Cohort Wage Effects and Job Mobility - Evidence from German Linked Employer-Employee Data

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PRELIMINARY

Abstract

Economic conditions at the time of entering the labour market can induce wage differentials between entry cohorts. While there exists much empirical evidence on the existence and persistence of these cohort effects, little is known about their impact on employees' mobility behaviour. Using a linked employer-employee data set derived from German administrative data, this paper analyzes the determinants of job mobility, emphasizing the effect of cohort wage differences in this context. The analysis suggests that cohort effects play an important role in explaining job transitions. Labour market entrants affected by unfavourable conditions and earning less than the average starting wage tend to to be more mobile. Moreover, our empirical analysis shows that labour market transitions reduce the cohort effects in earnings, implying that job mobility operates as an adjustment mechanism that reverses the initial wage differences between entry cohorts.

JEL codes: *E24, J31, J62, J64*
Keywords: *job-to-job, linked employer-employee, mobility, wage differentials, cohort effects.*

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1 Introduction

It is a well-known fact that each individual's career is affected by labour market shocks - and that young workers are most affected (cf. Freeman, 1975, and Katz and Autor, 1999). Existing studies suggest that economic conditions prevailing at the time workers enter the labour market significantly affect their earnings (e.g. Bloom and Freeman, 1986, and Welch, 1979). Whether these wage effects are long-run in nature has been a widely studied question yielding ambiguous results. The competitive model of the labour market, for example, implies that the latter operates as a spot market, where wages are solely determined by labour demand and labour supply and thus are equal to the individual's marginal productivity. In such a model, labour market shocks at the beginning of a worker's career are temporary and do not lead to long-lasting wage effects. However, alternative economic theories suggest that differences in initial labour market conditions - arising, for example, from variations in the cohort size or fluctuations in the business cycle - can induce persistent wage differentials between entry cohorts (e.g. Harris and Holmstrom, 1982). While there exists a large body of literature that theoretically and empirically states the existence as well as the persistence of such cohort effects in wages, research on how these cohort wage differentials are related to workers' job mobility remains relatively scarce. Oreopoulos, Heisz, and von Wachter (2006) provide one of the few studies analyzing the impact of job-starting conditions on workers' early career. Using a large sample of Canadian college graduates, the authors document that the unemployment rate at job entry, diminishing the worker's wage, significantly raises the probability of job separation. This increased job mobility, in turn, positively affects wages, and therefore is able to partly reverse the earnings losses experienced through less favourable career starting conditions.

In our paper, we conduct a similar analysis for the German labour market. We also aim at studying the relationship between cohort effects and early job mobility and thereby address two questions: Do cohort-induced wage differentials significantly affect the individual's mobility decision? And can job mobility contribute to a reduction of these initial wage gaps? We contribute to the existing literature in several ways: First, we use a wider sample of the German labour market covering individuals of all skill groups. Second, our data set allows us to control for heterogeneity on both sides of the labour market by taking into account both observable and unobservable worker and establishment characteristics. Third,

due to the different reasons a job separation might have, we distinguish between various destination states.

The analysis is based on a linked employer-employee data set provided by the Institute for Employment Research (IAB) containing detailed information on both workers and firms in the German labour market for the time period 1993-2006. We first provide a detailed analysis of the mobility patterns of cohorts entering the labour market at different points in time. In a second step, we examine the determinants of individual job mobility, emphasizing the effect of cohort wage differences in this context. For that purpose, the probability of different separation transitions is modeled as a function of worker and establishment characteristics, as well as the cohort wage effect, which is proxied by the deviation of the cohort starting wage from the mean starting wage. Finally, we examine the question to what extent worker mobility can contribute to a reduction of the initial wage gaps between different entry cohorts. Throughout the empirical analysis, we mainly focus on employer-to-employer transitions. Similarly to other studies (e.g. Perez and Sanz, 2005), we define as voluntary moves, the employer changes that are direct or which occur with an intervening unemployment spell of less than one month. In addition, we also consider employer-to-employer transitions intervened by an unemployment spell longer than one month, which in all likelihood can be can be seen as involuntary moves. The results suggest that cohort-induced wage differentials play an important role in explaining job transitions. Labour market entrants affected by unfavourable conditions and earning less than the average cohort starting wage show an increased mobility compared to workers with average or higher-than-average earnings. This holds true for voluntary as well as for involuntary separations, whereas this result could be attributed to institutional settings of the German labour market. Moreover, our empirical analysis shows that labour market transitions reduce the cohort effects in earnings, implying that job mobility operates as an adjustment process that reverses the initial wage differences between entry cohorts.

The remainder of this paper is organized as follows. The next section contains a review of the literature on cohort effects and early job mobility. Section 3 presents a description of the data set, particularly addressing the identification of job transitions. In Section 4 we introduce the methodology used in this paper. Descriptive statistics and estimation results are discussed in Section 5. Section 6 summarizes our analysis.

2 Theory and Empirical Findings

The analysis conducted in this paper builds on two strands of the literature. These are on the one hand the cohort effects literature, studying the impact of initial labour market shocks on earnings, and on the other hand the job mobility literature, analyzing the determinants and wage effects of individual job transitions. In this section, we provide a brief survey of the existing theoretical and empirical studies for both strands. Although the subsequent empirical analysis in our paper will focus on the relationship between cohort effects and the individual mobility behaviour and does not differentiate between the causes of cohort-induced wage discrepancies, for the sake of completeness our overview also covers studies providing various explanations for differences in wages between entry cohorts.

2.1 Cohort Wage Effects

The economic literature points to several theories that explain why initial labour market conditions might lead to wage differentials between entry cohorts, creating cohort wage effects. One factor on the supply side consists in variations in the size of entry cohorts. Studies examining the impact of the demographic cycle on earnings find that an important increase in supply - emanating, for example, from the entry of baby boomers into the job market - adversely affects entry wages (Bloom and Freeman, 1986, Berger, 1985, Freeman, 1979, Welch, 1979, and Wright, 1991). The analysis whether these wage disadvantages experienced by large cohorts at a young age remain throughout their career has created contention among researchers (Berger, 1989, Bloom, Freeman, and Korenman, 1987, Freeman, 1979, Klevmarken, 1993, and Murphy, Plant, and Welch, 1988). In particular, Bloom, Freeman, and Korenman (1987) suggest that large cohorts are able to at least partly catch up in earnings. Contrary to that, Berger (1989) does not find any catch-up in wages, whereas this result has been questioned by Klevmarken (1993).[1]

Not only supply shocks, but also shocks on the demand side of the labour market have the potential to generate wage differentials between entry cohorts. These can be due to technological progress or business cycle fluctuations. There is evidence that individuals hired during economic recessions experience lower entry wages than individuals hired in economic

[1] Bloom, Freeman, and Korenman (1987) and Klevmarken (1993) review studies on the effects of cohort size on labour market outcomes and age-earnings profiles, respectively.

upturns (e.g. Bils, 1985, Devereux and Hart, 2006, Shin, 1994, and Solon, Barsky, and Parker, 1994). This adverse effect is found to last for some period, suggesting persistent cohort effects in wages (e.g. Devereux, 2004, Oreopoulos, Heisz, and von Wachter, 2006, Oyer, 2006, and von Wachter and Bender, 2007). There exist several theories on wage determination that explain this long-term impact of poor initial economic conditions. Models of implicit contracts, developed for example by Azariadis (1975) as well as Harris and Holmstrom (1982) and empirically tested by Beaudry and DiNardo (1991), and Baker, Gibbs, and Holmstrom (1994), suggest that due to missing or insufficient wage adjustments, business cycle conditions at the time of signing the contract affect the individuals' long-term wages. The second class of models focuses on cyclical variations in hiring and promotion standards, which might lead to differences in workers' productivity and hence to differences in current and future earnings (Okun, 1973, and Reder, 1955). Another prevalent explanation for persistent cohort effects is based on the neoclassical human capital model. There, the initial economic situation affects workers' opportunity to accumulate skills and thus has a sustained impact on individual labour market performance (Gibbons and Waldman, 2004).

2.2 Early Job Mobility

Individuals affected by unfavourable initial labour market conditions might have the opportunity to advance in their careers through job changes, prohibiting persistent earnings disadvantages and yielding a convergence between cohort and market wages. However, job mobility as a mechanism to adjust inside and outside wage is not taken into account by the theories of cohort effects mentioned above. The empirical literature on job search, examining the determinants of job transitions early in the career, suggest that wages play an important role for an individual's mobility decision. Topel and Ward (1992), for example, analyze the mobility patterns of young men and find a lower job stability for lower-paid jobs. This corresponds to a similar result found by Oreopoulos, Heisz, and von Wachter (2006), who use exogenous business cycle variations and show that economic downturns, diminishing workers starting wage, significantly raise the rate of job change. The increased rate of mobility in the early career can be attributed to the fact that young workers tend to start in less desirable jobs, particularly in times of poor economic conditions. Learning about their own ability, job match quality and outside options, the workers often feel underpaid and tend to search for a better employment relationship. The question whether

such an employer change can help to enhance young workers wages and to accelerate the catch-up process, has been addressed by many empirical studies and has lead to controversial results. Most of the literature on this issue, including job search and career mobility models, suggests that workers increase their wages through job changes, and therefore point to beneficial job mobility. For example Antel (1991), Bartel and Borjas (1978), and Topel and Ward (1992) find mobility-induced wage premiums that range between 8% and 20%. Similarly, the analysis by Oreopoulos, Heisz, and von Wachter (2006) indicates that wage losses, experienced by workers graduating in a recession, can partly be reversed through job changes. These studies often focus on the wage development of quitters, which implies that only voluntary job transitions are dealt with. Alternative studies, based on the theory of internal labour markets, point to the fact that job displacements in workers' early careers lead to permanent wage losses (e.g. Kletzer and Fairlie, 2003, and von Wachter and Bender, 2006). Consistent with that, von Wachter and Bender (2007) show that initial wage advantages, obtained from favourable labour market conditions, are reduced when worker lose their job. With the exception of, for example, Keith and McWilliams (1999), Moore, Viscusi, and Zeckhauser (1998), and Perticara (2004), few empirical papers analyze voluntary and involuntary job changes simultaneously and thus allow for both beneficial as well as adverse mobility. The one most closely resembling our study is an investigation by Perticara (2004), who find that workers earning less than the customary wage rate are more likely to initiate a job change, which leads to a post-separation wage gain. On the contrary, workers earning more than the average wage have a higher probability of being laid off and often experience wage losses after separation.

3 Data

3.1 The data source

For the empirical analysis we use the IAB Linked Employer- Employee data set (LIAB), which was constructed through the combination of the *IAB Establishment Panel* and the *Employment Statistics Register*.[2] The *IAB Establishment Panel* is an annual representative survey of German establishments that employ at least one employee who pays social security

[2]Information on the LIAB data set is given by Alda, Bender, and Gartner (2005).

contributions.[3] Starting in West-Germany in 1993 and extended to East-Germany in 1996, this survey is drawn from a random and stratified sample of the establishments included in the Employment Statistics Register, where the stratification is done according to establishment size classes, industries and regions. The survey data provide detailed information on the establishment structure and performance, such as number of employees, the decomposition of the workforce, sales, investment expenditures, and wage policies. The second data source, the *Employment Statistics Register* is an administrative panel data set of all German individuals paying social security contributions.[4] It covers every person who worked between 1975 and 2006 for at least on day in an employment covered by social security, implying that civil servants, self-employed and workers in marginal employment are not included. For 1995, the employment statistics cover nearly 79.4% of all employed persons in Western Germany, and 86.2% of all employed persons in Eastern Germany. As for the unemployed, only those entitled to transfer payments are covered, implying that the unemployment stock is about one third lower compared to official labour statistics (see Bender, Haas, and Klose, 1999). The basis of the data is the integrated notification procedure for the German health insurance, the statutory pension scheme and the unemployment insurance, which was introduced in 1973. Since then, employers have been obliged to make notifications to the social security agencies at the beginning and at the end of any employment spell. Furthermore, an annual report for each employee registered within the social insurance system is compulsory at the end of the year (31^{st} December). These reports include information on a daily basis on, for example, the employees year of birth, sex, education, nationality, date of entering the labour market and daily gross earnings. To meet the problem of inconsistent and missing information on the individual's education, we use an education variable corrected according to an imputation procedure provided by Fitzenberger, Osikumino, and Völter (2006). Particularly, we use the imputation procedure 2B, where education reports are extrapolated and only for individuals having inconsistencies in their education reports, the extrapolation is restricted to degrees that are reported at least three times.

Both data sources contain a unique establishment identification number which makes it possible to match the information on all employees covered by social security with the

[3] A detailed description of the IAB Establishment Panel is given by Bellmann, Kohaut, and Lahner (2002) and Kölling (2000).

[4] A detailed description of the Employment Statistics Register and the notification procedure is given by Bender, Haas, and Klose (2000) as well as Bender and Haas (2002).

establishments in the IAB Establishment Panel. The first step of this matching process comprises the selection of establishments who participated in the IAB Establishment Panel between 2000 and 2002. Moreover, we exclude establishments in Eastern Germany. Based on the establishment data, we retrieve information on some firm characteristics, which are expected to affect the likelihood of job separation. These include industry, establishment size, as well as establishment age. In the second step, the Employment Statistics Register is used to link the sample of establishments with the employee history information for all individuals who worked at least one day in one of the selected establishments during 1997 to 2003. We restrict our sample to West-German individuals whose labour market entry we can observe in the data. Since labour market entrants have not accumulated any work experience and are particularly affected by economic conditions at the beginning of their career, they can be easily compared and are therefore an ideal group to study the relationship between cohort wage effects and job mobility. Moreover, studying labor market entrants has the advantage that the starting date of the first job spell is well known, such that the analysis is not affected by the 'initial conditions problem'. For a better comparison of wages, we exclude part-time workers, homeworkers, apprentices, trainees, and persons who are unemployed at the time of entry.[5] Finally we drop individuals with parallel employment spells and with missing values for the variables used in the empirical analysis. Using these selection criteria our final sample comprises a total of about 3.3 million observations. At the individual level, the age, sex, skill level, tenure and daily gross wage are used for the empirical analysis. In addition to that, we exploit the individual information to calculate a number of establishment-specific variables, such as the share of apprentices, females, part-time workers, and different skill groups, the employment growth as well as the worker reallocation rate. Following Burgess, Lane, and Stevens (2000), we define the worker reallocation rates at the establishment level as follows: $WFR_{et} = \frac{A_{et}+S_{et}}{(E_{et}+E_{et-1})/2}$, where worker accessions A_{et} include any employment relationship observed on June 30th in year t but not on June 30th in year $t-1$. Correspondingly, worker separations S_{et} comprise any employment relationship which is observed in year $t-1$ but not in year t. The Table A.1 provides definitions of all the worker and establishment characteristics used in the empirical analysis.

[5]Other studies based on administrative individual data are usually concerned with the problem that wages are censored at the social contribution ceiling (only the ceiling is reported in the data set and not the true earnings). But due to the fact that we only consider individuals entering the labour market for the first time, these data problems barely affect our analysis.

3.2 Measuring Job Separations

In the LIAB data we can derive three labour market states at each moment in time: employment (E) covered by social security, unemployment (U), if the worker is receiving transfer payments, and non-participation. Since the latter state cannot be directly observed in the data, we define non-participants as individuals out of sample. These individuals are not recorded in the data sets, i.e. we are not able to differentiate them from civil servants, self-employed, retired and marginally employed workers. Because of the way the data are collected, both firms' reports of a new employee and individuals' notifications of moving into or out of unemployment are not exactly consistent with the actual change of labour market state. The latter potential measurement error can be corrected in the following way: If the time lag between two employment or unemployment notifications does not exceed 30 days, it is defined as a direct transition between the two states recorded. We count it as an intervening spell of non-participation if the time interval between the two records is larger than 30 days.

Given the daily information on the employment and unemployment history of every individual in the sample, it is possible to calculate separation flows taking into account every change of the labour market state that occurs within a certain time period. Using the three mentioned states E, U and N, as well as the establishment identification number provided in the data set, we are able to identify three different separation flows. These are the transitions from employment to nonparticipation (EN), from employment to unemployment (EU) and from employment to another employment (EE). Adding up these three flows yields the total separations for the aggregate economy, $S_t = EN_t + EU_t + EE_t$. Throughout the empirical analysis, we mainly focus on EE flows. In this context, recent research has pointed out that a distinction between voluntary and involuntary job changes proves to be important (Perticara, 2004). Since the LIAB data do not designate any reason for a job separation, we are not able to directly differentiate between voluntary and involuntary moves. As an alternative, we examine direct employer-to-employer transitions and those with an intervening unemployment spell of less than 1 month (EE_d) on the one hand and employer-to-employer transitions with an intervening unemployment spell that is larger than 1 month on the other hand (EE_U). Corresponding to the notion in the job mobility literature, the first type of separation is with a high probability initiated by the worker and can usually be seen as a voluntary move. The latter one, however, results in all likelihood

from a lay-off and can be considered as an involuntary move. It should be noted here that our definition of a job is based on the establishment level and not on the firm level. Therefore a transition from one establishment to another one within the same firm will also be identified as an employer-to-employer flow. According to Davis and Haltiwanger (1999), we calculate the corresponding rates of each flow by using the average of current and past employment $(E_t - E_{t-1})/2$ as the denominator.

4 Econometric Framework

In the first part of the empirical analysis, we approach the individuals' job mobility from the event history perspective, i.e. we estimate the probability of experiencing a certain job separation by using a hazard rate model. Since the LIAB data set contains daily information a continuous-time framework is used. The hazard rate then is assumed to take the following proportional hazard form:

$$\lambda(t, X(t)) = \lambda_0(t) exp(X(t)\beta). \tag{1}$$

The component λ_0 denotes the baseline hazard function, which measures the effect of the elapsed employment duration on the separation rate of a certain reference group. The term X refers to a set of possibly time-varying explanatory variables, and β is a vector of coefficients to be estimated. According to Lancaster (1990), duration analysis produces biased estimation results if unobserved heterogeneity is not taken into account. For this reason, the term α, assumed to have a multiplicative effect on the individual hazard, is additionally included:

$$\lambda(t, X(t), \alpha) = \alpha \lambda_0(t) exp(X(t)\beta). \tag{2}$$

Regarding the functional form of the baseline hazard one can make different assumptions. The Cox proportional hazard model, for example, allows an unspecified form for the underlying baseline hazard. Compared to parametric approaches, this model has the advantage that one does not have to assumption about the shape of the hazard function, even though this implies that no explicit estimates of it can be identified. Because of this, we opt for an alternative strategy and parameterize the hazard function as a piecewise-constant exponential model. That is, we assume a baseline hazard rate which is constant within given time intervals, but is allowed to vary between them. Therefor, the basic duration is partitioned

into k prespecified sub segments with cutpoints $0 = t_0 < t_1 < \ldots < t_k$. The baseline hazard then can be expressed by the equation:

$$\lambda_0(t) = \left\{ \begin{array}{ll} \lambda_1, & t \in (0, \tau_1], \\ \lambda_2, & t \in (\tau_1, \tau_2], \\ \ldots & \\ \lambda_k, & t \in (\tau_{k-1}, \infty], \end{array} \right\}$$

where the k parameters $\lambda_1, \ldots, \lambda_k$ represent the separation probability for a certain reference group in one particular time interval. Thus, in contrast to the Cox proportional hazard model explicit estimates of the baseline hazard function can be obtained, enabling us to directly assess the effect of duration dependence. In the subsequent analysis we distinguish between seven sub-segments: 0-6 months, 7-12 months, 13-18 months, 19-24 months, 2-3 years, 3-5 years, and more than 5 years of employment duration.

Using the piecewise constant exponential model, we estimate two different multiple destination models, also known as competing risk models. In order to get a general idea of young workers' mobility behaviour, we first distinguish between three possible separation destination states: individuals may transit from one employer to another one (EE), from employment to unemployment (EU), and from employment to non-participation (EN). In a second step, we focus on job-to-job transitions and estimate the competing hazards of changing employers voluntarily (EE_d flows $\rightarrow$ EE flows and EE flows with an intervening unemployment spell $<$ 1 month) and changing employers involuntarily (EE_U $\rightarrow$ EE flows with an intervening unemployment spell $\geq$ 1 month). In the case of continuous time models with multiple destinations, the log-likelihood can be divided into the sum of multiple subcontributions. Given this separability property it is possible to estimate a competing-risk model by estimating a single-risk model for each destination. On the basis of the linked employer-employee data set we are now able to explain the probability of certain transitions by a set of individual and establishment characteristics. The explanatory variable of main interest is the cohort effect in wages at the beginning of the worker's career. In order to calculate these initial wage differentials as deviations from the mean starting wage, we employ the methodology proposed by Haisken-DeNew and Schmidt (1997). For that purpose we estimate, in a first step, the following wage regression:

$$\ln w_{it} = \alpha_1 + \alpha_2 X_{it} + \sum_{j=2}^{J} \beta_j C_j + \epsilon_{it}, \tag{3}$$

where $\ln w_{it}$ refers to the real hourly log wage of individual i at the time of entering the labour market (t=0), X_{it} is a vector of explanatory variables, C_j is a set of $j-1$ cohort dummies indicating the year of entry, and α_1, α_2, and β_j are the coefficients to be estimated. In a second step, the coeffcients of the cohort dummy variables, obtained from equation (3) by using an arbitrarily chosen reference cohort, are transformed to deviations from the mean starting wage.[6] These starting wage deviations, enter the hazard equation with one variable comprising values smaller than zero and a second one comprising values larger than zero, so that positive and negative deviations are allowed to have different effects on the transition probabilities.[7] Other variables, which we use to explain the probability of certain job separations, are sex, skill level, and region at the individual level, as well as establishment size, industry, and employment growth at the establishment level. In order to account for differences in economic conditions at the time of separating, we also include monthly and yearly dummies.

In the second part of the empirical analysis, we aim at investigating the contribution of individuals' mobility behaviour to the adjustment of cohort and market wages. That is, we want to examine whether job mobility can significantly decrease the initial wage differential between job starting cohorts. To do so, we concentrate on individuals who stayed in their first job and those who transit from one employer to another one, and compare how the initial cohort effect has changed for both groups. The comparison model, on which the estimates in this paper are based on, is given by:

$$\ln w_{it} = \gamma_1 + \gamma_2 X_{it} + \gamma_3 M_i t + \sum_{j=2}^{J} \delta_j C_j + \sum_{j=2}^{J} \theta_j C_j M_{it} + \epsilon_{it}. \tag{4}$$

In contrast to the first model (equation (3)), we now examine the wages after gaining some labour market experience. Moreover, equation (4) extends the previous one as it additionally includes a set of two categorical variables M_{it}, indicating whether job-to-job transitions occur voluntarily or involuntarily, and their interactions with the cohort dummies C_j. When examining the impact of job mobility on the variation of the cohort wage effect, we need to be concerned about two econometric issues. First, the problem of possible endogeneity might arise due to the correlation between job mobility and unobservable wage

[6] For more background information on this two-step procedure, see Haisken-DeNew and Schmidt, 1997.

[7] Since a predicted variable is included as an regressor, standard errors are corrected according to the calculation procedure proposed by Murphy and Topel, 1985.

determinants. Second, there is the problem of unobserved heterogeneity, which can be attributed to unmeasured variation across individuals in characteristics that influence both mobility and cohort wage effects. Due to this, the standard Ordinary Least Squares (OLS) approach might generate biased estimators of the returns to mobility. In order to tackle this problem, we apply Heckman's two-stage estimation approach (see Heckman, 1979). In the first step of this procedure, we apply a multinomial probit model for job mobility, whereby we distinguish between no job change, voluntary job change and involuntary job change. The residuals from this first-step equation are exploited to construct two selection bias control factors, which are equivalent to the so called Inverse Mill's Ratio. The first one, λ_1, accounts for the endogeneity of a voluntary job change, whereas the second one, λ_2 controls for the endogeneity of an involuntary job change. In the second step of the Heckman approach, we estimate equation 4, where we now use the selection bias control factors (λ_1 and λ_2) as additional explanatory variables. Since these factors summarize the effects of all unmeasured characteristics that are related to job mobility, all other covariates do not reflect this effect anymore, such that the regression analysis leads to unbiased and consistent results.

5 Descriptive Evidence and Estimation Results

5.1 Impact of Cohort Wage Effects on Job Mobility

To illustrate the job mobility behaviour of individuals starting their career at different points in time, we begin by presenting the first year transition rates by year of labour market entry. Table A.2 shows the separation flows distinguished by the three destinations states employment, unemployment and nonparticipation, while the focus of table A.3 is to present the pattern of voluntary (EE_d) and involuntary employment changes (EE_U). We see that, in general, cohorts with lower than average earnings tend to be more mobile at the beginning of their career. Workers of cohorts with starting wages that negatively deviate from the sample mean, show employer-to-employer transition rates (EE) ranging between 23% and 29%. On the contrary, the EE flow rates of cohorts whose entry wage lies above the sample mean, only reach 12% to 18%. Voluntary transitions from one employer to another (EE) as well as transitions from employment to non-participation (EN) show a very similarly pattern, while for involuntary employer-to-employer flows (EE_U) and employment-to-unemployment

transitions (EU) a slightly different properties can be observed. Again, the workers with cohort wages below the average have higher transition rates, and also workers with relatively large positive cohort effects show an increased mobility behaviour.

Both tables give a first indication towards the impact of the initial wage differentials on the individual's job mobility. Table A.4 enlarges on this interrelation and displays the different separation transitions by labour market experience and deviation from the mean starting wage (in quintiles) . It becomes apparent, that the transition rates of workers that belong to the lower quintile are much higher compared to workers of the higher quintiles. The two exceptions are again the transitions from employment to unemployment and the involuntary employer-to-employer transitions, which are also relatively large in the higher quintiles, but low for workers with starting wages near the average. Furthermore, all transition rates are decreasing with the individual's labour market experience, whereas the percentage decline is larger for the lower quintiles. For example, workers of the first cohort effect quintile have an employer-to-employer transition rate of about 31% one year after entering the labour market, and this rate decreases to 17% after five years of experience. For workers of the highest quintile, however, the employer- to-employer transition rate lies at about 16% in the first and at about 12% in the fifth year of their career. From the descriptive evidence above, we can infer that individuals with a large negative cohort effect in wages tend to be more mobile than individuals with starting wages near the average.

To be more precise, we estimate the determinants of different separation transitions by using the hazard rate models described in the previous section, particularly emphasizing the impact of initial cohort wage effects. The first table A.5 displays the estimation results for the hazards of the three separation flows EE, EN, and EU, obtained from the piecewise constant exponential hazard model with and without random effects. A comparison of the results reveals that the consideration of random effects does not change the estimated hazard rates. The estimation results of all three transitions indicate that the hazard of experiencing a job separation falls with employment duration, implying that there exists negative duration dependence. Moreover, the relationship between separating from the job and the size of the establishment is decreasing. And finally, separation transitions seem to be a more common phenomenon among less educated individuals. Regardless of the size of cohort wage effect, the probability of separating from employment to unemployment and

from employment to non-participation is negatively correlated with the skill level. This is not the case for the hazard of employment-to-employment transitions, which is higher for the high-skilled individuals. These general results are consistent with the results of previous research on job mobility. The results, we are most interested in, is the impact of the cohort wage effect on the separation probabilities. The estimated hazard rates largely confirm the results from the descriptive analysis. Workers with cohort wages, lying below the sample mean, are more likely to separate from their current job, whereas workers with higher-than-average cohort wages show a lower transition probabilities. And this finding holds true for all three types of separations.

The results obtained from estimating the competing hazards of voluntary and involuntary job changing are shown in table A.6. We can see, that very similar features emerge with respect to the duration dependence, the worker's skill level and the size of the establishments. And also for the cohort wage effect we find very similar results. This stays in contrast to previous studies which suggest that workers with wages below the average are more likely to voluntarily separate from the current job, while workers earning more than the average wage faces a higher risk of being laid off. Since most of these studies are based on data of the United States, our controversial findings can presumably attributed to institutional settings of the German labour market.

5.2 Adjustment of Cohort Wage Effects

Another question, we are looking at and which approaches the interaction between cohort wage effects and the individual mobility behaviour from a different angle, is to what extent does increased job mobility contribute to a reversion of initial wage differentials? A first impression is given by Figure B.2, which displays the wage growth by type of separation and deviation from the mean cohort entry wage (in quintiles). We see, that the rate of wage growth is much higher for workers of the lower quintiles, irrespectively of whether they stay at their current employer, move voluntarily or involuntarily. From this figure it also becomes apparent, that the earnings of voluntary movers grow much faster than the earnings of all other workers. For workers of the lowest quintile, even involuntary employer-to-employer transitions result in a higher wage growth compared to staying with the same employer. This implies that for cohorts unfavourable labour market conditions at the time of labour market entry result in inappropriate job matches, such that any kind of job change seems

to be beneficial.

Given this pattern of wage growth one can conclude that cohorts with wage disadvantages at the beginning of their career, are able to catch up and close the initial wage gaps. To investigate this issue in more detail, we look at the evolution of the cohort effects, calculated as the deviations of the cohort wage from the mean cohort wage, when workers gain some labour market experience. Figure B.3 shows these wage deviations for exp=0, exp=1, and exp=2. While the initial wage deviation shows strong variations between the different entry cohorts, the wage gaps decrease with labour market experience. In order to examine this aspect in more detail, we estimate equation 4 by using a Heckman two-step approach, as has been explained in the previous section.

TO BE COMPLETED

6 Conclusion

In this paper, we aim at investigating the relationship between cohort effects in wages and workers' mobility behaviour early in their career. Throughout the analysis we use a linked employer-employee data set, which contains detailed information on both workers and firms on the German labour market and covers the time period 1993-2006. In the first step of this research, we model the hazard of experiencing job transitions, where we mainly focus on voluntary and involuntary employer-to-employer transitions. One of the explanatory variables, which is included in the regressions and is of particular interest, is the cohort wage effect, proxied by the deviation of the cohort starting wage from the mean starting wage. The estimation results suggest that wage differentials caused by variations in economic conditions at the time of entering the labour market are an important determinant of mobility decisions. As a general rule, workers with initial cohort wages below the average are more likely to separate from their job. This finding holds true for all types of separations. In the second step, we estimate the change in the cohort wage effect, that can be attributed to job mobility. Since job mobility is likely to be endogenous, the econometric model we use is a two-step procedure proposed by Heckman (1979), in which a probit survival equation is first estimated to correct for sample selection bias. We find, that workers can highly benefit by changing employers. Moreover, the estimation results show that the initial wage

differentials between entry cohorts can be reduced by labour market transitions, which implies that job mobility operates as an adjustment process that reverses the initial cohort effects in wages.

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Appendix A Tables

Table A.1: **Definition of Characteristics**

Variable	Definition
EE flows	Transitions from one employer to another one.
UE flows	Transitions from unemployment to employment.
NE flows	Transitions from nonparticipation to employment.
Separation flows	EE + UE + NE.
EE_d flows	Direct EE flows and EE flows with an intervening unemployment spell $<$ 1 month.
EE_U flows	EE flows with an intervening unemployment spell $\geq$ 1 month.
Cohort effect	Cohort differences in starting wage estimated as deviations from the mean starting wage.
Age	Age of individual.
Low-skilled workers	Dummy=1 if individual holds a lower secondary school diploma without a professional degree.
Medium-skilled workers	Dummy=1 if individual has a lower secondary school diploma and professional degree; or a high school diploma and without a professional degree; or a school diploma as well as a professional degree.
High-skilled workers	Dummy=1 if individual holds a university degree or university of applied sciences degree.
Establishment size	Size of the employing establishment; dummy variables for categories from 1 = less than 5 to 10 = more than 1000 employees.
Industry dummies	Dummy variables for categories 1 = Agriculture, Mining and Energy; 2 = Production; 3 = Construction; 4 = Trade, Transport; 5 = Services; 6 = State.
Worker flow rate	Hirings and Separations in establishment e at time t divided by average employment.

Table A.2: **Mobility Statistics by Labour Market-Entry Cohort I**

			Worker flow rates		
Year of entry	log entry wage	deviation from Ø entry wage	EE	EN	EU
1993	4.093	0.022	0.181	0.271	0.141
1994	4.071	0.000	0.178	0.294	0.157
1995	4.116	0.023	0.145	0.309	0.176
1996	4.089	-0.006	0.230	0.431	0.199
1997	4.037	-0.065	0.243	0.541	0.191
1998	4.066	-0.042	0.262	0.399	0.186
1999	4.077	-0.012	0.299	0.400	0.161
2000	4.108	0.016	0.256	0.397	0.146
2001	4.139	0.036	0.193	0.332	0.166
2002	4.150	0.042	0.162	0.305	0.190
2003	4.167	0.040	0.123	0.257	0.194

Source: Authors' calculations, based on LIAB 1993-2006.

Note: This table presents the transition rates for the first year after labour market entry. EE: employer-to-employer flows, EU: employment- to-unemployment flows, EN: employment-to-nonparticipation flows.

Table A.3: **Mobility Statistics by Labour Market-Entry Cohort II**

			Worker flow rates	
Year of entry	log entry wage	deviation from Ø entry wage	EE_d	EE_U
1993	4.093	0.022	0.271	0.141
1994	4.071	0.000	0.294	0.157
1995	4.116	0.023	0.309	0.176
1996	4.089	-0.006	0.431	0.199
1997	4.037	-0.065	0.541	0.191
1998	4.066	-0.042	0.399	0.186
1999	4.077	-0.012	0.400	0.161
2000	4.108	0.016	0.397	0.146
2001	4.139	0.036	0.332	0.166
2002	4.150	0.042	0.305	0.190
2003	4.167	0.040	0.257	0.194

Source: Authors' calculations, based on LIAB 1993-2006.

Note: This table presents the transition rates for the first year after labour market entry. EE_d: direct employer-to-employer flows and those with an intervening unemployment spell < 1 month, EE_U: employer-to-employer flows with an intervening unemployment spell ≥ 1 month.

Table A.4: **Mobility Statistics by deviation from entry wage**

Deviation from entry wage	Experience in years	Worker flow rates				
		EE	EN	EU	EE_d	EE_U
1st quintile	1 year	0.311	0.786	0.239	0.331	0.094
	2 years	0.245	0.416	0.209	0.266	0.071
	5 years	0.169	0.324	0.115	0.181	0.043
2nd quintile	1 year	0.283	0.463	0.266	0.315	0.115
	2 years	0.218	0.281	0.199	0.242	0.085
	5 years	0.160	0.241	0.113	0.173	0.048
3rd quintile	1 year	0.224	0.366	0.192	0.248	0.082
	2 years	0.187	0.225	0.140	0.205	0.061
	5 years	0.147	0.215	0.083	0.156	0.036
4th quintile	1 year	0.200	0.352	0.165	0.220	0.090
	2 years	0.174	0.227	0.120	0.189	0.051
	5 years	0.139	0.222	0.072	0.148	0.029
5th quintile	1 year	0.161	0.295	0.124	0.173	0.059
	2 years	0.142	0.208	0.083	0.151	0.035
	5 years	0.123	0.229	0.053	0.128	0.021

Source: Authors' calculations, based on LIAB 1993-2006.

Note: EE: employer-to-employer flows, EU: employment- to-unemployment flows, EN: employment-to-nonparticipation flows, EE_d: direct employer-to-employer flows and those with an intervening unemployment spell < 1 month, EE_U: employer-to-employer flows with an intervening unemployment spell ≥ 1 month.

Table A.5: **Estimation Results from the Piecewise Constant Exponential Model**

	Without Random Effects			With Random Effects		
	EE	EU	EN	EE	EU	EN
Male	1.190	1.364	0.955	1.199	1.403	0.941
	(0.006)	(0.010)	(0.003)	(0.006)	(0.012)	(0.004)
Mediumskill	0.860	0.638	0.521	0.836	0.630	0.427
	(0.006)	(0.005)	(0.002)	(0.006)	(0.006)	(0.002)
Highskill	0.962	0.266	0.392	0.930	0.254	0.264
	(0.008)	(0.004)	(0.002)	(0.009)	(0.005)	(0.002)
20-99 empl.	0.670	0.511	0.769	0.666	0.537	0.805
	(0.005)	(0.006)	(0.003)	(0.005)	(0.006)	(0.004)
100-999 empl.	0.369	0.299	0.607	0.368	0.327	0.671
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
more than 1000 empl.	0.250	0.183	0.589	0.248	0.194	0.649
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
pos. cohort effect	0.998	0.984	1.000	0.998	0.982	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
neg. cohort effect	1.003	1.009	1.014	1.004	1.011	1.018
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	Baseline Hazard					
	Reference Category: 0-6 months employment					
7-12 months	0.945	0.722	0.594	0.931	0.747	0.577
	(0.006)	(0.006)	(0.002)	(0.006)	(0.006)	(0.002)
13-18 months	0.785	0.476	0.435	0.795	0.530	0.430
	(0.006)	(0.005)	(0.003)	(0.006)	(0.006)	(0.003)
19-24 months	0.813	0.409	0.426	0.826	0.471	0.428
	(0.006)	(0.006)	(0.002)	(0.007)	(0.007)	(0.002)
25-36 months	0.714	0.217	0.376	0.743	0.262	0.386
	(0.005)	(0.003)	(0.002)	(0.006)	(0.004)	(0.002)
37-60 months	0.666	0.152	0.414	0.715	0.193	0.440
	(0.005)	(0.003)	(0.002)	(0.006)	(0.004)	(0.002)

Source: Authors' calculations, based on LIAB 1993-2006.

Note: Standard errors in parentheses. Significant levels: *: 10%, **: 5%, ***: 1%. Each regression includes region, year, and month dummies. EE: employer-to-employer flows, EU: employment- to-unemployment flows, EN: employment-to-nonparticipation flows.

Table A.6: **Estimation Results from the Piecewise Constant Exponential Model**

	Without Random Effects		With Random Effects	
	EE_d	EE_U	EE_d	EE_U
Male	1.227	1.429	1.252	1.454
	(0.005)	(0.015)	(0.006)	(0.017)
Mediumskill	0.850	0.715	0.820	0.695
	(0.005)	(0.009)	(0.005)	(0.010)
Highskill	0.829	0.294	0.803	0.292
	(0.007)	(0.007)	(0.007)	(0.008)
20-99 empl.	0.668	0.459	0.666	0.473
	(0.004)	(0.007)	(0.004)	(0.008)
100-999 empl.	0.373	0.272	0.373	0.284
	(0.002)	(0.004)	(0.002)	(0.004)
more than 1000 empl.	0.258	0.170	0.255	0.174
	(0.002)	(0.003)	(0.002)	(0.003)
pos. cohort effect	0.994	0.987	0.994	0.986
	(0.000)	(0.001)	(0.000)	(0.001)
neg. cohort effect	1.004	1.005	1.003	1.005
	(0.000)	(0.001)	(0.000)	(0.001)
	Baseline Hazard			
	Reference Category: 0-6 months employment			
7-12 months	1.036	1.072	1.028	1.081
	(0.005)	(0.012)	(0.005)	(0.013)
13-18 months	0.821	0.800	0.845	0.852
	(0.005)	(0.011)	(0.005)	(0.012)
19-24 months	0.846	0.787	0.890	0.863
	(0.006)	(0.013)	(0.006)	(0.014)
25-36 months	0.735	0.498	0.797	0.569
	(0.005)	(0.008)	(0.005)	(0.010)
37-60 months	0.665	0.348	0.751	0.415
	(0.004)	(0.007)	(0.005)	(0.008)

Source: Authors' calculations, based on LIAB 1993-2005.

Note: Standard errors in parentheses. Significant levels: *: 10%, **: 5%, ***: 1%. Each regression includes region, year, and month dummies. EE_d: direct employer-to-employer flows and those with an intervening unemployment spell $<$ 1 month, EE_U: employer-to-employer flows with an intervening unemployment spell $\geq$ 1 month.

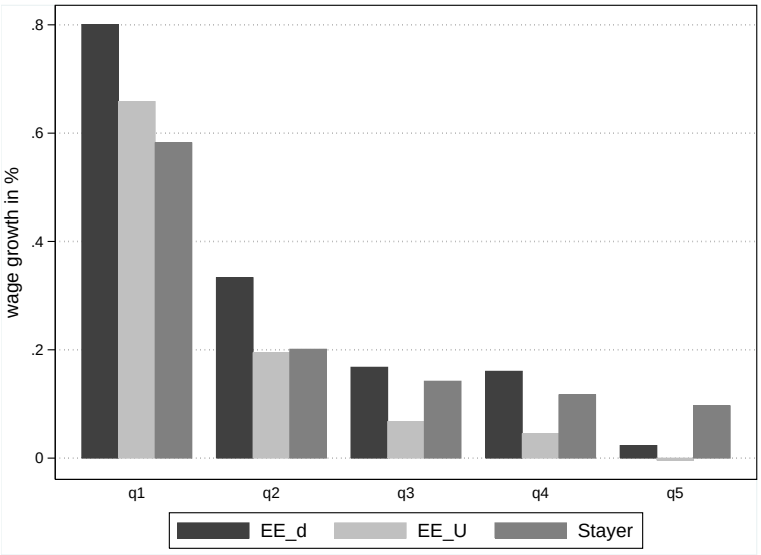
Appendix B Figures

Figure B.1: **Wages by year of labour market entry**

Source: Authors' calculations, based on LIAB 1993-2006.

Note: This table shows cohort wages for workers entering the labour market 1993 to 2003.

Figure B.2: **Percentage wage growth by type of separation and cohort wage effect(quintile**



Source: Authors' calculations, based on LIAB 1993-2006.

Note: This table shows the wage growth calculated as the mean of all workers entering the labour market between 1993 to 2003. EE_d: direct employer-to-employer flows and those with an intervening unemployment spell $<$ 1 month, EE_U: employer-to-employer flows with an intervening unemployment spell $\geq$ 1 month

Figure B.3: **Deviation from mean wage by experience year**

Source: Authors' calculations, based on LIAB 1993-2006.

Note: For workers entering the labour market 1993 to 2003 this table shows the cohort wage effect, proxied by the deviation of the cohort starting wage from the mean starting wage.