + v_{jit} \qquad (3.11)$$

where X_{jit} and Z_{jt} each has been split into a time-varying part and a time-invariant part, and $a_{ji} = u_j + \alpha_{ji}$. X_{1jit} and Z_{1jt} are vectors of exogenous time-varying variables assumed to be uncorrelated with a_{ji}. T_{jit} is the vector of endogenous time-varying tenure variables assumed to be correlated with a_{ji}. X_{2ji} and Z_{2j} are vectors of exogenous time-invariant variables assumed to be uncorrelated with a_{ji}. U_{ji} is the aggregated level of unemployment experienced prior to the first job; this variable is a time-invariant endogenous variable assumed possibly to be correlated with a_{ji}. Finally, a_{ji} is the unobserved, job-level random effect that is assumed to be i.i.d. over the panels.

The fixed-effect (within) estimator consistently estimates β_1, β_2 and β_3, but does not allow estimates of β_4, β_5 and β_6 or $\sigma_{a_{ji}}$. The Hausman-Taylor estimator

resolves this problem by using $\left(T_{jit} - \overline{T}_{ji}\right)$ as instruments for T_{jit}, and $\overline{X}_{1ji}$ and $\overline{Z}_{1j}$ as instruments for U_{ji} in a GLS transformed version of (3.11) (see Stata (2005) or EBW (2004)).[7]

$$\breve{w}_{jit} = \beta_1 \breve{T}_{jit} + \beta_2 \breve{X}_{1ijt} + \beta_3 \breve{Z}_{1jt} + \beta_4 \breve{X}_{2ij} + \beta_5 \breve{Z}_{2j} + \beta_6 \breve{U}_{ji} + \breve{v}_{jit} \qquad (3.12)$$

Extending the model with an additional level, i.e. including $a_{ji} = u_j + \alpha_{ji}$, does not increase the number of endogenous variables, but the endogenous relations might now go through two random effects, u_j and α_{ji}. To account for this additional firm level, the applied instruments are extended to include $\left(\overline{T}_{ji} - \overline{\overline{T}}_j\right)$ as well as $\overline{\overline{X}}_j$.

$$\breve{w}_{jit} = \beta_1 \breve{T}_{jit} + \beta_2 \breve{X}_{1ijt} + \beta_3 \breve{Z}_{1jt} + \beta_4 \breve{X}_{2ij} + \beta_5 \breve{Z}_{2j} + \beta_6 \breve{U}_{ji} + u_j + \breve{v}_{jit} \qquad (3.13)$$

I start out by estimating this model, which I denote the random intercept model. Extending the model to allow for $u_j = T_{jit} u_{Tj} + u_{0j}$ is a little more complicated. In general, endogenous variables interacted with exogenous variables are straightforward to deal with in an IV model (see e.g. Wooldridge (2002)), but for random coefficient models the general setting does not hold. Even though EBW conclude that the same reasoning as for the random intercept model also apply to the random coefficient model, they also establish that if dependency between the random coefficient and the explanatory variables exists, then a fixed-effect approach should be used. For now, I have to assume that no dependency exists, but further research on this issue needs to be done.[8]

[7] Note that the GLS transformation accounts for the random effect a_{ji}.

[8] The issue of endogeneity in multilevel models, specifically random coefficient models, still needs a lot of research to be adequately addressed, a conclusion also drawn by EBW.

The solution to the endogeneity problem in the multilevel random coefficient model is to fit an instrumental variables regression of a GLS-transformation of (3.6):[9]

$$\breve{w}_{jit} = \left(\beta_1 + u_{Tj}\right)\hat{\breve{T}}_{jit} + \beta_2 \breve{X}_{1ijt} + \beta_3 \breve{Z}_{1jt} + \beta_4 \breve{X}_{2ij} + \beta_5 \breve{Z}_{2j} + \beta_6 \hat{\breve{U}}_{ji} + u_{0j} + \breve{v}_{jit} \qquad (3.14)$$

where $\hat{\breve{T}}_{jit}$ and $\hat{\breve{U}}_{ji}$ are the 1st stage predictions of the endogenous variables estimated using $\left(T_{jit} - \overline{T}_{ji}\right), \left(\overline{T}_{ji} - \overline{\overline{T}}_{j}\right)$, $\overline{\overline{X}}_{j}$, $\overline{X}_{1ji}$ and $\overline{Z}_{1j}$ as instruments. The standard errors of the estimated parameters in (3.14) are estimated by bootstrap methods.[10]

Finally, the model can be extended to allow for observed individual- and firm-specific return to tenure. This can be done by including interactions with the tenure variables and the explanatory variables of interest:

$$w_{jit} = \beta_1 T_{jit} + \beta_2 X_{jit} + \beta_3 Z_{jt} + \gamma_1 T_{jit}\tilde{X}_{jit} + \gamma_2 T_{jit}\tilde{Z}_{jt} + \varepsilon_{jit} \qquad (3.15)$$

In an instrumental variable setting inclusion of interactions between endogenous and exogenous variables will, however, result in at least one additional equation for each interaction, which will very fast result in an intractable system of equations. Hence, for now I have chosen to abstract from the endogeneity problem of tenure and merely estimate (3.15) in an OLS and a plain multilevel model setting.[11]

As in the starting wage equation, I finish the analysis by investigating if firms with both skilled and unskilled labour market entrants apply the same wage setting rules for the two groups. This is done by including both firm- and skill-

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[9] The GLS transformation consists of multiplying (3.6) by $\Omega^{-½}$, where $\Omega^{-½} = \mathbf{I} - \hat{\theta}_{ji}\overline{m}_{ji}$ and $\hat{\theta}_{ji} = 1 - \frac{\hat{\sigma}_v^2}{\hat{\sigma}_v^2 + N_{ji}\hat{\sigma}_{\alpha_{ji}}^2}$. $\hat{\theta}_{ji}$ is obtained by using a two-step procedure estimating a job-level fixed-effect model of (3.6) in the first step (see Stata (2005)).

[10] The standard errors reflect variation due to the sample used to perform the simulation. The bootstrapped sample size equals the size of the true sample. 200 iterations are applied.

[11] See Section 6.1.1 and 6.1.2, below.

specific random intercepts and tenure slopes. By rewriting (3.6) to allow for this, I obtain:

$$w_{jit} = \left(\beta_1 + u_{TSj}\right) T_{jit} S_{ji} + \beta_2 X_{jit} + \beta_3 Z_{jt} + u_{0Sj} S_{ji} + \alpha_{jit} + v_{jit} \qquad (3.16)$$

where S_{ji} is a vector of skill levels. Denoting two different skill levels by *m* and *l*, I allow for the following correlations between the firm-specific random terms: $corr\left(u_{TS^l j}, u_{0S^l j}\right)$, $corr\left(u_{TS^l j}, u_{TS^m j}\right)$, and $corr\left(u_{0S^l j}, u_{0S^m j}\right)$. The first correlation describes the relation between starting wage and wage growth, as already included in the multi-level models presented above. The two other correlations describe the firm-specific relations between skills within the same firm for the tenure slopes and the starting wages, respectively. Negative correlations indicate that the same firm treat individuals with different skill levels, differently.

4 Data

The comprehensive Danish employer-employee linked data available for this study is extremely suitable for the purpose of this paper, since it allows me to follow the same person in different labour market states over a period of considerable length. Together with information on work experience, which is calculated based on information dating back to 1964, this allows me to identify individuals when they enter their first job.

The main sources are the Integrated Database for Labour Market Research (IDA), which contains employer and employee information on a yearly basis, and a spell database containing information on each person's labour market state on a weekly basis. The spell database includes the period 1986-1999, and the analysis period is consequently defined as 1987-1998.

4.1 IDA

The Integrated Database for Labour Market Research (IDA) is the most used administrative database for labour market studies in Denmark. It is an employer-

employee linked database, and it covers the entire Danish population (about 5.3 million) as well as all firms with at least one employee (about 250,000). About 250 different variables are available from IDA. For each employment spell, information on the employer is available and it is linked to the employee via a unique employer id. Both individuals and firms can be followed over time.

For the present study, I use IDA to collect information on individual characteristics such as age, gender, level of education and marital status, and on firm characteristics such as industry and firm size. The fact that the database includes of all employees within each firm, allows me moreover to construct variables on the labour composition within each firm. Among the compositional variables I include in the analysis are: the share of UI benefit insured, share of males, average age, average hourly wage and average years of education.

A key variable collected from IDA is the hourly wage rate. This is calculated by Statistics Denmark and is based on annual wage and number of weekly working hours. The quality of the hourly wage is related to the number of working hours, since these only are registered within certain intervals. Thus, the fewer weekly working hours, the less reliable is the measure. Consequently, I only include full-time workers in my analysis. Since part-time jobs only play a minor role in the Danish labour market, even among unskilled workers,[12] the exclusion of these workers is not expected to alter the result considerably (see Table A.1 in the Appendix). The wage variable has another drawback: it is only measured as an annual wage, collected in November. Job spells lasting less than a year and which do not include the month of November will lack information on wages, and consequently these jobs have been deleted from the sample. Likewise, for jobs lasting more than a year, wages will only be updated once a year, even though they might change more often. For jobs lasting a year or more, but ending before November in the final year, I repeat the wage from the previous year.

[12] Including all types of part-time jobs (student jobs included), the percentage of part-time jobs varies around 15 per cent during the period of interest (source: www.statistikbanken.dk).

4.2 Spell data

The spell data come from a data set constructed from various administrative registers from Statistics Denmark. It defines each person's labour market state on a weekly basis within the following states: employment, unemployment, temporary unemployment, active labour market program, in formal education and out of the labour force. In case a person is observed in more than one register at the same time, the following order of preference between the different labour market states has been made: 1) unemployment, 2) education, 3) employment and 4) out of the labour force. Hence, registration in the unemployment register (CRAM) dominates registration in any other register, whereas individuals not registered in any of the applied registers are defined as out of the labour force.[13] In the present study, I have put some further restrictions on the definitions of the labour market states: For individuals having a job while being enrolled as a student, the labour market state will be defined as employment, if the yearly salary exceeds DKK 100,000 in 2000-wages and as education otherwise.[14] I define active labour market programs as unemployment, and finally temporary layoffs are defined as employment if they last less than 13 weeks and as unemployment otherwise.[15]

The labour market states defined for this paper are employment, unemployment, education and out of the labour force. All non-employment spells are merely used for identifying destination states from job spells.

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[13] See Larsen (2002) for further description of the spell data.

[14] This distinction is made because nearly all educations in Denmark are free of charge, and hence there is no consequence of being enrolled as a student without actually studying. Therefore, it is possible to find students who never finish their education, but who never formally drop out, either. If a student earns more than 2/3 of the wage of a low-skilled worker (about DKK 100,000 in 2000-wages) I therefore conclude that he cannot be a full-time student, and he is instead defined as being employed.

[15] Temporary lay-off is a definition for having an unemployment spell in between two employment spells with the same employer. This is common practice in some seasonal branches, but not of interest for this paper.

4.3 Skill definition and sampling frame

From a 10 per cent sample of the above mentioned data set, I create a flow sample consisting of all labour market entrants, i.e., *a sample of individuals with less than one year of work experience, and who for the first time during the sample period enter a full-time job lasting more than 20 weeks*.[16] It turned out that individuals with a higher education are unlikely to enter their first full-time job with less than 1 year of work experience. This is the case because a lot of students are working during their studies and are accumulating working experience without, according to my definitions, having formally entered the labour market. Therefore, I also include all individuals entering a full-time job lasting more than 20 weeks directly after a period in formal education, regardless of their labour market experience at the time they enter the job.

The sample is then divided into skill-level categories. The definition of unskilled individuals is based on the education variable from IDA. The unskilled workers are defined as those without an education above lower secondary schooling (folkeskolens afgangseksamen), which corresponds to the highest compulsory school level in Denmark. Consequently, the skilled group consists of individuals with an upper secondary education, a finished apprenticeship, a short higher (tertiary) education or a long higher (tertiary) education. Based on the sampling frame and the skill-level definition employed, I end up with three groups of labour market entrants for my analysis: 1) *unskilled entrants with less than 1 year of work experience,* 2) *skilled entrants with less than 1 year of work experience, and* 3) *skilled entrants with more than 1 year of work experience*. The sampling frame is not depending on the subsequent labour market states, i.e. the sample may consist of students-to-be who have had a job for at least 20 weeks before

[16] The consequence for the sample, that the first jobs are restricted to be full-time jobs lasting more than 20 weeks, can be seen in Table A.1 in the Appendix. I find that this restriction does not alter the composition of the included individuals concerning age and gender or the composition of the included industries significantly. However, the level of education seems to be a little lower for all first jobs, compared to the applied sample.

returning to school. As a robustness-check, the analysis has been repeated for the unskilled group excluding students-to-be (see section 9.1.1 in the appendix).
I have a sample consisting of 19,343 individuals with each one first job observation and 9,797 subsequent job observations, in all. The job spells are distributed over 12,786 different firms.

4.4 Descriptive analysis

In this section, I present some descriptive statistics of the labour market entrants, their first jobs and the firms they are employed at.
Table 4.1 gives the mean characteristics of the sample individuals divided into unskilled and skilled, with or without work experience attained during their studies. The differences between the three groups are not big. The most important difference is that unskilled labour market entrants are a little younger than other labour market entrants. But this is a logical consequence of the time spent in education. It is, however, interesting to note that on average skilled individuals with less than one aggregated year of work experience (column 2) are younger than those who enter their first job after a spell of education, with more than a year of work experience (column 3). Moreover, the individuals that have spent most time in unemployment before entering the first formal job are the skilled with more than one year of work experience, even though the difference is just a few weeks. As for the subsequent jobs for these individuals, it is clear that the unskilled individuals experience relatively more unemployment after their first job than the other two groups. Thus, at the beginning of their subsequent jobs the unskilled have on average spent more time in unemployment. That some of the unskilled labour market entrants might return to education after their first job can be seen from the fact that at the beginning of the subsequent jobs observed for this group, only 75 per cent still have lower secondary school level, 8 per cent have got a high school level, 11 per cent have

finished an apprenticeship and 6 per cent have taken a higher education. Also the skilled have been moving up the education ladder, although not as much.

Table 4.1. Average individual characteristics of the labour market entrants.

Variable	**Unskilled**		**Skilled Work exp. < 1 year**		**Skilled Work exp. >1 year**	
	First job	Subse-quent jobs	First job	Subse-quent jobs	First job	Subse-quent jobs
Age	24.38	26.39	26.22	27.74	25.49	28.24
Female	0.53	0.48	0.51	0.50	0.52	0.50
Children 0-14	0.19	0.20	0.18	0.24	0.17	0.33
Single	0.55	0.55	0.55	0.49	0.55	0.39
Lower secondary education	1.00	0.75	0.00	0.00	0.00	0.00
Upper secondary education	0.00	0.08	0.52	0.40	0.22	0.15
Finished apprenticeship	0.00	0.11	0.26	0.37	0.40	0.43
Short higher (tertiary) education	0.00	0.05	0.15	0.16	0.24	0.26
Long higher (tertiary) education	0.00	0.01	0.07	0.07	0.14	0.16
Total time spent in un-employment prior to job (weeks)	19.7	46.5	24.1	44.8	25.2	38.1
Work exp. start of job (months)	7.1	34.4	7.4	37.8	31.6	60.8
Starting wage (DKK 2000-wage)	133.86	152.07	143.45	160.78	161.83	182.18
Number of observations	10,832	5,754	9,601	7,469	6,838	5,754

Next, we look at the types of firms employing the labour market entrants. There seems to be surprisingly few and small differences between characteristics of the firms employing unskilled labour market entrants compared to skilled entrants (Table 4.2).

Table 4.2. Average characteristics of the firms employing labour market entrants.

	Unskilled		Skilled Work exp. < 1 year		Skilled Work exp. >1 year	
	First job	Subsequent jobs	First job	Subsequent jobs	First job	Subsequent jobs
UI insurance degree	0.69	0.86	0.74	0.83	0.81	0.86
Firm size:						
1-20 employees	0.36	0.32	0.37	0.38	0.30	0.32
21-100 employees	0.30	0.30	0.29	0.29	0.30	0.30
101-500 employees	0.21	0.23	0.21	0.22	0.23	0.23
501 or more employees	0.13	0.15	0.13	0.11	0.17	0.85
Industry						
Primary sector	0.06	0.04	0.06	0.08	0.03	0.04
Manufacturing	0.21	0.20	0.21	0.22	0.18	0.20
Telecommunication	0.01	0.02	0.01	0.02	0.01	0.02
Construction	0.04	0.05	0.04	0.04	0.05	0.05
Trade	0.14	0.13	0.16	0.15	0.16	0.13
Transport	0.03	0.05	0.03	0.05	0.04	0.05
Finance	0.01	0.04	0.03	0.03	0.04	0.04
Service	0.06	0.02	0.04	0.03	0.03	0.02
Public	0.32	0.28	0.28	0.26	0.30	0.28
	10,832	5,754	9,601	7,469	6,838	5,754

According to search theory, the job mobility is higher at the beginning of the employment career, where individuals still are looking for better matches, a prediction supported by several empirical studies. Moreover, in a European context the Danish labour market is known to have a high job turnover (see e.g. Aagaard et al. (forthcoming)). Thus it is not surprising that the duration of the first job for these labour market entrants is rather short (see Table 4.3). More than 1/3 of the first jobs held by labour market entrants last less than a year.[17] This is of course unfortunate for the analysis, because I will only have one wage observation on each of these spells, and they will consequently not contribute to the return to tenure estimation. However, more than 40 per cent of the jobs last more than two years, thus for these observations I have at least 2 wage observations. In general, all subsequent jobs have longer durations than the first job, and individuals with longer educations tend to experience longer jobs; this is especially true for the subsequent jobs.

[17] This number is, however, somewhat smaller for jobs employed by labour market entrants with more than a year of work experience (see column 3 of Table 4.3).

Table 4.3. Duration of first and subsequent jobs for labour market entrants.

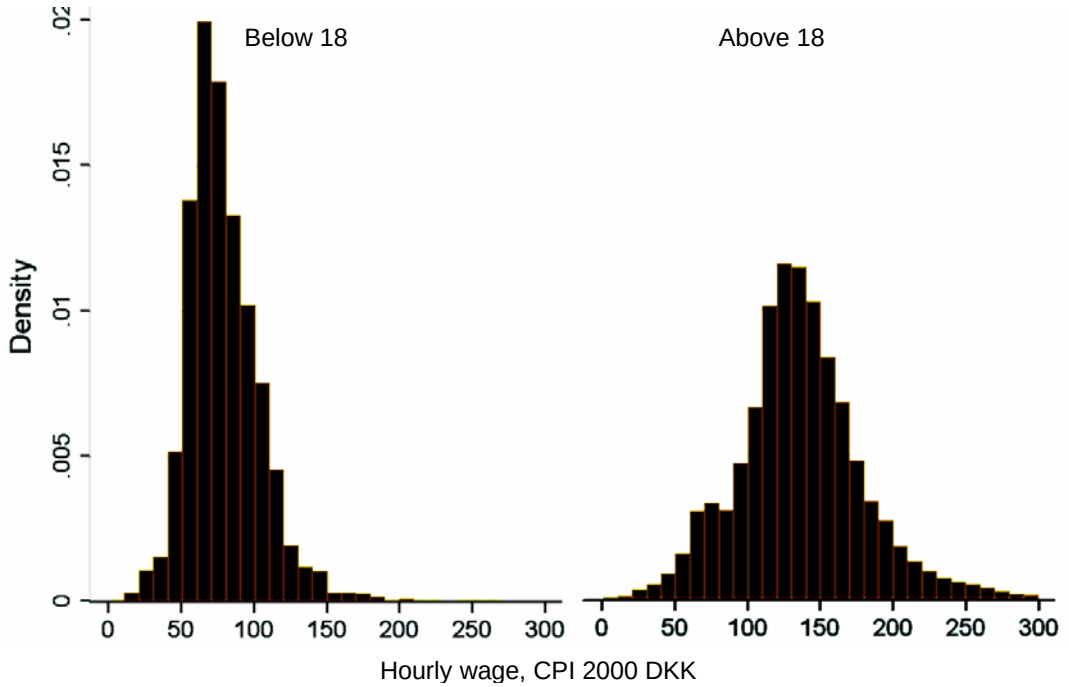
	Unskilled		Skilled Work exp. < 1 year		Skilled Work exp. >1 year	
	First job	Subsequent jobs	First job	Subsequent jobs	First job	Subsequent jobs
4-6 months	11.3	3.4	11.0	3.2	3.8	2.4
6-12 months	24.3	20.8	22.4	16.1	16.5	11.9
12-18 months	12.5	9.2	10.5	8.9	11.8	5.8
18-24 months	9.9	7.0	7.9	5.9	5.7	5.3
24-36 months	20.4	17.3	19.5	15.2	17.3	12.9
36 – months	21.6	42.4	28.7	50.7	44.9	61.6

5 Starting wages – a firm level perspective

As the observed characteristics of unskilled labour market entrants are relatively narrow, it could be that the employers consider them as a homogenous group. It could therefore also be expected that the distribution of starting wages for this group is relatively narrow. However, even though the distribution of starting wages for the unskilled labour market entrants is narrower than that for educated labour market entrants, the variance is still significant with the 25th percentile at DKK 74 and the 75th percentile at DKK 194 per hour (2000-prices). Some of this variance may be due to differences in abilities unobserved to the researcher but observed by the firm, and some of the variance may be explained by differences in the firms' wage policies. As mentioned above, the on-the-job training theory, the sorting theory and the deferred wages theory, all predict that some firms will set starting wages lower than others even when they face the same group of potential employees.

Figure 5.1 shows the distribution of starting wages in the first job for unskilled labour market entrants. I distinguish between employees below or above 18 years of age, since in most cases special wage rules apply to employees below 18.

Figure 5.1. Starting wage distribution for unskilled labour market entrants. Hourly wages measured in 2000 CPI wages.



Clearly the starting wage distribution is narrower for the young group of labour market entrants, but even so, both distributions show a significant spread. Not many observed individual characteristics can explain this spread, since we only observe variation in gender, age and marital status. The question of interest is whether characteristics of the employing firm are important for the setting of the starting wage. In order to answer this question, I estimate OLS and random effect models of equation (3.2). The results are shown in Table 5.2.

A simple decomposition of the variance of log starting wages shows how much of model (3.2) the firm-specific factors can explain (Table 5.1). This exercise clearly demonstrates that firm-specific factors explain a large part of the entry wages for all labour market entrants. The observed part of the variance only explains between 8 and 11 per cent of the variance, whereas the unobserved part explains between 19 and 25 per cent, leading to an overall part of the variance in

the log entry wages explained by firm-specific factors of between 26 and 36 per cent. Both the observed and unobserved parts of the variance are larger for unskilled individuals. The fact that the firm-specific factors seem to account for a larger share of the variance for unskilled individuals may to some extent be explained by the fact that individual-observed effects vary more among skilled individuals, and that this variation is not offset by as relatively large an increase in the total variation of the starting wages among skilled individuals. Now, as mentioned above, some of the unobserved firm-specific effects may include some individual-specific effects to the extent that individuals with the same unobserved characteristics sort into the same firm. Hence, the relatively large fraction of the variance in the starting wages for unskilled labour market entrants, which can be ascribed to unobserved firm factors, may to some extent be explained by a larger tendency to employ individuals with certain unobserved characteristics.

Table 5.1. Variance decomposition of the log starting wages. The fraction explained by firm-specific factors.

	Firm specific fraction	Sensitivity coefficient [a]	Observations
Unskilled	Observed fraction	0.11	6899
	Unobserved fraction	0.25	6899
	Total fraction	0.36	6899
Skilled with < 1 year of work experience	Observed fraction	0.09	6229
	Unobserved fraction	0.21	6229
	Total fraction	0.30	6229
Skilled with > 1 year of work experience	Observed fraction	0.08	6532
	Unobserved fraction	0.19	6532
	Total fraction	0.26	6532

[a] The sensitivity coefficients are estimated as follows: 1) the observed fraction: ($RSS_{OLS\text{-}j}$ - RSS_{OLS})/*TSS*, 2) the unobserved fraction: ($RSS_{OLS} - RSS_{RE}$)/*TSS* and 3) the total fraction: ($RSS_{OLS\text{-}j} - RSS_{RE}$)/*TSS*, where RSS_{OLS} is the residual sum of squares of the OLS estimation of (3.1), $RSS_{OLS\text{-}j}$ is the OLS estimate of (3.1) excluded all observed firm-specific variables, RSS_{RE} is the random effect estimation of (3.1) and *TSS* is the total variation (total sum of squares) of the log starting wages.

Next, I shortly summarise some of the individual- as well as firm-specific factors explaining the variance in the log starting wages. Estimation results are shown in Table 5.2. Age seems to be an important factor in determining the starting wage for labour market entrants. This is true for both unskilled and skilled entrants, as

for both groups I find the wage to increase with age. This is not surprising for ages below 18, since special rules apply to this age group, but the same effect is also found for higher ages. Most likely, this is because age is correlated with some unobserved ability factors such as maturity. These factors might even be unobserved by the firm, in which case age will act as a signal. It is, however, remarkable that individuals above 30 have significantly higher starting wages than individuals below 25, even though they have the same education and amount of work experience. The reason for this finding could be that the older labour market entrants have spent some time in education, albeit without getting a formal degree, and firms might acknowledge this informal level of education.

Female entrants seem to receive lower starting wages than male entrants. This effect is a little stronger for skilled entrants, which might be due to the fact that occupational segregation according to gender may be stronger for this group.

The total amount of unemployment experience prior to the first job has a positive effect on the starting wage for unskilled entrants. Thus, it seems to be the case that an unemployment period prior to the first job is a sign of the individual searching for a better-paid job, rather than a signal of low ability. However, for higher skilled individuals with less than one year of work experience the effect is insignificant, and for higher skilled individuals with more than a year of work experience, the effect is significantly negative. Thus, it seems that unemployment is more likely to be a disadvantage the stronger the employee's prior connection to the labour market is.

Next, I turn to the firm effects. The size of the firm has a significant impact on the starting wage for all skill groups, with larger firms paying higher wages. This is a finding which is widely established for wages in general (see e.g. Brown and Medoff (1989)), but Barron et al. (1987) also find this relation for starting wages. Barron et al. explain this relation by the fact that large employers will tend to screen new applicants more extensively because they can spread the monitoring costs over more employees. This extended screening will tend to discourage applicants and hence to reduce the number of applicants. In order to be able to

attract enough applicants, the large employers consequently have to offer higher starting wages. I find that the firm size-starting wage effect is stronger for the unskilled labour market entrants, which is in accordance with the theory of Barron et al., since the difference in monitoring costs is likely to be bigger among unskilled labour market entrants than among other entrants.
For all skill groups the lowest starting wages are found in the trading sector, and the highest starting wages are found in the service and primary sectors, which otherwise are thought of as low-wage sectors. Likewise, starting wages are found to be lower in the financial sector, which otherwise are thought to have higher wages.

Also the labour force composition inside the employing firm has significant effects on the labour market entrants' starting wages. The average education level as well as the average age among all employees in the firm are associated with lower starting wages for all labour market entrants. These effects should be seen in relation to the individual effects of age and education, which both are positive. Hence, being higher educated in a firm with a general high education level seems to offset some of the positive effect on the starting wages. The average wage level among all employees inside the firm except the entrants has on the other hand a positive effect on the starting wage. It is however likely that this effect is merely a selection effect. Hence individuals with higher wage potential (unobserved) are more likely to pursuit firms with higher wage levels.
Of the local labour market variables, only the local unemployment rate has a significant influence on the starting wages, and this effect is considerably stronger among labour market entrants with less than a year of work experience. For skilled entrants, who have been working during their studies, the negative impact of the local unemployment rate is only significant on a 10 per cent level.

Table 5.2. Estimation of log-starting wage for labour market entrants, separated by education level.

	Unskilled				**Skilled Work exp. < 1 year**				**Skilled Work exp. >1 year**			
	OLS		RE (firm id)		OLS		RE (firm id)		OLS		RE (firm id)	
lnwage00	Coef.	*Std. Err.*	Coef.	*Std. Err.*	Coef.	*Std. Err.*	Coef.	*Std. Err.*	Coef.	*Std. Err.*	Coef.	*Std. Err.*
Female	-0.048 **	*0.007*	-0.030 **	*0.007*	-0.070 **	*0.008*	-0.063 **	*0.007*	-0.104 **	*0.008*	-0.098 **	*0.008*
Age below 18	-0.632 **	*0.013*	-0.609 **	*0.013*	-0.677 **	*0.018*	-0.652 **	*0.018*	a)		a)	
Age 18-20	-0.164 **	*0.011*	-0.152 **	*0.011*	-0.389 **	*0.013*	-0.375 **	*0.012*	-0.379 **	*0.021*	-0.375 **	*0.020*
Age 21-25	-0.094 **	*0.012*	-0.087 **	*0.012*	-0.214 **	*0.012*	-0.199 **	*0.012*	-0.177 **	*0.018*	-0.176 **	*0.017*
Age 26-30	-0.023	*0.016*	-0.022	*0.015*	-0.131 **	*0.015*	-0.117 **	*0.014*	-0.094 **	*0.019*	-0.091 **	*0.018*
Age 31-40	-0.029 *	*0.015*	-0.016	*0.014*	-0.067 **	*0.014*	-0.061 **	*0.014*	-0.035	*0.021*	-0.034	*0.020*
Age above 40	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Lower secondary education	Ref.		Ref.		-----		-----		-----		-----	
Upper secondary education	-----		-----		-0.267 **	*0.016*	-0.254 **	*0.015*	-0.348 **	*0.016*	-0.343 **	*0.015*
Finished apprenticeship	-----		-----		-0.285 **	*0.016*	-0.277 **	*0.015*	-0.305 **	*0.013*	-0.308 **	*0.013*
Short higher education	-----		-----		-0.154 **	*0.016*	-0.144 **	*0.015*	-0.140 **	*0.012*	-0.143 **	*0.012*
Long higher education	-----		-----		Ref.		Ref.		Ref.		Ref.	
Work experience (years)	-----		-----		-----		-----		0.051 **	*0.007*	0.056 **	*0.007*
Work exp. squared (years)	-----		-----		-----		-----		-0.004 **	*0.001*	-0.004 **	*0.001*
Agg. time spent in unemployment prior to job (weeks)	0.025 **	*0.004*	0.026 **	*0.004*	0.002	*0.004*	0.005	*0.004*	-0.020 **	*0.004*	-0.020 **	*0.004*
Firm characteristics												
UI insurance degree	0.186 **	*0.011*	0.190 **	*0.012*	0.228 **	*0.013*	0.242 **	*0.013*	0.252 **	*0.016*	0.274 **	*0.017*
Firm size:												
1-20 employees	-0.106 **	*0.011*	-0.077 **	*0.012*	-0.063 **	*0.012*	-0.036 **	*0.013*	-0.077 **	*0.012*	-0.066 **	*0.013*
21-100 employees	-0.068 **	*0.011*	-0.039 **	*0.012*	-0.052 **	*0.012*	-0.026 *	*0.012*	-0.060 **	*0.011*	-0.045 **	*0.012*
101-500 employees	-0.048 **	*0.011*	-0.028 *	*0.012*	-0.028 *	*0.012*	-0.017	*0.013*	-0.039 **	*0.011*	-0.027 *	*0.012*
501 or more employees	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Industry												
Primary sector	0.018	*0.018*	0.050 *	*0.021*	0.010	*0.019*	0.058 **	*0.021*	0.047	*0.025*	0.088 **	*0.028*
Manufacturing	-0.011	*0.012*	0.008	*0.015*	-0.014	*0.013*	0.015	*0.015*	-0.008	*0.013*	0.006	*0.016*
Telecommunication	0.065	*0.035*	0.078	*0.070*	0.078 *	*0.040*	0.095	*0.064*	0.021	*0.036*	0.030	*0.055*
Construction	-0.058 **	*0.019*	-0.036	*0.022*	-0.038 *	*0.019*	-0.011	*0.021*	-0.051 **	*0.019*	-0.026	*0.021*
Trade	-0.059 **	*0.013*	-0.045 **	*0.016*	-0.088 **	*0.013*	-0.066 **	*0.015*	-0.053 **	*0.013*	-0.042 **	*0.015*

Transport	-0.062 **	*0.022*	-0.030	*0.026*	-0.050 *	*0.021*	-0.011	*0.024*	-0.037	*0.020*	-0.019	*0.024*
Finance	-0.082 **	*0.027*	-0.052	*0.032*	-0.070 **	*0.020*	-0.051 *	*0.024*	-0.055 **	*0.019*	-0.024	*0.024*
Service	0.033 *	*0.016*	0.054 **	*0.018*	0.043 *	*0.018*	0.065 **	*0.021*	0.050 *	*0.024*	0.061 *	*0.026*
Public	-0.003	*0.012*	0.003	*0.014*	0.002	*0.013*	0.010	*0.015*	-0.006	*0.013*	0.004	*0.016*
Other	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Labour force composition												
Average age	-0.005 **	*0.001*	-0.004 **	*0.001*	-0.003 **	*0.001*	-0.002 **	*0.001*	-0.005 **	*0.001*	-0.005 **	*0.001*
Share of males	0.014	*0.015*	0.023	*0.018*	0.033 *	*0.016*	0.009	*0.018*	-0.005	*0.018*	-0.018	*0.021*
Avr. Education level (years)	-0.034 **	*0.003*	-0.029 **	*0.004*	-0.032 **	*0.003*	-0.030 **	*0.004*	-0.026 **	*0.004*	-0.022 **	*0.004*
Avr. wage level	0.003 **	*0.000*	0.003 **	*0.000*	0.003 **	*0.000*	0.003 **	*0.000*	0.002 **	*0.000*	0.002 **	*0.000*
Local labour market												
Municipality size (100,000)	0,060 **	*0,018*	0,030	*0,022*	-0,001	*0,019*	0,006	*0,022*	0,003	*0,020*	0,002	*0,023*
Municipality size sq.	-0,004	*0,003*	0,001	*0,003*	0,005	*0,003*	0,003	*0,003*	0,003	*0,003*	0,002	*0,003*
Big city dummy[b)]	-0,065 **	*0,024*	-0,039	*0,029*	-0,024	*0,025*	-0,027	*0,028*	-0,055 *	*0,025*	-0,047	*0,029*
Local unemployment rate	-1,718 **	*0,121*	-1,940 **	*0,133*	-1,189 **	*0,126*	-1,203 **	*0,136*	-0,321 *	*0,136*	-0,251 *	*0,145*
_cons	5.187 **	*0.045*	5.047 **	*0.050*	5.480 **	*0.049*	5.335 **	*0.053*	5.578 **	*0.058*	5.473 **	*0.062*
Sigma_u			0.205				0.177				0.164	
Sigma_e			0.262				0.268				0.237	
Rho			0.379				0.305				0.322	

The model is estimated in Stata using the GLS random effects estimator with u_i ~ Gaussian.

[a)]No observations for this group.

[b)] Copenhagen, Aarhus, Odense or Aalborg.

** Significant on a 1 % level, *Significant on a 10% level.

As for the unobserved firm effects, I find for all skill groups that the random firm effects explain between 30 and 40 per cent of the error term variances. This clearly indicates that besides the observed variables to some extent starting wages are also affected by unobserved firm-specific effects.

5.1 Firm-specific differences in starting wages between skill groups

To investigate if firms apply the same starting wage rules to unskilled as well as skilled labour market entrants, I finalize the analysis of starting wages by looking at the correlations between firm- and skill-specific random terms, as defined in (3.3). All correlation coefficients are positive indicating that firms which apply starting wage premiums for skilled labour market entrants also tend to apply it for unskilled entrants. The correlation is stronger between unskilled and skilled with less than 1 year of work experience, than between skilled with more than 1 year of work experience and any of the other two groups.

Table 5.3. Correlation between unobserved skill- and firm-specific random intercepts for the starting wage equation.

	Unskilled	**Skilled <1 year of work experience**	**Skilled > 1 year of work experience**
Unskilled	*0.29*		
Skilled <1 year of work experience	0.48	*0.26*	
Skilled >1 year of work experience	0.26	0.25	*0.21*
Intercept [a]	4.91	5.21	5.26

The model is estimated in Stata using xtmixed.
Note: Numbers in the diagonal are standard deviations.
[a] Level of skill-specific intercepts.

6 Wage formation for labour market entrants

6.1 Within-job wage growth

The wage equation is estimated using the model specification described in Section 3.2. I start out by estimating single level models, consisting of an OLS model, a Mundlak model, a panel model with fixed job-specific effects and a

Hausman-Taylor model. Then I turn to estimating multilevel models, first only with job- and firm-specific random intercepts, then both with random intercepts and random tenure slopes. Three different models within the multilevel structure are estimated: the simple mixed model, the Mundlak mixed model and the Hausman-Taylor mixed model.

First, the estimates of the return to tenure are presented in Table 6.1, with the single-model estimates presented in Panel 1. As expected the estimate from the OLS model is higher than the rest, which indicates that tenure is positively correlated with the error term ε_{jit} in (3.4). However, simply by including observed characteristics into the model, the OLS estimates drop significantly and no longer differ significantly from the equivalent estimates of the other models. The wage in the first job for unskilled labour market entrants grows with approximately 1.8 per cent per year, with a decreasing squared rate of 0.2 per cent. This translates into a 2.5 per cent increase after 5 years, a result more in line with the findings by Altonji and Williams (1997), than those of Topel (1991). As a matter of fact, the wage growth in the first job is the same for unskilled and skilled labour market entrants with less than a year of work experience. For the skilled entrants with more than one year of work experience, the picture is less clear. The fixed-effect and Hausman-Taylor estimations suggest a wage growth around 2.5 per cent, whereas the Mundlak estimate suggests an annual wage growth around 1 per cent. Dustman and Meghir (2005) have estimated the return to experience, sector tenure and firm tenure for unskilled and skilled individuals, separately. On a post-displacement sample they find an annual within-job wage growth of 2.8 per cent for skilled workers and 4.5 per cent for unskilled workers during the first 5 years, and respectively -0.6 per cent and -2.6 per cent, hereafter. Thus, they find a higher return to tenure at the beginning of the job spell but a lower return hereafter for unskilled workers compared to skilled workers. The estimates for skilled workers resemble the findings in the present paper, whereas Dustman and Meghir's estimates for unskilled workers are considerably higher.

Table 6.1 (Panel 1) Tenure estimates in the OLS, Mundlak, Fixed Effect and Hausman Taylor models for single level models.

	[Model 1]		[Model 2]		[Model 3]		[Model 4]	
	OLS[a]		***Mundlak***[a]		***FE***[b]		***Hausman Taylor***[c]	
	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*
Unskilled								
Tenure	**0.079**	*0.005*	**0.028**	*0.005*	**0.019**	*0.007*	**0.017**	*0.004*	**0.019**	*0.002*	**0.018**	*0.002*
Tenure sq.	**-0.007**	*0.001*	**-0.003**	*0.000*	**-0.002**	*0.001*	**-0.002**	*0.001*	**-0.002**	*0.000*	**-0.002**	*0.000*
Skilled <1 year exp.								
Tenure	**0.101**	*0.004*	**0.036**	*0.004*	0.009	*0.006*	0.008	*0.005*	**0.009**	*0.002*	**0.012**	*0.002*
Tenure sq.	**-0.007**	*0.000*	**-0.003**	*0.000*	-0.001	*0.001*	-0.001	*0.001*	**-0.001**	*0.000*	**-0.001**	*0.000*
Skilled >1 year exp.								
Tenure	**0.056**	*0.003*	**0.033**	*0.003*	**0.022**	*0.004*	**0.024**	*0.003*	**0.022**	*0.001*	**0.023**	*0.001*
Tenure sq.	**-0.003**	*0.000*	**-0.002**	*0.000*	**-0.001**	*0.000*	**-0.002**	*0.000*	**-0.001**	*0.000*	**-0.002**	*0.000*
Additional covariates[d]	No		Yes		no		Yes		No		Yes	

[a] Estimated by *reg* in Stata.
[b] Estimated by *xtreg* in Stata.
[c] Estimated by *xthtaylor* in Stata
[d] Additional covariates included: female, age spline, 1-digit industry spline, firm-size spline, large city dummy, unempl. level in municipality, labour force composition: rate of UI insured, rate of male employees, avr. education level, avr. wage.
Coefficients in **bold** are significant on a 1% level.

Table 6.1 -continued (Panel 2) Tenure estimates for the mixed, Mundlak-mixed and Hausman Taylor-mixed models for multilevel models. Random intercept model, corresponding to (3.13).

	[Model 5]				[Model 6]				[Model 7]	
	Mixed[e]				***Mundlak-mixed***[e]				***Hausman Taylor***[f]	
	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*[g]
Unskilled										
Tenure	**0.025**	*0.002*	**0.021**	*0.003*	**0.019**	*0.002*	**0.019**	*0.003*	**0.018**	*0.003*
Tenure sq.	**-0.003**	*0.000*	**-0.003**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.000*
Skilled <1 year exp.										
Tenure	**0.017**	*0.002*	**0.015**	*0.002*	**0.009**	*0.002*	**0.011**	*0.002*	**0.011**	*0.002*
Tenure sq.	**-0.001**	*0.000*	**-0.001**	*0.000*	**0.001**	*0.000*	**-0.001**	*0.000*	**-0.001**	*0.000*
Skilled >1 year exp.										
Tenure	**0.026**	*0.001*	**0.024**	*0.002*	**0.022**	*0.001*	**0.023**	*0.002*	**0.022**	*0.002*
Tenure sq.	**-0.002**	*0.000*	**-0.002**	*0.000*	**-0.001**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.000*
Additional covariates[h]	No		Yes		No		Yes		Yes	

[e] Estimated by *xtmixed* in Stata.
[f] Estimated by a two-stage procedure using *xtreg* and *xtmixed* in Stata (program available upon request).
[g] Bootstrapped standard errors.
[h] Additional covariates included: female, age spline, 1-digit industry spline, firm-size spline, large city dummy, unempl. level in municipality, labour force composition: rate of UI insured, rate of male employees, avr. education level, avr. wage.
Coefficients in **bold** are significant on a 1% level.

Table 6.1 -continued (Panel 3) Tenure estimates for the mixed, Mundlak-mixed and Hausman Taylor-mixed models for multilevel models. Random coefficient model allowing for correlation between u_{0j} and u_{Tj}, corresponding to (3.14).

	[Model 8]				[Model 9]				[Model 10]	
	Mixed[e]				***Mundlak-mixed***[e]				***Hausman Taylor***[f]	
	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*[g]
Unskilled										
Tenure	**0.037**	*0.004*	**0.026**	*0.004*	**0.024**	*0.004*	**0.023**	*0.004*	**0.021**	*0.004*
Tenure sq.	**-0.003**	*0.000*	**-0.003**	*0.000*	**-0.005**	*0.000*	**-0.003**	*0.000*	**-0.002**	*0.000*
Skilled <1 year exp.										
Tenure	**0.011**	*0.004*	0.003	*0.004*	-0.007	*0.004*	-0.004	*0.004*	-0.004	*0.004*
Tenure sq.	0.001	*0.000*	0.000	*0.000*	0.002	*0.000*	0.001	*0.000*	0.001	*0.000*
Skilled >1 year exp.										
Tenure	**0.035**	*0.003*	**0.028**	*0.003*	**0.026**	*0.003*	**0.025**	*0.003*	**0.025**	*0.003*
Tenure sq.	**-0.002**	*0.000*	**-0.001**	*0.000*	**-0.001**	*0.000*	**-0.001**	*0.000*	**-0.001**	*0.000*
Additional covariates[h]	No		Yes		No		Yes		Yes	

[e] Estimated by *xtmixed* in Stata.
[f] Estimated by a two-stage procedure using *xtreg* and *xtmixed* in Stata (program available upon request).
[g] Bootstrapped standard errors.
[h] Additional covariates included: female, age spline, 1-digit industry spline, firm-size spline, large city dummy, unempl. level in municipality, labour force composition: rate of UI insured, rate of male employees, avr. education level, avr. wage.
Coefficients in **bold** are significant on a 1% level.

Next, we consider the wage growth estimates from the multilevel setting of the model (panels 2 and 3 in Table 6.1). In general, the inclusion of both job- and firm-level random intercepts does not alter the estimates of the within-job wage growth significantly, although they drop slightly for all groups (panel 2). The difference between models with and without additional covariates is in most cases no longer significant. Hence, the random intercepts seem to account for most of the observed heterogeneity affecting wage growth. When I allow for a firm-specific random return to tenure, which is correlated with the firm-specific random intercept, the within-job wage growth is no longer significant for skilled workers with less than a year of work experience (panel 3). The estimates for the two other groups are, however, not changing significantly. Hence, it seems to be the case that the wage growth of the skilled but less experienced labour market entrants, on average is caused by a firm-specific wage growth. Why this is the case for this particular group is less clear and needs further investigation.

In general the estimated return to tenure seems to be rather similar across methods. Especially for the mixed model which allow for firm-specific correlation between u_{Tj} and u_{0j}, neither the Mundlak nor the Hausman-Taylor model generate significant different return to tenure estimates.

This might very well have to do with the choice of sample. By only including the first job for each labour market entrant I can avoid some of the potential endogeneity problems, which e.g. otherwise would have been caused by previous job experience. On the other hand, the choice of sample does not allow me to account for any individual specific ability bias. However, as mentioned earlier the direction of such a potential bias is ambiguous so it is questionable how a correction of a possible ability bias will change the result. Nevertheless, the similar results across the different methods do seem to suggest that endogeneity caused by correlation between tenure and either the firm-specific or the match-specific error term is not very strong, especially not when a formal correlation between the firm-specific return to tenure and the firm-specific starting wage is accounted for.

6.1.1 Individual-specific wage profiles

As mentioned earlier, observed characteristics of the individual and the employing firm may affect not only the wage level, but also the wage growth. In this section some of these observed relations are examined by estimating equation (3.15).

First, the age at job entry is evaluated. The most striking feature from Figure 6.1 is that the wage profiles for the individuals below 18 are significantly steeper with much lower starting wages compared to the other wage groups, a picture which is true for both skill groups.[18] This fact is most likely due to a widespread practice in the collective agreements, that workers below 18 are paid significantly lower wage rates than workers above 18. Since this practice will

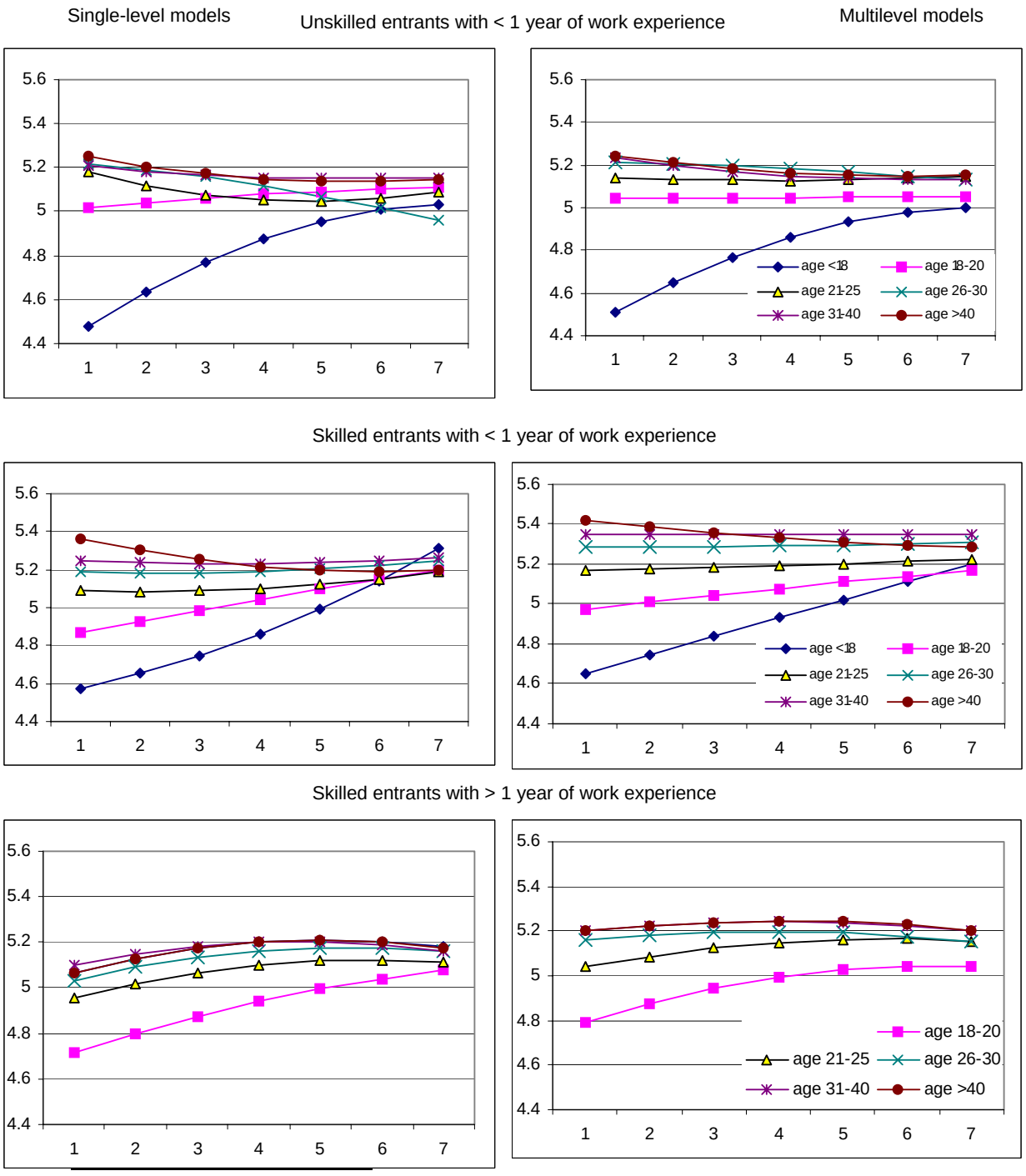
[18] As mentioned above, no individuals below 18 are found among the skilled with more than 1 year of work experience.

result in a large wage increase as soon as the worker is 18, large wage growths will show up during the first years in the job. For both skilled and unskilled labour market entrants, individuals who are below 18 when they enter the first job will catch up with the older labour market entrants after 5-6 years in the same firm. The second order tenure effect is negative for workers below 18, and this diminishing return to tenure makes the wage growth flatten out after 4-5 years. Among the skilled entrants, the general finding is that younger entrants have lower wages but higher wage growth.

6.1.2 Firm-specific wage profiles

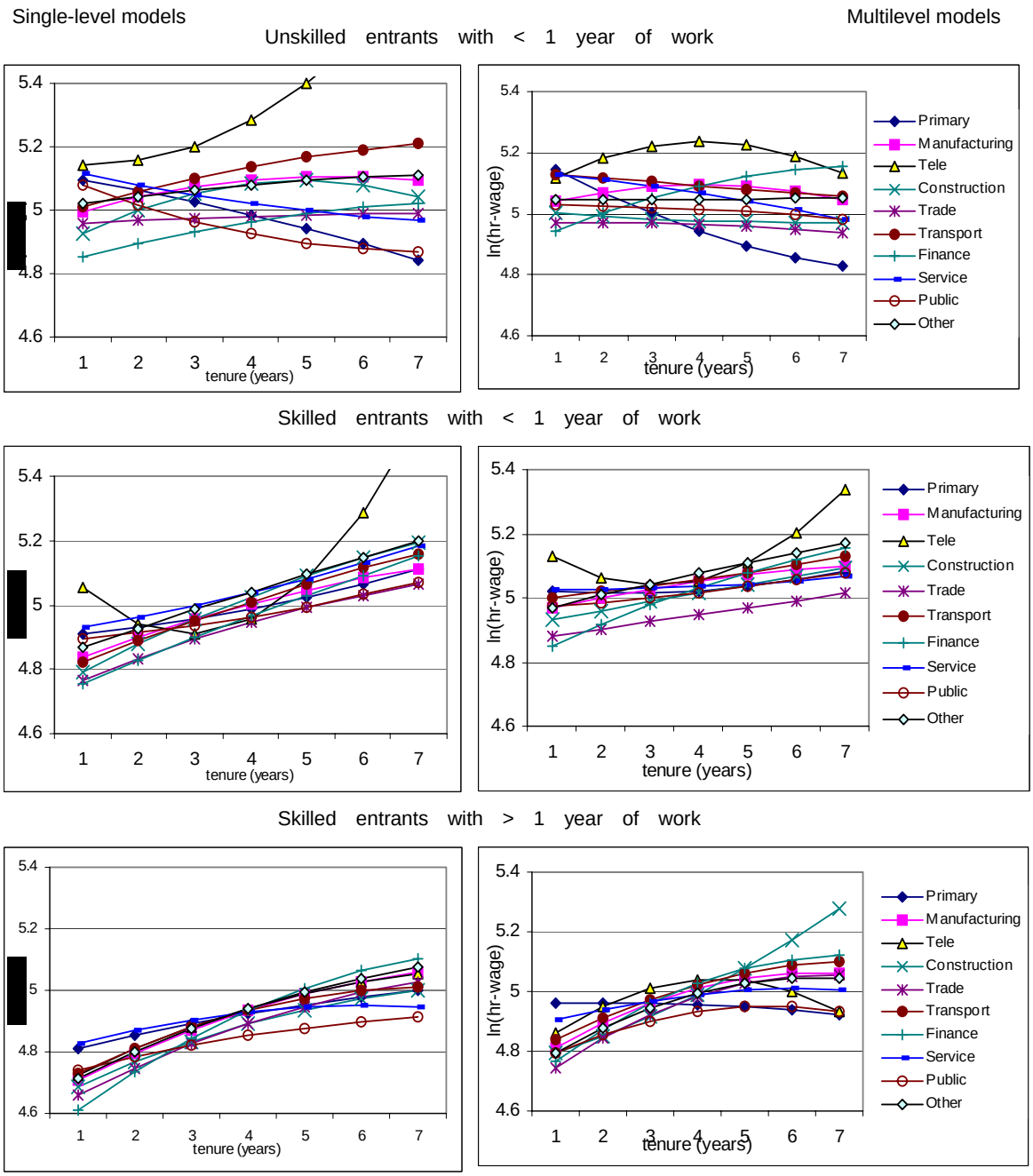
The industry-specific wage profiles are shown in Figure 6.2, below. In general, the effects are stronger for unskilled entrants for whom there seems to be a clear negative relation between starting wage and wage growth at the industry level. It can be seen that some of the industries which in Section 3 were found to have high starting wages, tend to have a lower wage growth, like e.g. the primary sector, and opposite some of the industries with low starting wages seem to have a high wage growth, like e.g. the finance sector. This is an expected consequence of different wage strategies pursued in different industries, and this effect is most likely strengthened by the collective agreements often being settled on the industry level.

Figure 6.1 Estimated log-wage profiles in first job by age at job entry. Eq. (3.15)
[19]



[19] The estimated wage profiles are estimated for a standard person: male, low secondary schooling (for unskilled) / upper secondary schooling (for skilled), 20 weeks of unemployment prior to job entry, in a standard firm: 100-500 employees, other sector, 60 % males, average age: 40, average education level: 12 years, average hourly wage: DKK 160, local unemployment rate: 5 %, not in large city.

Figure 6.2 Log-wage profiles by industry. Eq. (3.15)[20]



[20] The estimated wage profiles are estimated for a standard person: male, 18-20 years, low secondary schooling (for unskilled) / upper secondary schooling (for skilled), 20 weeks of unemployment prior to job entry, in standard firm: 100-500 employees, 60 % males, average age: 40, average education level: 12 years, average hourly wage: DKK 160, local unemployment rate: 5 %, not in large city.

6.2 The starting wage-wage growth relation in the first job

Next, we look at the unobserved firm-specific relation between starting wage and wage growth, which has been estimated in the multilevel model in equation (3.6) (see Table 6.2). For all models, I find a negative correlation between u_{0j} and u_{Tj}. There are no noteworthy changes in level of correlation across the models, not even when observed individual- and firm-specific tenure effects are included, but it seems as if for unskilled workers the correlation is more affected by the estimation procedure than for the other groups. The negative correlation is stronger for the skilled labour market entrants and for those with more than a year of work experience prior to the first full-time job. The predictions of the theories are that a firm-specific negative correlation between starting wages and wage growth will exist in 1) a labour market with large differences in the level of on-the-job-training conducted by different firms (human capital theory), 2) a labour market with low information on the hired workers' abilities (the sorting theory) or 3) a labour market with big differences in the average turnover rate of the firm (deferred wages theory). Opposite, in a tight labour market, where firms compete to attract the good workers, some firms will tend to provide both high starting wages and high wage growth (efficiency wage theory).

As mentioned above, the employing firm will tend to have less information on the unskilled labour market entrants, compared to the skilled and especially those with some prior work experience. According to 2), above, this will tend to make the negative correlation larger among unskilled labour market entrants. On the other hand, even though it is clear that the level of on-the-job training will tend to be lower among unskilled firms, and the employee turnover rate will tend to be higher, it is less clear whether the *difference* between firms is higher or lower among unskilled firms employing unskilled compared to skilled labour market entrants. The same is true for differences in the turnover rates. However, since the skilled labour market entrants form a more diverse group, the firms at which they are employed may be more diverse, resulting in a stronger negative

correlation between starting wages and wage growth for this group of labour market entrants according to both 1) and 3).

Table 6.2. Estimated correlations between u_{0j} and u_{Tj}.

	[Model 8]				[Model 9]				[Model 10]	
	Mixed[a]				***Mundlak-mixed***[a]				***Hausman Taylor***[b]	
	Coeff.	*St.d.*	Coeff.	*St.d.*	Coeff.	*St.d.*	Coeff.	*St.d.*	Coeff.	*St.d.*
Unskilled Corr(tenure, constant)	**-0.58**	*0.04*	**-0.51**	*0.04*	**-0.49**	*0.05*	**-0.59**	*0.03*	**-0.52**	*0.04*	**-0.49**	*0.05*	**-0.43**	*0.05*
Skilled <1 year exp. Corr(tenure, constant)	**-0.61**	*0.03*	**-0.71**	*0.03*	**-0.69**	*0.04*	**-0.63**	*0.03*	**-0.72**	*0.03*	**-0.71**	*0.03*	**-0.66**	*0.04*
Skilled >1 year exp. Corr(tenure, constant)	**-0.73**	*0.03*	**-0.81**	*0.03*	**-0.82**	*0.03*	**-0.75**	*0.03*	**-0.81**	*0.03*	**-0.82**	*0.03*	**-0.76**	*0.03*
Additional covariates[c] / tenure interactions[d]	*No / no*		*Yes / no*		*Yes / yes*		*No / no*		*Yes / no*		*Yes / yes*		*Yes / no*	

Note: for simplicity, the tenure squared-specific random terms are excluded from the table, although these have been included in the estimated model.
a Estimated by *xtmixed* in Stata.
[b] Estimated by a multi-stage procedure using *xtreg, reg* and *xtmixed* in Stata (program available upon request).
[c] Additional covariates included: female, age spline, 1-digit industry spline, firm-size spline, large city dummy, unempl. level in municipality, aggregated time spent in unemployment prior to job, labour force composition: rate of UI insured, rate of male employees, avr. education level.
[d] Additional tenure interactions: T*female, T*(age spline), T*(1-digit industry spline), T*(firm-size spline), T*(large city dummy), T*(rate of UI insured), T*(aggregated time spent in unemployment prior to job), where T=[tenure, tenure^2].
Coefficients in **bold** are significant on a 1% level.

That the negative correlation is stronger among firms employing skilled labour seem hence to favour either the human capital or the deferred wages theories above the sorting and efficiency wage theories. It is worth noting, however, that the correlation remains stronger and even increases among the skilled entrants after accounting for a wide range of observed individual- and firm-specific effects. Moreover, as mentioned earlier, it is clear that the collective agreements tend to be more influential in the unskilled labour market, which leaves less room for firm-specific wage setting rules and hence makes the firm-specific correlation among unskilled labour market entrants lower. This finding contrasts, however, the finding in Section 5, that the starting wages for unskilled entrants are more affected by firm-specific effects than those of skilled entrants.

Further research need to be done in order to properly test one theory above the others. In this relation firm-level information on turnover rates and levels of on-the-job training, as well as some measures for expected wages would be very beneficial.

6.2.1 Firm-specific differences in wage profiles between skill groups

This last issue, regarding wage formation in the first job for labour market entrants, examines whether each firm treats their skilled and unskilled labour market entrants equally. Essentially this is done by estimating equation (3.16) for the entire sample of entrants, with $S_{ji} = \left\{ S_{ji}^{unskilled}, S_{ji}^{skilled} \right\}$, and the skilled group consist of all skilled labour market entrants. To simplify the estimation procedure, I restrict the estimation to Model 8 with additional covariates but no tenure interactions.[21]

Table 6.3 presents the estimated correlations between the random factors, as well as the standard deviations for each of the random terms. The standard deviations of the firm-specific random terms attributed to unskilled entrants are slightly but significantly larger than the random terms attributed to skilled entrants. This larger variation in the random terms for unskilled labour market entrants seems to indicate that for this group a larger part of the difference in both starting wages and wage growth can be attributed to the firm. However, consistent with the finding from Table 6.2, I find a negative relation between starting wages and wage growth within the same skill level, which is stronger for skilled labour market entrants compared to unskilled. Hence, even though each of the firm-specific terms describing the wage setting rules seems to be stronger for the unskilled labour market entrants, the firm-specific *relation* between the two is stronger for the skilled entrants.

[21] Since the estimated correlation presented in Table 6.2 does not differ significantly between the estimation methods, I feel comfortable using this method.

The negative relation also holds across skill levels, such that high starting wages for unskilled entrants are related to low wage growth for skilled entrants, and opposite. Together with the positive correlations found between skilled and unskilled intercepts, and skilled and unskilled tenure slopes, these findings indicate that firms tend to apply the same wage strategy towards their skilled and unskilled labour market entrants.

Table 6.3. Correlation between unobserved firm-specific random effects between skill groups. (Model 8 with additional covariates [a])

	Unskilled intercept	Skilled intercept	Unskilled tenure slope	Skilled tenure slope
Unskilled intercept	*0.25*			
Skilled intercept	0.81	*0.22*		
Unskilled tenure slope	-0.49	-0.40	*0.12*	
Skilled tenure slope	-0.56	-0.79	0.64	*0.10*

The model is estimated in Stata using xtmixed.
Note: Numbers in the diagonal are standard deviations.
Note: For simplicity, the tenure squared-specific random terms are excluded from the table, although these have been included in the estimated model.
[a] Additional covariates included: female, age spline, 1-digit industry spline, firm-size spline, large city dummy, unempl. level in municipality, aggregated time spent in unemployment prior to job, labour force composition: rate of UI insured, rate of male employees, avr. education level, avr. wage.

7 Conclusion

In this paper, I examine how starting wages and return to tenure are determined for unskilled labour market entrants as compared to those who enter the labour market with an education. The study is conducted with special focus on the role of the employing firm. My aim is to establish whether firms apply different strategies when determining the wage profiles for unskilled labour market entrants. Furthermore, I seek to find out if initial wages and return to tenure are negatively correlated as suggested by several microeconomic theories.

The empirical part of the paper is divided into an analysis of individual and firm effects on the starting wages and of the wage growth in the first job for labour market entrants.

By estimating starting wage equations, I find that the characteristics of the employing firm account for a large part of the variance in initial wages, but that

these firm effects differ between unskilled and skilled labour market entrants, both according to industry, firm size and workforce composition. By simple decomposition I find that between 26 and 36 per cent of the variance in the starting wages can be attributed to firm-specific effects. This fraction is larger among unskilled labour market entrants, suggesting that the role of the firm-specific wage strategy is more important for this group. Moreover, I find that firms that offer higher starting wages for skilled labour market entrants also tend to offer higher starting wages for unskilled entrants.

In the wage equation, I find both individual and firm characteristics to have a significant impact on the return to tenure. Furthermore, for some sectors, wage profiles seem to be characterised by both low initial wages and low return to tenure, whereas for others the wage profiles have low initial wages and a high return to tenure, as predicted by the conventional theories. Even after accounting for a wide range of observed individual effects, as well as for personnel composition and industry and size of the firm, unobserved firm-specific effects still remain important in explaining differences in wages among labour market entrants. By estimating first and second order effects, I find what resembles a 2.5 per cent wage growth after five years in the first job for unskilled workers, and what resembles a 10 per cent wage growth after five years for skilled entrants with more than one year of work experience before entering the first full-time job. However, for skilled entrants with less than one year of work experience no significant within-job wage growth is found after a firm-specific random coefficient is included.

I find support for the conventional theories: firms employ different wage setting schemes with either high starting wages and low wage growth or low starting wages and high wage growth. This finding is significant even after accounting for a wide range of characteristics of the firms, their employees and the labour market entrants. Whereas the difference in the firm-specific wage terms, such as starting wages and tenure slopes, seems to be stronger among unskilled labour market entrants, the firm-specific relation between the two is clearly found to be

stronger for the more skilled and more experienced labour market entrants. Hence, factors such as large differences in the level of on-the-job training or large differences in the average turnover rate between firms might explain why this relation is stronger among the skilled labour market entrants.

Finally, I find that firms that hire both skilled and unskilled labour market entrants seem to apply the same wage strategy, as to starting wages and wage growth, towards the two groups.

8 References

Aagard, Anders, Tor Eriksson and Niels Westergaard-Nielsen (forthcoming). Wage and Labor Mobility in Denmark, 1980-2000", chapter in: E. Lazear and K. Shaw (eds.), *The Structure of Wages within Firms. Europe and the United States*. Forthcoming on University of Chicago Press.

Abowd, John M., Francis Kramarz, David N. Margolis (1999). High Wage Workers and High Wage Firms. *Econometrica*, Vol. 67, No. 2 (March), pp. 251-333.

Altonji, J. G. and R. A, Shakotko (1987). Do wages Rise with Job Seniority? *The Review of Economic Studies*, Vol. 54 (3), pp. 437-459.

Altonji, J. G. and N. Williams (1997). Do Wages Rise with Job Seniority? a Reassessment. *NBER Working Paper 6010*.

Barron, John M., Dan A. Black and Mark A. Loewenstein (1987). Employer Size: The Implications for Search, Training, Capital Investment, Starting Wages and Wage Growth. *Journal of Labor Economics,* Vol. 5 (1) (Jan.), pp. 76-89.

Barron, John M., Dan A. Black and Mark A. Loewenstein (1989). Job Matching and On-the-Job Training. *Journal of Labor Economics*, Vol. 7 (1), pp. 1-19.

Barth, Erling (1997). Firm-Specific Seniority and Wages. *Journal of Labor Economics*, Vol. 15, No. 3, Part 1, pp. 495-506.

Becker, Gary S (1975). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. 2nd ed. Chicago: University of Chicago Press.

Bronars, Stephen and Melissa Famulari (1997). Wage, Tenure and Wage Growth Variation within and across Establishments. *Journal of Labour Economics*, Vol. 15, Issue 2 (April), pp. 285-317.

Brown, Charles and James Medoff. (1989). The Employer Size-Wage Effect. *Journal of Political Economy*, Vol. 97, No. 5 (Oct., 1989) , pp. 1027-1059

Buchinsky, Moshe, Denis Fougère, Francis Kramarz and Rusty Tchernis (2005). Interfirm Mobility, Wages, and the Returns to Seniority and Experience in the U.S. IZA Discussion-Paper No. 1521.

Connolly, Helen and Peter Gottschalk (2000). Returns to Tenure and Experience Revisited - Do Less Educated Workers Gain Less from Work Experience?" Boston College Working Paper 473 (11/2000).

Dustman, Christian and Costas Meghir (2005) Wages, Experience and Seniority. *Review of Economic Studies*, Vol. 72, pp. 77-108.

Ebbes, Peter, Ulf Böckenholt and Michel Wedel (2004). Regressor and random-effects dependencies in multilevel models. *Statistica Neerlandica*, Vol. 58, nr. 2, pp. 161-178.

Guasch, J. Luis and Andrew Weiss (1980). Wages as Sorting Mechanisms in Competitive Markets with Asymmetric Information: A Theory of Testing. *The Review of Economic Studies*, Vol. 47, No. 4. (Jul., 1980), pp. 653-664.

Hausman, J. A. and W. E. Taylor (1981). Panel data and unobservable individual effects, *Econometrica* 49, pp. 1377–1398.

Hu, Luojia (2003). The Hiring Decisions and Compensation Structures of Large Firms. *Industrial and Labor Relations Review*, Vol. 56 (4), pp. 663-681.

Jensen, Hans and Jørn Neergaard Larsen (2005). The Nordic Labour Markets and the Concept of Flexicurity. In Martens and Shuperts (eds.) *The Nordic Model: A Reciept for European Success?* EPC Working Paper No. 20.

Jovanovic, B. (1979), Job Matching and the Theory of Turnover, *Journal of Political Economy*, 87, pp. 972-990.

Krueger, Alan and Summers, Lawrence (1988). Efficiency Wages and the Inter-Industry Wage Structure, *Econometrica* 56, pp. 259-94.

Larsen, Jonas Møller (2002). Konstruktion af Individuelle Forløbshistorier på Baggrund af Data fra CRAM, CON, IDA og Amfora. Aarhus School of Business, Mimeo, December 2002.

Lazear, Edward P. (1981). Agency, Earnings Profiles, Productivity, and Hours Restrictions. *The American Economic Review*, Vol. 71, No. 4 (Sep.), pp. 606-620.

Lillard, Lee A. (1999). Job Turnover Heterogeneity and Person-Job-Specific Time-Series Wages. *Annales d'Économie et de Statistique*, No. 55-56, pp. 183-210.

Mundlak, Yair (1978). On the Pooling of Time Series and Cross Section Data. *Econometrica,* Vol. 46, No. 1 (Jan.), pp. 69-85.

Shapiro, Carl and Stiglitz, Joseph (1984). Equilibrium Unemployment as a Worker Discipline Device, *American Economic Review* 74, 433 - 44.

Stata (2005). *Reference Manual Release 9. Longitudinal/Panel Data*, College Station, TX: StataCorp LP.

Topel, Robert (1991). Specific Capital, Mobility and Wages: Wages Rise with Job Seniority. *The Journal of Political Economy*, Vol. 99, No. 1 (Feb.), pp. 145-176.

Wooldridge, Jeffrey M. (2002). *Econometric Analysis of Cross Section and Panel Data*. The MIT Press, Cambridge, Massacchusetts.

9 Appendix

Table A.1. Individual and industry composition of the first job, for all and for the sample.

	All first jobs		**Full-time jobs >20 weeks with wage observation**	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Lower secondary education (unskilled)	0.47	0.50	0.35	0.48
Upper secondary education	0.27	0.43	0.24	0.43
Finished apprenticeship	0.13	0.32	0.22	0.41
Short higher (tertiary) education	0.08	0.28	0.12	0.33
Long higher (tertiary) education	0.05	0.22	0.07	0.25
Female	0.52	0.50	0.50	0.50
Age	24.3	9.35	25.4	10.01
Industry	Freq.	Percent	Freq.	Percent
Construction	1,352	4.5	889	4.6
Finance	760	2.5	656	3.4
Mail and telecommunication	409	1.4	252	1.3
Manufacturing	6,439	21.5	4,054	20.9
Primary	1,574	5.3	1,106	5.7
Public	8,745	29.2	5,488	28.4
Service	1,619	5.4	897	4.6
Trade	5,163	17.2	3,125	16.2
Transport	869	2.9	690	3.6
Other	3,058	10.2	2,186	11.3
Total	29,988	100	19,343	100

9.1.1 Robustness-check

As a robustness-check, all students-to-be have been removed from the sample of unskilled labour market entrants. The result is shown in Table A.2 below.

Neither the estimates of return to tenure nor the estimated correlation between tenure and starting wages are significantly different from those of all unskilled labour market students.

Table A.2. Unskilled labour market entrant excluding students-to-be.

	***Mixed*[e]**				***Mundlak-mixed*[e]**				***Hausman Taylor*[f]**	
	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*	Coef.	*St.d.*[g]
No corr. between tenure and starting wage										
Tenure[a]	**0.018**	*0.002*	**0.015**	*0.003*	**0.016**	*0.002*	**0.014**	*0.003*	**0.013**	*0.005*
Tenure sq.[a]	**-0.002**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.000*
Corr. Between tenure and starting wage										
Tenure[b]	**0.025**	*0.004*	**0.018**	*0.004*	**0.018**	*0.004*	**0.016**	*0.004*	**0.015**	*0.005*
Tenure sq.[b]	**-0.002**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.000*	**-0.002**	*0.001*
Corr(tenure, constant)[c]	**-0.60**	*0.03*	**-0.53**	*0.05*	**-0.61**	*0.03*	**-0.54**	*0.05*	**-0.44**	*0.05*
Additional covariates[h]	No		Yes		No		Yes		Yes	

[a] To be compared with Table 6.1 (Panel 2)
[b] To be compared with Table 6.1 (Panel 3)
[c] To be compared with Table 6.2
[e] Estimated by *xtmixed* in Stata.
[f] Estimated by a two-stage procedure using *xtreg* and *xtmixed* in Stata (program available upon request).
[g] Bootstrapped standard errors.
[h] Additional covariates included: female, age spline, 1-digit industry spline, firm-size spline, large city dummy, unempl. level in municipality, labour force composition: rate of UI insured, rate of male employees, avr. education level.
Coefficients in **bold** are significant on a 1% level.