The Performance Of Employer-to-Employer Mobility*

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Abstract

This paper contributes to the investigation of employer-to-employer mobility across the career of wage maximizing individuals. The mobility model derived here is establishing the benchmark for optimal transitions. Furthermore, generalizations provide an explanation for the coexistence of wage reductions and wage markups induced by mobility. The empirical investigation, based on German linked employer-employee data, is on estimating counterfactual wage trajectories to conclude whether the between-firm wage path exceeds the within-firm wage trajectory. Hence, an evaluation of the performance of individual employer-to-employer mobility is conducted. The results show that most of the employer-to-employer transitions are accompanied by wage losses.

JEL-Classification: J24, J30, J31, J62

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1 Introduction

A variety of studies show that worker turnover is frequent in many countries (Burgess et. al. 2000, OECD 1997). Hence, labor market mobility continues to be important and recent literature is examining the extent of mobility attributable to wages. Furthermore, mobility and wage growth are assumed to be interrelated because mobility directly affects the distribution of wages and of individual human capital. This analysis is responsive to this interrelation and introduces an optimal mobility strategy for wage maximizing individuals which is dependent on the individual's labor market experience. Furthermore, the focus is on the results of Nosal and Rupert (2007) and Fitzenberger and Garloff (2007) who present evidence for the coexistence of wage markups and wage reductions in the period of mobility in different countries. Moreover, it is shown that a small fraction of workers is mobile without wage improvements[1].

This study differs from the current literature in several ways. In this paper, a model is derived where changing employer without wage improvements becomes optimal. Furthermore, generalizations of the model are appropriate to explain the coexistence of wage markups and wage reductions induced by mobility. Moreover, compared to the existing literature, counterfactual wage trajectories are estimated to describe between-firm mobility. For this reason, the application of linked employer-employee data is inevitable.

A variety of literature regarding to mobility associated with wages is existent. Borjas (1981) emphasizes that the individual earnings profile is discontinuous across jobs because job mobility results, on average, in a wage markup. This implies that the wage path of mobile individuals is, on average, characterized by a step in the period of mobility. Upward mobility is empirically confirmed by several authors (e.g., Topel and Ward 1992) and emphasized by the search theory (e.g., Burdett and Mortensen 1998). Fitzenberger and Garloff (2007), and Nosal and Rupert (2007) show that upward and downward mobility coexist. Furthermore, studies mention that downward mobility has become a growing problem (e.g., Smith 1994). Hence, numerous wage reductions are induced by

[1] Nosal and Rupert (2007) show that about 8% of all workers and approximately 5% of the voluntarily mobile workers are changing jobs without any wage improvements.

mobility. An explanatory approach is derived by Connolly and Gottschalk (2008). The authors argue that wage reductions are accepted by mobile individuals because of a larger wage growth in the new job. Therefore, the downward mobility can be justified as an investment in the future wage growth. All together, the findings provide evidence for discontinuous wage profiles across a working career.

However, the mentioned authors are not explicitly investigating the wage paths at different employers simultaneously. Hence, it is impossible to conclude whether the within-firm wage path exceeds the between-firm wage path. Furthermore, the issue whether individuals are optimizing the wage path across the working career cannot be solved. Moreover, there is no explanatory approach accounting for the coexistence of upward and downward mobility. That is why the present analysis focuses on individual employer-to-employer mobility and especially examines the wages between firms simultaneously. Hence, the performance of individual employer-to-employer mobility across the working career is analyzed.

This paper derives an optimal employer-to-employer mobility strategy which is incorporated into a generalized framework of Burdett and Mortensen (1998). Workers are searching on-the-job for higher wages permanently, whereas they benefit from free cost of search, an infinite information distribution speed, and full information. In contradiction, employers do not interact with each other and post take-it-or-leave-it wage offers with respect to the labor market experience of the applicant. For mobile employees, the wage paths are characterized by an intersection point. Career developments exhibiting no intersection point during the working career of an individual become non-optimal. Figure 1 illustrates the different scenarios which are analyzed in the underlying paper. Furthermore, the interrelationship of wages, mobility, and human capital is illustrated.

Insert figure 1 about here

The theoretical model predicts that mobility in the intersection point of the wage trajectories as illustrated in scenario 4 is *optimal*. Therefore, changing employer without any wage improvements becomes optimal as the wage trajectory exceeds the other one in the future periods. If the wage profile is depicted by an intersection point in combination with a wage markup or a wage reduction in the period of mobility, the individual changes employer *suboptimally.* If the wage trajectories at different employers exhibit a steady between-firm wage differential across the career horizon, it is referred to *discontinuous* wage profiles which are split up into upward mobility and downward mobility.

As depicted in figure 1, this analysis contributes to the literature by investigating individual wage profiles across the career. Furthermore, the paper picks up empirical findings about wage markups and wage reductions induced by mobility. Additionally, it will be shown that wage improvements may be accompanied by wage losses.

For the empirical investigation of the model, the main concern is on the application of the most relevant determinant of wage growth. As several studies address the interrelation between wages and human capital as most important for wage growth, a brief review of the literature regarding experience is conducted. Some contributions advert to the returns to tenure within a certain firm (e.g., Altonji and Shakotko 1987, Topel 1991) as it can be interpreted as firm-specific human capital which interrelates with wages and mobility. Another strand of literature argues that wage growth is essentially attributable to industry-specific experience (Parent 2000). Zangelidis (2008) shows that occupational experience is more important for the wage determination than tenure in an industry. Furthermore, Kambourov and Manovskii (2008, 2009) suggest that tenure with an employer has little impact on the wage determination when accounting for occupational experience. Kwon and Meyersson Milgrom (2007) reflect that worker's wages are less sensitive to changes in the occupation-specific labor market outside the firm. Moreover, firms prefer hiring employees from outside of the firm if they are comprising occupational experience. Furthermore, the authors show that these newly hired workers do not have to start the within-firm career at firm-based ports of entry.

The importance of labor market experience on the wage determination is closely linked to the concept of task-specific human capital (Gibbons and Waldman 2004). Schönberg and Gathmann (2007) show that this type of human capital is portable to a large extent in Germany when individuals move to similar occupations with similar tasks. As shown above, recent literature examines wage growth primarily determined by experience. Furthermore, general human capital seems to be a valid determinant driving wage growth of mobile workers. Therefore, the empirical procedure applied in this paper focuses on the reward to labor market experience and adopts the concept of task-specific human capital.

In brief, this analysis is a contribution to the existing empirical literature by describing employer-to-employer mobility using counterfactual wage trajectories as depicted in Bingley and Westergard-Nielsen (2006). The authors illustrated the worker's careers as different wage trajectories across different employment relationships. Here, the empirical work is on estimating average wage paths within firms, conditional on certain individual's characteristics using German linked employer-employee data. Hence, this particular study extracts information on whether the between-firm mobility wage trajectory exceeds the within-firm wage path. Therefore, this procedure empirically investigates the performance of mobility.

The results show that the minority of wage paths is characterized by an intersection point. Hence, the analysis adverts to more complex aspects than pure wage maximization of individuals. As a consequence, when referring to the performance of employer-to-employer mobility, more complex aspects of mobility than the ones discussed here have to be accounted for.

The paper proceeds as follows: Section 2 derives the theoretical benchmark for optimal mobility and illustrates the scope of the model. The data and the empirical procedure are shown in section 3. Section 4 presents the main results while section 5 concludes.

2 The Model

2.1 The Optimal Employer-to-Employer Mobility Strategy

Based on the findings of Nosal and Rupert (2007), this paper presents a model where changing employers without any wage improvements is optimal. Anyhow, only if the wage trajectories of different employers intersect each others the employee will have an incentive to change employer. Optimal individual mobility -in the range of a working career- will be shown to occur in the intersection point of wage trajectories. Wage profiles characterized by wage markups or wage reductions in the period of mobility become suboptimal if an intersection point is existent. Specifically, this paper shows that wage improvements are accompanied by wage losses.

The following optimal employer-to-employer mobility model is incorporated into the Burdett and Mortensen (1998) framework ('BM'). In particular, this paper focuses on the job-to-job mobility component where employed workers search for higher wages offered by other employers in order to improve the wage path across the working career. Transitions into unemployment remain unconsidered in this paper. For deriving the optimal employer-to-employer mobility strategy BM has to be generalized.

The model framework imposed here corresponds to a continuous time setting where only steady states are considered. Starting from an existing wage maximizing match, wage maximizing individuals search on-the-job for the highest wage. Therefore, individuals are searching actively in contrast to BM where workers randomly receive information on job offers[2]. By assuming zero costs of search, perfect search in each period is introduced.

It is imposed that employers do not interact with each other. This assumption assures, on the one hand, that employers who suffer from a shock do not affect other firms. On the other hand, it assures that poaching does not have an impact on the wage setting. Moreover, employers reply to applications immediately after receiving them, and offer a wage with respect to the experience of individual i in t. This is a departure of BM and meets the wage setting of Postel-Vinay and Robin (2002) and Burdett and Coles (2003) where firms can vary their wage offer according to the worker's characteristics. Therefore, given the labor market experience of the worker, wages are predictable in each period. As in Burdett and Coles (2003), the wage offer of firm f is designed as a take-it-or-leave-it working contract. Moreover, the wage contracts are designed as long-term contracts which can be dissolved by the workers without penalties.

[2]However, it is to expect that workers are randomly contacted with larger wage offers because of different reasons directly affecting wages (e.g., business cycle). As the model only corresponds to steady states, these factors are not affecting the employer's wage offer and the individual on-the-job search.

The wage contracts are following a function F subject to employer f:

$$w_{i,f,t} = F_f(exp_{i,t}) \tag{1}$$

$$\frac{\partial w_{i,f,t}}{\partial exp_{i,t}} \overset{(<)}{\geq} 0; \ \frac{\partial^2 w_{i,f,t}}{\partial exp_{i,t}^2} \overset{(>)}{\leq} 0 \tag{2}$$

$w_{i,f,t}$ is the monotonically increasing (decreasing) wage, offered by a certain employer f to individual i in period t.

$exp_{i,t}$ denotes the experience of individual i in period t.

Individuals maximize the utility function by the set of firms f given their labor market experience in period t. Therefore, the worker is assumed to stay in the firm as long as the wage of the current employer exceeds the wages offered by other firms. Hence, workers should realize the upper wage path. The maximization problem is described by:

$$\max_f w_{i,f,t} = F_f(exp_{i,t}) \tag{3}$$

This is an isolated wage maximizing problem. Individual i is willing to work at firm f if $F_f(exp_{i,t}) > F_k(exp_{i,t})$ for all $f \neq k$. Hence, if any wage trajectory exceeds other wage trajectories perpetually, the worker is shown to have no incentive to change employer because it is preferable to stay at this employer all the time. This special case is not specifically excluded by Borjas (1981), Smith (1994), and among many others. In this model, this special case is referred to as discontinuous wage profile and is excluded by the isolated wage maximization of individuals.

Furthermore, it is imposed that the market price for other individual skills is constant over the entire working career and among different employers[3]. X_i describes these characteristics (e.g., education) whereas the vector ρ describes the constant returns to these characteristics. As a result, the maximization problem can be expressed as an isolated examination of different wage offers given the individual's labor market experience. The

[3]This is to impose that the individual wage trajectories are not saw blade formed across the working career and across different firms. As a consequence, this assures exactly one clearly identifiable intersection point.

individual utility $U_{i,t}$ of any wage maximizing individual in period t is:

$$\max_f U_{i,f,t} = F_f(exp_{i,t}) + \rho(X_i) - \underbrace{C_{i,t}^{search}}_{=0} - \underbrace{C_{i,t}^{mobility}}_{=0} \quad (4)$$

$$U_{i,t} = F_f(exp_{i,t}) + \rho(X_i) - [F_k(exp_{i,t}) + \rho(X_i)] \geq 0 \quad (5)$$

$$U_{i,t} = F_f(exp_{i,t}) - F_k(exp_{i,t}) \geq 0 \quad (\forall \text{ f} \neq \text{k}) \quad (6)$$

Hence, the model depicts that the decision of individual i to work at firm f depends solely on the reward to experience offered by firm f to the individual in period t.

In the modified BM framework, individuals are able to optimize their wage path. In particular, individuals achieve the upper wage path. Furthermore, mobility without an intersection point is excluded and optimal mobility is not characterized by wage markups or wage reductions in the period of mobility.

Some of the assumptions are rather critical. However, the most crucial restriction of the model is that the reward to education remains constant over the entire career. It is expected that the reward to education differs between different employers. Additionally, within-firm restructuring activities enforce individual (re)training over time. This certain model is facing a lack of considerations regarding the impact of (re)training gratifications.

To recapitulate, it is to note that only this type of mobility is not accompanied by wage losses which will be illustrated in the following section. Therefore, this model is the benchmark for optimal employer-to-employer mobility.

2.2 Illustration of the Model

This section visualizes the scope of the model. In this analysis, one employer-to-employer transition is regarded to[4]. For this reason, the analysis is reduced to a closer inspection of two wage trajectories over the working career. Moreover, different prevalent scenarios

[4]By enhancing the theoretical analysis to more than one mobility event the empirical investigation becomes more complex. In the case of 2 mobility events 3 wage trajectories have to be examined. But how to deal with a wage trajectory which dominates the other wage paths which itself intersect each other? Therefore, the analysis of more mobility events is challenging. Furthermore, Orlowski and Riphahn (2008) suggest that mobility is rather infrequent in Germany. Hence, this restriction is consistent with German literature.

for employer-to-employer transitions are illustrated.

Insert figure 2 about here

Figure 2 presents the wage trajectories of main interest. Because of the model derived above, both wage trajectories are assumed to be the wage maximizing ones for individual i. In the intersection point of the curves the worker is indifferent to staying at employer 1 or moving to employer 2. To maximize the wage path across the working career, the individual changes the employer in the intersection point to avoid hopping from one wage trajectory to the other one. Therefore, the intersection point determines the optimal period for being mobile ('OPM'). The realized period of mobility ('m') equals OPM if optimal mobility is existent.

Hence, if optimal mobility occurs, the wage trajectory offered by firm 1 is not observed after the intersection point, while that of firm 2 is counterfactual before the intersection point. This is the main problem of this analysis, and the following section shows how this analysis deals with that serious issue.

The lifetime utility of individual i, working at firm f in period t, is optimized by the choice of the utility-maximizing firm over the career horizon (t=1,..., T):

$$\max_f V_{i,f,t} = \int_{t=1}^{T} F_f(exp_{i,t}); \quad \text{f}\in\text{(1,2)} \tag{7}$$

The complete wage path of individual i is subdivided into three sections.

The individual stays in firm 1 if:

$$V_{i,f,t} = \int_{t}^{OPM} [F_1(exp_{i,t}) - F_2(exp_{i,t})]dt > 0 \quad \text{(if t} \rightarrow \text{OPM)} \tag{8}$$

In OPM, the area under both wage trajectories is 0:

$$V_{i,f,t} = \int_{OPM} [F_1(exp_{i,t}) - F_2(exp_{i,t})]dt = 0 \quad \text{(if t = OPM)} \tag{9}$$

$$\int_{OPM} F_1(exp_{i,t})dt = \int_{OPM} F_2(exp_{i,t})dt \tag{10}$$

Working in firm 2 is more valuable if:

$$V_{i,f,t} = \int_{OPM}^{T} [F_2(exp_{i,t}) - F_1(exp_{i,t})]dt > 0 \qquad \text{(if OPM} \rightarrow \text{T)} \tag{11}$$

This is the benchmark for an optimal wage path for individuals changing the employer once. However, suboptimal mobility is expected because of the restrictive model. For instance, if the assumption of (completely) portable human capital is not satisfied, individuals have to invest in future wage growth. A generalization of the utility function by introducing e.g. risk aversion would give further insights on individual mobility along the career horizon. Moreover, either economic and individual uncertainty are not under consideration in this paper. Two settings for suboptimal mobility behavior are depicted in figure 3. The major criterion for suboptimal mobility is the existence of an intersection point of the individual wage trajectories.

Suboptimal mobility (early) is shown in the upper part of figure 3. Here, the wage path of the individual i is characterized by a step. This is suboptimal because the mobility event does not occur in OPM. Furthermore, a wage loss becomes evident by closer inspection of figure 3. The area enclosed by the wage trajectories of individual i from m to OPM is to be interpreted as a wage loss during the working career.

Insert figure 3 about here

As shown in figure 3, the employee hops from one wage trajectory to another one in the period of mobility. Hence, the individual changes employers suboptimally and is suffering a loss of wages over his/ her working career.

$$\begin{aligned} V_{i,f,t} = & \int_{t=1}^{OPM} F_1(exp_{i,t})dt + \int_{OPM}^{T} F_2(exp_{i,t})dt + \\ & + \underbrace{\int_{m}^{OPM} [F_2(exp_{i,t}) - F_1(exp_{i,t})]dt}_{<\,0;\ \text{wage loss: } \textit{suboptimal mobility (early)}} \end{aligned} \tag{12}$$

A wage reduction as mentioned by Smith (1994) becomes evident. Therefore, the wage path is characterized by a step induced by mobility. Hence, the interpretation of wage cuts as investments in future wage growth (Connolly and Gottschalk 2008) becomes to be of special interest. In the current framework, wage reductions are never due to investment in future wage growth, but they are due to suboptimal behavior of individuals.

Suboptimal employer-to-employer transitions can also be executed after OPM. If the assumption of costless on-the-job search is not fulfilled, individuals may introduce the search too late. Moreover, job satisfaction may cause this certain type of suboptimal mobility. In this case, again, the wage path is characterized by a step in m. Hence, the individual changes employers suboptimally in the context of this model, as illustrated at the bottom of figure 3.

$$V_{i,f,t} = \int_{t=1}^{OPM} F_1(exp_{i,t})dt + \int_{OPM}^{T} F_2(exp_{i,t})dt + \\ + \underbrace{\int_{OPM}^{m} [F_1(exp_{i,t}) - F_2(exp_{i,t})]dt}_{<\ 0;\ \text{wage loss: } \textit{suboptimal mobility (late)}} \tag{13}$$

A wage loss, defined as the area from the intersection point of the curves to the mobility event becomes evident. Furthermore, a wage markup induced by mobility, as mentioned by Borjas (1981) and Topel and Ward (1992), become evident. None of the above authors consider upward mobility in combination with wage losses explicitly. A further interpretation for this type of wage loss is costly on-the-job search which is excluded by assumption. Furthermore, analogously to Bingley and Westergard-Nielsen (2006), the separation probability synchronously increases with the wage loss.

If the benchmark for optimal mobility derived above is correct, wage reductions and wage markups result simply from a suboptimal mobility choice of individual i. Here, it is shown that wage markups are possibly not compensating for the wage loss attained by the suboptimal mobility period. Hence, a waste of wage potentials of individuals is evident. If between-firm mobility is not executed in the optimal way, the discontinuities are shown to cause wage losses in the individual's wage profile across the career.

It is necessary to mention that downward and upward mobility (in the context of this paper) are characterized by a steady wage differential in two firms across the working career of individual i. Hence, these wage paths become discontinuous by mobility and are not characterized by an intersection point. Hence, OPM is non-existent. The concepts of Borjas (1981) and Smith (1994) are not specifically excluding such mobility patterns.

Although, these profiles cannot be displayed by the model, they describe further wage paths of interest. Several possibilities are expected to cause such profiles across the working career horizon. First, discontinuous profiles can be due to the individual's lack of full information about wage profiles and match quality in all firms. Second, this path may introduced by individual utility functions of other forms than the one described above. Third, uncertainty with respect to the economic environment or individual career developments is not accounted for. Moreover, the literature refers to upward and downward mobility as the prevalent types of mobility.

Equation 14 illustrates the wage loss introduced by downward mobility:

$$\begin{aligned} V_{i,f,t} = &\int_{t=1}^{m} F_1(exp_{i,t})dt + \int_{t=m}^{T} F_2(exp_{i,t})dt + \\ &+ \underbrace{\int_{m}^{T} [F_2(exp_{i,t}) - F_1(exp_{i,t})]dt}_{< 0;\ \text{wage loss: } \textit{downward mobility}} \end{aligned} \tag{14}$$

By being mobile in accordance to this scenario a loss of utility is generated from m until the end of the career by moving to firm 2.

The corresponding wage loss accompanied by upward mobility is described by:

$$\begin{aligned} V_{i,f,t} = &\int_{t=1}^{m} F_1(exp_{i,t})dt + \int_{t=m}^{T} F_2(exp_{i,t})dt + \\ &+ \underbrace{\int_{t=1}^{m} [F_1(exp_{i,t}) - F_2(exp_{i,t})]dt}_{< 0;\ \text{wage loss: } \textit{upward mobility}} \end{aligned} \tag{15}$$

From the beginning of the working career until m a loss becomes evident. Working in firm 2 all the time is of higher value across the working career.

This analysis enhances the literature by introducing an explanation for the coexistence of wage reductions as well as wage markups in the period of mobility. Moreover, the study extracts information on whether the between-firm wage path exceeds the within-firm trajectory. Therefore, the performance of employer-to-employer mobility is under investigation.

3 Data and Procedure

3.1 Data

Holzer et al. (2004) stress the importance of both, firm as well as individual characteristics for mobility. Therefore, the linked employer-employee dataset of the Institut für Arbeitsmarkt und Berufsforschung ('LIAB') is applied (Alda et al. 2005). The underlying dataset is a panel of cross-sections from 1993 to 2006 at the corresponding record date of June 30^{th}. Hence, 14 periods are available for investigating working careers of individuals who are observed in at least two consecutive periods. This analysis focuses on mobile employees who are changing once from one LIAB-firm to another LIAB-firm[5]. A benefit of this dataset is that the construction of wage trajectories is as precise as possible by controlling for a variety of firm characteristics and by the observation of comparable workers in the same firm.

The sample is restricted to vocational trainees and full-time working employees who are observed in two consecutive period. In a next step, all observations on workers being not subject to social insurance contribution are dropped. To sum up, only males subject to social insurance contribution aged between 18 and 60 years are subject to the analysis[6]. Here, average individual daily wages achieved in the primary occupation which are surveyed in the data are of main interest. When referring to 'schooling', the school leaving degree surveyed by the individual is accounted for. Potential experience ('$\exp_{pot}$') is calculated with respect to the individuals' stated labor market entry. Hence, possible unemployment spells following schooling are considered by construction of $\exp_{pot}$.

An advantage of this dataset is that a worker is to be observed in different firms. Therefore, it is assured that employer and employee committed an employment relationship. Moreover, problems regarding sorting or individual selection into LIAB-firms are

[5] In the data, establishments are observed. From now on, firm and establishment are used interchangeably. For reasons of efficient estimation, the analysis only includes firms for which at least 50 observations are available.

[6] A considerable fraction of females and vocational trainees are shown to change employers in contrary to the expectations of the model (Schneck 2008). Hence, differences in the mobility pattern among males and females are expected. Furthermore, vocational trainees are assumed to be characterized by another type of job search behavior in contrast to non-trainees. These are the main reasons for excluding both groups from the analysis. Moreover, part-time workers are excluded from the analysis.

non-existent because workers are not expected to systematically move from one LIAB-firm to another LIAB-firm. It is to mention that the research is not able to address certain moves: Transitions from a non-LIAB-firm into the sample or transitions out of the sample are not identified. Therefore, the number of individual transitions is unknown if the individual was not observed in the sample for the whole career horizon as the individual's employment history is not completely surveyed in the data. Furthermore, this analysis refers to a employer-to-employer transition when the individual changes establishments within the same employer.

After consideration of all restrictions, 13439321 observations on 8750 firms are subject to the analysis. Table A1 in the appendix displays descriptive statistics of the entire sample.

3.2 Methodology

The empirical analysis is on estimating the wage trajectories of individuals changing once from a LIAB-firm to another LIAB-firm. This procedure becomes necessary as the wages of individual i can not be observed in two firms simultaneously. The wage trajectories are estimated for each LIAB-firm f $\in (1, 2)$ the employee was employed at.

Considerations about the structure of time-invariant unobserved characteristics and the individual utility function tend to be in favor of the fixed-effects estimation. For example, a higher schooling degree is expected to be correlated with the number of languages an individual is able to speak. Therefore, the fixed-effects tend to be correlated with the regressors. Possibly, individual fixed-effects can account for the individual risk aversion which is expected to remain constant over time. An exact test, as proposed by Hausman (1978), is not applicable here because some firm-specific random-effects estimates are not converging. Therefore, a Hausman test is applied to all workers in the sample. Moreover, a further Hausman test is applied for the workers changing once from a LIAB-firm to another LIAB-firm. Both Hausman tests reject uncorrelated time-invariant individual effects with the regressors at the 0.01 level. As the the Hausman test and economic considerations prefer the fixed-effects estimation the within fixed-effects estimator ('FE') is applied.

3.3 Procedure

The main goal of the procedure is to extract information about whether the between-firm mobility wage trajectory exceeds the within-firm wage path of mobile workers. Therefore, the wage trajectories of individuals who change employer once are estimated. Hence, for each mobile individual, wages are estimated in both firms at which the individual was employed in period t (f $\in (1,2)$). Separate estimates for each firm are conducted as it is assumed that different employers reward labor market experience in different ways. This is closest to the model framework derived above. Furthermore, individual i's wages are not observable in two firms simultaneously. Hence, estimation of wage trajectories is expected to be in accordance to the model.

This analysis focuses on the reward to $\exp_{pot}$. The inclusion of $\exp_{pot}^2$ is to impose decreasing returns to experience over time. Moreover, Dustmann and Meghir (2005) advert to sources possibly causing bias in the determination of returns to $\exp_{pot}$. The authors advert to larger returns to experience and larger opportunity costs of not being employed for highly skilled workers in comparison to low skilled employees. In this analysis, the goal is to test the model rather than to estimate the most precise wage trajectory. Furthermore, adjustment variables for the bias may generate saw blade formed wage trajectories. These are the main reasons for leaving such control variables out.
Wage trajectories are estimated by OLS, distinguishing the firms at which the employee was employed (f$\in$(1,2)):

$$\widehat{log(w)}_{i,f,t}^{OLS} = \hat{\beta}_{0,f}+\hat{\beta}_{1,f}(exp_{pot})_{i,t} + \hat{\beta}_{2,f}(exp_{pot})^2_{i,t} + \hat{\gamma}'_f X_{i,t} \tag{16}$$

where the log wage of individual i in period t in firm f is to be estimated.

$X_{i,t}$ contains additional characteristics of individual i in period t.
As described above, wage trajectories are estimated by accounting for individual time-invariant effects distinguishing the firms the employee was employed at (f$\in$(1,2)):

$$\widehat{log(w)}_{i,f,t}^{FE} = \hat{\beta}_{i,f}+\hat{\beta}_{1,f}(exp_{pot})_{i,t} + \hat{\beta}_{2,f}(exp_{pot})^2_{i,t} + \hat{\gamma}'_f X_{i,t} \tag{17}$$

$X_{i,t}$ is composed of information on the occupation (unskilled worker, skilled worker, technician, clerk), a dummy variable describing the first 180 days in a firm, and the time-invariant dummies for schooling and Germans. The FE estimation procedure takes account of the time-invariant components. All the variables included in $X_{i,t}$ describe main determinants of an individual's wage path. Analogously to Kambourov and Manovskii (2009) a dummy variable is included which equals 1 if the individual is in the first 180 days in a certain firm. This threshold is chosen because of the length of the probation period in Germany which typically equals 6 months. Moreover, if an individual is observed in another firm in the consecutive period, it is expected that the match was of worse quality and the match was broken up while a wage reduction due to the monitoring is accounted for. The inclusion of dummies for schooling becomes necessary as schooling strongly configures an individual's working career. Moreover, certain educational levels provide access to certain jobs. A further determinant affecting wages is the occupational status of blue-collar and white-collar workers.

Adjacent, the estimates are used to predict the wage trajectories in each firm. For each mobile individual, changing from one LIAB-firm (firm 1) to another LIAB-firm (firm 2), the wage differential between the predicted wages is used to determine optimal mobility.

$$\widehat{log(w)}_{i,1,t}^{estimator} - \widehat{log(w)}_{i,2,t}^{estimator} \tag{18}$$

where $\widehat{log(w)}_{i,f,t}$is the prediction of the log wage of individual i, working in firm f at period t. 'estimator' is to distinguish the OLS and the FE predictions.

The counterfactual wage trajectories represent average wage dynamics conditional on certain individual's characteristics within certain firms. Hence, this analysis is an investigation of the performance of individual employer-to-employer mobility across the working career.

Table 1 shows the calculation of the different mobility patterns which are illustrated in figure 1. Scenarios 1 and 2 verify steady between-firm wage differentials, and therefore, are discontinuous[7]. Discontinuous mobility results in a wage markup as described in

[7]Scenarios 1 and 2 have to be examined more differentiated. If the wage trajectories do not run exactly

scenario 1. Evidence for this type of mobility is presented in Borjas (1981) and Topel and Ward (1992). Smith's (1994) contribution becomes evident in scenario 2 because the predicted wage differential indicates a wage cut during the individual's career horizon.

Insert table 1 about here

Scenarios 3 and 4 depict intersecting wage profiles. Scenario 3 depicts individual mobility that is problematic for the model to deal with. While the individual is employed in firm 1, he/ she would be better off in firm 2, whereas, while he/ she is employed in firm 2, the estimated wage is larger in firm 1. This case is referred to as 'unanticipated mobility' because the model does not consider this type of mobility. Scenario 4 describes the optimal and suboptimal mobility pattern as described above. Hence, only this scenario is in line with the model derived above.

4 Results

The empirical investigation of the model illustrates 50566 individual wage profiles for workers changing once from one LIAB-firm to another LIAB-firm.

Table 2 presents the frequencies of the different mobility scenarios as depicted in figure 1. The results on the different mobility scenarios advert to large wage losses. Most of the individual employer-to-employer transitions are characterized by discontinuous wage profiles. When examining the FE results, only each 13^{th} (OLS: 11^{th}) individual is mobile in accordance to the model.

Insert table 2 about here

The FE predictions reveal that downward mobility, as defined here, is most frequent ($\approx$ 45%). Furthermore, upward mobility is very common. 40% of the individuals are consistently mobile to that scenario. Together, about 84% of the wage paths are characterized

parallel, they have to intersect at any point in time. Moreover, it is to note that discontinuous wage profiles can exhibit an intersection point when enlarging the sample horizon. Hence, upward mobility could possibly become to unanticipated mobility, whereas downward mobility possibly changes to early suboptimal mobility. Here, it is imposed that the wage trajectories do not intersect during the observed working career horizon of individual i.

by steady between-firm wage differentials. Only a minority of 8% is mobile in accordance to the model when applying FE estimation.

When investigating the OLS results, upward mobility turns out to be the most common scenario. 46% of the individuals wage paths exhibit a steady between-firm wage differential whereas the wage trajectory of firm 2 exceeds the one of firm 1 during the observed period. Downward mobility is shown to be the second most frequent employer-to-employer mobility case. 38% of the individuals are changing employers in accordance to this scenario. 7% of the individuals are shown to be unanticipatedly mobile (FE: 8%). Hence, about 91% of individual wage paths are non-optimal. Only 9% of the individual wage paths are in accordance to the model derived above.

To sum up, the results in table 2 suggest that the optimal mobility pattern is rather infrequent. Hence, mobility seems not to be restricted to an isolated wage maximization.

Table 3 illustrates the optimality of individual mobility by focusing only on individuals changing employer in accordance to the model. It is shown that a larger fraction of individuals is changing employer suboptimally after OPM (FE: 59%, OLS: 61%). The rest invests in future wage growth. Hence, a larger fraction generates wage markups in the period of mobility. On average, the FE results advert to a wage reduction in m of 0.0032 log units while the OLS results refer to a wage markup of 0.0120 log units. It is to note that optimal mobility is only calculated by accident. The reason for this is that the predicted wage trajectories have to equal each others in the observed period of mobility.

Insert table 3 about here

Additionally, table 3 displays that the wage markup of suboptimally late individuals in m is, on average, 0.0562 (OLS: 0.0549) log wage units. When looking at the median, a wage markup of 0.0290 (OLS: 0.0293) becomes evident for workers being mobile after OPM. The average wage reduction of the early suboptimal mobile workers in m equals 0.0884 (OLS: 0.0556) log points. Analogously to Connolly and Gottschalk (2008), this can be interpreted as an average investment in future wage growth. The median investment in future wage growth equals 0.0353 (OLS: 0.0295). As a result, choosing a threshold of $\left|\widehat{log(w)}_{i,1,m}^{estimator} - \widehat{log(w)}_{i,2,m}^{estimator}\right| \leq 0.03$ log units delivers evidence that about 50% of the individuals changing the employer optimal. This suggests that under consideration of a confidence interval for OPM, the existence of optimal mobility is confirmed.

In combination, tables 2 and 3 show that most employer-to-employer changes are accompanied by wage losses. This indicates that the performance of employer-to-employer mobility is either poor or not completely described by the model derived above.
Tables 4 and 5 illustrate the means of the individual characteristics by the different mobility scenarios.

Insert table 4 about here

In table 4, the FE predictions illustrate that all workers changing employer once generate a wage reduction of 0.01 log points. Furthermore, the youngest individuals are investing in future wage growth. The most experienced workers are unanticipatedly mobile or are suboptimally late changing the employer. Moreover, downward mobility and unanticipated mobility are most common in East Germany. Individuals with a university degree are more likely to execute upward mobility.

Table 5 illustrates the means of the individual characteristics by the different mobility scenarios predicted by OLS. On average, all mobile workers changing establishment once achieve a predicted wage markup of 0.0115 log points.

Insert table 5 about here

Table 5 shows that upward mobility and late suboptimal mobility are more likely for more experienced workers. Furthermore, it is shown that suboptimal early mobility and downward mobility is executed by the most unexperienced workers. When looking at the educational level, workers with a secondary school level I certificate in combination with an apprenticeship turn out to be commonly unanticipated mobile. Employees with an university degree are most commonly upward mobile or derive a wage reduction when being mobile suboptimally early.

Moreover, table 4 and 5 show that clerks are the most mobile group. This group is expected to accumulate the most portable human capital in comparison to workers who are familiarized with a certain mechanism or machine. Therefore, the results support the concept of task-specific human capital by Gibbons and Waldman (2004).

When distinguishing the individuals characteristics of early and late suboptimal mobility, the main differences are to find in the age, $\exp_{pot}$, and schooling. More experienced and older employees are more frequently mobile after OPM. An interesting difference turns out when examining workers with university degree. Especially the OLS results advert to a larger fraction of employees with university degree changing employer before OPM. This indicates that workers with an university degree change employers more likely to improve the future career. Moreover, as students invest in their future career by completing their academic studies, this fraction seems to outperform the fraction of workers with other degrees in calculating the future payoffs.

In brief, the results suggest that optimal mobility is rather uncommon among workers changing employer once during the career. Very few wage cuts ($\approx$ 7%, OLS: $\approx$ 8%) are described by the model[8]. Hence, a very low fraction of workers is accepting wage reductions in order to improve the future career. Furthermore, about 10% (OLS: 11%) of the wage markups are due to late suboptimal mobility[9]. Therefore, the model is describing direct mobility to a rather low degree. Hence, it is suggested that individual mobility decisions depend on more than just a utility function which only accounts for wages.

5 Conclusion

Why is the optimal strategy rather uncommon among workers changing employer once? The FE predictions show that just 8% (OLS: 9%) of the mobile workers changing employer are mobile in accordance to the model. Moreover, discontinuous mobility becomes evident to a large degree. Possible reasons are, on the one hand, the restrictive assumptions of the model, and, on the other hand, insufficient estimation of counterfactual wage trajectories.

It is of use to discuss the most disputable assumptions of the model. In reality, the individual's utility is not limited to a wage maximizing problem. Introducing an enhanced utility function that accounts, e.g., for the aversion to unemployment spells the model

[8] $\frac{\text{suboptimal (early)}}{\text{downward mobility + suboptimal (early)}}$ (FE: $\frac{1616}{22543+1616} = 0.0669$, OLS: $\frac{1729}{19419+1729} = 0.0818$)

[9] $\frac{\text{suboptimal (late)}}{\text{upward mobility + suboptimal (late)}}$ (FE: $\frac{2320}{20079+2320} = 0.1036$, OLS: $\frac{2728}{23166+2728} = 0.1054$)

would become more realistic. The evident problem of enlarging the utility function is that the upper wage path is not exactly to identify. The empirical application of the FE estimation possibly diminishes the problems regarding to a time-invariant risk aversion. But it is expected that a downswing enforces the desire for secure employment (albeit lower wages). Hence, even the application of the FE estimation is to be reviewed critically because economic uncertainty cannot be covered by this methodology. Moreover, as discussed above, individual characteristics remain constant over the working career and among different employers. This is assumed to be the most critical assumption of the model.

A further source causing problems is the estimation of the counterfactual wage trajectories. The dataset contains 14 periods and possibly is too short to reproduce working careers. It is to notice that the availability of data for a longer time horizon would be of advance, although 14 years are expected to be large enough to illustrate one employer-to-employer transition. Beyond, the most advance would arise from a survey which incorporates the whole working biographies of individuals. Then, the optimal mobility strategy is used to be completely illustrated by the individual's counterfactual wage path. Furthermore, the estimates are facing a lack of information on promotions or transfers within the firm. The dataset lacks this information on the individual level. All in all, the estimates designed here are expected to be in accordance to the model.

In summary, the literature regarding employer-to-employer mobility is enhanced by introducing the investigation of wage trajectories at different firms simultaneously. Hence, this analysis contributes to the literature by analyzing the performance of employer-to-employer mobility across the working career. An additional profit of this study is that the approach is appropriate to explain the coexistence of upward and downward mobility. Moreover, the results suggest that the utility function of mobile workers is not reduced to a wage maximization problem.

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Figures and Tables

Figures

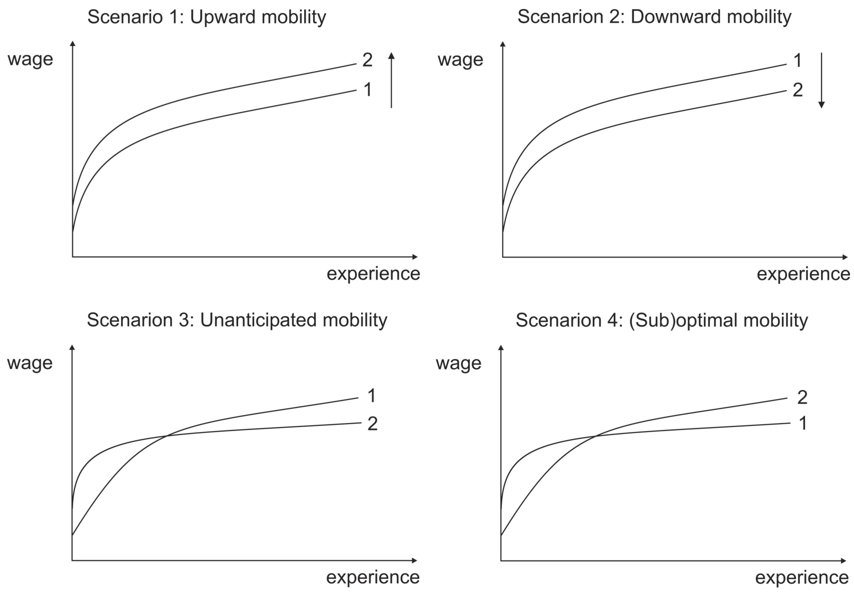

Figure 1: Different mobility scenarios

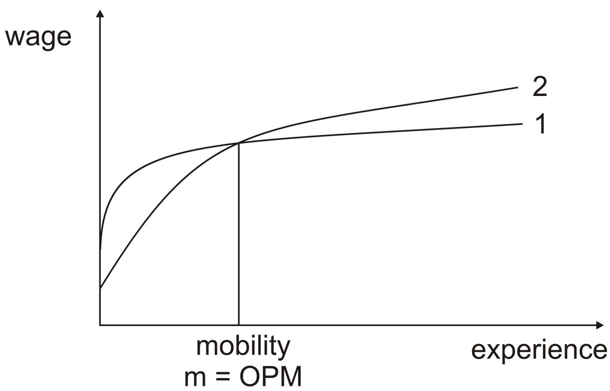

Figure 2: Optimal mobility

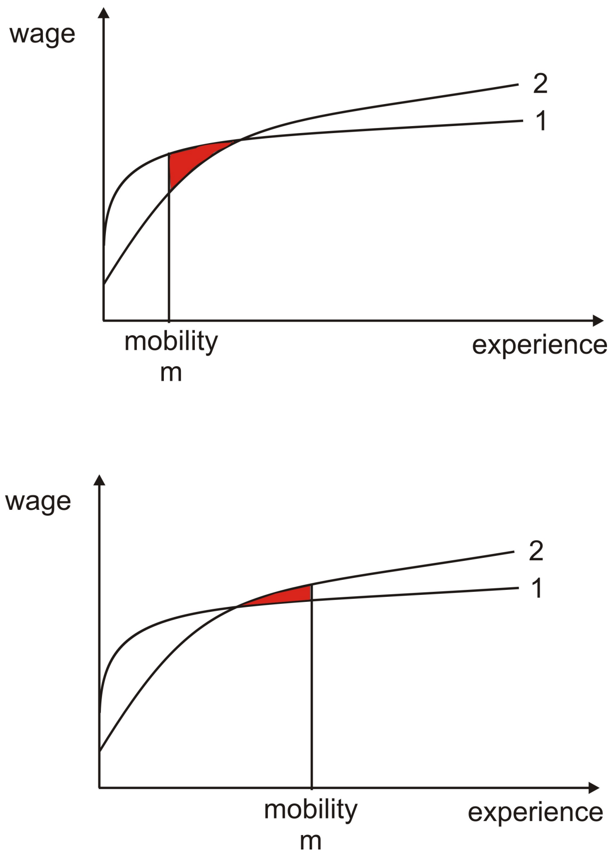

Figure 3: Suboptimal mobility

Tables

Table 1

Description of the calculation of the different mobility scenarios

Predicted between-firm wage differential of individual i in t, f∈(1,2)	$t_{1,i}$, ... , $t_{OPM,i}$	$t_{OPM+1,i}$, ... , $t_{T,i}$	Scenario (see figure 1)
$\widehat{log(w)}_{i,1,t}^{estimator} - \widehat{log(w)}_{i,2,t}^{estimator}$	< 0	< 0	[1] upward mobility *
$\widehat{log(w)}_{i,1,t}^{estimator} - \widehat{log(w)}_{i,2,t}^{estimator}$	> 0	> 0	[2] downward mobility *
$\widehat{log(w)}_{i,1,t}^{estimator} - \widehat{log(w)}_{i,2,t}^{estimator}$	< 0	> 0	[3] unanticipated mobility **
$\widehat{log(w)}_{i,1,t}^{estimator} - \widehat{log(w)}_{i,2,t}^{estimator}$	> 0	< 0	[4] (sub)optimal mobility **

* persistent wage differential from t=1, ..., T → no intersection point (OPM) existent

** wage differential non-uniform in t=1, ..., OPM and t=OPM+1, ..., T → intersection point (OPM) is existent

'*estimator*' is to distinguish the OLS and the fixed-effects predictions.

Table 2

Frequencies of the scenarios (one employer-to-employer change is accounted for)

	Fixed-effects predictions			OLS predictions		
	Frequency	Percent	Cumulative	Frequency	Percent	Cumulative
[1] upward mobility	20079	39.71		23166	45.81	
[2] downward mobility	22543	44.58	84.29	19419	38.40	84.22
[3] unanticipated mobility	4008	7.93	92.22	3524	6.97	91.19
[4] (sub)optimal mobility	3936	7.78	100	4457	8.81	100
Total	50566	100		50566	100	

Table 3

Descriptive statistics on the realized period of mobility (m) in case of (sub)optimal mobility

Fixed-effects predictions	Frequency	Percent	predicted between-firm wage differencial	Mean	Std.Dev	Median
suboptimal (early)	1616	0.41	$\widehat{log(w)}^{FE}_{i,1,m} - \widehat{log(w)}^{FE}_{i,2,m} > 0$	0.0884	0.2591	0.0353
optimal	0	0.00	$\widehat{log(w)}^{FE}_{i,1,m} - \widehat{log(w)}^{FE}_{i,2,m} = 0$	0	0	0
suboptimal (late)	2320	0.59	$\widehat{log(w)}^{FE}_{i,1,m} - \widehat{log(w)}^{FE}_{i,2,m} > 0$	-0.0562	0.0840	-0.0290
Total	3936	1.00	$\widehat{log(w)}^{FE}_{i,1,m} - \widehat{log(w)}^{FE}_{i,2,m}$	0.0032	0.1918	-0.0078
OLS predictions	Frequency	Percent	predicted between-firm wage differencial	Mean	Std.Dev	Median
suboptimal (early)	1729	0.39	$\widehat{log(w)}^{OLS}_{i,1,m} - \widehat{log(w)}^{OLS}_{i,2,m} > 0$	0.0556	0.0751	0.0295
optimal	0	0.00	$\widehat{log(w)}^{OLS}_{i,1,m} - \widehat{log(w)}^{OLS}_{i,2,m} = 0$	0	0	0
suboptimal (late)	2728	0.61	$\widehat{log(w)}^{OLS}_{i,1,m} - \widehat{log(w)}^{OLS}_{i,2,m} < 0$	-0.0549	-0.0733	-0.0293
Total	4457	1.00	$\widehat{log(w)}^{OLS}_{i,1,m} - \widehat{log(w)}^{OLS}_{i,2,m}$	-0.0120	0.0915	-0.0074

Table 4

Arithmetic means in the mobility period (m), displayed by the different scenarios: Fixed-effects predictions

Variable	All	Upward mobility	Downward mobility	Unanticipated mobility	Optimal mobility	Suboptimal mobility Early	Suboptimal mobility Late
$\widehat{log(w)}^{FE}_{i,1,m}$	4.4761	4.4074	4.5501	4.4832	0	4.4762	4.5091
$\widehat{log(w)}^{FE}_{i,2,m}$	4.4661	4.5923	4.3463	4.4816	0	4.3877	4.5654
potential experience (exp_{pot})	12.3847	12.9838	11.6056	14.1006	0	10.2160	13.3155
potential experience^2 (exp^2_{pot})	205.8986	219.8318	189.6189	244.1100	0	139.0996	224.0129
age	37.4803	37.5998	37.2902	38.7612	0	34.1999	38.3659
monitoring*	0.3159	0.2931	0.3256	0.3328	0	0.4196	0.3159
$occupation_{unskilled}$	0.1856	0.1691	0.2051	0.1532	0	0.2197	0.1720
$occupation_{skilled}$	0.2858	0.2718	0.2762	0.3887	0	0.3385	0.2858
$occupation_{technician}$	0.0109	0.0097	0.0112	0.0152	0	0.0142	0.0086
$occupation_{clerk}$	0.5174	0.5493	0.5073	0.4419	0	0.4264	0.5336
west	0.8225	0.8637	0.7905	0.7999	0	0.8360	0.8060
secondary school level I certificate	0.0857	0.0965	0.0831	0.0651	0	0.1021	0.0409
secondary school level I certificate & apprenticeship	0.5557	0.5225	0.5612	0.6584	0	0.5780	0.5974
advanced (technical) college entrance qualification	0.0101	0.0072	0.0136	0.0068	0	0.0050	0.0109
advanced (technical) college entrance qual. & apprenticeship	0.0531	0.0515	0.0567	0.0359	0	0.0476	0.0655
advanced technical college certificate	0.0891	0.0959	0.0881	0.0724	0	0.0668	0.0853
university degree	0.2062	0.2264	0.1973	0.1614	0	0.2005	0.2000
Observations	50566	20079	22543	4008	0	1616	2320

* days within firm < 180

Table 5

Arithmetic means in the mobility period (m), displayed by the different scenarios: OLS predictions

Variable	All	Upward mobility	Downward mobility	Unanticipated mobility	Optimal mobility	Suboptimal mobility Early	Suboptimal mobility Late
$\widehat{log(w)}_{i,1,m}^{OLS}$	4.5345	4.5093	4.5705	4.5563	0	4.5730	4.5091
$\widehat{log(w)}_{i,2,m}^{OLS}$	4.5460	4.6401	4.4384	4.5203	0	4.5174	4.5639
potential experience (exp_{pot})	12.3847	13.0450	11.4553	12.9455	0	11.6189	13.1529
potential experience^2 (exp_{pot}^2)	205.8986	222.3961	183.6123	221.2577	0	177.7264	222.4608
age	37.4803	37.7119	36.9619	38.4268	0	36.6536	38.5055
monitoring*	0.3159	0.2766	0.3052	0.4478	0	0.5836	0.3853
$occupation_{unskilled}$	0.1856	0.1916	0.1816	0.1748	0	0.1764	0.1837
$occupation_{skilled}$	0.2858	0.2580	0.3152	0.2946	0	0.2822	0.3046
$occupation_{technician}$	0.0109	0.0103	0.0113	0.0128	0	0.0121	0.0103
$occupation_{clerk}$	0.5174	0.5401	0.4917	0.5173	0	0.5286	0.5015
west	0.8225	0.8896	0.7640	0.7619	0	0.7848	0.7705
secondary school level I certificate	0.0857	0.0824	0.1026	0.0525	0	0.0457	0.0612
secondary school level I certificate & apprenticeship	0.5557	0.5357	0.5589	0.6215	0	0.5656	0.6122
advanced (technical) college entrance qualification	0.0101	0.0088	0.0139	0.0022	0	0.0064	0.0063
advanced (technical) college entrance qual. & apprenticeship	0.0531	0.0525	0.0575	0.0477	0	0.0474	0.0381
advanced technical college certificate	0.0891	0.0938	0.0856	0.0789	0	0.0908	0.0861
university degree	0.2062	0.2268	0.1815	0.1972	0	0.2441	0.1961
Observations	50566	23166	19419	3524	0	1729	2728

* days within firm < 180

Appendix

Table A1

Descriptive statistics on the underlying LIAB sample

Variable	Mean	Std. Deviation	Minimum	Maximum
$\log(w)_{i,f,t}$	4.5839	0.3016	-5.2760	9.8600
potential experience ($\exp_{pot}$)	15.6034	7.5087	0	31
potential experience^2 ($\exp_{pot}^2$)	299.8451	238.0330	0	961
occupation$_{vocational}$	0.0002	0.0147	0	1
occupation$_{unskilled}$	0.2495	0.4327	0	1
occupation$_{skilled}$	0.3142	0.4642	0	1
occupation$_{technician}$	0.0251	0.1564	0	1
occupation$_{clerk}$	0.4110	0.4920	0	1
german	0.9180	0.2743	0	1
monitoring*	0.0159	0.1252	0	1
west	0.8755	0.3301	0	1
secondary school level I certificate	0.1289	0.3350	0	1
secondary school level I certificate & apprenticeship	0.6728	0.4692	0	1
advanced (technical) college entrance qualification	0.0078	0.0879	0	1
advanced (technical) college entrance qual. & apprenticeship	0.0390	0.1937	0	1
advanced technical college certificate	0.0605	0.2385	0	1
university degree	0.0910	0.2876	0	1
Observations		13439321		
Individuals		2783047		
Establishments		8750		

* days within firm < 180