Darmstadt Discussion Papers in Economics

Transatlantic Differences in Labour Markets
Changes in Wage and Non-Employment Structures in the 1980s and the 1990s

Patrick A. Puhani

Nr. 156

Arbeitspapiere
des Instituts für Volkswirtschaftslehre
Technische Universität Darmstadt

ISSN: 1438-2733

Applied Research in Economics

Transatlantic Differences in Labour Markets

Changes in Wage and Non-Employment Structures in the 1980s and the 1990s

Patrick A. Puhani
Darmstadt University of Technology; SIAW, University of St. Gallen; IZA, Bonn; WDI, Ann Arbor, MI

November 2005

JEL classification: J21, J31, J64

Keywords: wage, earnings, unemployment, non-employment, rigidity, identification

Patrick A. Puhani
Darmstadt University of Technology
Residenzschloss S313/138, Marktplatz 15
64283 Darmstadt
Germany

Phone: *++49 – 6151 – 16-3693*
Fax: *++49 – 6151 – 16-3897*
E-Mail: puhani@vwl.tu-darmstadt.de

Abstract: Rising wage inequality in the U.S. and Britain and rising continental European unemployment have led to a popular view in the economics profession that these two phenomena are related to negative relative demand shocks against the unskilled, combined with flexible wages in the Anglo-Saxon countries, but wage rigidities in continental Europe ('Krugman hypothesis').

This paper tests this hypothesis based on seven large person-level data sets for the 1980s and the 1990s. I use a more sophisticated categorisation of low-skilled workers than previous studies, which highlights the distinction between German workers with and without apprenticeship training. I find evidence for the Krugman hypothesis when Germany is compared to the U.S. However, supply changes differ considerably between countries, with Britain experiencing enormous increases in skill supply explaining the relatively constant British skill premium in the 1990s.

1 Introduction

The last quarter of the 20th century has seen a significant increase in wage inequality in the United States and Great Britain. However, this phenomenon has not been observed for Germany to a similar extent (*cf.* Gottschalk and Smeeding, 1997; Steiner and Wagner, 1998; Fitzenberger, 1999; Katz and Autor, 1999; Acemoglu, 2003[1]). In Germany (and other continental European countries), a significant rise in unemployment has occurred in the 1980s and the 1990s, which contrasts with the fall in British and U.S. joblessness rates, especially during the 1990s. This difference in wage inequality and unemployment developments across the Atlantic led to a view which is sometimes called the 'Krugman hypothesis' (Krugman, 1994). It states that the rise in wage inequality in the Anglo-Saxon countries and the rise in unemployment in continental Europe are 'two sides of the same coin', namely a fall in the relative demand for unskilled workers.[2]

This paper uses several (seven in total) person-level data sets to test whether the low skilled experienced a negative net demand shock in the U.S., Britain, and western Germany in the 1980s and the 1990s and whether relative wage behaviour for the low skilled was rigid in western Germany but not in the Anglo-Saxon countries. If there is something to the Krugman hypothesis, then Germany – the country with increasing average unemployment – should have experienced a change in the unemployment/non-employment structure such that the relative unemployment likelihood of the unskilled has increased. The U.S. and Britain, however, should have seen a

[1] The large increase in the 90/10 decile ratio reported in Table 1a in Acemoglu (2003) for the early 80s is most likely due to a change in the underlying original data set for Germany, which occurred in the Luxembourg Income Study between 1981 and 1984 (http://www.lisproject.org/techdoc/ge/geindex.htm).

[2] The main reason for this fall in relative demand for unskilled workers seems to be skill-biased technological change, rather than trade/globalisation (*cf.* Katz and Murphy, 1992; Berman, Bound, and Machin, 1998; Machin and Van Reenen, 1998; Pflüger, 2001; Acemoglu, 2002). See Card and DiNardo (2002) for an alternative view for the U.S. and Goux and Maurin (2000) for France.

stable (or converging) unemployment but a flexible wage structure.[3] Unlike previous papers, my results will point to the crucial role of the German apprenticeship system in shielding a large section of German workers from the negative demand shocks experienced by low-skilled workers in the United States and Britain (prominent related studies are Nickell and Bell 1995; 1996; Blau and Kahn, 1996; Gottschalk and Joyce 1998; Krueger and Pischke, 1997; Card, Kramarz, and Lemieux, 1999; Kahn, 2000; Acemoglu, 2003).[4] My results are also supportive of recent discussions in Britain to boost vocational education, which are in part influenced by the German apprenticeship system.[5]

The paper is structured as follows. Section 2 describes the data sets used. Studies that analyse a wider spectrum of countries often must compromise on data quality (*cf.* Blau and Kahn, 1996; Gottschalk and Joyce, 1998; Kahn, 2000; Acemoglu, 2003). The Luxembourg Income Study (LIS), for example, contains micro data on many countries, but often only monthly wages for household heads. Furthermore, one has at most 4 waves available for a two-decade period. Hence it is impossible to trace the developments in the 1980s and 1990s in a robust fashion with these data. Similar reservations apply to the International Social Survey Programme (ISSP) data, where in addition the sample size per country is rather small (about 1,000-2,000 observations). Therefore, for each country investigated in this paper, I use at least one data set with 150,000

[3] Figure 1 plots unemployment rates for the U.S., Britain, and Western Germany from 1980 to 2000. Although there are some issues concerning comparability mentioned in the note to the figure, one may argue that the increase in British and German unemployment in the 1980s was more like a 'catch-up' to standard U.S. levels. It was British, not German unemployment that became exceptionally high during this period. However, in the 1990s both British and U.S. unemployment fell markedly, whereas German unemployment ratched up again. From a macro perspective one might wonder whether this divergence is just a temporary cyclical phenomenon. However, it is the fact that the U.S. and Britain experienced significantly larger increases in wage inequality than Germany, especially in the 1980s when hourly wage inequality in Germany seems to have fallen as Figure 2 shows, which evoked wage rigidity explanations for rising continental European unemployment and made the Krugman hypothesis so widely accepted.

[4] Estimates of structural models of nominal and/or real wage rigidities in Germany are provided in Beissinger and Knoppik (2001), Bauer, Bonin and Sunde (2003), Fehr, Götte and Pfeiffer (2003), and Cornelißen and Hübler (2005), for example.

[5] Reform proposals of the Tomlinson report are available on http://www.dfes.gov.uk/14-19/.

workers or more in the labour force (with Britain in the 1980s as the only exception). I also check the sensitivity of my results using more than one data source for both Britain and western Germany in the 1990s.

Differences in the changes of the relative skill (proxied by education) supply structures between countries are documented in Section 3. Section 4 presents a 'microeconometric' (using person-level data) test of the Krugman hypothesis in the form of statistical inference on changes in the wage and unemployment as well as non-employment structures. Consistent with the Krugman hypothesis, the results support the view that the rise in German unemployment was accompanied by insufficiently flexible wages in face of negative demand shocks against the unskilled. The affected groups are young workers and those with an education below apprenticeship training. Section 5 concludes.

2 Data

For the United States, I use the Current Population Survey Merged Outgoing Rotation Group (CPS-MORG) files. This is a representative and comfortably large data set frequently used in the related literature. For Britain and western Germany, I use three different data sets. For Britain, the (large) British Labour Force Survey (BLFS) and the British Household Panel Study (BHPS) provide the desired information for the 1990s, but for the 1980s, I have to use the General Household Survey (GHS), for reasons explained below. For Germany in the 1990s, I use the German Socio-Economic Panel (GSOEP), the (large) German Labour Force Survey (*Mikrozensus*, GLFS), and a (large) German administrative data set (IABR). Only the latter survey is available since the beginning of the 1980s, when German unemployment increased sharply.

The optimal data set for my purposes would (1) be representative for the whole population of a country, (2) contain a definition of labour force states in accordance with the International Labour Office (ILO) definition, (3) have accurate information on hourly wage rates, and (4) contain enough observations to guarantee precise statistical measurement.

The U.S. CPS fulfills virtually all these criteria, although wages would be measured more accurately with administrative data. There has been a recoding of the education variable in 1992, which is treated as suggested by Jaeger (1997). Furthermore, I exclude all imputed earnings whenever they are flagged. However, I checked that the inclusion or exclusion of the flagged imputed wages made virtually no difference to my results (*cf.* Hirsch and Schumacher, 2002).

The British Labour Force Survey (BLFS) is similar to the CPS, but there is no wage information before 1993 in the BLFS and until 1996. The BHPS has a much smaller sample size than the BLFS, but no clear advantages, except that it can be used as a robustness check. As the provided education variable in the BHPS is coded slightly differently than in the BLFS, I recoded the BHPS variable to make the two data sets better comparable. People on government schemes are identifiable in each wave and are counted as out of the labour force. For the 1980s, I use the General Household Survey (GHS), as the BLFS has no wage information during this period and the BHPS has not existed yet. The definition of O-level (exams at about the level of U.S. junior high school) and A-level (exams at about the level of U.S. high school) equivalents is different in the GHS from the BLFS, but these differences are not key to the results below. Due to the design of the GHS, I use only full-time workers to measure changes in the structure of wages, but all workers are used to estimate changes in un-/non-employment structures.

For Germany, the data situation is also complicated (*cf.* Zimmermann and Wagner, 2002, p. 113). The GSOEP fulfills all criteria except (4), large sample size, and (3) in the sense that it

does not contain administrative wage data. The administrative IABR data is strong on criteria (3) and (4) except that this data is top-coded, excludes very low-wage workers, as well as civil servants. Also, hours of work are not reported, only a full-time/part-time indicator. Moreover, this data set does not meet requirements (1) and (2), as it is only sampling workers and people registered with the labour office who receive some form of unemployment benefit. One does not know whether these persons are really searching and are available for work in the short term, as required by the ILO definition of unemployment. Nevertheless, for what it measures, the IABR has the most accurate wage data available for Germany. As this data comes in spell form, I sample people on the 10th of April each year. The German Labour Force Survey (GLFS) meets criteria (1), (2), and (4), but fails on (3), as it only measures after-tax (hourly) income within intervals. This income can come from any sources, not just labour. Also, the top interval is open (implying top coding). Hence, as none of the German data sets comes close to being optimal for my purposes, it is worthwhile to consider all three data sets for Germany to check the robustness of the results for the 1990s. For the complete 1980s, only the IABR data are available.

If feasible, I create a gross hourly wage variable (including overtime). This is possible in all countries and data sets except the IABR and the GLFS: in the IABR, I only use full-time workers as hours of work are not available; in the GLFS, I create a net hourly income variable for employed people as a proxy for the hourly wage. Wages of apprentices are excluded in all German data sets for the wage regressions below. In all countries and data sets, wages of self-employed workers are excluded in the analysis of wage structures, but self-employed workers are counted as employed in the analysis of unemployment and non-employment.

Similarly to the previous literature, I measure skill in the education dimension. Education is discretised into 4-5 groups depending on the data set and country. In order to acknowledge

diversity in the educational systems between countries, I preserve the national education categories instead of allocating American labels to non-American degrees. This would be especially difficult in Germany, which operates an apprenticeship system which has no direct equivalent in the U.S.[6]

As some of the previous literature assumes the absence of relative supply shocks, Section 3 provides a descriptive analysis of supply structures before the empirical methodology is developed in Section 4.

3 Differences in Supply Changes Across Countries

The graphs in Figure 3 demonstrate that, first, *even within each decade*, there were substantial supply side changes within the analysed economies (the results presented in the following are robust to the choice of the labour force instead of the working age population as the proxy for supply). Second, these figures show that the supply side changes *differed* between the three countries.[7] It is shown in the graphs that, both in the 1980s and the 1990s, all countries have experienced skill upgrading in their working age populations (the same holds for the labour forces). Indeed, all data sets show an increase in the share of workers who have a degree as well as a decrease in the share of workers with the lowest level of education. However, it is very clear just from visual inspection of the graphs that these changes were most dramatic in Britain, caused by educational reforms (*cf.* Machin, 1996; 1998). The share of workers with no qualification in the working age population (as well as in the labour force) decreased by about 10 percentage points in Britain during the 1990s and by even more than 10 percentage points in the 1980s

[6] Numbers of observations for each data set and sample unemployment and non-employment rates for different skill groups (using sampling weights as provided in the respective data sets) are available in the Internet Appendix.

(slight differences between the GHS and BLFS definitions of *O-level equivalents* account for small differences in the absolute shares of those below *O-level equivalent*).

In the light of these results, the following section will apply a methodology to test the Krugman hypothesis without making any assumptions on the nature of supply (or demand) shocks.

4 Differences in the Changes of the Wage, Unemployment, and Non-Employment Structures

4.1 Identification of Relative Net Demand Shocks and Relative Wage Rigidities

The methodology applied in this section identifies relative *net* demand shocks (*i.e.* 'increasing' and 'decreasing' labour markets) and wage rigidities from estimates based on person-level data. Conceptually, it draws on Nickell and Bell (1996) and Gottschalk and Joyce (1997) in that it uses unemployment/non-employment as a measure of quantity rationing (*i.e.* the failure of the market to clear) in the presence of wage rigidities. However, unlike these previous studies, I consider several classes of skill in the education dimension and control for these as well as other labour market characteristics (age, gender, region) in a regression framework in *both* the wage *and* unemployment models. As a sensitivity check, I also use non-employment (instead of unemployment) as a measure for quantity rationing. The modelling approach does not exclude that there is competition between heterogeneous types of labour.

[7] There were also substantial differences in the changes of the age structures between the three countries. I will therefore – among other variables – control for age in the regressions below to account for changes in other dimensions of skill than education.

Theoretical Justification – Net Demand Shocks

In order to make out increasing and decreasing labour markets, I develop a model that shows how 'net demand shocks' can be identified from the observation of wage and unemployment/non-employment changes. The framework rests on a neoclassical model of the labour market:

$$S_t = S_t\left(W_t, Z_t\right) \qquad (L\times 1 \text{ vector of labour supplies})$$

$$D_t = D_t\left(W_t, Z_t\right) \qquad (L\times 1 \text{ vector of labour demands})$$

where D_t and S_t denote vectors of labour demand and supply for L different labour markets, respectively. W_t is a vector of wage rates and Z_t is a vector of demand and/or supply 'shift factors', like the size of the labour force, technological change or domestic and foreign demand.

Unemployment or non-employment can arise due to a real wage rigidity that causes quantity rationing (*i.e.* the failure of the market to clear). Unemployment due to rigid wages can be expressed as a function of the vector of wage rates and supply/demand shift factors as

$$U_t = \frac{\left(S_t - D_t\right)}{S_t} = 1 - \frac{D_t\left(W_t, Z_t\right)}{S_t\left(W_t, Z_t\right)} = U_t\left(W_t, Z_t\right) \qquad (1)$$

($L\times 1$ vector of unemployment rates).

In practice frictional unemployment may be higher for some groups than for others. In order to net out this effect, it is useful to observe *changes* in unemployment and wages between two points in time t (1980 or 1991 in this paper) and $t+\tau$ (from 1981 to 1990 or from 1992 up to 2001 in this paper).[8] Using a Taylor expansion one obtains

[8] Data availability is the reason for a separate consideration of the 1980s and the 1990s. Data availability (for Germany) is also the reason why 1991 and not 1990 is chosen as the base year for the 1990s. Below, I will also discuss sensitivity checks with respect to the base year.

$$\Delta_t^{t+\tau} U^l \approx \underbrace{U_W^{l,l} \cdot \Delta_t^{t+\tau} W^l}_{\text{own wage effect}} + \underbrace{\underbrace{\sum_{j \neq l} U_W^{l,j} \cdot \Delta_t^{t+\tau} W^j}_{\text{cross wage effects}} + \underbrace{\sum_j U_Z^{l,j} \cdot \Delta_t^{t+\tau} Z^j}_{\text{pure net supply shift effects}}}_{\text{net supply shift effect } \xi^l} \tag{2}$$

where $U_W^{l,l}$, $U_W^{l,j}$, and $U_Z^{l,j}$ are elements of the Jacobian derivative of U referring to the own wage (the wage in the same labour market), the wages in other labour markets, and the demand/supply shift factors, respectively.

Economic theory allows to impose a light restriction, which is helpful for identification in the econometric analysis: if labour supply and demand schedules are 'upward' and 'downward sloping', respectively, then $U_W^{l,l}$ will be positive, because a *ceteris paribus* increase of the own-wage will increase unemployment in the corresponding labour market. $U_W^{l,l}$ will also be positive in other cases, one of them being 'backward-bending' labour supply behaviour in case the slope of the demand curve is less steep than the one of the supply curve and there is no excess demand for labour. It therefore seems innocuous to impose the restriction that $U_W^{l,l}$ is positive.

As to the sign of the cross-wage effects $U_W^{l,j}$, economic theory has little to say. This is also true for the sign of the derivative of unemployment with respect to the supply/demand shift variables, $U_Z^{l,j}$, as these variables subsume a wide range of unspecified factors. Note that no assumption is made on the size of substitution or any other demand or supply elasticities. These weak assumptions come at the price of not being able to measure demand or supply shocks and wage rigidity *quantitatively*. However, as can be deduced from equation (2), observation of the signs of the changes in wage and unemployment rates between two points in time identify the *sign* of the change in the net supply shift effect (*i.e.* the net supply shock)

$$\xi^l = \underbrace{\sum_{j \neq l} U_W^{l,j} \cdot \Delta_t^{t+\tau} W^j + \sum_j U_Z^{l,j} \cdot \Delta_t^{t+\tau} Z^j}_{\text{net supply shift effect}}$$

in 7 out of 9 cases (distinguished by the sign of wage and unemployment changes, similarly as in Table 1). Note that a negative net demand shock is equivalent to a positive net supply shock, *i.e.* $\xi^l > 0$. A negative net demand shock implies a 'decreasing' market, that is, at a given wage, demand is falling faster than supply.

Relative Net Demand Shocks

However, the question posed by the Krugman (1994) hypothesis is not whether low-skilled workers experienced a negative net demand shock, but whether they faced a *relative* negative net demand shock. A relative negative net demand shock for a labour market *l* means that the net demand shock experienced by this market is more negative than the one affecting the reference market *r* (the latter refers to an 'average' market and is defined to be the *1980* or *1991 sample mean* of the labour force or of the working age population in this paper). Identification of relative net demand (or supply) shocks is based on observing relative wage and unemployment changes: $\left[\Delta_t^{t+\tau} W^l - \Delta_t^{t+\tau} W^r\right]$ and $\left[\Delta_t^{t+\tau} U^l - \Delta_t^{t+\tau} U^r\right]$.

The identification of relative net demand shocks also requires an additional assumption, namely $U_W^{l,l} \approx U_W^{r,r}$ (*i.e.* the *ceteris paribus* responsiveness of unemployment to the own-wage has to be roughly equal in all markets including the reference market). Using a Taylor approximation as for the derivation of (2) one can write:

$$\left[\Delta_t^{t+\tau}U^l - \Delta_t^{t+\tau}U^r\right] \approx$$
$$U_W^{l,l}\cdot\Delta_t^{t+\tau}W^l - U_W^{r,r}\cdot\Delta_t^{t+\tau}W^r + \sum_{j\neq l}U_W^{l,j}\cdot\Delta_t^{t+\tau}W^j - \sum_{j\neq r}U_W^{r,j}\cdot\Delta_t^{t+\tau}W^j +$$
$$\sum_j U_Z^{l,j}\cdot\Delta_t^{t+\tau}Z^j - \sum_j U_Z^{r,j}\cdot\Delta_t^{t+\tau}Z^j \quad . \qquad (3)$$

Imposing $U_W^{l,l} \approx U_W^{r,r}$ yields:

$$\left[\Delta_t^{t+\tau}U^l - \Delta_t^{t+\tau}U^r\right] \approx U_W^{l,l}\left[\Delta_t^{t+\tau}W^l - \Delta_t^{t+\tau}W^r\right] + \xi^{l,r} \qquad (4)$$

where

$$\xi^{l,r} = \sum_{j\neq l}U_W^{l,j}\cdot\Delta_t^{t+\tau}W^j - \sum_{j\neq r}U_W^{r,j}\cdot\Delta_t^{t+\tau}W^j + \sum_j U_Z^{l,j}\cdot\Delta_t^{t+\tau}Z^j - \sum_j U_Z^{r,j}\cdot\Delta_t^{t+\tau}Z^j$$

is the relative net supply shock.

Hence, by observing relative wage and unemployment changes, $\Delta_t^{t+\tau}W^l - \Delta_t^{t+\tau}W^r$ and $\Delta_t^{t+\tau}U^l - \Delta_t^{t+\tau}U^r$, and noting that equation (4) holds, even without knowledge of $U_W^{l,l}$, the sign of the relative net supply shock $\xi^{l,r}$ (which is the negative of the relative net demand shock) can be identified. $\xi^{l,r}$ is the basis for the classification into 'increasing' ($\xi^{l,r} < 0$) or 'decreasing' ($\xi^{l,r} > 0$) markets of labour market characteristics in Table 1 as will be shown in the following subsection.

Empirical Implementation

In order to take the above concepts to individual (person-level) data, I define a labour market *l* by its characteristics $\mathbf{x}_l$ (*e.g.* education, age, gender, region; the subscript *l* will be dropped hereafter), and denote the reference labour market *r* by $\bar{\mathbf{x}}$ (the 1980 or 1991 sample mean of the labour force). *W* and *U* are defined as expected values of the wage rate *w* and the

unemployment indicator $u = 1(\textit{unemployed})$, respectively. $1(\bullet)$ is the indicator function which takes on value *1* if the argument is true and *0* otherwise. Hence I define

$$\left[\Delta_t^{t+\tau} W^l - \Delta_t^{t+\tau} W^r\right] \equiv E\left[w_{t+\tau} - w_t \,|\mathbf{x}\right] - E\left[w_{t+\tau} - w_t \,|\bar{\mathbf{x}}\right]$$

$$\left[\Delta_t^{t+\tau} U^l - \Delta_t^{t+\tau} U^r\right] \equiv E\left[u_{t+\tau} - u_t \,|\mathbf{x}\right] - E\left[u_{t+\tau} - u_t \,|\bar{\mathbf{x}}\right].$$

In order to identify labour market *characteristics* associated with relative earnings or unemployment changes, I parameterise the distributions of w and u in the following way:

$$E\left[\ln w_t \,|\mathbf{x}\right] = \mathbf{x}\boldsymbol{\beta}_t$$

$$E\left[u_t \,|\mathbf{x}\right] = \Phi\left(\mathbf{x}\boldsymbol{\gamma}_t\right)$$

where $\Phi(\bullet)$ denotes the cumulative distribution function of the standard normal distribution. These regressions are estimated using person-level data. A transformed version of the (dummy variable) coefficients of these non-linear parametric regression models forms the basis for the classification of each labour market characteristic x_k (*e.g.* low level of education as a proxy measure for a low level of skill) to its contribution to relative wage and unemployment changes. This contribution is measured by the changes in the transformed (denoted by an asterisk) coefficients over time: $\left(\beta^*_{t+\tau,k} - \beta^*_{t,k}\right)$ and $\left(\gamma^*_{t+\tau,k} - \gamma^*_{t,k}\right)$, respectively. The transformed coefficients (as well as their standard errors) are calculated as in Haisken-De New and Schmidt (1997): $\boldsymbol{\beta}^*_t = (\mathbf{I} - \mathbf{W})\boldsymbol{\beta}_t$, $\boldsymbol{\gamma}^*_t = (\mathbf{I} - \mathbf{W})\boldsymbol{\gamma}_t$, where $\mathbf{I}$ is the identity matrix and $\mathbf{W}$ is a matrix containing weights, which in my case are the *base period* (1980 or 1991) *sample means*. This transformation sets the 'base category' for all dummy variables equal to the *base period sample mean*. It can be shown that due to the non-linearity of the log-linear wage regression and the

probit model, this transformation is necessary to interpret changes in the coefficients over time as contributions to rising relative wages or unemployment likelihoods. Hence, instead of classifying each conceivable labour market defined by all dummy variable groups, one can just classify each labour market characteristic x_k into one of the nine cells defined in Table 1, depending on whether it contributed to a rising, constant, or falling relative wage rate or unemployment likelihood. The joint observation of the associations of a labour market ('skill') characteristic with changes in wage and unemployment/non-employment changes identifies both whether the characteristic (*e.g.* low level of education) is experiencing a net relative demand shock *and* whether it is affected by a relative wage rigidity. This is the approach taken in the following subsection.

4.2 Empirical Results on Relative Net Demand Shocks and Relative Wage Rigidities

In order to focus the discussion on the test of the Krugman hypothesis, Table 2 to Table 3 present the classification results as defined in Table 1 for the low-skilled groups only. Table 2 reports results for the 1980s with 1980 as the base year, after which unemployment rose sharply (*cf.* Figure 1). Results for the 1990s are displayed in Table 3.[9] Between 4 and 5 different categories in of educational levels are distinguished in the estimations (depending on the data set, as exhibited in Figure 3), rather than only allowing for 2 skill types as in the studies by Nickell and Bell (1996) or Gottschalk and Joyce (1997). This is important because the low-skilled group is not as homogeneous in Germany as it is in the Anglo-Saxon countries, as more than half of the German population has received vocational training (apprenticeship), whereas just 20 percent have

[9] The choice of 1992 as the base year in the CPS is due to the definition change of the education categories between 1991 and 1992. In the following, I will also discuss results for 1991 and 1993 as the base year when considering

obtained only ordinary school education. This latter share is much higher in the Anglo-Saxon countries, at around 50 percent in the U.S. and even higher in Britain in the 1990s (*cf.* Figure 3).

The classification results are based on two-sided *t*-tests with the null hypothesis that there were no changes in the coefficients of the wage or the unemployment/non-employment equation for a certain low-skill characteristic, *e.g.* education below apprenticeship level, between the base year (1980 or 1991) and the reporting year mentioned at the top of each column. Sizes of 5 percent of these *t*-tests correspond to a *level* of 10 percent (which is the upper bound of the true size, the lower bound being 5 percent) of the Bonferroni joint test of the null hypothesis $\left(\hat{\beta}^*_{t+\tau,k} - \hat{\beta}^*_{t,k}\right) = \left(\hat{\gamma}^*_{t+\tau,k} - \hat{\gamma}^*_{t,k}\right) = 0$. As I do not want the level of the joint test to exceed 10 percent, I only consider 5 percent critical values for the *t*-statistics. This testing procedure allows for correlations in the error terms of the wage and unemployment regressions without imposing functional forms on their joint distribution.

Depending on the test results each skill characteristic is classified into one of the nine fields as exhibited in Table 1 (tables and figures of detailed estimation results are presented in the Internet Appendix; figures of estimated education coefficients in the wage and unemployment regressions are displayed in Figure 4 and Figure 5. Classification results for the control variables gender and region are not presented here, but are available on request.[10] The type of classification is reported as a number which is explained in the note to the tables and also corresponds to the numbers in Table 1. If the Krugman (1994) hypothesis were to hold, one would expect that low-skilled categories in western Germany be classified as (1): 'strongly rigid', (2): 'weakly rigid in a decreasing market', or, if wages were somewhat but not sufficiently flexible, as (3): 'weakly

---

the *age* dimension of skill. The results are robust with respect to the choice of base year. The year 1993 is chosen as base in the BLFS because there is no information on wages before this year.

[10] The working paper version also contains classification results with respect to different age groups.

adjusting in a decreasing market'. In the U.S. and in Britain, one would only expect relative wage adjustments, but no changes in relative quantity rationing (at least not to the disadvantage of the unskilled). Hence, low-skilled characteristics for these countries should be classified as (4): 'strongly adjusting in a decreasing market'. Although there is evidence for the Krugman hypothesis in the data, it turns out that the results are not as 'clean'.

Testing the Krugman Hypothesis with Respect to the Education Dimension of Skill

Table 2 and Table 3 present classification results for the education coefficients (as a proxy measure for skill) in the three countries for the 1980s and 1990s, respectively. I report only the two lowest education groups in each country, which are *high school* and *high school dropouts* in the U.S., *O-level equivalent* and *below O-level equivalent* in Britain, and *apprenticeship* and *below apprenticeship* in western Germany. For the lowest education groups in these countries, there is a clear contrast between the Anglo-Saxon economies on the one hand, and western Germany on the other: The large data sets in Germany predominantly display classifications (1): 'strongly rigid' (GLFS data) and (3): 'weakly adjusting in a decreasing market' (IABR data): results here are similar for the 1980s and the 1990s.[11] In the U.S., by contrast, only the 'flexible' classifications (4): 'strongly adjusting in a decreasing market' and (9): 'converging' are observed in the 1990s (classification (4) also dominates during the end of the 1980s). In Britain, the least skilled group seems not to have experienced a negative relative *net* demand shock in the 1990s as it did in the 1980s (in the 1980s there are much fewer 'rigid' classifications (3) for the British than the German low skilled). However, as discussed in Section 3, there was a massive decrease in the relative supply of the least educated group in Britain in the 1990s (*cf.* Figure 3), which

[11] The point estimates of the small GSOEP data set also suggest rising relative unemployment for the least skilled and falling relative wages, but especially the former are mostly not significant as the classifications in Table 3 show.

must have netted out a relative 'gross' demand shock against this group. Hence, although the differences between western Germany and the United States are striking and consistent with the Krugman hypothesis, the British evidence points to the potential importance of supply side effects, which clearly differed between countries as shown in Section 3.[12]

Considering the second lowest skill groups, there is no consistent picture supporting the Krugman hypothesis: In the U.S., classifications (4): 'strongly adjusting in a decreasing market' and (9): 'converging' alternate for high school graduates in the 1990s and classification (4) predominates in the 1980s. The evidence from the large British BLFS data set, however, suggests insufficiently flexible relative wages in terms of classification (3): 'weakly adjusting in a decreasing market' for the 1990s (nothing much happened in the 1980s). In western Germany, the evidence for the 1990s is not robust, with the GLFS exhibiting relative wage rigidity in the form of classification (2): 'weakly rigid in a decreasing market' but the IABR and GSOEP data suggesting otherwise (where classifications (6): 'strongly adjusting in an increasing market' and (7): 'weakly adjusting in an increasing market' prevail). The 1980s evidence supports the view that workers with apprenticeship training were not affected by relative wage rigidities in western Germany: over the decade as a whole, they experienced a positive instead of a negative net demand shock (classification (7)).

If I use *non-employment* as the measure for quantity rationing (*cf.* the lowest panel of Table 2 for the 1980s and the lower panel of Table 3 for the 1990s), the results for the 1990s are

[12] In the 1980s, choosing 1981 or 1982 instead of 1980 as the base year leads to similar results: The contrast between the Anglo-Saxon economies and Germany becomes even stronger, as the rigid classification (3) vanishes almost completely in these robustness checks for the United States and Britain, but not for western Germany. The German results are also robust to choosing 1984 as base year (this check is warranted by the inclusion of fringe benefits in wage measurement in the IABR since 1984, *cf.* Steiner and Wagner, 1998).
In the 1990s, the classification results for western Germany are robust to the choice of 1992 or 1993 as the base period in *all three* data sets and in both the models with unemployment and non-employment as the measure for quantity rationing (there are only minor deviations which do not alter the interpretation of the results). The same

very similar to those obtained for *unemployment* as the measure for quantity rationing, except that in the British BLFS the lowest instead of the second lowest skill group displays relative wage rigidity. For the 1980s, however, the Krugman hypothesis breaks down if non-employment is used as the measure for quantity rationing, because wages for the lowest skill groups are now indicated to be rigid in the sense of classification (3), 'weakly adjusting', in both Britain and the United States (for Germany, the only data set available for the complete 1980s is the IABR, which does not allow to measure non-employment as opposed to unemployment). [13]

The Importance of Apprenticeship Training in Germany and Supply Changes in Britain

The differences in the results for the two lowest education categories substantiate the value of considering various dimensions of skill as well as more detailed *national* education characteristics. Unlike previous studies like Nickell and Bell (1996) and Gottschalk and Joyce (1998), I show that distinguishing between additional than just high- and low-skilled groups reveals more sophisticated results: Indeed, both in the 1980s and the 1990s, evidence for Krugman's hypothesis can only be found for the least skilled education groups, but not for German workers with an apprenticeship certificate. The relative supply of apprenticeship certificate holders has not fallen at all in western Germany in the 1980s and not fallen by much during the 1990s (*cf.* Figure 3c). This evidence is consistent with a point made by Nickell and Bell (1996) and Freeman and Schettkat (2000), namely that a large part of the 'low-skilled' in

holds for the British BHPS data with 1992 or 1993 as the base, as well as the U.S. results if 1993 is chosen as the base period.

[13] As in the case of the lowest education groups, the classification results for the second-lowest education groups are robust to the choice of alternative base years. For the 1980s, there is no change to the main results if 1981 or 1982 instead of 1980 is chosen as base year. The German results are also robust to choosing 1984 as base year (this check is warranted by the inclusion of fringe benefits in wage measurement in the IABR since 1984, *cf.* Steiner and Wagner, 1998). For the 1990s, the classification results for the second-lowest education groups are robust to the choice of 1992 or 1993 as base period in all three German data sets; and in the British BLFS in both the models with unemployment and non-employment as the measure for quantity rationing. The U.S. results are also robust when 1993 is chosen as the base period (note that 1991 is not a useful choice due to the definition change of the education variable between 1991 and 1992; *cf.* Section 2).

Germany may have a higher level of human capital than their peers in the Anglo-Saxon countries due to the training they receive through the German apprenticeship system. Indeed, the evidence presented here raises doubts on whether workers who have gone through Germany's apprenticeship system experienced the same relative negative demand shocks as American high school graduates. Previous studies have lumped several low-skilled groups together and therefore blurred this interesting finding: A German-style apprenticeship education seems to convey skills that are of a rather different quality than the American high school (which provides classroom, but no vocational training). Consequently, the major low-skilled groups in the U.S. and Germany do not seem to have experienced the same relative negative demand shocks. However, what supports the view that negative relative demand shocks against the unskilled have been experienced across the industrialised world is that German workers with an educational level below apprenticeship have been affected by such shocks both in the 1980s and in the 1990s. Although my classification results identify only relative *net* demand shocks for the least skilled in western Germany, the fact that the supply of this group in terms of the working age population (and of the labour force) fell (*cf.* Figure 3c) leads to the conclusion that the negative relative *net* demand shock has been generated by a negative relative 'gross' supply shock and an even more negative relative 'gross' demand shock.

Apart from relying on the classification results based on statistical inference, a look at the point estimates presented graphically in Figure 4 and Figure 5 helps to illustrate the different experiences of the three countries. The U.S. educational wage structure displayed in Figure 4a and Figure 5a shows how educational wage inequality increased fairly smoothly throughout the two decades (there might be short pauses in this trend in the late-1980s and the mid-1990s). By contrast, both the educational unemployment (and non-employment) structures became more equal since the mid-1980s. The most striking support for Krugman's hypothesis is revealed by a

comparison of the changes in western Germany's unemployment structure with the one of the U.S. in the 1990s (*cf.* Figure 5a and Figure 5c). The German unemployment structure has become more *unequal*, whereas the one in the U.S. has become more *equal*. This is exactly what the Krugman hypothesis states. The least educated in western Germany have also faced an increase in their non-employment likelihood in this period, which is not the case for the least skilled in the U.S., who have experienced a decrease (results are available upon request). However, albeit insufficiently flexible, the west German wage structure has not been completely rigid according to the administrative IABR data set (*cf.* Figure 5c for the 1990s and Figure 4c for the 1980s).

What about Britain? Figure 5b shows that, compared to the U.S. experience, the British educational wage structure was fairly stable during the 1990s, although the developments were similar in both countries in the 1980s (*cf.* Figure 4a/b). The educational unemployment structure did not become much more unequal in neither the 1980s nor the 1990s (*cf.* Figure 4b and Figure 5b), which contrasts with the German experience, especially when the least skilled are considered in the 1990s. What is interesting about comparing Britain and Germany in the 1980s is that despite large increases in the *aggregate* unemployment rate in both countries in the early 1980s with a subsequent decrease in the late 1980s (*cf.* Figure 1), in Britain, these shocks were not accompanied by large swings in the *structure* of unemployment as they were in Germany. This is further support for the view that unemployment in Germany is more related to the failure of relative wages between skill groups to clear the markets, so that we observe changes in relative quantity rationing. This illustrates the rigidity of the relative wage structure in Germany. For Britain, the broad picture that a stable wage structure could be sustained in the 1990s, without relative unemployment increases for the least educated as in western Germany, can be explained by the substantial relative supply changes as discussed in Section 3.

Are There Alternative Explanations?

Sample Selection

Although the evidence presented here (especially when western Germany and the U.S. are compared) is broadly consistent with the Krugman hypothesis, especially in the 1990s, one may raise alternative explanations for these regression results. One argument could be based on the issue of sample selection in wage regressions (Heckman, 1979; Leung and Yu, 1996): In the face of relative demand shocks against the unskilled, one expects workers with the least *unobserved* skills to lose their jobs first. Hence, standard wage regressions as presented here might falsely conclude that the wage structure between *observed* skill categories has remained stable, whereas in fact the price of skills (taking into account observed and unobserved factors) has fallen. At the same time, one would measure an increase in the relative unemployment and non-employment of the least skilled workers, as they either leave the labour force or prefer to draw unemployment benefits instead of working for a lower wage. However, if this explanation is claimed to be the only factor underlying the present results, then one would expect an increase in the relative unemployment *or* relative non-employment for the low skilled not only in western Germany, but *also* in the U.S. Yet, this did not happen to low education groups in the U.S. in the 1990s (it did in the 1980s, *cf.* Table 2 and Table 3) Therefore, the 'sample selection interpretation' cannot be the main factor driving the empirical observations of this paper for the 1990s.

Changes in Search Intensity

Another alternative explanation could be that changes in the search intensities of low-skilled workers drive differences across countries in the changes in the relative unemployment and non-employment likelihoods. If this were the case, the Krugman hypothesis would not be the correct interpretation of the results presented here. In the 1990s, major reforms of the unemployment

benefit and welfare systems in the Unites States and in Britain with their emphasis on mandatory job search assistance and the introduction of work requirements were, with the exception of the British New Deal of 1998, not explicitly targeted at less educated workers (*cf.* Monthly Labor Review, various issues; Blank and Haskins, 2001; and Weil, 2002; for the U.S.; Van Reenen, 2001; for Britain). However, the U.S. profiling system for unemployment insurance introduced since 1993 and significant welfare reform triggered by the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 can be expected to have taken effect mostly on these socio-economic groups (Blank, 2002). The same holds in Britain for the introduction of the Job Seekers' Allowance in 1996 and the New Deal of 1998. However, also in Germany, welfare eligibility was made more stringent and work incentives were increased through the Welfare Reform Act of 1996. Moreover, there were no significant changes in the unemployment benefit regime in Germany during the 1990s that could explain the increased relative unemployment of the low skilled.[14]

In the early 1980s, changes in German regulations made unemployment benefit receipt more stringent, but still relative unemployment of the low-skilled increased. Since 1984, the system became more generous again, especially for older workers (Steffen, 2002). Therefore, the steady upward trend in relative unemployment for the least skilled in Germany is not consistent with the timing of changes in unemployment benefit regulations in the 1980s. Similarly, the timing of major changes in unemployment benefit policy in the United States and Britain in the 1980s does not concur with the development of the relative unemployment structures in Figure 4. The relative unemployment likelihood of the least skilled in Britatin remained rather constant

[14] The only potential exception are increases in the minimum age for certain prolonged entitlement periods for unemployment benefits in 1997. These affected workers above 42 years of age. However, these changes, which for any given age group only altered the entitlement period by 2 months (*e.g.* from 14 to 12 months for 42 year olds), were rather minor. A summary of social policy changes in Germany since the 1970s is provided in German in Steffen (2002).

overall and even increased despite the introduction of the Restart program in 1987 (*cf.* Dolton and O'Neill, 2002). Also in the United States, the development of the unemployment structure is rather smooth, despite the large drop in benefit take-up rates in the early 1980s (*cf.* Blank and Card, 1991; Vroman, 1998). Nevertheless the tightening of eligibility rules since the mid 1980s by many states may have contributed to the decline in relative unemployment of the least skilled (*cf.* Monthly Labor Review, various issues).

Business Cycles

A third critique of the interpretation of the results might argue that the three countries are observed at different stages of their business cycles and that changes in wage and unemployment structures are mere reflections of movements within different stages of the business cycle. This argument also does not stand up to scrutiny: Although there are some movements in the wage and unemployment/non-employment structures, visual inspection of these movements in Figure 4 and Figure 5 provides no support that the movement towards more equality in the unemployment structure of the United States is a mere cyclical phenomenon. Instead, it seems to be a trend-like movement from the early 1980s onwards; two decades being a much longer period than the average cycle (*cf.* Stock and Watson, 1999). Similarly, no cyclical movements can be detected for Britain. In Germany, the increase in relative unemployment of the least skilled has also been a trend-like process in the 1990s and to some extent even in the 1980s, although in the 1980s the sharp increase in unemployment inequality between educational groups had been concurrent with the decreasing growth rates in the early 80s. Similarly, unemployment inequality decreased during the boom in 1989/1990. Nevertheless, even in the 1980s, the relative unemployment incidence of the least skilled in Germany moved almost monotonically upward and never reached the low level of the early 1980s again. Hence, the continuing deterioration in the relative

unemployment position of the least skilled in Germany seems to be a systematic problem of the last two decades. A further argument against the business cycle interpretation of my results is provided by the fact that robustness checks on the classifications (statistical tests) as discussed in the footnotes above give credence to the view that the reported main results are not sensitive to varying the base period between the years 1980 and 1982 as well as 1991 and 1993.

Efficiency Wages

A fourth argument could be that efficiency wages rather than institutions (as claimed by the Krugman hypothesis) are responsible for wage rigidities. Efficiency wages seem to be a particularly unconvincing explanation for least-skilled unemployment. One reason is that the least skilled may be a cheap group to monitor as they mostly do routine tasks which may be easier to evaluate than more diversified tasks of qualified workers (*cf.* Milgrom and Roberts, 1992, Chapter 12). As monitoring costs are a major ingredient to the efficiency wage hypothesis (Shapiro and Stiglitz, 1984), this raises doubt about efficiency wages explaing the rise in relative unemployment for workers without apprenticeship in western Germany. More importantly, the efficiency wage hypothesis cannot explain why experiences should differ as they do between the investigated countries.

In sum, the microeconometric investigation of changes in wage, unemployment, and non-employment structures with respect to education has found some support for the Krugman hypothesis both in the 1980s and even more so in the 1990s. This is especially true when comparing western Germany with the United States.

5 Conclusions

Although it seems a consensus view among economists that rising European unemployment and rising inequality in the Anglo-Saxon countries are 'two sides of the same coin', namely a secular fall in the relative demand for the low skilled ('Krugman hypothesis'), there are only few empirical studies testing this hypothesis with individual data. This paper tests the Krugman hypothesis for the 1980s and the 1990s. It is first shown that relative supply of skill groups changed in a different fashion in Britain, Germany and the United States. Subsequently, a methodology is applied which is agnostic about the nature of demand and supply shocks in its testing procedure. The approach developed in this paper also allows a more sophisticated distinction between different types of low-skilled workers than the previous literature. This turns out to be important, especially when distinguishing between Germans with and without apprenticeship training.

Comparing the U.S. with western Germany renders support for the view that wage rigidities influenced unemployment (and non-employment) developments in Germany: Tests on changes in the wage, unemployment, and non-employment structures with respect to education reveal that the lack of sufficient wage flexibility impinged on the least educated German workers in terms of higher relative unemployment risk. However, there is tentative evidence that persons with a German apprenticeship certificate were not affected by a negative relative (net) demand shock. This suggests that the German vocational education system provides many workers with skills shielding them from both relative wage and relative employment losses. By contrast, the relative wage position of American high-school graduates deteriorated.

On the other hand, the evidence on Britain demonstrates the importance of relative supply effects that helped to keep the educational wage structure constant in the 1990s.

References

Acemoglu, D. (2002): Technical Change, Inequality, and the Labor Market, *Journal of Economic Literature* 40: 7-72.

Acemoglu, D. (2003): Cross-Country Inequality Trends, *Economic Journal* 113: F121-F149.

Bauer, T. H. Bonin and U. Sunde (2003): *Real Nominal Wage Rigidities and the Rate of Inflation: Evidence from German Micro Data*, IZA Discussion Paper No. 959, Bonn.

Beissinger, T. and C. Knoppik (2001): Downward Nominal Rigidity in West German Earnings, 1975-95, *German Economic Review* 2: 385-417.

Berman, E., J. Bound and S. Machin (1998): Implications of Skill-Biased Technological Change: International Evidence, *Quarterly Journal of Economics* 113: 1245-79.

Blank, R.M. (2002): Evaluating Welfare Reform in the United States, *Journal of Economic Literature* 40: 1105-1166.

Blank, R.M. and D.E. Card (1991): Recent Trends in Insured and Uninsured Unemployment: Is There an Explanation?, *Quarterly Journal of Economics* 106: 1157-1189.

Blank, R.M. and R. Haskins (eds.) (2001): *The New World of Welfare*, Washington, D.C.: Brookings Institution Press.

Blau, F.D. and L.M. Kahn (1996): International Differences in Male Wage Inequality: Institutions versus Market Forces, *Journal of Political Economy* 104: 791-837.

Card, D.E., F. Kramarz, and T. Lemieux (1999): Changes in the Relative Structure of Wages and Employment: A Comparison of the United States, Canada, and France, *Canadian Journal of Economics* 32: 843-877.

Card, D.E. and J.E. DiNardo (2002): Skill Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles, *Journal of Labor Economics* 20: 733-783.

Cornelißen, T. and O. Hübler (2005): *Downward Wage Rigidity and Labour Mobility*, IZA Discussion Paper No. 1523, Bonn.

Dolton, P. and D. O'Neill (2002): The Long-Run Effects of Unemployment Monitoring and Work-Search Programs: Experimental Evidence from the United Kingdom, *Journal of Labor Economics* 20: 381-403.

Fehr, E., L. Götte, and F. Pfeiffer (2003): *Dimensions and Consequences of Wage Rigidities in Germany*, Centre for European Economic Research (ZEW), Mannheim, mimeo.

Fitzenberger, B. (1999): *Wages and Employment Across Skill Groups, An Analysis for West Germany*, Heidelberg: Physica/Springer.

Freeman, R. and R. Schettkat (2000): Skill Compression, Wage Differentials and Employment: Germany vs. the U.S., NBER Working Paper No. 7610, Cambridge, MA.

Gottschalk, P. and M. Joyce (1998): Cross–National Differences in the Rise in Earnings Inequality, Market and Institutional Factors, *Review of Economics and Statistics* 80: 489-579.

Gottschalk, P. and T.M. Smeeding (1997): Cross–National Comparisons of Earnings and Income Inequality, *Journal of Economic Literature* 35: 633-687.

Goux, D. and E. Maurin (2000): The Decline in Demand for Unskilled Labour: An Empirical Analysis Method and its Application to France, *Review of Economics and Statistics* 82: 596-607.

Haisken-DeNew, J.P. and C.M. Schmidt (1997): Interindustry and Interregion Differentials: Mechanics and Interpretation, *Review of Economics and Statistics* 79: 516-521.

Heckman, J. J. (1979): Sample Selection Bias as a Specification Error, *Econometrica,* 47: 153–161.

Hirsch, B.T. and E.D. Schumacher (2002): Match Bias in Wage Gap Estimates Due to Earnings Imputation, Trinity University, TX, and East Carolina University, NC, mimeo.

Jaeger, D.A. (1997): Reconciling the Old and New Census Bureau Education Questions: Recommendations for Researchers, *Journal of Business & Economic Statistics* 15: 300-308.

Kahn, L.M. (2000): Wage Inequality, Collective Bargaining, and Relative Employment from 1985 to 1994: Evidence from Fifteen OECD Countries, *Review of Economics and Statistics* 82: 564-579.

Katz, L. and K. Murphy (1992): Changes in Relative Wages 1963-1987: Supply and Demand Factors, *Quarterly Journal of Economics* 107: 35-78.

Katz, L.F. and D.H. Autor (1999): Changes in Wage Structure and Earnings Inequality, in: O.C. Ashenfelter and D. Card (eds.): *Handbook of Labor Economics*. Handbooks in Economics, Vol. 3A. Amsterdam: Elsevier, 1463-1555.

Krueger, A.B. and J-S. Pischke (1997): *Observations and Conjectures on the U.S. Employment Miracle*, NBER Working Paper No. 6146, Cambridge MA.

Krugman, P. (1994): Past and Prospective Causes of High Unemployment, *Economic Review*, Federal Reserve Bank of Kansas City, 23-43.

Leung, S., F., Yu, S. (1996): On the Choice Between Sample Selection and Two–Part Models, *Journal of Econometrics* 72: 197–229.

Machin, S. (1996): Wage Inequality in the UK, *Oxford Review of Economic Policy* 12: 47-64.

Machin, S. (1998): Recent Shifts in Wage Inequality and the Wage Returns to Education in Britain, *National Institute Economic Review* 166(4): 87-96.

Machin, S. and J. Van Reenen (1998): Technology and Changes in Skill Structure: Evidence From Seven OECD Countries, *Quarterly Journal of Economics* 113: 1215-44.

Milgrom, P. and J. Roberts (1992): *Economics, Organization and Management*, Upper Saddle River, NJ: Prentice Hall.

Monthly Labor Review (Various Issues): January Issue, 1992-2002, available electronically at http://www.bls.gov/opub/mlr/archive.htm.

Nickell, S. and B. Bell (1995): The Collapse in Demand for the Unskilled and Unemployment across the OECD, *Oxford Review of Economic Policy* 11: 40-62.

Nickell, S. and B. Bell (1996): Changes in the Distribution of Wages and Unemployment in OECD Countries, *American Economic Review Papers and Proceedings* 86: 302-321.

Pflüger, M. (2001): Trade, Capital Mobility, and the German Labor Market, *Weltwirtschaftliches Archiv – Review of World Economics* 137: 473-500.

Shapiro, C. and J.E. Stiglitz (1984): Equilibrium Unemployment as a Worker Discipline Device, *American Economic Review* 74: 433-444.

Steffen, J. (2002): *Sozialpolitische Chronik*, Arbeitskammer Bremen.

Steiner, V. and Wagner, K. (1998): Has Earnings Inequality in Germany Changed in the 1980s?, *Zeitschrift für Wirtschafts- und Sozialwissenschaften* 118: 29-59.

Stock, J.H. and M.W. Watson (1999): Business Cycle Fluctions in U.S. Macroeconomic Time Series, in: J.B. Taylor and M. Woodford (eds.): *Handbook of Macroeconomics*, Volume 1A, Amsterdam: Elsevier, 3-64.

Van Reenen, J. (2001): *No More Skivvy Schemes? Active Labour Market Policies and the British New Deal for the Young Unemployed in Context*, Institute for Fiscal Studies (IFS) Working Paper No. 01/09, London.

Vroman, W. (1998): *Labor Market Changes and Unemployment Insurance Benefit Availability, U.S. Deparment of Labor*, Washington, DC.

Weil, A. (2002): Ten Things Everyone Should Know about Welfare Reform, *Assessing the New Federalism*, Policy Brief No. A-52, Washington D.C.: The Urban Institute.

Zimmermann, K.F. and G.G. Wagner (2002): Labor Economics, in: K.F. Zimmermann (ed.): *Frontiers in Economics*, Berlin/Heidelberg: Springer, 95-126.

Table 1: Relative Wage and Unemployment/Non-Employment Behaviour and Labour Market Classification

	Contributing to a relative unemployment decrease $\left(\gamma^*_{t+\tau,k} - \gamma^*_{t,k}\right) < 0$	**Contributing to a constant relative unemployment** $\left(\gamma^*_{t+\tau,k} - \gamma^*_{t,k}\right) = 0$	**Contributing to a relative unemployment increase** $\left(\gamma^*_{t+\tau,k} - \gamma^*_{t,k}\right) > 0$
Contributing to a relative wage increase $\left(\beta^*_{t+\tau,k} - \beta^*_{t,k}\right) > 0$	*(7): $\xi^{l,r} < 0$ weakly adjusting in increasing market relative to the reference market*	*(6): $\xi^{l,r} < 0$ strongly adjusting in increasing market relative to the reference market*	*(1): $\xi^{l,r} = ?$ strongly rigid (wage push) relative to the reference market*
Contributing to a constant relative wage $\left(\beta^*_{t+\tau,k} - \beta^*_{t,k}\right) = 0$	*(8): $\xi^{l,r} < 0$ weakly rigid in increasing market relative to the reference market*	*(5): $\xi^{l,r} = 0$ stable in stable market relative to the reference market*	*(2): $\xi^{l,r} > 0$ weakly rigid in decreasing market relative to the reference market*
Contributing to a relative wage decrease $\left(\beta^*_{t+\tau,k} - \beta^*_{t,k}\right) < 0$	*(9): $\xi^{l,r} = ?$ converging (wage pull) relative to the reference market*	(4): $\xi^{l,r} > 0$ *strongly adjusting in decreasing market relative to the ref. market*	(3): $\xi^{l,r} > 0$ *weakly adjusting in decreasing market relative to the ref. market*

Note: The terminology 'increasing market' refers to a positive relative net demand shock (which is the same as a negative relative net supply shock $\xi^{l,r} < 0$ for labour market *l* with respect to the reference market *r* as defined in Section 4). Increasing markets relative to the reference market are identified in cases (6), (7), and (8). Analogously, a 'decreasing market' is equivalent to a negative net demand shock. Decreasing markets relative to the reference market are identified in cases (2), (3), and (4). In cases (1) and (9), the sign of the net demand shock cannot be identified, $\xi^{l,r} = ?$. In case (5), there is no such shock. See also the theoretical discussion in Section 4.

Table 2: Low Level of Education Classification Summary for the 1980s (Codes 1, 2 and 3 Indicate Rigidity)

Variable	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
With Unemployment as the Measure for Quantity Rationing										
U.S. (CPS; Base 1980)										
High School	-	***2***	***3***	4	4	4	4	4	4	4
High School Dropout	4	***3***	***3***	***3***	***3***	***3***	4	4	4	4
Britain (GHS; Base 1980)										
O-level equivalent	-	-	-	-	-	8	-	-	8	6
Below O-level equivalent	2	-	4	4	***3***	***3***	4	4	***3***	4
Germany (IABR; Base 1980)										
Apprenticeship	-	-	4	4	4	4	7	7	7	7
Below Apprenticeship	***2***	***2***	***3***	***3***	***3***	***3***	***3***	***3***	***3***	***3***
With Non-employment as the Measure for Quantity Rationing										
U.S. (CPS; Base 1980)										
High School	-	2	2	4	3	4	4	4	4	4
High School Dropout	***3***	***3***	***3***	***3***	***3***	***3***	***3***	***3***	***3***	***3***
Britain (GHS; Base 1980)										
O-level equivalent	8	-	-	8	-	8	8	8	7	7
Below O-level equivalent	***2***	***2***	***3***	***3***	***3***	***3***	***3***	***3***	***3***	***3***

Note: The classifications are based on regression results controlling for education, age, gender, region, as well as the month of interview in the CPS and the GHS. The classification codes are as defined in Table 1)

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); General Household Survey (GHS); German Administrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR); own calculations.

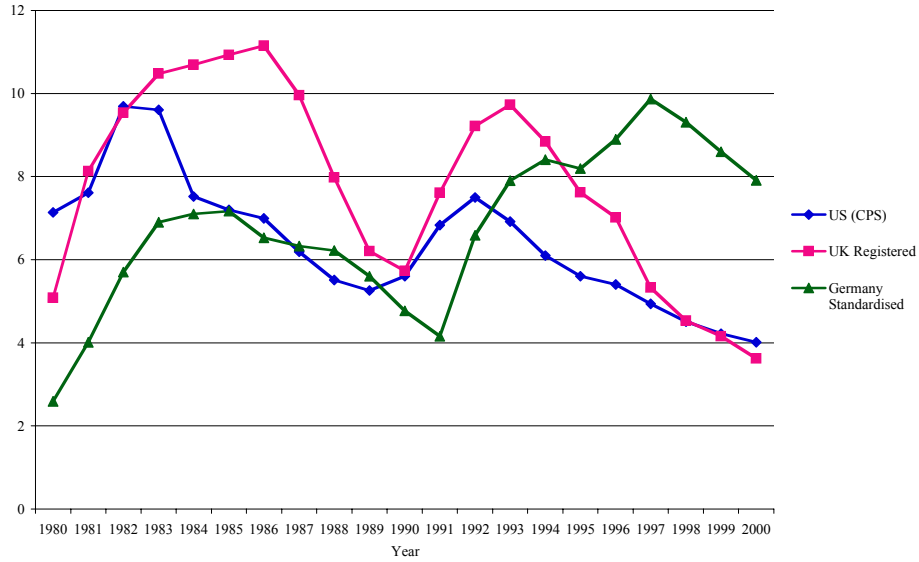
Table 3: Low Level of Education Classification Summary for the 1990s (Codes 1, 2 and 3 Indicate Rigidity)

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
With Unemployment as the Measure for Quantity Rationing										
U.S. (CPS; Base 1992)										
High School		-	-	-	4	4	4	9	4	9
High School Dropout		-	4	4	4	4	4	9	9	9
Britain (BLFS; Base 1993)										
O-level equivalent			-	-	-	-	4	***3***	***3***	
Below O-level equivalent			-	-	-	-	-	-	-	
Britain (BHPS)										
O-level equivalent	-	-	-	-	-	-	-	-	-	
Below O-level equivalent	-	-	-	-	-	-	-	-	-	
Germany (GSOEP)										
Apprenticeship	***2***	***2***	***2***	6	6	-	6	6	6	
Below Apprenticeship	-	4	-	4	4	-	-	-	4	
Germany (GLFS)										
Apprenticeship		***3***		***2***	***2***	***2***			***3***	
Below Apprenticeship		-		6	***1***	***1***			***1***	
Germany (IABR)										
Apprenticeship	6	6	6	6	7	7				
Below Apprenticeship	4	***3***	***3***	***3***	***3***	***3***				
With Non-employment as the Measure for Quantity Rationing										
U.S. (CPS; Base 1992)										
High School		-	-	-	4	4	4	4	4	4
High School Dropout		-	4	4	4	4	9	9	9	9
Britain (BLFS; Base 1993)										
O-level equivalent			-	-	-	5	9	4	4	
Below O-level equivalent			***2***	-	***2***	***2***	***2***	***2***	***2***	
Britain (BHPS)										
O-level equivalent	-	-	-	-	-	-	-	-	-	
Below O-level equivalent	-	-	-	8	-	-	-	-	-	
Germany (GSOEP)										
Apprenticeship	-	-	-	6	6	-	6	6	6	
Below Apprenticeship	-	4	-	4	4	-	-	-	4	
Germany (GLFS)										
Apprenticeship		***3***		***3***	***3***	***3***			***3***	
Below Apprenticeship		8		***1***	***1***	***1***			6	
Germany (IABR)										
No Data										

Note: The classifications are based on regression results controlling for education, age, gender, region, as well as the month of interview in the CPS and the BLFS. The classification codes are as follows (*cf.* Table 1): (1): strongly rigid (rising relative wage and rising relative non-employment); (2): weakly rigid in a decreasing market (constant relative wage and rising relative non-employment); (3): weakly adjusting in a decreasing market (falling relative wage and rising relative non-employment); (4): strongly adjusting in a decreasing market (falling relative wage and constant relative non-employment); (- = 5): stable in a stable market (constant relative wage and constant relative non-employment); (6): strongly adjusting in an increasing market (rising relative wage and constant relative non-employment); (7): weakly adjusting in an increasing market (rising relative wage and falling relative non-employment); (8): weakly rigid in an increasing market (constant relative wage and falling relative non-employment); (9): converging (falling relative wage and falling relative non-employment).

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); British Labour Force Survey (BLFS); British Household Panel Survey (BHPS); German Socio-Economic Panel (GSOEP); German Labour Force Survey – Mikrozensus (GLFS); German Adminsitrative Data – Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe (IABR); own calculations.

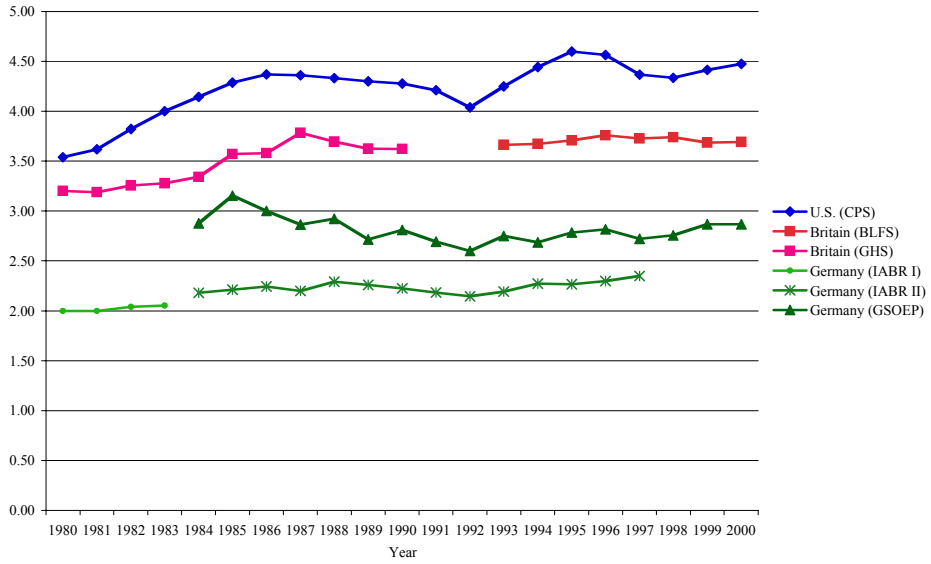
Figure 1: Unemployment Rates 1980 - 2000



Note: The U.S. unemployment rate is base on the CPS, which uses a definition of unemployment equivalent to the ILO definition. For Western Germany, OECD figures only provide the registered unemployment rate for a longer time period. Comparing the registered with the OECD standardized unemployment rate for united Germany suggests about a 1.5 percent difference between the two, so that the standardised unemployment rate for western Germany would also be lower than depicted in the graph. For the UK, however, the standardised unemployment rate is about 1 percentage point higher than the registered one shown in the graph. It is, however, not available for such a long time period.

Source: OECD.

Figure 2: Wage Inequality (Decile Ratios) 1980 - 2000



Note: The plots exhibit the 9th divided by the 1st decile of the hourly wage rate (for German IABR data: daily earnings of full-time workers). The increase in the inequality measure for Germany in the IABR data between 1983 and 1984 is largely driven by a change of measurement between those two years: Since 1984, fringe benefits are included in the earnings variable (*cf.* Steiner and Wagner, 1998).

Source: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); General Household Survey (GHS); British Labour Force Survey (BLFS); German Administrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR); German Socio-Economic Panel (GSOEP); own calculations.

Figure 3a: U.S. Education Sample Means Working Age Population 1980s & 1990s - (CPS)

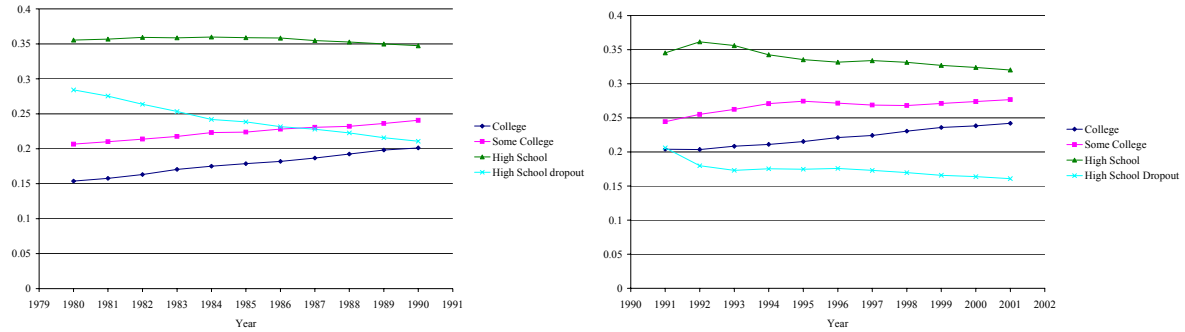


Figure 3b: British Education Sample Means Working Age Population 1980s & 1990s - (GHS & BLFS)

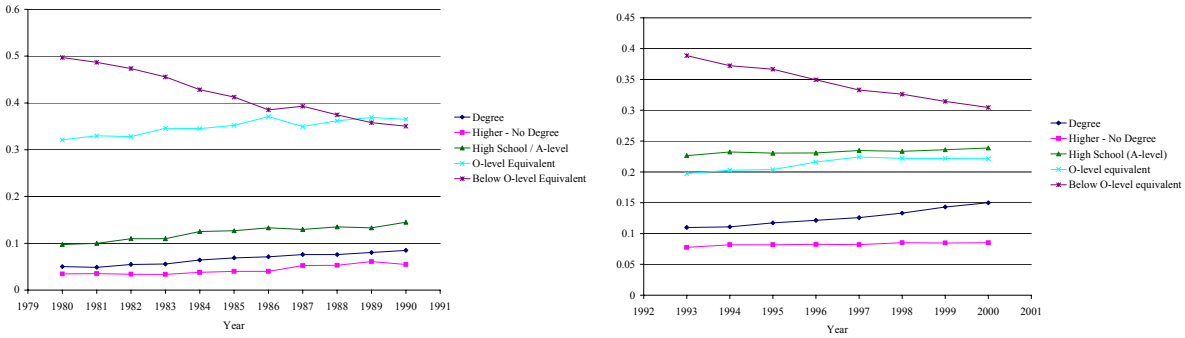
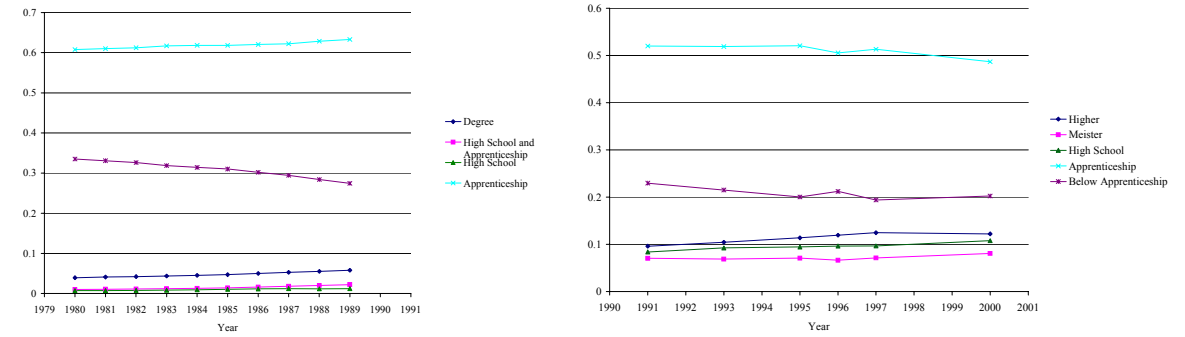


Figure 3c: German Education Sample Means Working Age Population 1980s & 1990s - (IABR & GLFS)



Note: Between 1991 and 1992 the coding of the education variable changed in the CPS, which explains changes in the shares of especially *high school graduates* and *high school dropouts* between those years. I therefore use 1992 as the base year for the reported classifications.

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); General Household Survey (GHS); British Labour Force Survey (BLFS); German Administrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR); German Labour Force Survey – *Mikrozensus* (GLFS).

Figure 4a: U.S. Wage and Unemployment Regression: Education Coefficients 1980s - (CPS)

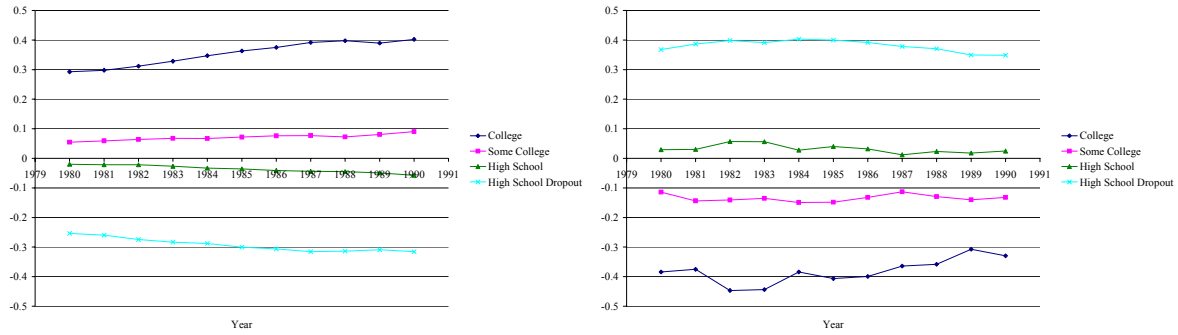


Figure 4b: British Wage and Unemployment Regression: Education Coefficients 1980s - (GHS)

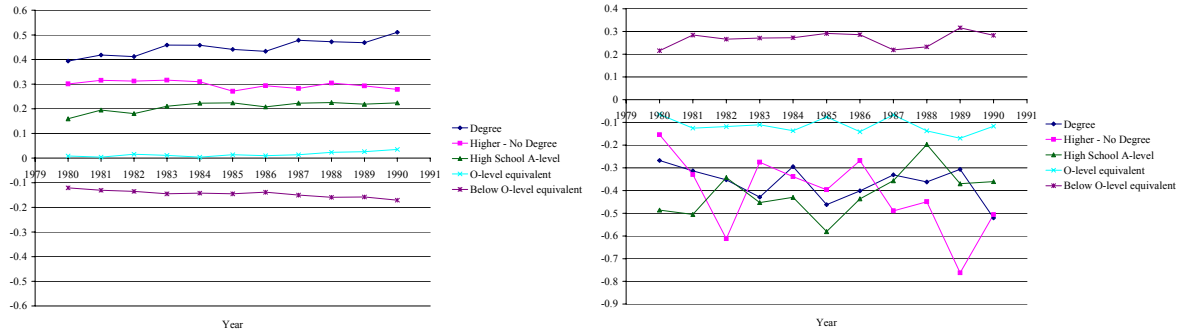
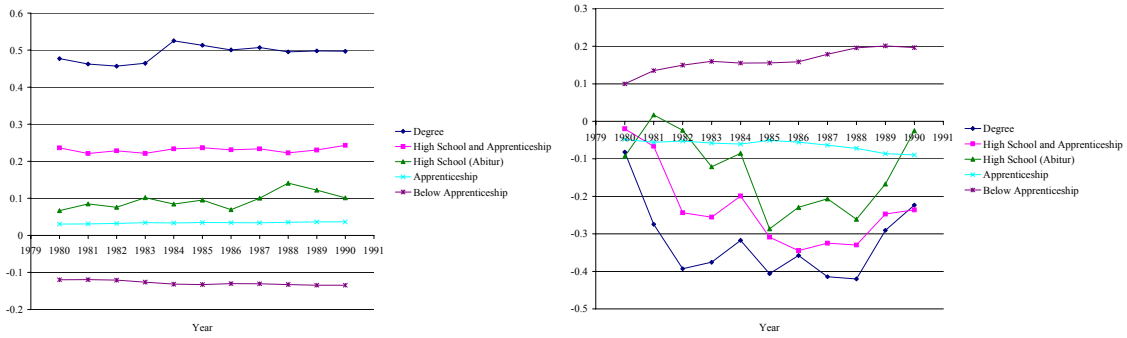


Figure 4c: German Wage and Unemployment Regression: Education Coefficients 1980s - (IABR)



Note: The left and right panels exhibit the transformed wage and unemployment regression coefficients $\beta^*_{t,k}$ and $\gamma^*_{t,k}$, respectively.

The jump in the relative wages of workers with a degree in the IABR data is explained by a statistical phenomenon: Since 1984, companies have to include fringe benefits when reporting wages for this data set (Steiner and Wagner, 1998). In the paper's text and footnotes, I therefore report sensitivity checks with respect to the choice of the base period for the classifications. It turns out that the change in measurement does not affect the classification results for low-skilled workers in the sense that classification results are essentially the same no matter whether 1980, 1981, 1982 or 1984 is chosen as base year.

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); General Household Survey (GHS); German Administrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR).

Figure 5a: U.S. Wage and Unemployment Regression: Education Coefficients 1990s - (CPS)

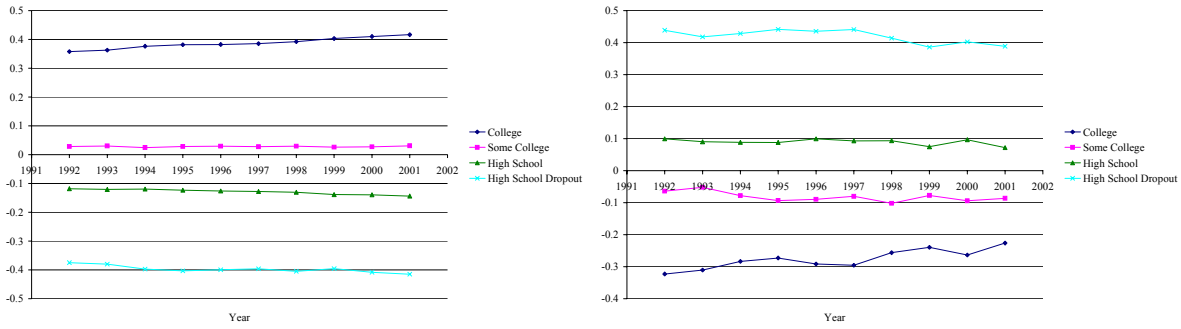


Figure 5b: British Wage and Unemployment Regression: Education Coefficients 1990s - (BLFS)

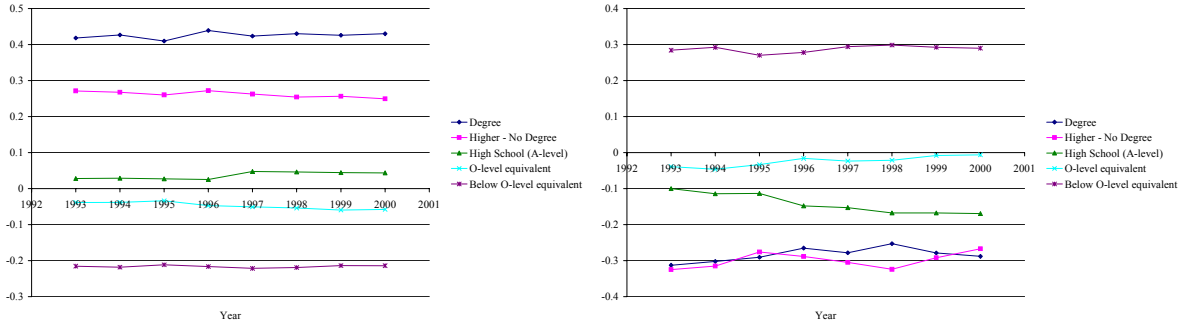
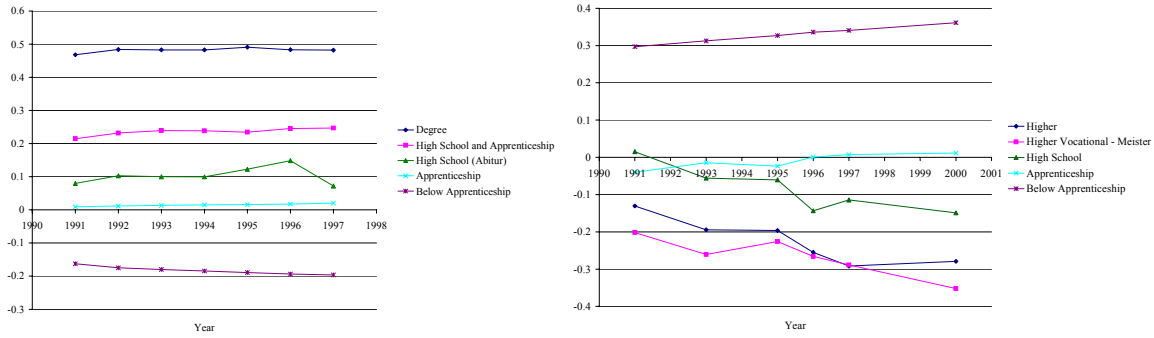


Figure 5c: German Wage and Unemployment Regression: Education Coefficients 1990s - (Wages: IABR; Unemployment: GLFS)



Note: The left and right panels exhibit the transformed wage and unemployment regression coefficients $\beta^*_{t,k}$ and $\gamma^*_{t,k}$, respectively.

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); British Labour Force Survey (BLFS); German Labour Force Survey – *Mikrozensus* (GLFS); own calculations.

Appendix

Transatlantic Differences in Labour Markets

Changes in Wage and Non-Employment Structures in the 1980s and the 1990s

Patrick A. Puhani
Darmstadt University of Technology; SIAW, University of St. Gallen; IZA, Bonn; WDI, Ann Arbor, MI

This Appendix includes only tables for the 1990s in order to demonstrate the regression results underlying the classifications reported in the paper. The results for the 1980s are made available on request

Table A1: Numbers of Observations

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
U.S. (CPS)											
Wage Regression	166,640	164,571	161,685	147,040	134,019	105,589	107,365	106,798	103,098	101,048	105,440
Unempl. Regression	214,970	212,232	208,411	202,498	200,246	177,983	180,462	181,377	182,691	183,530	196,172
Non-Empl. Regression	283,576	278,606	274,198	266,401	263,147	232,780	235,372	235,549	237,754	238,950	255,548
Britain (BLFS)											
Wage Regression			33,441	33,924	35,809	35,485	63,367	69,952	67,058	64,366	
Unempl. Regression			283,381	279,782	282,896	274,108	260,728	262,232	258,136	253,360	
Non-Empl. Regression			362,679	357,707	362,278	350,368	332,907	334,519	327,482	321,094	
Britain (BHPS)											
Wage Regression	4,355	4,085	3,922	3,971	3,975	4,132	4,254	4,230	4,140	3,974	
Unempl. Regression	6,184	5,714	5,458	5,455	5,296	5,506	5,520	5,408	5,309	5,076	
Non-Empl. Regression	8,056	7,598	7,269	7,225	7,036	7,314	7,289	7,005	6,866	6,553	
Germany (GSOEP)											
Wage Regression	3,969	3,852	3,877	3,747	4,007	3,898	3,789	3,949	4,100	7,258	
Unempl. Regression	5,527	5,360	5,378	5,119	5,423	5,311	5,159	5,588	5,560	10,156	
Non-Empl. Regression	7,567	7,462	7,393	7,215	7,633	7,335	7,126	7,723	7,559	14,013	
Germany (GLFS)											
Wage Regression	134,115		131,774		135,266	132,696	133,106			132,930	
Unempl. Regression	169,287		169,734		176,098	171,260	174,199			170,346	
Non-Empl. Regression	238,321		235,371		244,291	239,708	242,307			234,421	
Germany (IABR)											
Wage Regression	156,049	157,493	154,606	148,811	147,495	143,780	140,906				
Unempl. Regression	205,424	209,560	210,288	207,097	205,829	203,028	200,607				

Note: Changes between 1995 and 1996 in the CPS are explained by the changes in the imputation flags (*cf*. Hirsch and Schumacher, 2002). The large increase in the number of wage observations in the BLFS between 1996 and 1997 is explained by the fact that respondents were asked about their wage only in the 1st quarter of interview up to 1996, but also in the 5th quarter since 1997. Columns with no entry signify that no data are available (to me) for these years.

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); British Labour Force Survey (BLFS); British Household Panel Survey (BHPS); German Socio-Economic Panel (GSOEP); German Labour Force Survey – *Mikrozensus* (GLFS); German Adminsitrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR); own calculations.

Table A2: Unemployment Rates by Education

Variable	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
U.S. (CPS)											
Whole sample	6.8	7.5	7.0	6.1	5.6	5.3	4.9	4.5	4.1	3.9	4.6
College Degree	3.0	3.3	3.2	2.8	2.5	2.3	2.0	2.0	1.9	1.7	2.4
Some College	5.8	6.3	6.1	5.0	4.4	4.2	3.9	3.4	3.4	3.0	3.8
High School	6.9	8.2	7.7	6.6	6.0	5.9	5.4	5.0	4.5	4.4	5.1
High School Dropout	14.1	15.6	14.8	13.6	13.2	12.6	12.0	10.9	9.9	9.6	10.9
Britain (BLFS)											
Whole sample			10.4	9.6	8.7	8.1	7.0	6.3	6.0	5.5	
Degree			5.4	5.1	4.8	4.7	3.8	3.5	3.2	2.8	
Higher – No Degree			4.7	4.5	4.5	4.0	3.3	2.8	2.9	2.8	
High School (A-level)			9.1	8.2	7.5	6.5	5.5	4.8	4.6	4.2	
O-level equivalent			10.2	9.3	8.7	8.6	7.4	6.8	6.7	6.3	
Below O-level equivalent			14.7	13.9	12.4	11.9	10.7	9.8	9.4	8.7	
Britain (BHPS)											
Whole sample	8.7	9.4	9.0	8.5	6.4	6.5	5.3	4.6	4.2	4.6	
Degree	3.8	5.4	5.4	5.3	5.1	4.7	4.7	3.0	3.1	2.3	
Higher - No Degree	3.4	3.5	4.5	4.0	3.3	1.2	3.1	4.2	1.8	3.7	
High School (A-level)	6.4	6.9	6.0	7.1	4.1	4.8	4.1	3.4	3.0	3.4	
O-level equivalent	7.8	7.9	7.8	6.4	6.8	6.1	4.7	4.0	4.1	4.1	
Below O-level equivalent	13.5	15.0	14.9	13.9	10.0	11.0	8.4	8.2	7.9	9.5	
Germany (GSOEP)											
Whole sample	3.6	3.7	5.1	5.4	5.9	5.6	6.7	6.8	5.4	4.5	
Degree	3.3	2.1	2.7	4.2	4.6	5.9	3.0	5.5	2.5	3.4	
Higher - No Degree	4.5	1.5	1.3	2.7	2.7	4.5	7.3	3.3	2.1	3.8	
High School - Abitur	5.0	6.8	9.7	5.4	11.1	9.8	8.8	11.7	10.0	8.9	
Apprenticeship	2.6	3.5	4.9	5.3	5.1	4.2	6.2	6.0	4.3	3.1	
Below Apprenticeship	5.8	5.7	7.9	7.9	9.3	9.5	10.2	10.7	11.3	10.2	
Germany (GLFS)											
Whole sample	3.2		5.3		5.8	6.4	7.1			5.0	
Degree	2.2		3.3		3.8	3.7	3.9			2.6	
Meister	1.8		2.9		3.5	3.7	4.0			2.2	
High School	3.2		4.7		5.0	4.6	5.6			3.4	
Apprenticeship	2.8		4.9		5.4	6.2	7.1			4.9	
Below Apprenticeship	5.6		9.3		10.5	11.4	12.9			9.4	
Germany (IABR)											
Whole sample	4.7	5.3	7.2	8.6	8.5	9.4	9.7				
Degree	2.9	3.0	3.5	4.5	4.5	5.4	5.5				
High School and Apprenticeship	3.3	3.0	3.8	4.7	4.1	4.7	5.0				
High School (Abitur)	3.1	3.5	4.9	5.9	4.8	5.7	5.9				
Apprenticeship	4.0	4.5	6.3	7.5	7.5	8.2	8.5				
Below Apprenticeship	7.0	8.1	11.2	13.7	13.5	14.8	15.4				

Note: Sampling weights are used wherever applicable.

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); British Labour Force Survey (BLFS); British Household Panel Survey (BHPS); German Socio-Economic Panel (GSOEP); German Labour Force Survey – *Mikrozensus* (GLFS); German Adminsitrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR); own calculations.

Table A3: Non-Employment Rates by Education

Variable	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
U.S. (CPS)											
Whole sample	29.4	29.6	29.3	28.5	28.1	27.7	27.1	26.6	26.5	26.5	27.3
College Degree	14.7	14.9	14.8	14.5	14.5	14.5	14.2	14.4	14.9	15.1	15.9
Some College	25.0	24.6	24.4	23.2	22.7	22.6	22.4	21.7	22.1	22.1	22.9
High School	27.6	29.4	29.4	28.7	28.3	27.6	27.0	27.0	26.8	27.0	27.7
High School Dropout	51.9	53.7	53.8	53.4	52.9	52.5	51.3	50.0	49.8	49.2	51.2
Britain (BLFS)											
Whole sample			29.8	29.1	28.4	27.8	26.9	26.3	25.6	25.1	
Degree			14.7	13.8	13.6	13.5	12.8	12.9	12.5	11.8	
Higher - No Degree			17.0	16.5	16.7	16.3	15.1	15.0	14.5	14.4	
High School (A-level)			24.9	24.6	24.1	22.9	22.3	21.8	21.1	20.7	
O-level equivalent			29.1	28.0	27.5	26.8	25.9	24.9	24.8	24.7	
Below O-level equivalent			39.9	39.9	39.1	39.3	38.9	38.7	38.6	38.5	
Britain (BHPS)											
Whole sample	30.3	32.0	32.1	31.8	30.2	30.5	29.2	27.3	27.3	27.3	
Degree	13.3	15.7	15.3	17.1	14.6	17.2	15.7	14.3	15.2	14.6	
Higher - No Degree	22.6	26.3	25.9	26.0	25.6	24.3	24.7	24.8	24.6	26.9	
High School (A-level)	21.7	24.4	24.7	25.2	24.2	23.8	22.1	19.0	19.3	19.9	
O-level equivalent	27.2	28.3	30.0	29.1	29.8	30.2	28.4	27.2	27.1	27.9	
Below O-level equivalent	41.9	44.2	44.5	44.2	42.1	43.2	43.6	43.8	44.1	44.8	
Germany (GSOEP)											
Whole sample	30.6	31.7	31.8	34.2	33.9	32.3	32.5	33.0	31.0	30.7	
Degree	16.0	14.6	14.8	15.4	15.0	15.0	13.3	15.1	11.9	14.7	
Higher - No Degree	22.4	23.4	19.0	23.5	24.8	24.2	24.9	25.0	20.4	22.4	
High School - Abitur	49.5	48.5	49.5	45.6	43.8	43.2	39.3	45.6	43.7	45.2	
Apprenticeship	26.9	27.5	28.4	30.2	30.4	29.1	30.6	30.7	28.8	29.5	
Below Apprenticeship	43.0	46.5	46.2	51.2	50.4	48.6	46.7	47.2	46.7	45.8	
Germany (GLFS)											
Whole sample	31.2		31.7		32.1	33.1	33.2			31.0	
Degree	15.0		15.3		15.8	16.5	16.8			15.9	
Meister	16.0		16.1		16.9	18.7	19.3			17.3	
High School	50.2		50.0		46.0	44.3	42.8			37.2	
Apprenticeship	26.1		27.4		28.6	29.9	30.9			29.6	
No Prof Training	47.1		47.1		49.3	49.7	50.2			45.4	

Note: Sampling weights are used wherever applicable.

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); British Labour Force Survey (BLFS); British Household Panel Survey (BHPS); German Socio-Economic Panel (GSOEP); German Labour Force Survey – *Mikrozensus* (GLFS); German Adminsitrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR); own calculations.

Table A4: U.S. and British Wage Regressions (Changes in Transformed Education Coefficients with Respect to the Base Year – Corresponding t-values in Parentheses)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
U.S. (CPS; Base 1992)										
College		0.00	0.02	0.02	0.02	0.03	0.03	0.05	0.05	0.06
		(1.4)	(4.7)	(6.1)	(5.9)	(6.8)	(8.5)	(11.4)	(12.9)	(14.1)
Some College		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		(0.7)	-(1.1)	(0.0)	(0.5)	-(0.2)	(0.4)	-(0.6)	-(0.3)	(0.8)
High School		0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.03
		-(1.1)	-(0.4)	-(1.9)	-(2.9)	-(3.5)	-(4.4)	-(7.2)	-(7.4)	-(8.8)
High School Dropout		-0.01	-0.02	-0.03	-0.02	-0.02	-0.03	-0.02	-0.03	-0.04
		-(1.2)	-(4.0)	-(4.9)	-(4.3)	-(3.9)	-(5.4)	-(3.8)	-(6.0)	-(7.0)
Britain (BLFS; Base 1993)										
Degree			0.01	-0.01	0.02	0.01	0.01	0.01	0.01	
			(0.9)	-(0.9)	(2.2)	(0.6)	(1.4)	(0.9)	(1.4)	
Higher - No Degree			0.00	-0.01	0.00	-0.01	-0.02	-0.01	-0.02	
			-(0.3)	-(1.0)	(0.1)	-(0.9)	-(1.7)	-(1.5)	-(2.2)	
High School (A-level)			0.00	0.00	0.00	0.02	0.02	0.02	0.02	
			(0.1)	-(0.1)	-(0.4)	(3.0)	(2.8)	(2.5)	(2.4)	
O-level equivalent			0.00	0.00	-0.01	-0.01	-0.02	-0.02	-0.02	
			(0.0)	(0.6)	-(1.1)	-(1.7)	-(2.2)	-(3.0)	-(2.8)	
Below O-level equivalent			0.00	0.00	0.00	-0.01	0.00	0.00	0.00	
			-(0.5)	(0.7)	-(0.2)	-(1.2)	-(0.8)	(0.3)	(0.3)	
Britain (BHPS; Base 1991)										
Degree	0.04	0.06	0.01	0.01	0.04	0.03	0.01	0.03	0.03	
	(1.8)	(2.6)	(0.5)	(0.5)	(1.4)	(1.2)	(0.5)	(1.2)	(1.3)	
Higher - No Degree	-0.05	0.00	-0.05	-0.04	-0.07	-0.06	-0.05	-0.09	-0.04	
	-(2.0)	(0.1)	-(1.5)	-(1.2)	-(2.3)	-(1.8)	-(1.7)	-(2.5)	-(1.1)	
High School (A-level)	0.00	0.00	0.00	-0.02	-0.01	-0.03	-0.03	-0.03	-0.03	
	(0.2)	(0.2)	-(0.1)	-(1.3)	-(1.0)	-(2.0)	-(2.0)	-(1.8)	-(2.0)	
O-level equivalent	0.01	-0.01	0.02	0.01	0.03	0.01	0.01	0.02	-0.01	
	(0.5)	-(0.5)	(1.3)	(1.0)	(1.7)	(0.4)	(0.7)	(1.5)	-(0.6)	
Below O-level equivalent	-0.01	-0.01	-0.01	0.01	0.00	0.02	0.02	0.01	0.03	
	-(0.7)	-(1.2)	-(0.5)	(0.6)	-(0.2)	(1.4)	(1.5)	(0.8)	(1.9)	

Note: *t*-values are based on standard errors allowing for clustering wherever applicable. Estimates use sampling weights wherever applicable.

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); British Labour Force Survey (BLFS); British Household Panel Survey (BHPS); own calculations.

Table A5: German Wage Regressions (Changes in Transformed Education Coefficients with Respect to 1991 – Corresponding t-values in Parentheses)

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Germany (GSOEP)									
Degree	0.00	0.01	-0.02	-0.06	-0.05	-0.10	-0.12	-0.06	-0.07
	-(0.1)	(0.2)	-(0.7)	-(1.6)	-(1.6)	-(3.4)	-(3.3)	-(1.4)	-(1.5)
Higher - No Degree	-0.01	0.04	-0.02	0.03	-0.04	-0.03	-0.03	-0.03	0.06
	-(0.4)	(1.2)	-(0.4)	(0.7)	-(0.9)	-(0.6)	-(0.8)	-(0.6)	(1.6)
High School - Abitur	0.04	0.07	0.10	0.14	0.03	0.06	0.00	-0.02	-0.01
	(0.6)	(1.3)	(1.6)	(2.5)	(0.4)	(0.8)	(0.0)	-(0.2)	-(0.2)
Apprenticeship	0.00	0.01	0.00	0.02	0.03	0.01	0.03	0.03	0.04
	-(0.7)	(1.0)	(0.0)	(2.1)	(3.6)	(1.6)	(2.9)	(2.8)	(3.5)
Below Apprenticeship	0.01	-0.05	0.00	-0.05	-0.05	0.02	-0.01	-0.04	-0.08
	(0.8)	-(2.4)	(0.2)	-(2.0)	-(2.4)	(0.8)	-(0.3)	-(1.4)	-(2.8)
Germany (GLFS)									
Higher		0.00		-0.03	-0.05	-0.06			-0.06
		-(0.3)		-(6.1)	-(11.2)	-(14.5)			-(13.6)
Meister		0.00		-0.01	-0.03	-0.03			-0.01
		-(0.7)		-(2.3)	-(4.8)	-(5.9)			-(1.4)
High School		0.03		0.04	0.06	0.06			0.05
		(5.4)		(6.7)	(9.0)	(9.4)			(8.4)
Apprenticeship		0.00		0.00	0.00	0.00			0.00
		-(3.2)		-(1.9)	-(1.1)	-(1.0)			-(3.4)
Below Apprenticeship		0.01		0.02	0.03	0.04			0.04
		(1.4)		(4.4)	(7.5)	(9.9)			(10.1)
Germany (IABR)									
Degree	0.02	0.01	0.01	0.02	0.02	0.01			
	(3.8)	(3.7)	(3.5)	(5.6)	(2.6)	(1.5)			
High School and Apprenticeship	0.02	0.02	0.02	0.02	0.03	0.03			
	(3.1)	(4.2)	(3.7)	(3.1)	(4.2)	(4.3)			
High School (Abitur)	0.02	0.02	0.02	0.04	0.07	-0.01			
	(1.4)	(1.1)	(0.9)	(2.3)	(3.4)	-(0.4)			
Apprenticeship	0.00	0.00	0.01	0.01	0.01	0.01			
	(3.0)	(4.9)	(6.6)	(7.3)	(8.6)	(10.7)			
Below Apprenticeship	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03			
	-(6.8)	-(8.8)	-(10.4)	-(12.4)	-(13.1)	-(13.2)			

Note: *t*-values are based on standard errors allowing for clustering wherever applicable. Estimates use sampling weights wherever applicable.

Sources: German Socio-Economic Panel (GSOEP); German Labour Force Survey – *Mikrozensus* (GLFS); German Adminsitrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR); own calculations.

Table A6: U.S. and British Unemployment Regressions (Changes in Transformed Education Coefficients with Respect to the Base Year – Corresponding t-values in Parentheses)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
U.S. (CPS; Base 1992)										
College Degree		0.01	0.04	0.05	0.03	0.03	0.07	0.08	0.06	0.10
		(0.9)	(2.6)	(3.2)	(2.0)	(1.7)	(4.1)	(5.1)	(3.5)	(6.2)
Some College		0.01	-0.01	-0.03	-0.03	-0.02	-0.04	-0.01	-0.03	-0.02
		(1.1)	-(1.2)	-(2.4)	-(2.0)	-(1.3)	-(2.9)	-(1.0)	-(2.2)	-(1.8)
High School		-0.01	-0.01	-0.01	0.00	-0.01	-0.01	-0.02	0.00	-0.03
		-(1.1)	-(1.2)	-(1.2)	(0.0)	-(0.7)	-(0.6)	-(2.4)	-(0.3)	-(2.8)
High School Dropout		-0.02	-0.01	0.00	0.00	0.00	-0.02	-0.05	-0.04	-0.05
		-(1.4)	-(0.6)	(0.2)	-(0.2)	(0.1)	-(1.5)	-(3.0)	-(2.1)	-(3.0)
Britain (BLFS; Base 1993)										
Degree			0.01	0.02	0.05	0.03	0.06	0.03	0.02	
			(0.5)	(1.0)	(2.2)	(1.6)	(2.7)	(1.5)	(1.1)	
Higher - No Degree			0.01	0.05	0.04	0.02	0.00	0.03	0.06	
			(0.4)	(1.7)	(1.3)	(0.7)	(0.0)	(1.1)	(1.9)	
High School (A-level)			-0.01	-0.01	-0.05	-0.05	-0.07	-0.07	-0.07	
			-(1.2)	-(1.0)	-(3.5)	-(3.8)	-(4.7)	-(4.7)	-(4.7)	
O-level equivalent			-0.01	0.01	0.02	0.02	0.02	0.03	0.03	
			-(0.6)	(0.4)	(1.6)	(1.1)	(1.2)	(2.1)	(2.1)	
Below O-level equivalent			0.01	-0.01	-0.01	0.01	0.01	0.01	0.01	
			(0.9)	-(1.4)	-(0.6)	(0.9)	(1.3)	(0.8)	(0.5)	
Britain (BHPS; Base 1991)										
Degree	0.11	0.06	0.14	0.29	0.24	0.33	0.16	0.19	-0.01	
	(1.0)	(0.5)	(1.1)	(2.4)	(2.0)	(2.7)	(1.2)	(1.4)	-(0.1)	
Higher - No Degree	-0.07	0.11	0.07	0.11	-0.33	0.13	0.37	-0.03	0.21	
	-(0.4)	(0.7)	(0.4)	(0.6)	-(1.7)	(0.7)	(2.0)	-(0.1)	(1.2)	
High School (A-level)	-0.05	-0.10	0.03	-0.09	0.00	-0.01	-0.04	-0.04	-0.02	
	-(0.8)	-(1.6)	(0.5)	-(1.3)	(0.0)	-(0.1)	-(0.6)	-(0.6)	-(0.3)	
O-level equivalent	-0.04	-0.02	-0.10	0.05	0.03	-0.05	-0.07	-0.01	-0.08	
	-(0.7)	-(0.4)	-(1.6)	(0.8)	(0.4)	-(0.8)	-(0.9)	-(0.1)	-(1.0)	
Below O-level equivalent	0.04	0.05	0.00	-0.07	-0.02	-0.07	-0.04	-0.01	0.03	
	(1.1)	(1.1)	-(0.1)	-(1.4)	-(0.4)	-(1.4)	-(0.6)	-(0.2)	(0.5)	

Note: *t*-values are based on standard errors allowing for clustering wherever applicable. Estimates use sampling weights wherever applicable.

Sources: Current Population Survey – Merged Outgoing Rotation Group Files (CPS); British Labour Force Survey (BLFS); British Household Panel Survey (BHPS); own calculations.

Table A7: German Unemployment Regressions (Changes in Transformed Education Coefficients with Respect to 1991 – Corresponding t-values in Parentheses)

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Germany (GSOEP)									
Degree	-0.24	-0.24	-0.07	-0.08	0.10	-0.34	-0.08	-0.29	-0.09
	-(1.2)	-(1.4)	-(0.4)	-(0.5)	(0.6)	-(2.0)	-(0.5)	-(1.6)	-(0.6)
Higher - No Degree	-0.52	-0.70	-0.39	-0.47	-0.19	-0.04	-0.46	-0.52	-0.16
	-(2.3)	-(3.4)	-(1.9)	-(2.3)	-(0.8)	-(0.2)	-(2.2)	-(2.5)	-(0.9)
High School - Abitur	0.17	0.11	-0.22	0.18	0.08	-0.05	0.08	0.10	0.09
	(0.9)	(0.5)	-(0.8)	(0.7)	(0.3)	-(0.2)	(0.3)	(0.4)	(0.4)
Apprenticeship	0.11	0.14	0.12	0.07	0.02	0.10	0.07	0.07	-0.01
	(2.4)	(3.1)	(2.7)	(1.6)	(0.4)	(2.0)	(1.4)	(1.5)	-(0.1)
Below Apprenticeship	-0.03	-0.04	-0.14	-0.03	-0.05	-0.06	-0.02	0.10	0.09
	-(0.3)	-(0.5)	-(1.5)	-(0.3)	-(0.5)	-(0.6)	-(0.2)	(1.0)	(1.1)
Germany (GLFS)									
Higher		-0.06		-0.07	-0.12	-0.16			-0.15
		-(2.6)		-(2.7)	-(5.2)	-(6.8)			-(5.9)
Meister		-0.06		-0.02	-0.06	-0.09			-0.15
		-(1.8)		-(0.8)	-(2.1)	-(2.8)			-(4.6)
High School		-0.07		-0.08	-0.16	-0.13			-0.16
		-(2.2)		-(2.4)	-(5.0)	-(4.2)			-(5.2)
Apprenticeship		0.03		0.02	0.04	0.05			0.05
		(3.4)		(2.2)	(5.6)	(6.7)			(6.8)
Below Apprenticeship		0.02		0.03	0.04	0.04			0.06
		(1.0)		(1.9)	(2.5)	(2.8)			(4.0)
Germany (IABR)									
Degree	-0.04	-0.13	-0.12	-0.11	-0.08	-0.11			
	-(1.4)	-(4.9)	-(4.6)	-(4.1)	-(3.1)	-(4.1)			
High School and Apprenticeship	-0.09	-0.13	-0.13	-0.18	-0.17	-0.18			
	-(2.2)	-(3.1)	-(3.2)	-(4.2)	-(4.1)	-(4.3)			
High School (Abitur)	-0.01	0.00	-0.02	-0.09	-0.07	-0.08			
	-(0.2)	(0.0)	-(0.3)	-(1.5)	-(1.1)	-(1.4)			
Apprenticeship	0.00	0.00	-0.01	-0.01	-0.01	-0.01			
	(0.5)	(0.7)	-(1.7)	-(1.3)	-(2.4)	-(2.5)			
Below Apprenticeship	0.01	0.04	0.06	0.06	0.07	0.08			
	(1.4)	(3.9)	(6.4)	(6.5)	(6.8)	(7.8)			

Note: *t*-values are based on standard errors allowing for clustering wherever applicable. Estimates use sampling weights wherever applicable.

Sources: German Socio-Economic Panel (GSOEP); German Labour Force Survey – *Mikrozensus* (GLFS); German Adminsitrative Data – *Institut für Arbeitsmarkt und Berufsforschung Regionalstichprobe* (IABR); own calculations.