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## **Abstract**

Using data from the British Household Panel Survey for 1991-99 and the German Socio-Economic Panel for 1984-99, the authors investigate job mobility and estimate the returns to tenure and experience. Job mobility was higher in the United Kingdom than in Germany. Returns to experience also seem to have been substantially higher in the United Kingdom, where the wage gain associated with ten years of labor market experience was around 80%, compared to 35% in Germany. The low returns to labor market experience in Germany appear to have been accountable to one group of workers: those with apprenticeship training, who tended to receive fairly high starting wages but to experience relatively low wage growth thereafter. Wage growth due to labor market experience was similar between the two countries for the other skill groups. Returns to tenure were close to zero in both countries.

## **Keywords**

wage growth, job mobility

# WAGE GROWTH AND JOB MOBILITY IN THE UNITED KINGDOM AND GERMANY

CHRISTIAN DUSTMANN and SONIA C. PEREIRA\*

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Using data from the British Household Panel Survey for 1991–99 and the German Socio-Economic Panel for 1984–99, the authors investigate job mobility and estimate the returns to tenure and experience. Job mobility was higher in the United Kingdom than in Germany. Returns to experience also seem to have been substantially higher in the United Kingdom, where the wage gain associated with ten years of labor market experience was around 80%, compared to 35% in Germany. The low returns to labor market experience in Germany appear to have been accountable to one group of workers: those with apprenticeship training, who tended to receive fairly high starting wages but to experience relatively low wage growth thereafter. Wage growth due to labor market experience was similar between the two countries for the other skill groups. Returns to tenure were close to zero in both countries.

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**I**n this paper we analyze job mobility and wage growth for two large European economies that are possibly polar opposites in terms of their labor market institutions and regulations: the United Kingdom and

Germany.<sup>1</sup> We focus our analysis on the relative magnitude of the effects of tenure in the firm and experience in the labor market on the wage growth of workers in the two countries. Unlike most previous work, our analysis allows for different tenure and experience profiles for different education groups. For our empirical analysis, we use two panel data sets, the British Household Panel Survey and the German Socio-Economic Panel.

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The data on which this analysis is based are available from the DIW in Berlin (GSOEP) and the Data Archive in Essex, U.K. (BHPS). Users must register and sign agreements with the data providers. A data appendix with additional results is available from the authors. Contacts: Christian Dustmann, Department of Economics, University College London, Gower Street, London WC1E7AR, U.K.; Sonia Pereira, Economics Department, Barnard College, Columbia University, 3009 Broadway, New York, NY 10027.

While the impact of job seniority on wages has generated extensive debate, the role of general labor market experience has attracted less interest. Job tenure and general experience are understood as measures of job-specific and general human capital, respectively, and their association with wages is often interpreted as effects of specific and general human capital on individual wage profiles. Straightforward estimation confounds these effects with alternative

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<sup>1</sup>Our analysis considers West Germany only, but we sometimes refer to it as “Germany.” Wage structures in East and West Germany are not comparable, in particular not in the first years after unification.

mechanisms that induce correlation between wages on the one hand and labor market experience and tenure on the other, as we will discuss below. Various estimators have been suggested to address these problems (see, for example, Abraham and Farber 1987; Altonji and Shakotko 1987; Topel 1991; Altonji and Williams 1998; Williams 2004; Dustmann and Meghir 2005).

Our investigation of job mobility and wage growth in the United Kingdom and Germany addresses possible bias in the returns to experience and tenure due to individual and job match effects. To allow for different human capital accumulation by skill group, we provide separate estimates for different qualification groups in the two countries. In our discussion of the results we suggest two possible explanations for the differences we observe in terms of selection and mobility, and for how these may relate to differences in labor market and education institutions: “stickier wages” in Germany than in the United Kingdom (in models with employers’ learning of workers’ ability); and adverse selection of job movers in Germany due to low mobility in a context of asymmetric information between current and prospective employers about workers’ ability.

### 1. Labor Market and Training Institutions in the United Kingdom and Germany

Most investigations of returns to job tenure and labor market experience have been one-country studies. This paper, in contrast, investigates and compares job mobility and the determinants of wage growth in two countries with very different labor market institutions and patterns of job mobility: Germany and the United Kingdom. Institutional disparities may play an important role in facilitating or hampering wage flexibility and job mobility, as well as affect the way general and specific human capital relates to wage growth. Comparison of these two countries is also interesting in light of the current debates about labor market de-regulation and vocational training programs. The relatively flexible U.K. labor market is often seen as a model for labor market reforms that have yet to be implemented in Germany and other Euro-

pean economies. It is likely that differences in labor market institutions, regulations, and training systems have consequences for the way both job search and firm-specific and general human capital contribute to wage growth. In this section we briefly explain some of the key differences; later, in Sections 5–6, we discuss implications of these differences for our analysis.<sup>2</sup>

According to the *OECD Employment Outlook* (1999), the United Kingdom is among the countries with the least restrictive employment protection legislation, while Germany, like France and some southern European countries, has relatively strict employment protection<sup>3</sup> (see also Nickell 1997). Dismissals or redundancies in Germany are costly in terms of time, money, and procedural complexity (see Hunt 2000 for details on German dismissal policies). Higher firing costs in Germany may lead to lower mobility and more screening, as it is more costly for firms to hire bad workers (see, for example, Kugler and Saint Paul 2000). They may also reduce the importance of search for wage growth, which may affect the way returns to tenure and experience are biased in straight-forward OLS regressions. Finally, asymmetric information between current and prospective employers about workers’ ability may lead to more adverse selection when mobility is low (see Schoenberg 2004), eventuating in higher job attachment of more able workers in Germany, and more negative selection of job movers.

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<sup>2</sup>One may wonder how German reunification, which took place in 1990, might have affected the estimates of returns to tenure and experience in West Germany. That would depend on the flows of labor between the two regions. How these flows affect returns to skills depends on how migration changes the skill composition in the receiving region. Recent studies investigating the impact of immigration influxes from Eastern Europe have failed to find any statistically significant effects on wages or relative wages of natives (see, for example, Bonin 2005; Glitz 2006). This negative evidence suggests that reunification is unlikely to have affected our results.

<sup>3</sup>The indicators of strictness of employment protection used are based on the regulations concerning firing, such as redundancy procedures, mandated pre-notification periods and severance payments, special requirements for collective dismissals, and short-time work schemes.

Moreover, unlike the United Kingdom, Germany has a tight corporatist labor market, with centralized wage negotiations.<sup>4</sup> Although there are no legal minimum wages in Germany, and union membership is relatively low, union wage coverage affected about 76% of workers in the private sector in West Germany over the period 1996–99 (see Dustmann and Schoenberg 2004 for details). In the United Kingdom over the years 1991–99, wages were less regulated, with collective bargaining coverage declining from 54% in 1990 to 36% in 1997 (Ochel 2001) and no minimum wages for nearly the entire period.<sup>5</sup> These differences can lead to differences in the returns to tenure and experience, since unions tend to be associated with reduced wage dispersion in general and lower returns to labor market experience in particular (Pereira 2002).

A further distinguishing feature is the way young workers are trained after secondary school and their ensuing transition from secondary school to the labor market. In the United Kingdom, post-secondary education is usually state-provided, through universities, colleges, and vocational schools. Germany, on the other hand, operates an apprenticeship-based training system, combining state-financed academic education with firm-financed on-the-job training. Training takes place in about 320 registered occupations, and lasts between two and three years.

<sup>4</sup>There are strong unions and employers' associations with the power to conclude collective agreements on virtually all labor relations matters. The Federal Minister of Labor and Social Affairs estimates that, in 1990, the number of collective agreements in force was about 32,000, encompassing almost all industries and services and about 90% of all employees (Paqué 1993). Typically, these collective agreements fix contractual minima for wages and working conditions, and in practice virtually all organized employers offer the same wages and working conditions to union members and non-members alike.

<sup>5</sup>Wage councils were abolished in 1993. They covered around 2.5 million employees in retailing, clothing, and hairdressing. Their scope was reduced by the Wages Act 1986, which exempted workers under 21 and restricted the Councils to setting a unique minimum hourly rate for all covered workers. Minimum wages were re-introduced in the United Kingdom in April 1999, with a National Minimum Wage (see Metcalf 1999; Emire database).

Successful graduates are certified as skilled workers. This system trains the majority (about 65%) of the German work force. It is well suited to providing the labor market with the skills needed, and, by creating strong links with the labor market already during the training period, it promotes a smooth transition into work from secondary school (see Ryan 2001 and Steedman; Gospel and Ryan 1998). As young workers who graduate after the training period are well trained in their chosen occupation and entitled to receive at least the minimum wage for skilled workers in that occupation and industry, they are likely to have higher initial wages than workers who enter the labor market through other channels, but lower wage growth through later learning. Further, as training is occupation-specific, it may reduce workers' mobility. Both of these dynamics may sufficiently affect the returns to tenure and experience to differentiate Germany from the United Kingdom along those dimensions. The particularities of this training system therefore call for a breakdown of experience and tenure effects by educational attainment.

## 2. Methods

### Empirical Model

Our aim is to estimate the wage effects of general and firm-specific human capital. We assume that workers obtain the full return to general human capital, but that they share some portion of the return to specific human capital with the employer.<sup>6</sup> Let

$$(1) \quad \ln H_{ijt} = g(T_{ijt}) + f(X_{ijt}) + m_{ijt}$$

be the part of human capital for which worker  $i$  in firm  $j$  is paid in period  $t$ , with  $g(T_{ijt})$  and

<sup>6</sup>See Becker (1993) for an illuminating discussion of an equilibrium in which employers share the return on specific human capital with employees. See Hashimoto (1981), Harris and Felli (1996), and Scoones and Bernhardt (1996) for equilibrium models exploring how returns are shared between employer and employee. Parent (2002) pointed out that finding no returns to firm tenure does not imply that firm-specific human capital is not important, and offered an approach for assessing the importance of firm-specific human capital based on second moments.

$f(X_{ijt})$  being functions in tenure and labor market experience, and  $m_{ijt}$  a composite of individual- and job match-specific effects. Further, define the wage as  $w_{ijt} = H_{ijt} e^{\gamma_t + v_{ijt}}$ , where  $\gamma_t$  are economy-wide macro shocks and  $v_{ijt}$  are transitory shocks and measurement error.<sup>7</sup>

Assuming for expositional purposes that  $g$  and  $f$  are linear functions in experience and tenure (we will estimate higher-order polynomials below), and taking logs, we obtain the wage equation

$$(2) \quad W_{ijt} = \gamma_t + \beta_1 X_{ijt} + \beta_2 T_{ijt} + \varepsilon_{ijt},$$

where  $W_{ijt}$  is the log of the gross real hourly wage of individual  $i$  in job  $j$  at time  $t$ ,  $X_{ijt}$  is actual experience in the labor market, and  $T_{ijt}$  is seniority with the current employer. The key parameters of interest,  $\beta_1$  and  $\beta_2$ , give the partial effects of an additional year of experience or tenure on the wage, conditional on the three orthogonal components in the error term  $\varepsilon_{ijt} = \theta_{ij} + A_i + v_{ijt}$ . The individual fixed effect  $A_i$  captures unmeasured differences in ability, the job match effect  $\theta_{ij}$  is fixed during the course of a job and allows for heterogeneity in the quality of the job matches, and the transitory component  $v_{ijt}$  accounts for idiosyncratic shocks and measurement error.

As Altonji and Shakotko (1987) and Topel (1991) noted, if the unobserved individual and job match effects are correlated with tenure, experience, or both, then least squares estimates of  $\beta_1$  and  $\beta_2$  are likely to be biased. To assess these biases, consider the following auxiliary regressions:

$$(3) \quad \begin{aligned} A_i &= b_1 X_{ijt} + b_2 T_{ijt} + \zeta_{ijt}; \\ \theta_{ij} &= c_1 X_{ijt} + c_2 T_{ijt} + \psi_{ijt} \end{aligned}$$

Therefore, in a cross-section of individuals, both the individual effects and the job match effects can be correlated with years of seniority and labor market experience. Least squares estimation of (2) is likely to produce biased estimates of returns to seniority and experience, with  $\beta_1^{OLS} - \beta_1 = b_1 + c_1$  and  $\beta_2^{OLS} - \beta_2 = b_2 + c_2$ .

In order to assess the likely signs of these biases, one can use straightforward partitioned regression results applied to (3) to obtain explicit expressions for  $b_1$ ,  $b_2$ ,  $c_1$ , and  $c_2$  in terms of the variances and covariances of the unobservable components and the variables of interest:

$$(4) \quad b_1 = \frac{Cov(X_{ijt}, A_i) - \gamma_{TX} Cov(T_{ijt}, A_i)}{Var(X_{ijt}) [1 - \rho_{XT}^2];}$$

$$b_2 = \frac{Cov(T_{ijt}, A_i) - \gamma_{XT} Cov(X_{ijt}, A_i)}{Var(T_{ijt}) [1 - \rho_{XT}^2]}$$

$$(5) \quad c_1 = \frac{Cov(X_{ijt}, \theta_{ij}) - \gamma_{TX} Cov(T_{ijt}, \theta_{ij})}{Var(X_{ijt}) [1 - \rho_{XT}^2];}$$

$$c_2 = \frac{Cov(T_{ijt}, \theta_{ij}) - \gamma_{XT} Cov(X_{ijt}, \theta_{ij})}{Var(T_{ijt}) [1 - \rho_{XT}^2]}$$

Here  $\gamma_{TX}$  is the coefficient from a regression of experience on tenure,  $\gamma_{XT}$  the coefficient from a regression of tenure on experience, and  $\rho_{XT}$  the correlation coefficient between  $X$  and  $T$ . It is clear from these expressions that a bias in estimating the returns to labor market experience affects the estimate of the return to tenure and vice-versa, as tenure and experience are correlated with each other. Unlike with the instrumental variables estimators below, under plausible assumptions the least squares biases in experience and tenure due to both the individual fixed effect and the job match effects cannot be signed unambiguously. (See Altonji and Shakotko 1987, Altonji and Williams 2005, and Topel 1991 for further discussion.)

**Estimation**

The estimators we use are the instrumental

<sup>7</sup>A more flexible model was proposed by Dustmann and Meghir (2004). They allowed for differences in career paths between individuals. The quality of a match is reflected not only by the match-specific productivity, but also by the steepness of the career profile within a given firm. They also allowed for individual-specific experience profiles. Their more general model requires additional identifying information, which is not available in the surveys we are using.

variable estimator suggested by Altonji and Shakotko (1987) and Finnie's (1993) modification of the Altonji and Shakotko estimator (see also Parent 1999, 2000; Marcotte 1998). In Altonji and Shakotko's (1987) approach, each of the tenure variables is instrumented with its deviations from *job means*  $DT_{ijt}$ . Let  $\bar{T}_{ij}$  be the job mean of the tenure variable; then  $DT_{ijt} = T_{ijt} - \bar{T}_{ij}$ . As this variable has zero mean within each job, it is by construction orthogonal to the fixed individual and job match components.<sup>8</sup> Hereafter we will call the estimation method of instrumenting tenure with its deviations from job means *IVten1*.<sup>9</sup>

Applying *IVten1* to (2) may still produce biased estimates of returns to seniority and experience. Consider a variable  $\hat{T}_{ijt}$  containing the predicted values of a regression of tenure on its deviations from job means. The resulting expressions can be easily derived as

$$(6) \quad b_1^{IVten1} = \frac{Cov(X_{ijt}, A_i)}{Var(X_{ijt}) [1 - \rho_{X\hat{T}}^2]};$$

$$b_2^{IVten1} = \frac{-\gamma_{X\hat{T}} Cov(X_{ijt}, A_i)}{Var(\hat{T}_{ijt}) [1 - \rho_{X\hat{T}}^2]}$$

$$(7) \quad c_1^{IVten1} = \frac{Cov(X_{ijt}, \theta_{ij})}{Var(X_{ijt}) [1 - \rho_{X\hat{T}}^2]};$$

$$c_2^{IVten1} = \frac{-\gamma_{X\hat{T}} Cov(X_{ijt}, \theta_{ij})}{Var(\hat{T}_{ijt}) [1 - \rho_{X\hat{T}}^2]}$$

A positive correlation between experience and the job match effect may impart an upward bias to the experience effect and a downward bias to the tenure effect. Both biases may be reinforced by any remaining ability bias in the experience variable.

As an attempt to compare the relative importance of the individual and job heterogeneity bias in the two countries, in our empirical section we also use as an alternative instrumental variable for tenure its deviations from individual means (Finnie 1993). We call this instrumental variable estimator *IVten2*. Intuitively, while *IVten2* would represent an improvement over least squares since it produces an estimate of returns to tenure free from the bias due to the correlation between tenure and the individual fixed effect, *IVten1* produces an estimate of returns to tenure free from the bias due to the correlation between tenure and both the individual and job match effects. A comparison of least squares, *IVten1*, and *IVten2* could give an indication of the relative importance of individual and job match heterogeneity in the returns to tenure. Indirectly, this could yield evidence of the relative importance in the two countries of the correlation between ability and job duration and between job match quality and job duration. Such evidence is, however, not conclusive, as can be shown by comparing the expressions of the remaining biases in the returns to tenure and experience for *IVten1* above with the ones for *IVten2* (available upon request).

To take account of the correlation between labor market experience and the individual effect, *IVten1* can be extended by using as an instrument for experience its deviations from *individual means*,<sup>10</sup>  $DExp_{ijt} = Exp_{ijt} - \overline{Exp}_{ij}$ , where  $\overline{Exp}_{ij}$  is the individual mean of the experience variables. Extension to higher-order polynomials is straightforward. As this variable has zero average over each individual, it is by construction orthogonal to the individual fixed effect:  $b_1^{IVten\ exp} = 0$  and  $b_2^{IVten\ exp} = 0$ . Experience instruments can still nevertheless be correlated with the job match component, leading to a positive bias in experience and a negative bias in returns to tenure:

$$(8) \quad c_1^{IVten\ exp} = \frac{Cov(\hat{X}_{ijt}, \theta_{ij})}{Var(\hat{X}_{ijt}) [1 - \rho_{X\hat{T}}^2]};$$

<sup>8</sup>In our empirical analysis we also include higher-order terms in tenure that are instrumented in the same way.

<sup>9</sup>Topel (1991) showed that this estimator is equivalent (at least for the linear case) to his two-step estimator, where macro effects are pre-estimated, and where (in his second step) experience is used as an instrument for experience at the start of a job.

<sup>10</sup>This instrument has been used by Finnie (1993) and Parent (2000).

$$c_2^{IVtenexp} = \frac{-\gamma_{\hat{X}\hat{T}} Cov(\hat{X}_{ijt}, \theta_{ij})}{Var(\hat{T}_{ijt}) [1 - \rho_{\hat{X}\hat{T}}^2]}$$

We refer to the instrumental variables estimator that uses  $DExp_{ijt}$  as an additional instrument for experience as  $IVtenexp$ . Both  $IVten1$  and  $IVtenexp$  give upper bounds to returns to experience and lower bounds to returns to tenure.

A further problem in estimating equation (2) is the treatment of time effects, represented by  $\gamma_t$ . Time may be correlated with job match effects or individual heterogeneity for various reasons, as discussed by Altonji and Williams (2005). With that in mind, we instrumented time with the deviation of time from its mean within individuals in our regressions, but the resulting estimates were practically identical to non-instrumented ones. We therefore report results with non-instrumented time dummies below.

### 3. Data

We use the first nine waves of the British Household Panel Survey (1991–99) and the first sixteen waves of the German Socio-Economic Panel (1984–99).<sup>11</sup> Below are brief descriptions of these data sets; further details are provided in the Appendix.

#### The British Household Panel Survey

The BHPS<sup>12</sup> was designed as an annual survey of all adult (age 16+) members of a nationally representative sample of more than 5,000 households, generating a total of approximately 10,000 individual interviews. The same individuals are followed in successive waves. In order to construct tenure and experience, we use the retrospective data on past jobs collected in the second and third waves (1992 and 1993). For this reason, we may not be able to include some adults of

newly formed households with members that split off from the original households. We assume that this sample selection is random and does not affect the wage regressions as long as tenure and experience are included in the regressions.<sup>13</sup>

At each wave the interviewees are asked to state the beginning date of the ongoing job spell, which is defined by a change of employer or a change of job within the same employer. We link this information collected at various waves to construct tenure with the employer.

When linking the job spell information in the various yearly questionnaires and the retrospective data collected in waves 2 and 3, one is confronted with overlapping information for the same spell. Conflicting answers are resolved by giving priority to the information collected closest to the event occurrence, in recognition of the fact that recall error is likely to increase with the time elapsed between an event and the time of the interview.

We restrict the sample to observations of non-self-employed white men aged between 18 and 60 with jobs in the private sector. The earnings variable used is the real hourly wage, which is obtained by dividing real gross monthly pay in the current job by 4.33 times weekly hours worked, where weekly hours is the sum of the number of normal hours worked per week and the number of overtime hours. Imputed wage values were discarded, along with 37 wage outliers.<sup>14</sup>

<sup>13</sup>The BHPS follows children of sampled families when they reach the age of 16. If they leave their parents to create their own household, they continue to be surveyed. Additional members of these newly formed households also become part of the BHPS. In our sample we are able to include young adults of original BHPS-sampled families, since we observe their complete labor market history. However, we are not able to include additional members of these newly formed households if the age at which they entered the labor market differs from the age they started their current job. This is because we are unable to construct actual experience for these individuals. Sample selection bias could be present to the extent that higher-skilled individuals are more likely to form their own households and to live with other high-skilled individuals. Our IV regressions may reduce some of that bias.

<sup>14</sup>These include 17 observations with hourly wages less than 0.5 GBP, 6 observations with a within-job hourly

<sup>11</sup>The results we report in the tables refer to these two time windows. We have also estimated models using the period between 1991 and 1999 for both countries; this changes the results only marginally, and does not affect the implications we draw from our analysis.

<sup>12</sup>We are grateful to the U.K. Data Archive at the University of Essex for providing us with the data.

Table 1. Summary Statistics—  
Mean Sample Characteristics for White Men.

Variable	U.K.— BHPS	Germany— GSOEP
Log Real Hourly Wage	1.78 (0.43)	2.93 (0.36)
Hours Worked per Week	39.8 (6.7)	43.09 (6.7)
Age	36.87 (10.88)	39.28 (10.72)
Tenure (years)	8.2 (7.9)	11.9 (10.1)
Experience (years)	19.6 (11.6)	19.2 (11.7)
Percent Married	63.8	69.8
Percent Unskilled	26.09	10.6
Percent Medium-Skilled/ Apprenticeship Training	63.64	78.0
Percent University Graduates	10.28	11.45
Number of Observations	7,073	16,318
Number of Individuals	1,502	2,729
Number of Jobs	2,259	3,827
Number of Waves	9	16

Note: Standard deviations in parentheses. U.K. wages are in British pounds and German wages are in Deutschmarks.

In our analysis we divide workers into three skill groups: *unskilled*, *medium-skilled*, and *university graduates*. For the U.K. data the unskilled include those who report the following qualifications: no qualifications, other qualifications, apprenticeship, CSE, commercial qualifications, no O levels. The medium-skilled include those with O levels or equivalent, nursing qualifications, teaching qualifications, or A levels. Finally, the university graduates are those with a higher degree, a first degree, or other higher qualification.

### The German Socio-Economic Panel

The GSOEP started in 1984 as a yearly longitudinal survey of 4,298 private households<sup>15</sup> and around 9,000 individuals in West

wage decline of 85% between two consecutive years, and 14 observations with a within-job hourly wage growth larger than 500% between two consecutive years.

<sup>15</sup>These numbers are for GSOEP subsample A—"Residents in the FRG," 95% scientific-use version. See the excellent documentation by Haisken-DeNew and Frick

Germany. Although data have also been collected for former East Germany since 1990, we restrict our analysis to West Germany. Similar to the BHPS, in the GSOEP all household members are interviewed individually from the age of 16. Our sample is also constructed in a similar way: only non-self-employed white men aged between 18 and 60 with jobs in the private sector are included.

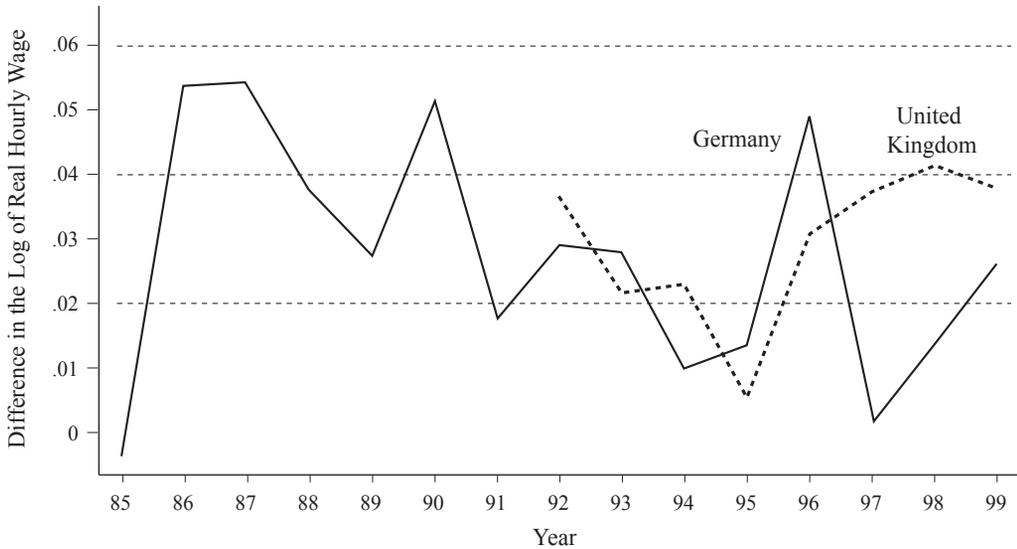
The number of years of labor market experience was constructed in two stages. In the first stage we use the yearly biographical scheme (included in the first wave, or the questionnaire administered to every new panel entrant) containing employment information from the age of 16 to construct total experience at the entry of the panel. Both part-time and full-time spells are considered. In the second stage we use the calendar available for each wave, listing all labor market activities for each month in the year preceding the interview. This information is added to the information computed in the first stage to construct experience at each wave. The tenure variable is constructed from the information about the exact year and month the individual has started the current job (that is, the employment spell with the current employer), up to the time of the interview. Wages are computed by dividing reported gross earnings in the month before the interview by the number of hours worked for pay.<sup>16</sup>

The three skill groups considered are workers with no post-secondary education (*unskilled*), workers with post-secondary apprenticeship training but no university education (*medium-skilled*), and workers with a

2003 and SOEP-Group 2001 for more details on the data. The data used in this publication were made available to us by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW), Berlin.

<sup>16</sup>We use monthly gross earnings. Our wage measure does not include additional yearly payments in the form of holiday or Christmas money, a type of bonus that is not uncommon in Germany. To check robustness with respect to the inclusion of these remunerations, we have re-estimated the models below including these additional payments. The results, which are included in an appendix that is available on request, hardly differ from those we report below.

Figure 1. Yearly Wage Growth, United Kingdom and Germany.



university degree (*university graduates*). (See the Appendix for more details.)

Finally, we stress that in both data sets, wage information refers unequivocally to the current main job, employer changes are identified, and tenure information is based on monthly calendar information (GSOEP) or the exact start date (BHPS). These procedures avoid problems noted in some of the work on tenure effects based on the PSID data (see Altonji and Shakatko 1987; Topel 1992; Altonji and Williams 1998). While tenure and experience measures in the PSID can be dated to the interview date, wage information is based on annual earnings, thus creating error in the exact allocation of tenure and experience to a particular wage spell (see Altonji and Williams 2005 for a discussion). This problem is aggravated by the fact that the PSID does not identify employers, so that employer changes are inferred from calendar time and tenure (see Brown and Light 1992 for a detailed discussion).

#### 4. Descriptive Statistics

##### The Sample

In Table 1 we show the mean characteristics for the two samples. The two data sets are very similar. The average age was 37 in the

United Kingdom and 39 in Germany; mean experience, 19.6 years in the United Kingdom and 19.2 years in Germany. When constructing labor market experience in Germany, we did not include the apprenticeship training period; hence the larger age-experience gap in Germany than in the United Kingdom. Average tenure was two years longer in Germany than in the United Kingdom.

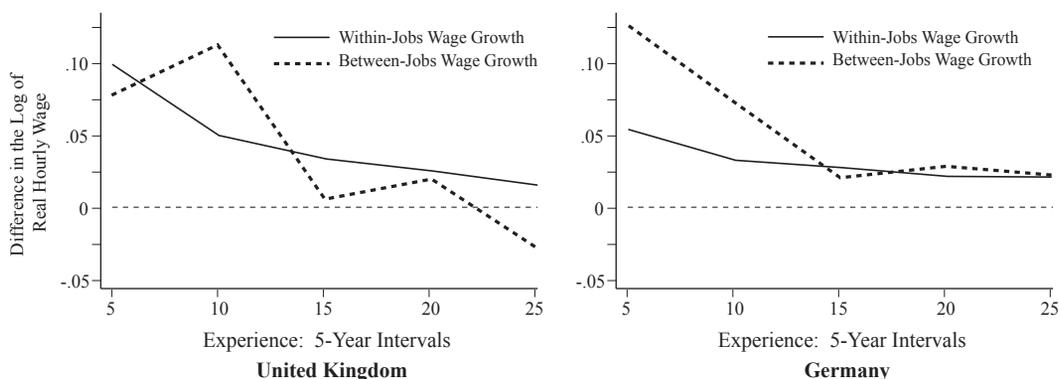
##### Wage Growth: Total, within Jobs, and between Jobs

Figure 1 illustrates the average yearly wage growth in both countries over the observation window.<sup>17</sup> Wage growth between two adjacent years is computed by averaging the difference in the log of the real hourly wage for all individuals observed in both periods. This does not necessarily coincide with total wage growth across all individuals, since it does not include those who entered and exited the panel.<sup>18</sup> In the years 1984–99, real

<sup>17</sup> Nominal wages were deflated with the retail price index for each country. All figures and tables use real wages.

<sup>18</sup> Wage growth between 1984 and 1985 in Germany may be understated, since, unlike in the other years, when 80–95% of interviews took place between Febru-

Figure 2. Wage Growth by Experience, United Kingdom and Germany.



gross hourly wages in the German sample grew on average 2.71% per year, and in the period 1991–99 real gross hourly wages in the United Kingdom sample grew on average 2.91% per year. During the years for which there are data for the two countries—1991 to 1999—the yearly wage growth was somewhat lower in Germany (2.11%, versus 2.91% in the United Kingdom).

Figure 2 plots within-job and between-job wage growth by 5-year experience intervals. In both countries, between-job wage growth (9.8% and 9.9% for Germany and the United Kingdom, respectively) was higher than within-job wage growth (4.1% and 6.6%) in the first 10 years of workers' careers. After that, wage gains at job changes fell below within-job wage growth. This is consistent with decreasing marginal returns to job search, and similar to what is reported for the United States (see, for example, Topel and Ward 1992).<sup>19</sup>

ary and April, in 1984 only 50% of the interviews had taken place by May, and the remaining were conducted between May and September. Measurement error in yearly wage growth is therefore likely to be higher between 1984 and 1985 than in the other periods. We expect the time dummies in our regression analysis to pick up the potential bias.

<sup>19</sup>The negative wage growth toward the end of individuals' careers is not significantly different from zero. At high experience levels the data become very sparse and standard errors very large. For example, for the United Kingdom, at 25–30 years of experience, there are 58 observations; wage growth is  $-0.05$ , with a standard error of 0.31.

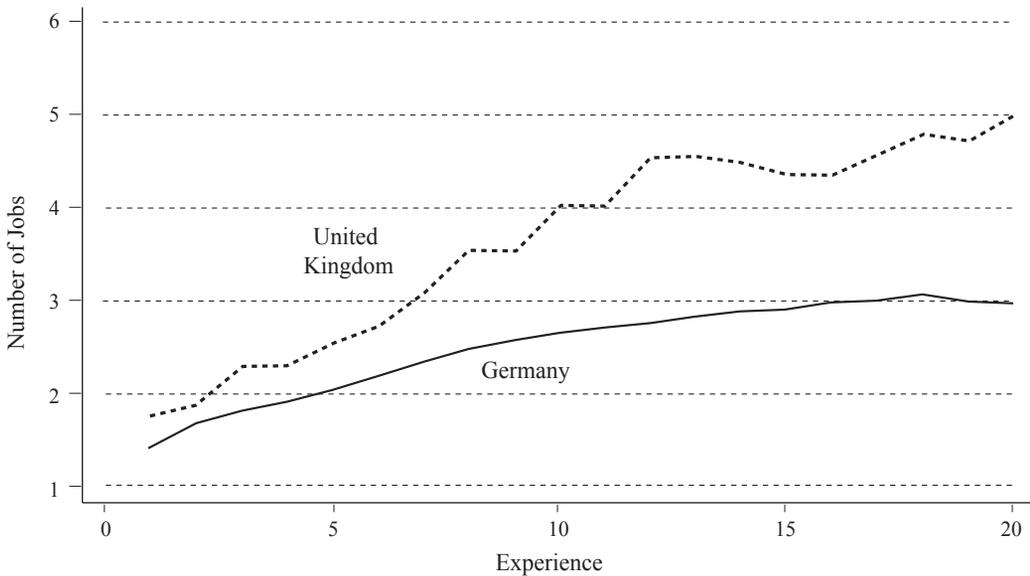
Figure 3 shows the number of jobs held by labor market experience.<sup>20</sup> British workers held on average 4 jobs during the first 10 years in the labor market, increasing to 5 jobs during the first 20 years; German workers, 2.7 jobs (first 10 years) and 3 jobs (first 10 years). Mobility was therefore clearly higher in the United Kingdom. However, in both countries the number of jobs held was small in comparison with the United States, where, during about the same period, workers held on average 6.96 jobs during the first ten years of labor market experience<sup>21</sup> (Topel and Ward 1992:448).

Figure 4 graphs the percentage of job-to-job transitions and job transitions with an unemployment spell between jobs on the total number of individuals observed in paid employment in two consecutive waves by 5-year experience interval. Unemployment

<sup>20</sup>Due to the relatively smaller number of observations in the United Kingdom, in Figure 3 we apply a 3-year moving average to the variable "number of jobs."

<sup>21</sup>It is important to note that Topel and Ward (1992) assumed that a full-time work spell occurs when an individual earns at least 70% of the minimum quarterly wage during that quarter across all jobs. In both the U.K. and German data, a work spell is defined as occurring when an individual reports that employment—as opposed to, for example, schooling—was his or her main activity. Student summer jobs may therefore be more likely to be excluded from the U.K. and German data than from similar U.S. surveys, and if so, one result could be a slight overstatement of the difference between the United States and the two European countries in the average number of jobs during the first 10 years of labor market experience.

Figure 3. Number of Jobs by Experience, United Kingdom and Germany.



is defined differently in the two data sets. Whereas in the United Kingdom individuals reported their own assessment of their labor market status, in Germany they were asked whether they were registered as unemployed. Because of this disparity, the figures also show the percentage of job-to-job transitions with an intermediate non-labor-market spell. The difference between the share of transitions with unemployment and the share of transitions with a non-labor-market spell was larger for Germany than for the United Kingdom. This is consistent with a more stringent definition of unemployment status in the German data. In both countries both job-to-job transitions and transitions with interruptions declined with time in the labor market. This is consistent with decreasing marginal returns from search. These graphs are consistent with higher job mobility in the United Kingdom than in Germany, since the occurrence of both types of transitions is higher in the former for all experience categories. However, the two countries differ much more in the occurrence of job-to-job transitions than in transitions with a non-employment spell. This is suggestive of a stronger role for voluntary job changes and search in the

United Kingdom than in Germany.

### 5. Estimating Returns to Experience and Tenure

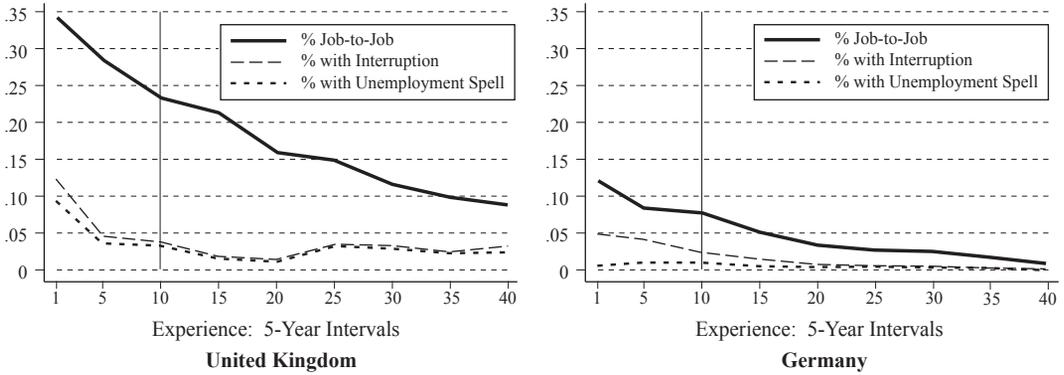
Table 2 shows the cumulative returns to tenure and experience in the two countries using the four estimation methods described: OLS, *IVten1*, *IVten2*, and *IVtenexp*.<sup>22</sup> All regressions use fourth degree polynomials in tenure and experience to allow for non-linear returns.

Columns (1) and (5) of Table 2 show that, according to OLS estimates, ten years of tenure were associated with an 8.8% wage increase in the United Kingdom and a 12.8% wage increase in Germany. Interestingly, these values are considerably smaller than typical estimates based on U.S. data, which indicate that ten years of tenure increase wages by 25% (Altonji and Shakatko 1987) and 30% (Topel 1991).

In columns (2) and (6) we present the results of estimations in which tenure is instrumented with its deviations from job

<sup>22</sup> Coefficient estimates are available on request to the authors.

Figure 4. Types of Transition Between Two Waves in Employment, United Kingdom and Germany.



means (*IVten1*). The returns to 10 years of tenure decline to 5.4% in the United Kingdom and to zero in Germany. This suggests that the correlation between tenure and the individual and job match effects generates a positive bias in the returns to tenure estimated by OLS. Taken at face value, the difference between the least squares and the *IVten1* estimates of the tenure effect suggests that this bias is larger in Germany than in the United Kingdom.

In columns (3) and (7) we present results from estimations instrumenting tenure with deviations from the individual means (*IVten2*). Recall that this estimator eliminates only the correlation between tenure and the effect of individual-specific productivity, not the correlation with the match-specific effect. For the United Kingdom, these coefficient estimates for tenure are very similar to the ones using OLS (as are experience coefficients). Since *IVten1* produces an estimate of returns to tenure free from the bias due to the correlation between tenure and *both* the individual and job match effects, this would be consistent with individual heterogeneity bias having only minor importance in the United Kingdom. Lower *IVten1* than *IVten2* estimates of the tenure effect suggest that least squares is positively biased mainly due to job match heterogeneity. However, as we discussed above, the differences between these estimates can only be interpreted as suggestive of such an interpretation.

In Germany, the tenure effects obtained from *IVten2* are lower than those from least squares estimation, and higher than those from *IVten1*. Returns to experience estimated with *IVten2* are higher than those estimated with least squares and slightly lower than those estimated with *IVten1*. These results are consistent with least squares returns to tenure being positively biased due to both individual and job match heterogeneity.

The evidence provided by the differences between least squares, *IVten1*, and *IVten2* estimates is suggestive of more able workers having longer job durations in Germany, and of jobs with better matches lasting longer in the United Kingdom. This underscores the importance of search in the United Kingdom, where an upward bias in the tenure coefficient seems to be driven largely by good matches being more likely to survive. This could help explain some of the difference in mobility patterns between the two countries. The considerably larger percentage of early job-to-job transitions in the United Kingdom described earlier is consistent with more frequent voluntary job changes resulting from higher gains from search.

As we pointed out above, because experience may be correlated with the individual and job error components, returns to experience are likely to be biased, which may in turn bias returns to tenure. Columns (4) and (8) show that when both tenure and experience are instrumented (*IVtenexp*), returns to tenure in both countries are close to zero

Table 2. Cumulative Returns to Tenure and Experience—OLS and IV.

Variable	United Kingdom				Germany			
	OLS 1	IVten1 2	IVten2 3	IVtenexp 4	OLS 5	IVten1 6	IVten2 7	IVtenexp 8
1 Year Tenure	0.0106 (0.0046)*	0.0118 (0.0091)	0.0113 (0.0072)	0.0131 (0.0089)	0.0165 (0.0025)**	0.0041 (0.0039)	0.0103 (0.0032)**	0.0042 (0.0039)
5 Years Tenure	0.0485 (0.0146)**	0.0416 (0.0284)	0.0487 (0.0213)*	0.0418 (0.0264)	0.0733 (0.0083)**	0.0097 (0.0133)	0.0383 (0.0107)**	0.0113 (0.0132)
10 Years Tenure	0.0880 (0.0165)**	0.0543 (0.0363)	0.0860 (0.0247)**	0.0445 (0.0292)	0.1276 (0.0100)**	-0.0037 (0.0181)	0.0483 (0.0134)**	0.0005 (0.0173)
15 Years Tenure	0.1218 (0.0163)**	0.0574 (0.0472)	0.1218 (0.0295)**	0.0363 (0.0341)	0.1701 (0.0100)**	-0.0335 (0.0232)	0.0383 (0.0155)*	-0.0283 (0.0208)
1 Year Exp.	0.0982 (0.0062)**	0.1008 (0.0071)**	0.0985 (0.0066)**	0.0915 (0.0131)**	0.0428 (0.0033)**	0.0439 (0.0036)**	0.0428 (0.0035)**	0.0458 (0.0048)**
5 Years Exp.	0.4612 (0.0303)**	0.4766 (0.0352)**	0.4630 (0.0321)**	0.4452 (0.0633)**	0.1851 (0.0130)**	0.1992 (0.0145)**	0.1912 (0.0137)**	0.2038 (0.0193)**
10 Years Exp.	0.7866 (0.0494)**	0.8209 (0.0596)**	0.7900 (0.0528)**	0.8090 (0.1103)**	0.2972 (0.0178)**	0.3473 (0.0209)**	0.3254 (0.0192)**	0.3434 (0.0284)**
15 Years Exp.	0.9509 (0.0549)**	1.0029 (0.0703)**	0.9544 (0.0595)**	1.0514 (0.1402)**	0.3499 (0.0181)**	0.4535 (0.0242)**	0.4127 (0.0206)**	0.4316 (0.0323)**
20 Years Exp.	1.0010 (0.0536)**	1.0682 (0.0745)**	1.0029 (0.0593)**	1.1837 (0.1620)**	0.3644 (0.0173)**	0.5318 (0.0293)**	0.4688 (0.0219)**	0.4905 (0.0359)**
F-Stat. (Tenure)	23.8	5.5	0.7	0.7	163.4	3.3	5.4	5.3
F-Stat. (Experience)	193.6	146.0	111.3	28.3	171.7	156.4	182.4	68.8
Observations	7,073	7,073	7,073	7,073	16,318	16,318	16,318	16,318
R <sup>2</sup>	0.3012	0.2880	0.2985	0.0226	0.3917	0.3127	0.3585	0.2874

Note: Log-wage returns to  $k$  years of tenure (experience) with  $k = 1, 5, 10, 15, 20$  is the cross-product of the row vector of the tenure (experience) polynomial coefficients with a column vector of the form  $(k, k^2, k^3, k^4)$ . Values presented are the wage returns and are obtained by applying an exponential transformation to the log wage returns minus 1. Standard errors are the square root of a 1st-order Taylor approximation of the corresponding variance.

IVten1: tenure instrumented with its deviations from job means.

IVten2: tenure instrumented with its deviations from individual means.

IVtenexp: tenure instrumented with its deviations from job means and experience instrumented with its deviations from individual means.

and not statistically significant. Returns to experience hardly change in comparison with *IVten1*, but standard errors are higher. Remember that both *IVten1* and *IVtenexp* give upper bounds to returns to experience and lower bounds to returns to tenure.

In the lower panel of Table 2 we report the estimated returns to labor market experience. Overall, estimates across the four estimation methods point to higher returns to experience in the United Kingdom than in Germany.<sup>23</sup> Estimates using OLS and in-

strumental variables are not very different. *IVtenexp* estimates for the United Kingdom show that the first year in the labor market yielded a return of about 9%, and by the 10th year in the labor market the resulting average cumulative return was roughly 80%. The marginal returns decreased with experience, and the following 10 years generated an additional wage gain of about 25%. In Germany, estimates from *IVtenexp* indicate wage gains of 4.6%, 34%, and roughly 50% associated with the first year in the labor market, the first 10 years, and the first 20 years, respectively.

<sup>23</sup>When computing years of experience in Germany, we did not include the apprenticeship period, since workers' wages are institutionally set during their apprenticeship training. If we added those years to the experience variable, the returns to the first 2–3 years in the labor market would be identified from the polynomial function in experience for apprentices, since it

would be inappropriate to use the wage data. Regression results show that returns to tenure would remain essentially unchanged and returns to experience would increase, but would still be considerably lower than in the United Kingdom. These results are available on request to the authors.

Table 3. Cumulative Returns to Tenure and Experience by Qualification.

Variable	Unskilled			Medium-Qualified			University Graduates		
	OLS 1	IVten1 2	IVtenexp 3	OLS 4	IVten1 5	IVtenexp 6	OLS 7	IVten1 8	IVtenexp 9
<b>A. United Kingdom</b>									
1 Year Tenure	0.0136 (0.0089)	0.0198 (0.0203)	0.0190 (0.0183)	0.0137 (0.0062)*	0.0111 (0.0116)	0.0109 (0.0112)	-0.0203 (0.0212)	-0.0075 (0.0354)	0.0214 (0.0332)
10 Years Tenure	0.0869 (0.0336)**	0.0563 (0.0914)	0.0397 (0.0613)	0.0934 (0.0204)**	0.0653 (0.0479)	0.0474 (0.0367)	0.0663 (0.0493)	-0.0445 (0.1199)	0.0364 (0.0853)
15 Years Tenure	0.1137 (0.0322)**	0.0255 (0.1147)	-0.0015 (0.0713)	0.1242 (0.0202)**	0.0801 (0.0632)	0.0513 (0.0426)	0.1362 (0.0592)*	-0.0315 (0.1572)	0.0560 (0.1201)
1 Year Exp.	0.0802 (0.0165)**	0.0818 (0.0191)**	0.0777 (0.0331)*	0.0977 (0.0077)**	0.0966 (0.0087)**	0.0939 (0.0159)**	0.1627 (0.0243)**	0.1738 (0.0300)**	0.0903 (0.0478)
10 Years Exp.	0.5938 (0.1171)**	0.6415 (0.1516)**	0.6749 (0.2562)**	0.8074 (0.0613)**	0.8171 (0.0731)**	0.8674 (0.1397)**	1.0477 (0.1423)**	1.1665 (0.2087)**	0.6531 (0.2729)**
20 Years Exp.	0.7164 (0.1170)**	0.8264 (0.1896)**	1.0085 (0.3232)**	0.9995 (0.0645)**	1.1163 (0.0944)**	1.3064 (0.2104)**	1.0441 (0.1223)**	1.2457 (0.2237)**	0.7023 (0.3084)**
Observations	7,073	7,073	7,073	7,073	7,073	7,073	7,073	7,073	7,073
R <sup>2</sup>	0.3314	0.3065	0.2987	0.3314	0.3065	0.2987	0.3314	0.3065	0.2987
<b>B. Germany</b>									
1 Year Tenure	0.0041 (0.0073)	-0.0110 (0.0130)	-0.0142 (0.0130)	0.0153 (0.0028)**	0.0030 (0.0044)	0.0040 (0.0044)	0.0210 (0.0085)*	0.0135 (0.0134)	0.0051 (0.0125)
10 Years Tenure	0.0613 (0.0296)*	-0.0422 (0.0650)	-0.0604 (0.0523)	0.1256 (0.0113)**	-0.0092 (0.0202)	0.0030 (0.0192)	0.1423 (0.0312)**	0.0121 (0.0626)	-0.0219 (0.0575)
15 Years Tenure	0.1020 (0.0308)**	-0.0544 (0.0853)	-0.0707 (0.0579)	0.1704 (0.0112)**	-0.0387 (0.0260)	-0.0216 (0.0229)	0.1777 (0.0320)**	-0.0317 (0.1151)	-0.0758 (0.0894)
1 Year Exp.	0.0860 (0.0106)**	0.0839 (0.0123)**	0.0879 (0.0182)**	0.0377 (0.0037)**	0.0399 (0.0041)**	0.0389 (0.0052)**	0.0478 (0.0111)**	0.0546 (0.0134)**	0.0797 (0.0171)**
10 Years Exp.	0.5207 (0.0634)**	0.5503 (0.0754)**	0.6226 (0.1239)**	0.2591 (0.0193)**	0.3148 (0.0229)**	0.2876 (0.0294)**	0.3944 (0.0604)**	0.4573 (0.0771)**	0.6264 (0.1113)**
20 Years Exp.	0.5138 (0.0578)**	0.6533 (0.1103)**	0.7427 (0.1371)**	0.3192 (0.0186)**	0.4867 (0.0324)**	0.4126 (0.0368)**	0.5532 (0.0600)**	0.7651 (0.1675)**	0.9403 (0.1778)**
Observations	16,318	16,318	16,318	16,318	16,318	16,318	16,318	16,318	16,318
R <sup>2</sup>	0.3950	0.3797	0.3118	0.3950	0.3797	0.3118	0.3950	0.3797	0.3118

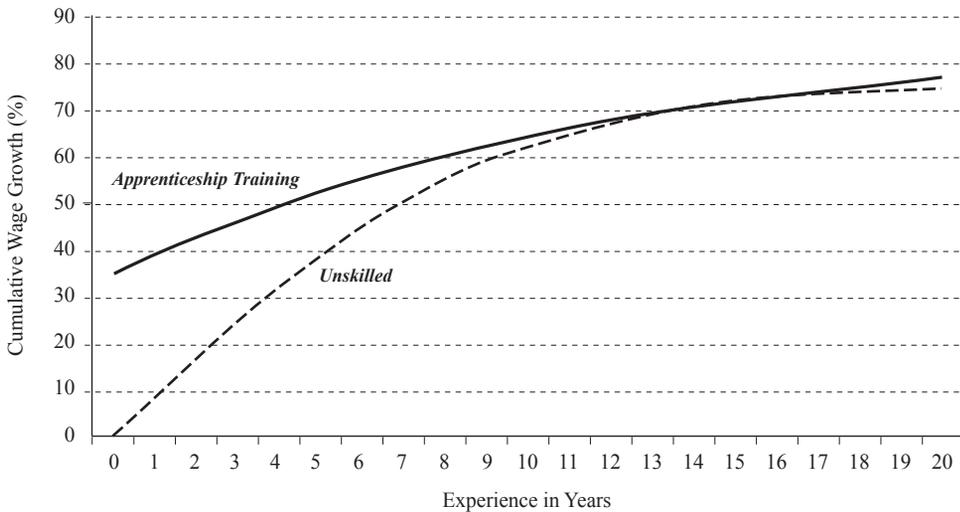
Note: Log-wage returns to  $k$  years of tenure (experience) with  $k = 1, 5, 10, 15, 20$  is the cross-product of the row vector of the tenure (experience) polynomial coefficients with a column vector of the form  $(k, k^2, k^3, k^4)$ . Values presented are the wage returns and are obtained by applying an exponential transformation to the log wage returns minus 1. Standard errors are the square root of a 1st-order Taylor approximation of the corresponding variance.

IVten1: tenure instrumented with its deviations from job means.

IVtenexp: tenure instrumented with its deviations from job means and experience instrumented with its deviations from individual means.

These differences in returns are quite substantial. One possible explanation is that centralized wage negotiations in Germany result in wage growth that is based more on the economy-wide time trend than on individual experience profiles. We investigate this possibility below. Another reason may be that part of the general human capital that is acquired in the United Kingdom in the early years after labor market entry is acquired in Germany before entering the labor market, resulting in higher entry

wages but lower wage growth with respect to experience. The large initial wage growth in the United Kingdom, paired with higher mobility, is suggestive of large increases in productivity at the start of a career, through both human capital accumulation and search. This explanation is quite plausible since, as we discuss in the introduction, Germany operates an apprenticeship system providing post-secondary education for about 65% of its work force, which trains workers on the job (4 days a week) and in state-run schools (1

Figure 5. Cumulative Wage Growth with Experience, *IVtenExp*—Germany.

day a week) for a period of between two and three years. If this training system is mainly responsible for the observed differences in estimates, then we should see more similarity for workers at the low and high ends of the skill distribution between Germany and the United Kingdom. To test this, we repeat our analysis, distinguishing between three different skill groups.

### Cumulative Returns to Tenure and Experience by Skill Group

Table 3 displays the returns to tenure and experience by qualification group for the United Kingdom and Germany.<sup>24</sup> The results shown in the table were obtained by interacting qualification dummies for the medium-skilled and university graduates with the tenure and experience polynomials. Results are shown for OLS, *IVtenI*, and *IVtenexp*. The various estimation methods differ in roughly the same way for each qualification group as for the whole sample of workers. For both countries and all skill groups, *IVtenI* estimates show lower tenure effects than least

squares, though *IVtenI* estimates are in most cases not significantly different from zero. In addition, in most cases *IVtenI* offers a higher lower bound to the returns to tenure and a lower upper bound to the returns to experience than *IVtenexp* (the exceptions are the university graduates in the United Kingdom and workers with apprenticeship training in Germany). However, none of the returns to tenure estimates are significantly different from zero.

In the United Kingdom, according to the *IVtenexp* estimates, returns to 10 years of experience were 67% for the unskilled, 87% for workers with medium skills, and approximately 65% for university graduates. Thus, returns were largest for workers in the intermediate category. In Germany, in contrast, intermediate-category workers received the smallest returns: for workers who went through apprenticeship training, returns to ten years of experience estimated by *IVtenexp* were 29%, with an increase of only 4% during the first year, while the estimate for the unskilled is 62%, with an increase of about 9% during the first year. Returns for university graduates were similar to those for the unskilled.

Figure 5 shows *IVtenexp* estimates of wage growth with experience for unskilled workers

<sup>24</sup>Coefficient estimates are available on request to the authors.

Figure 6. Macro Effects Estimated by OLS—United Kingdom and Germany.



and workers with apprenticeship training in Germany. Returns to tenure are not included, since these are not significantly different from zero. Entry wages were 35% higher for apprenticeship trainees. However, as experience wage returns were considerably higher for non-apprentices, the gap rapidly closed over the first 10 years. In fact, after 3 years of experience the difference in the wage returns between the two groups of workers was no longer significant at the 10% level.<sup>25</sup>

Comparing the United Kingdom and Germany, for both the unskilled and university graduates, estimates of returns to experience are not very dissimilar. According to *IVtenexp* point estimates, the unskilled seem to have enjoyed somewhat higher returns in the United Kingdom than in Germany, especially in the second decade of their careers, and university graduates had somewhat lower

returns in the United Kingdom. However, given the large magnitude of the standard errors, these differences are rather speculative. The difference in returns to labor market experience between the two countries seems to have been driven mainly by workers in the intermediate education category.

### Estimation of Macro Trends

The model in equation (2) allows for three distinct sources of wage growth: the partial effects of experience and tenure, the partial effect of match quality, and the partial effect of the macro trend, always holding individual ability constant. Studies that consider one country usually do not report the macro trend in wages. However, this is in itself an interesting variable when different labor markets are being compared. In Figure 6, we display estimates of macro effects for the two countries. These are coefficients of time dummies (in which the first year is omitted) based on simple OLS estimation. Using the other estimators or instrumental variable estimators yields very similar coefficients (see the discussion in Section 1). We have normalized the German series so that real wages are zero in 1991, the first year in which both countries are observed.

<sup>25</sup>Standard errors are computed as the square root of a 1st-order Taylor approximation of the corresponding variance. For the unskilled, the variance is calculated by pre-multiplying and post-multiplying the variance covariance matrix of the coefficients of the experience polynomial by a matrix with the values of the experience terms. For the apprenticeship trainees the variance-covariance matrix also includes the coefficient on the education dummy (omitted for the unskilled).

Over the early period 1991–96, aggregate wage growth was higher in Germany than in the United Kingdom, but toward the end of the decade the United Kingdom caught up, and by the end of the decade the contribution of aggregate growth to real wage growth was about 5.3% in the United Kingdom and 5.8% in Germany. These trends clearly illustrate the strong economic expansion in the United Kingdom after 1996 and the economic stagnation in Germany in the late 1990s. On average, the yearly contribution of the economy-wide time trend to wage growth in 1991–99 was about 0.66% for the United Kingdom and 0.73% for Germany.

To investigate whether the macro trend affected all education and experience groups alike, we have estimated log wage regressions, in which we interacted a linear year trend with educational dummies as well as with the level of experience. In Germany, we find that the macro trend contributed more to wage growth for the unskilled (on average, 1.9% per year over the entire observation window) than for the apprenticeship trainees and the university graduates (on average, 1.5% per year). This is not unexpected, as union wages should mainly affect the wage structure at the lower end of the skill distribution. When the linear trend interactions with the educational dummies are included, the coefficient of the interaction between experience and the year trend is virtually zero, suggesting that macro effects are similarly distributed across the experience distribution. For the United Kingdom, a fairly similar picture emerges, with the effect of the time trend on wage growth being 0.9% for the unskilled, 0.7% for workers with medium skills, and not statistically different from zero for university graduates. Again, the interaction between experience and the year trend is zero.

## 6. Discussion and Conclusions

Average returns to labor market experience during the years we examined were, according to our results, markedly higher in the United Kingdom than in Germany. The estimates by skill group suggest that at least some of this difference is likely to have been due to higher “entry wages” for workers

who had undergone apprenticeship training, since the returns to experience estimates are substantially lower for this group of workers than for the other two groups.<sup>26</sup> Workers who undergo apprenticeship training in Germany are known to receive general or transferable skills (Acemoglu and Pischke 1998, 1999), and their productivity and corresponding wage may increase less after full-time labor market entry, simply because much of the learning is concentrated during the apprenticeship period. In fact, for all other qualification groups in Germany and all qualification groups in the United Kingdom, returns to experience had a much steeper slope during the first few years. Estimated returns to experience among unskilled workers seem to be somewhat lower in Germany than in the United Kingdom, and the opposite seems to be the case for university graduates. However, given the magnitude of the standard errors, we cannot reject the possibility that these two groups of workers had similar returns to experience in the two countries.

Our estimates point to low average returns to tenure in both countries. These estimates imply either that the component of workers’ skills that is not transferable across employers is unimportant, or that workers do not share with employers the return to job-specific human capital in the form of higher wages. Our estimates may, however, still be downward-biased, as we could not correct for the potential upward bias in the experience effect. There is some evidence that this is a potential problem. Dustmann and Meghir (2005) used information on firm closure from administrative data to eliminate this potential downward bias; they found that a model with this refinement yielded higher estimates of returns to tenure and lower estimates of returns to experience. Finally, it is interesting to note that our OLS estimates for tenure are much lower for both the United Kingdom and Germany than similar OLS

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<sup>26</sup>Even though the qualification groups are defined differently in the two countries, it is interesting to note that in Germany entry wages were 35% higher for apprenticeship trainees than for unskilled workers, while in the United Kingdom medium-qualified workers’ entry wages were only 13% higher than those of the unskilled.

estimates that have been reported for the United States.

Our exploration of the differences between OLS and IV results has provided tentative evidence consistent with “more able” workers having longer job durations than “less able” workers in Germany, but not in the United Kingdom. There are two possible explanations for why “more able” workers experience longer job tenures in Germany or, in other words, why “less able” workers are laid off more often or have more incentives to quit.

One possible source of negative selection of job movers is the presence of “sticky wages” (Gibbons and Katz 1991:376). In a context of learning with sticky wages, where in a first stage the employer’s information about workers’ ability is imperfect, the firm may be led to lay off workers whose productivity turns out to be “too low.”<sup>27</sup> An assumption behind this model is that both current employers and prospective employers learn about the worker’s ability after a job spell. Our discussion in Section 1 suggests that it is likely that individual real wages of German workers are “stickier” than those of British workers. British employers are likely to have more discretion with respect to individual wage increases and promotions than German employers, who face wage tariffs for different occupations and industries as well as for worker-specific characteristics.<sup>28</sup> This would imply that in Germany less able workers would be laid off

more often than other workers but would not have more incentives to quit.<sup>29</sup>

An alternative possible source of negative selection of job movers is asymmetric information between the current and prospective employers about workers’ ability. Schönberg (2004) suggested that asymmetric information may result in an ability bias in the estimation of returns to job tenure. In the context of asymmetric information, adverse selection is less important the higher the job mobility (Acemoglu and Pischke 1998), reducing the expected difference in average ability between job stayers and job movers. Since overall job mobility is higher in the United Kingdom than in Germany, adverse selection would support higher job attachment of more able workers in Germany than in the United Kingdom. As pointed out by Acemoglu and Pischke (1998:114), an implication of this would be “a worse allocation of workers to jobs” in Germany, since workers would “end up staying in jobs for which they have high disutility.”

Our paper suggests many similarities, but also significant differences, between the U.K. and German labor markets. Surprisingly little comparative work exists so far studying either the mechanisms that drive wage growth and mobility across the different European economies or differences between European economies and the economies of other industrialized countries. Our paper suggests that institutional differences not only may lead to different underlying structural parameters, but also may affect the way and the extent to which coefficients retrieved by simple regression analysis are confounded with selection and search.

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<sup>27</sup>See Dustmann and Schönberg (2004) for a model in which the presence of union wages leads firms to lay off workers with productivity below the union wage, once workers’ ability is revealed. Their model’s main aim is to explain why firms pay for general training within the German Apprenticeship System.

<sup>28</sup>Indirect evidence of this is the fact that both the 90-50 and the 50-10 percentile male wage differentials are larger in the United Kingdom than in Germany (see, for example, Blau and Kahn 1996).

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<sup>29</sup>Distinguishing between workers in firms that do and do not recognize union agreements, Dustmann and Schoenberg (2007) found evidence of higher lay-off rates in firms that recognize agreements.

### Appendix: The Data

#### *British Household Panel Survey*

*Tenure* is the total number of years the individual works for the same employer. It is constructed for all individuals who are in paid employment. It is not constructed for the self-employed, since they are excluded from the sample. Individuals are asked to give the starting date of the job spell, and not the spell with the employer.<sup>30</sup> For example, if the individual is promoted, the date collected is the date of promotion. In order to track down the starting date with the present employer, we go back as many spells as there are job changes with the same employer, which in many instances involves using information from the inter-wave history files and the retrospective data. We add the time spent in the various spells with the same employer in order to compute tenure with the employer. When linking the job spell information in the various yearly questionnaires and the retrospective data collected in waves 2 and 3, one is confronted with the overlapping of two or more sources of information for the same spell, or part of it. Conflicting answers are resolved by giving priority to the information collected closest to the event occurrence. This is because recall error is likely to increase with the time elapsed between an event and the time of interview. In addition, in some cases in two consecutive waves, although the job starting date given in the later wave falls before the previous wave interview, the discrepancy between the two start dates makes it clear that they refer to two different job spells. We therefore also adopted the rule that if the starting date of a given spell occurs just before the previous wave interview date (that is, during the previous year) and it is more than 1 year removed from the starting date recorded in the previous interview, then this spell is assumed to have started just after the previous wave interview.

*Experience* sums the individual's time spent in paid employment<sup>31</sup> since leaving full-time education. Similar to the tenure variable, it combines the information from the various yearly questionnaires and the retrospective data collected in waves 2 and 3.

The *skill* variable is constructed from the information on the individuals' highest educational qualification. We classified workers into three skill groups as follows. *Unskilled*: No qualifications, other qualifications, apprenticeship, CSE, commercial qualifications, no O levels. *Medium-skilled*: O levels or equivalent, nursing qualifications, teaching qualifications, A levels, other higher qualifications. *University graduates*: 1<sup>st</sup> Degree, Higher degree.

The nominal hourly *wage* is obtained by first dividing the current job's usual gross monthly pay by 4.33 to obtain the weekly wage and then dividing that result by weekly hours. Weekly hours are the sum of the number of hours normally worked per week and the number of overtime hours in a normal week. The nominal hourly wage is then deflated with the Retail Prices Index<sup>32</sup> to obtain real hourly wages.

#### *German Socio-Economic Panel*

*Tenure* in the job was constructed as the period between the exact year and month the individual started the current job and the time of interview. This variable was rounded to the nearest year. Conflicts in the starting dates were resolved by giving priority to the information collected closest to the event occurrence.

The number of years of labor market *experience* is constructed in two stages. In the first stage we use the yearly biographical scheme containing employment information from the age of 16 to the first wave of the panel to construct total experience at entry into the panel. Both part-time and full-time spells are taken into account. In the second stage we use the calendar available for each wave listing all labor market activities for each month in the year preceding the interview. This information is added to the information computed in the first stage to construct experience at each wave. This variable was rounded to the nearest year.

Given the apprenticeship training system in Germany, for our *skill* variable we divided workers into three groups. *Unskilled*: no apprenticeship training and no university degree. *Medium-skilled or apprenticeship trainees*: apprenticeship training. *University graduates*: university degree. Workers who changed skill category were excluded.

The real hourly *wage* was constructed using the information on the reported gross earnings in the month preceding the interview. These excluded any payments by the employer that fell outside regular pay, such as holiday money, back-pay, and overtime. This amount was divided by 4.33 to obtain the weekly wage and then was divided by weekly hours. Weekly hours are derived from the actual number of hours worked per week, based on responses given to the question, "And how much on average does your actual working week amount to, with possible overtime?" Gross nominal hourly wages were deflated by the German consumer price index.

<sup>30</sup>Question text: "What was the date you started working in your present position? If you have been promoted or changed grades, please give me the date of that change. Otherwise please give me the date when you started doing the job you are doing now for your present employer."

<sup>31</sup>Self-employment spells are also included in experience, even though they do not make much difference, since our sample does not include those who were self-employed at the time of the survey.

<sup>32</sup>Monthly values are averaged for each year, with 1991 as the base year. Source: *Economic Trends, Annual Supplement 1999*, Office for National Statistics.

## REFERENCES

- Abraham, Katharine G., and Henry S. Farber. 1987. "Job Duration, Seniority, and Earnings." *American Economic Review*, Vol. 77, No. 3 (June), pp. 278-79.
- Acemoglu, Daron, and Jorn S. Pischke. 1998. "Why Do Firms Train? Theory and Evidence." *Quarterly Journal of Economics*, Vol. 113, No. 1 (February), pp. 79-119.
- \_\_\_\_\_. 1999. "The Structure of Wages and Investment in General Training." *Journal of Political Economy*, Vol. 107, No. 3 (June), pp. 539-72.
- Altonji, Joseph G., and Robert A. Shakotko. 1987. "Do Wages Rise with Job Seniority?" *Review of Economic Studies*, Vol. 54, No. 3 (July), pp. 437-59.
- Altonji, Joseph G., and Nicolas Williams. 1998. "The Effects of Labor Market Experience, Job Seniority, and Job Mobility on Wage Growth." In Solomon Polachek, ed., *Research in Labor Economics*, Vol. 17. Stamford, Conn., and London: JAI Press, pp. 233-76.
- \_\_\_\_\_. 2005. "Do Wages Rise with Job Seniority? A Reassessment." *Industrial and Labor Relations Review*, Vol. 58, No. 3 (April), pp. 370-97.
- Becker, Gary S. 1993. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. Chicago: University of Chicago Press (for NBER).
- Blau, Francine D., and Lawrence M. Kahn. 1996. "International Differences in Male Wage Inequality: Institutions versus Market Forces." *Journal of Political Economy*, Vol. 104, No. 4 (August), pp. 791-837.
- Blumen, Isadore, Marvin Kogan, and Phillip J. McCarthy. 1955. *The Industrial Mobility of Labor as a Probability Process*. Ithaca, N.Y.: Cornell University Press.
- Bonin, Holger. 2005. "Wage and Employment Effects of Immigration to Germany: Evidence from a Skill Group Approach." IZA Discussion Paper 1875, Bonn.
- Brown, James N., and Andrew Light. 1992. "Interpreting Panel Data on Job Tenure." *Journal of Labor Economics*, Vol. 10, No. 3 (July), pp. 219-57.
- Burdett, Kenneth. 1978. "A Theory of Employee Job Search and Quit Rates." *American Economic Review*, Vol. 68, No. 1 (March), pp. 212-20.
- Dustmann, Christian, and Costas Meghir. 2005. "Wages, Experience, and Seniority." *Review of Economic Studies*, Vol. 72, No. 1 (January), pp. 77-108.
- Dustmann, Christian, and Uta Schönberg. 2004. "Training and Union Wages." IZA Discussion Paper 1435, Bonn. Forthcoming in *Review of Economics and Statistics*.
- EMIRE database, European Employment and Industrial Relations Glossaries, <http://www.eurofound.eu.int/emire/emire.html>.
- Finnie, Ross. 1993. "Tenure, Experience, and Men's and Women's Wages: Panel Estimates from the National Longitudinal Survey of Youth." Cahier de recherche 9305. Quebec: Université Laval, Groupe de Recherche en Politique Économique.
- Gibbons, Robert S., and Lawrence F. Katz. 1991. "Layoffs and Lemons." *Journal of Labor Economics*, Vol. 9, No. 4 (October), pp. 351-80.
- Glitz, Albrecht. 2006. "The Labour Market Impact of Immigration: Quasi-Experimental Evidence." University College London Job Market Paper (November); CReAM Discussion paper 12/06.
- Haisken-DeNew, John, and Joachim Frick. 2003. *Desktop Companion to the German Socio-Economic Panel Study (GSOEP)*. Berlin: German Institute for Economic Research.
- Harris, Christopher, and Leonardo Felli. 1996. "Learning, Wage Dynamics, and Firm-Specific Human Capital." *Journal of Political Economy*, Vol. 104, No. 4 (August), pp. 838-68.
- Hashimoto, Masanori. 1981. "Firm-Specific Human Capital as a Shared Investment." *American Economic Review*, Vol. 71, No. 3 (June), pp. 475-82.
- Hunt, Jennifer. 2000. "Firing Costs, Employment Fluctuations, and Average Employment: An Examination of Germany." *Economica*, Vol. 67, No. 266 (May), pp. 177-202.
- Jovanovic, Boyan. 1979. "Job Matching and the Theory of Turnover." *Journal of Political Economy*, Vol. 87, No. 5 (October), pp. 972-90.
- Kugler, Adriana D., and Gilles Saint-Paul. 2000. "Hiring and Firing Costs, Adverse Selection, and Long-Term Unemployment." IZA Discussion Paper 134 (March), Bonn.
- Light, Audrey, and Katharine McGarry. 1998. "Job Change Patterns and the Wages of Young Men." *Review of Economics and Statistics*, Vol. 80, No. 2 (May), pp. 276-86.
- Marcotte, Dave E. 1998. "The Wage Premium for Job Seniority During the 1980s and Early 1990s." *Industrial Relations*, Vol. 37, No. 4 (October), pp. 419-39.
- Metcalfe, David. 1999. "The Low Pay Commission and the National Minimum Wage." *Economic Journal*, Vol. 109, No. 453 (February), pp. F46-F66.
- Nickell, Stephen. 1997. "Unemployment and Labor Market Rigidities: Europe versus North America." *Journal of Economic Perspectives*, Vol. 11, No. 3 (Summer), pp. 55-74.
- Ochel, Wolfgang. 2001. "Collective Bargaining in the OECD from the 1960s to the 1990s." *CESifo Forum*, Winter, pp. 62-65.
- OECD. 1999. *Employment Outlook*. Paris: Organization for Economic Cooperation and Development.
- Office for National Statistics. 1999. *Economic Trends, Annual Supplement*. London.
- Paqué, Karl-Heinz. 1993. "Germany: Living with Tight Corporatism." In Joop Hartog and Jules Theeuwes, eds., *Labour Market Contracts and Institutions*, pp. 209-32. Amsterdam: North-Holland.
- Parent, Daniel. 1999. "Wages and Mobility: The Impact of Employer-Provided Training." *Journal of Labor Economics*, Vol. 17, No. 2 (April), pp. 298-317.
- \_\_\_\_\_. 2000. "Industry-Specific Capital and the Wage Profile: Evidence from the National Longitudinal Survey of Youth and the Panel Study of Income Dynamics." *Journal of Labor Economics*, Vol. 18, No. 2 (April), pp. 306-23.
- \_\_\_\_\_. 2002. "Matching, Human Capital, and the Covariance Structure of Earnings." *Labour Economics*, Vol. 9, No. 3 (July), pp. 375-404.
- Pereira, Sonia. 2002. "Returns to Seniority and Experience in Union and Non-Union Jobs in the U.K." Ph.D. thesis, University College London, October.

- Ryan, Paul. 2001. "School-to-Work Transition: A Cross-National Perspective." *Journal of Economic Literature*, Vol. 39, No. 1 (March), pp. 34–92.
- Schönberg, Uta. 2007. "Testing for Asymmetric Employer Learning." *Journal of Labor Economics*, Vol. 25, No. 4 (October), pp. 651–91.
- Scoones, David, and Dan Bernhardt. 1998. "Promotion, Turnover, and Discretionary Human Capital Acquisition." *Journal of Labor Economics*, Vol. 16, No. 1 (January), pp. 122–41.
- SOEP Group. 2001. "The German Socio-Economic Panel (SOEP) after More Than 15 Years—Overview." In Elke Holst, Dean R. Lillard, and Thomas A. DiPrete, eds., *Proceedings of the 2000 Fourth International Conference of German Socio-Economic Panel Study Users (GSOEP2000)*, Vierteljahrshefte zur Wirtschaftsforschung, Jg 70, Nr. 1, S. 7–14.
- Steedman, Hillary, Howard Gospel, and Paul Ryan. 1998. "Apprenticeship: A Strategy for Growth." CEP Discussion Paper No. CEPSP11, London.
- Topel, Robert H. 1991. "Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority." *Journal of Political Economy*, Vol. 99, No. 1 (February), pp. 145–76.
- Topel, Robert H., and Michael P. Ward. 1992. "Job Mobility and the Careers of Young Men." *Quarterly Journal of Economics*, Vol. 107, No. 2 (May), pp. 445–79.
- Williams, Nicolas. 2004. "Seniority, Experience, and Wages in the U.K." Mimeo, University of Cincinnati.