

The erosion of union membership in Germany: determinants, densities, decompositions

Bernd Fitzenberger · Karsten Kohn ·
Qingwei Wang

Received: 4 May 2007 / Accepted: 17 September 2009 /
Published online: 24 December 2009
© Springer-Verlag 2009

Abstract Unionization in Germany has declined considerably during the last two decades. We estimate the impact of socioeconomic and workplace-related variables on union membership by means of Chamberlain-Mundlak correlated random effects probit models, using data from the German Socio-Economic Panel. Drawing on the estimates, we project net union densities (NUD) and analyze the differences between East and West Germany, as well as the corresponding changes in NUD over time. Nonlinear Blinder-Oaxaca-type

Responsible editor: Christian Dustmann

Electronic supplementary material The online version of this article (doi:10.1007/s00148-009-0299-7) contains supplementary material, which is available to authorized users.

B. Fitzenberger (✉)

Department of Economics, Albert-Ludwigs-University Freiburg, 79085 Freiburg, Germany
e-mail: bernd.fitzenberger@vwl.uni-freiburg.de

B. Fitzenberger · Q. Wang
ZEW, Mannheim, Germany

B. Fitzenberger · K. Kohn
IZA, Bonn, Germany

B. Fitzenberger
IFS, London, UK

K. Kohn
KfW Bankengruppe, Palmengartenstraße 5-9, 60325 Frankfurt am Main, Germany

Q. Wang
University of Mannheim, 68131 Mannheim, Germany

decompositions show that changes in the composition of the work force have only played a minor role for the deunionization trends in West and East Germany. In West-East comparison, differences in the characteristics of the work force reflect a lower quality of membership matches in East Germany right after German unification.

Keywords Union membership · Correlated random effects probit model · Decomposition analysis

JEL Classification J51

1 Introduction

Unionization in Germany has declined considerably during the last two decades. In West Germany, net union density (NUD), i.e., the share of unionized employees, declined from 30% in the year 1985 to 27% in 1993 and 20% in 2003.¹ NUD in East Germany was high shortly after German unification with a level of 37% in 1993, but declined even more strongly to merely 18% in 2003. The decline in union density weakens employees' position in wage bargaining and is associated with a decline in coverage of union wage contracts (Ebbinghaus 2003; Bosch 2004; Kohaut and Schnabel 2003b; Schnabel 2005). Moreover, deunionization may have contributed to the recent rise in wage inequality in Germany (Kohn 2006; Dustmann et al. 2009).

Why do people join a union at all? In Germany, as in many other countries, most outcomes of union activity apply to all employees irrespective of membership, and the share of employees covered directly or indirectly by the outcome of collective bargaining is much higher than actual membership (OECD 2004). Collective agreements constituting discriminatory wage policies with disadvantages for non-union members are forbidden by the German constitution (negative freedom of association, *negative Koalitionsfreiheit*, *Grundgesetz Art. 9*), and employers often recognize collective bargaining outcomes without being legally required to do so (Bosch 2004; Dustmann and Schönberg 2009). This results in an inherent free-rider problem for union membership. However, unions may **offer** selective incentives in addition to the collective goods provided (Olson 1965; Booth and Chatterji 1995; Moreton 1998). Membership may also result from social customs (Akerlof 1980; Booth 1985), where non-conformance would result in a loss of reputation. Complementary approaches in social and political sciences (Wallerstein and Western 2000) emphasize the importance of internal rules, peer **effects** and social values, and class consciousness, as well as political attitudes for unionization.

¹These numbers are based on the German Socio-Economic Panel, see Section 3 for details.

This paper analyzes determinants of union membership based on individual-level data from the German Socio-Economic Panel (GSOEP), and investigates the nature of deunionization in Germany. Our study extends upon the existing literature in two main dimensions. First, we estimate determinants of union membership in both East and West Germany, using the panel structure of the GSOEP and applying a Chamberlain-Mundlak correlated random effects probit model. Our analysis involves the time period 1985 to 2003 for West Germany and 1993 to 2003 for East Germany. In fact, it proves important to control for individual-specific effects in union membership. We analyze differences of socio-demographic personal characteristics and attitudinal factors both between East and West Germany and across time.

Second, we decompose differences in NUD in order to shed light on (1) the changes in unionization over time and (2) the differences in deunionization between East and West Germany. We find that changes in the composition of the work force only played a minor role for the deunionization trends in both East and West Germany since 1993. In an East-West comparison, differences in the characteristics of the work force are in favor of higher NUD in the West, and the stronger decline in union membership in East Germany reflects a stronger change in the impact of these characteristics. Our findings suggest that the traditional system of collective bargaining has not been able to meet the increased demand for flexibility of both employers and employees.

The paper is organized as follows: Section 2 describes specifics of the German system of industrial relations and reviews related studies in the literature. Section 3 presents our econometric investigation. Section 4 contains our decomposition analysis based on the regression estimates. Section 5 concludes. Selected data descriptions and empirical results are provided in the [Appendix](#), while detailed empirical results and background information are provided in the additional [online appendix](#) to this paper.

2 Institutional background

In Germany, there are basically three regimes of wage bargaining. First, collective bargaining takes place at the industry level between a union and an employers' association. Second, a union can also negotiate with single firms to sign firm-level collective contracts. Third, employers and employees may also negotiate individual contracts. According to the German Collective Bargaining Act (*Tarifvertragsgesetz*), collectively negotiated agreements are necessarily binding for individual job matches if the firm is a member of an employer association and, in addition, if the worker is a union member. However, this prerequisite only applies to a minority of employees.

In fact, the scope of collective agreements goes beyond the organized parties because negotiation outcomes cover not only union members, but actually the majority of all employees (Bosch 2004). Employers often recognize collective bargaining outcomes without being legally required to do so. Wages set at

the firm level and at the individual level take wage bargaining outcomes as a reference point, be it in order to reduce transaction costs, to prevent employees from joining a union (union threat effect), or to give a commitment to honor training effort (Dustmann and Schönberg 2009). Moreover, collective agreements can also be declared generally binding by the Federal Labor Minister.² As a result, collective bargaining coverage is considerably higher than union density (Schnabel 2005).

2.1 Unionization in Germany: three challenges

Against this institutional background, studies of union membership in Germany face three challenges. First, collective bargaining is an open-shop system. Membership is not compulsory and collective agreements constituting discriminatory wage policies at the expense of non-union members are forbidden by constitutional law (negative freedom of association, *negative Koalitionsfreiheit*, *Grundgesetz Art. 9*). By nature, the core services trade unions offer have public good character, which gives rise to the possibility of free-riding behavior. Thus, why would people want to join a union at all? Who joins the union? And how much do different determinants such as personal or workplace characteristics contribute to people's membership decision?

Second, union membership has been declining steadily during recent decades. Figure 1 depicts gross union density (GUD), defined as the ratio of the number of union members (irrespective of whether a member is employed) and the number of employees in the German labor market. After a period of slight increases in the 1970s, the early 1980s mark the beginning of a pronounced trend towards deunionization, which started out at a level of about 40%. By the year 2004, GUD was down to a historically low level of 27%. Deunionization was merely interrupted by a unification effect in 1990, when West German institutions were transferred to the East, and unions were initially very successful in recruiting members in the East. However, this upsurge was not sustainable, and deunionization has been continuing even more rapidly since then. Some trade unions have responded to the decline in size by merger (Keller 2005). To date, however, unions have not been able to reverse the trend; see also Ebbinghaus (2003) and Fichter (1997).

²Such contract extensions based on Section 5 of the German Collective Bargaining Act (*Tarifvertragsgesetz*) used to be of minor importance. In 2003, only 0.8% of all employees subject to social security contributions were covered by agreements that were binding by contract extension (BMWA 2004). Since the year 1996, however, minimum standards for working conditions (including, e.g., a minimum wage) may also be extended to all employees in one industry based on the job posting act (*Arbeitnehmer-Entsendegesetz*). So far, this has been applied in construction, for craftsman painters and building cleaners, and in postal services. At the same time, a considerable number of collective contracts have been modified during the last decade to include an explicit opening clause allowing for deviations from the terms of the contract under particular circumstances (Heinbach 2006).

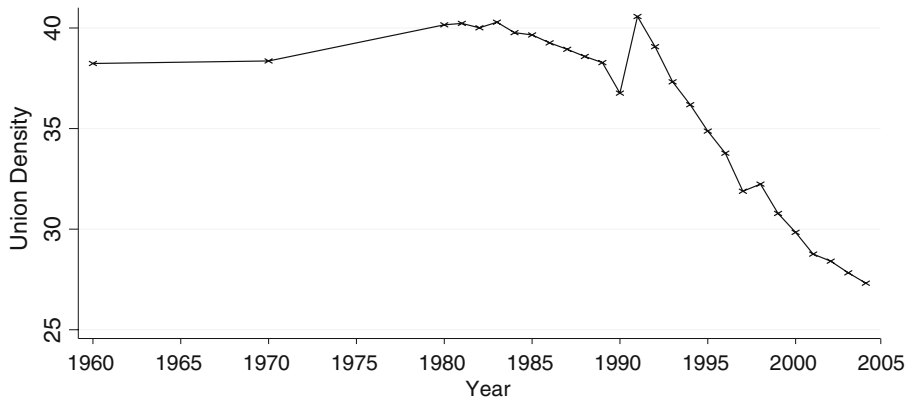


Fig. 1 Evolution of GUD. Gross union density in percent; 1960–1990: West Germany; 1991–2004: Unified Germany. Union membership in *Christlicher Gewerkschaftsbund* (CGB, data until 1999: German Statistical Office (*Statistisches Bundesamt*, *Statistische Jahrbücher*), union information thenceforward), *Deutsche Angestelltengewerkschaft* (DAG, until 2000; data: German Statistical Office), *Deutscher Gewerkschaftsbund* (DGB, data: www.dgb.de), *Deutscher Beamtenbund* (DBB, data: www.dgb.de), and *Deutsche Polizeigewerkschaft* (DPoIG, until 1970, data: German Statistical Office). Employment (*abhängig Beschäftigte ohne mithelfende Familienangehörige*) from German Microcensus: www.destatis.de

The decline in union membership parallels developments of employers' associations and rates of collective bargaining coverage. Membership in employers' associations (the share of members of an employer association among all firms, weighted by employment) has traditionally been higher than union density (Traxler 2004; Traxler et al. 2001), but has also been declining. Exact numbers from associations' records or from surveys are available for some industries only. Schnabel (2005) reports that, until the late 1980s, about three quarters of all employees in the (West) German metal and electronics industry were employed in firms that belonged to the employer association in the metal and electronics industry (*Arbeitgeberverband Gesamtmetall*). By the year 2003, employer membership rates were down to 59% in West Germany and to a low 21% in the East. Brenke (2004) reports that, in 2003, merely 10% of all East German industrial firms (employing some 30% of all workers) were members of an employer association.

Collective bargaining coverage, as measured by the share of employment contracts applying collective agreements, has been relatively stable until the mid 1990s, but has declined since then. By 2003, 70% (45%) of West German employees (firms) were covered by a collective agreement (Schnabel 2005). With respective shares of 54% and 26%, coverage in East Germany was markedly lower. Moreover, the decline in bargaining coverage has been more pronounced in East Germany: Whereas the share of covered employees had decreased by 7 ppnts in West Germany since the year 1996, the corresponding decline in East Germany was 14 ppnts. Micro-level studies on the

changes of individual membership over time can give insight into the nature of observed aggregate trends and possible explanations.

A third challenge is that the availability of adequate data from union records is limited. From 1991 onwards, only aggregate numbers for unified Germany are available, and unions' publications do not distinguish between employed members on the one hand and unemployed, retired, or student members on the other (Franz 2006). Yet, this distinction is important from an economic perspective. NUD, defined as the share of employed union members among all employees, is a better measure of union power than GUD because it is more closely related to the union's financial resources and to the potential to mobilize workers in case of a strike (Fitzenberger and Kohn 2005). NUD is lower than GUD by definition. Estimates of aggregate NUD usually fall short of GUD by about 10 ppoints, and this difference also varies over the business cycle (Ebbinghaus 2003). Union power further differs significantly between different labor market segments. For example, unions are traditionally strong in manufacturing industries, but they are less important in personal service sectors. Official membership information does not distinguish between sufficiently homogeneous segments. Detailed NUD estimates obtained from survey data thus help providing meaningful measures of union strength.

2.2 Determinants of union membership

A number of empirical studies investigate the decline in union membership in Germany based on survey data.³ Based on panel probit estimates from the GSOEP, Fitzenberger et al. (1999) and Beck and Fitzenberger (2004) conclude that the observed aggregate decline in union membership during the 1980s and 1990s was mainly driven by composition effects. Using data from the German general social survey (ALLBUS), a collection of independent biannual cross sections, Schnabel and Wagner (2003, 2005) show that the factors influencing an individual's propensity to be a union member have converged between East and West Germany from 1992 to 2000. Schnabel and Wagner (2007) decompose the decline in union membership and find that changes in the composition of the workforce only played a minor role for deunionization during the period from 1980 to 2004. Also based on ALLBUS data, Biebeler and Lesch (2007) find that a trend in workers' preferences for greater economic

³See Windolf and Haas (1989), Lorenz and Wagner (1991), and Goerke and Pannenberg (2004) for important empirical studies based on individual-level data. Goerke and Pannenberg (2004) test social customs theory and provide evidence that individual membership increases with a higher membership at the industry level. There also exist alternative approaches in the literature, see the surveys by Riley (1997) and Schnabel (2003) for studies using aggregate time series data to study long-run trends and business cycle effects, and Hassel (1999), Windolf and Haas (1989), and Frege (1996) for studies analyzing the impact of institutional regulations and interactions in social environments on union membership.

freedom has contributed to the decline in membership. However, large firms have remained a stronghold for unions and, if anything, firm-size effects have increased over time.⁴

Departing from this literature, we investigate the impact of various determinants of union membership. Covariates considered in the empirical analysis can be grouped into the following three categories:

- Personal characteristics: age, gender, education, marital status, citizenship, unemployment history.
- Workplace related variables: earnings, employee status, firm size, tenure, industry, job satisfaction.
- Social environment: political preferences.

These variables are mostly standard in the literature on union membership. The effects of some of these covariates may be ambiguous, though. Most specifically, the variables age and earnings may exert a nonlinear impact:⁵

Age – Mobility tends to decrease with the age of a worker. Family ties and specific human capital increase with age. Thus, older workers are more interested in job security and, therefore, in union membership as an implicit insurance. Yet, the interest in union representation may fade out once people know that they are successful in the labor market. In line with the evidence in Blanchflower (2007), an inverted U-shape relationship is expected. The link between age and union membership may also reflect cohort effects, as differences between generations in value orientation or social custom may result in different attitudes towards unions.⁶

⁴A related strand of literature examines the erosion of collective bargaining coverage and the trend towards more decentralized wage setting. Based on firm-level data, Kohaut and Schnabel (2003a, b) find that firm size, age of the establishment, and skill level of the work force positively affect the probability of bargaining coverage beyond industry-specific effects. In addition, the existence of a work council and the fact that a firm pays wages above the collective agreement significantly reduce the propensity of a firm to abolish recognition of a collective agreement (Bispinck and Schulten 2003).

⁵See the working paper version of this paper (Fitzenberger et al. 2006), as well as Schnabel (2003) and Beck and Fitzenberger (2004), for detailed conceptual discussions of the various determinants.

⁶Blanchflower (2007) finds an inverted U-shape pattern of union membership in age across many countries. The pattern is partly explained by cohort effects, but even remains when cohort effects are removed. So it also reflects “a broader life cycle pattern” (p. 20), which would imply a number of different arguments, such as less need for unions among younger and older workers as compared to prime-age workers because union wage mark-ups are less favorable to young workers and statutory employment protection is higher for older ones. The inverted U-shape is also in line with increasing free-rider behavior in later years of the life cycle, with moves to (non-union) managerial positions in later years, or with quits from full-time union jobs in favor of part-time or marginal employment in years preceding (early) retirement.

Earnings – Membership fees increase with earnings, and a higher wage tends to be associated with a higher professional status, both of which reduce the propensity to join a union. However, higher wages may indicate higher firm-specific human capital, thus increasing the demand for stability. Similar to education, a hump-shaped relationship may arise with a positive influence for low wage levels and a negative one for higher wages. This effect is expected even after controlling for observable human capital variables.⁷

In closed-shop systems as, e.g., in the USA, union membership itself may result in higher wages; see the broad literature on union wage gaps surveyed in Card et al. (2003). In Germany, however, there are no wage effects of union membership per se at the individual level (Goerke and Pannenberg 2004).

Each of the covariates above may influence union membership differently in East and West Germany, and over time. In addition, unobserved individual factors (e.g., social customs, attitudes) are likely to be important.

3 Empirical analysis

In the following, we first describe the employed data and we present descriptive evidence. We then discuss econometric estimates for the determinants of union membership and of the dynamics of membership.

3.1 Data and descriptives

Our empirical analysis is based on the GSOEP, a longitudinal survey of individuals in private households in the Federal Republic of Germany. The GSOEP started in (West) Germany in the year 1984 and was extended to East Germany in 1990; see Haisken-DeNew and Frick (2003) for detailed information on the GSOEP. Among others, questions related to the labor market are at the heart of the yearly survey. The question of membership in a trade union, however, is not included in every wave. Up to date, six waves contain accordant information for West Germany: 1985, 1989, 1993, 1998, 2001, and 2003. For East Germany, we can use four waves: 1993, 1998, 2001, and 2003. In order to analyze the determinants of employees' union membership decisions, we focus on individuals in gainful dependent employment who are between 16 and 65 years old and who do not earn more than DM 15,000 per month. Definitions of variables considered in the analysis are provided in Table 2.

⁷Our econometric specification controls for observable measures of professional status and firm-specific human capital (job status, tenure). Thus, the estimated effect of earnings partly reflects the impact of earnings due to the unobserved components of these two determinants.

Tables 3 and 4 report summary statistics for selected variables in some years based on our subsamples of West and East Germany for all employees and conditional on membership status.⁸ Union membership declines in West Germany from 29.9% in the year 1985 to 26.7% in 1993, and to 20% in 2003. The speed of the decline increases over time. Union membership in East Germany declines from 37% in 1993 to 17.7% in 2003. Hence, the decline is faster in East Germany than in West Germany.

Which characteristics are strongly correlated with the decline? In West Germany, the decline is stronger for males than for females (because the share of females among union members increases over time more strongly than among non-members). Furthermore, the decline is stronger for employees with an unemployment history, for younger employees, for employees with lower tenure, for employees with lower earnings, and for employees in medium-sized firms (20–199 employees) both compared to small firms and firms with 200–1,999 employees. For the largest firms (above 2,000 employees), the decline in membership is again stronger and there exist considerable differences across sectors. For East Germany, there are some noteworthy differences. The decline there is stronger for female employees, for Christian Democrats, and for employees with higher tenure. The decline is smaller both for employees in small and in very large firms. These descriptive results suggest that gender, unemployment experience, firm size, sector, earnings, age, and tenure (and political orientation in East Germany) may be important to explain differences in the decline in union membership. In addition, most characteristics are associated with differences in the overall level of membership. Thus, changes in those characteristics may also explain the decline in membership by changes in characteristics over time.

3.2 Panel membership equations

We employ a Chamberlain-Mundlak correlated random effects probit model based on unbalanced panel data (see Chamberlain 1984 and Wooldridge 2002, chapter 15.8) in order to estimate union membership y_{it} of individuals $i = 1, 2, \dots, N$ in periods $t = 1, 2, \dots, T$:

$$P(y_{it} = 1 | x_{i1}, \dots, x_{iT}, c_i) = \Phi(x_{it}\beta + c_i) = \Phi\left(\left(1 + \sigma_\epsilon^2\right)^{-1/2}(\mu + x_{it}\beta + \bar{x}_i\xi)\right), \quad (1)$$

where x_{it} denotes observable, possibly time-varying covariates, and c_i an unobservable individual-specific, time-invariant effect (see Section 1 of the [online appendix](#) for a complete description of our econometric model). σ_ϵ^2 denotes

⁸Summary statistics of all variables used are available in Section 2 of the [online appendix](#).

the variance for the part of the random effect c_i not captured by the averages \bar{x}_i . The approach allows us to control for unobserved heterogeneity and to take account of possible correlation of individual-specific effects with observed characteristics. Accounting for unobserved heterogeneity is crucial because it is likely that people's attitudes towards unions differ considerably and attitudes are correlated with observed characteristics. To gauge our results, we also discuss results of a standard random effects probit model and panel OLS results.

We estimate the following model specifications, separately for both West and East Germany:⁹

- (A) Preferred selected model: Our preferred Chamberlain-Mundlak specification is derived from a backward selection procedure described in Section 3 of the [online appendix](#). The resulting list of variables in \bar{x}_i related to the individual-specific effect comprises for West Germany: CHRISTIAN-DEMOCRAT, SOCIAL-DEMOCRAT, WHITE-COLLAR, TRAINEE, UNEMPLOYMENT HISTORY, EARNINGS, FIRM-SIZE, and SECTOR. For East Germany, EARNINGS, TENURE, FIRM-SIZE, and SECTOR turn out to be correlated to the individual-specific effect. The selection procedure also identifies those regressors in x_{jit} , whose effects vary significantly over time. The selected model is estimated as a correlated random effects probit.
- (B) Reduced selected model: Some time-varying regressors x_{jit} show only limited variation within individuals. For example, an individual's educational attainment rarely changes during his or her working life, and civil servants seldom change back to a private employer. Nevertheless, the averages of these variables might turn out significant in the selected model (A). This could be due to problems of multicollinearity, with the direct effects of x_{jit} becoming insignificant. Therefore, we also estimate a model without averages of educational attainment and vocational status variables.
- (C) Benchmark random effects model: We further estimate a standard random effects probit as a benchmark model. Here, we use the same procedure as described for specification (A) to consider time-varying coefficients, but we do not include any averages \bar{x}_i .

⁹The discussion paper version of this paper (Fitzenberger et al. 2006) reports two additional specifications based on restricted sets of covariates available in two large-scale German labor market data sets (IAB employment sample, German Structure of Earnings Survey). The corresponding estimates may be used to predict NUD in labor market segments (cells) defined by industry, region, and/or individual socio-economic characteristics (Fitzenberger et al. 2008). Union density in a labor market segment can reflect the importance of unionism as it is not meaningful to estimate wage effects of individual union membership in Germany (Fitzenberger and Kohn 2005).

To avoid the loss of a large number of observations due to missing values, we add dummy variables for missings in single regressors. In particular, we include dummy variables for missing values in ABITUR, FIRM-SIZE, and SECTOR, which contribute most to this problem. At the same time, some individuals appear in several, but not all sample periods—due to unemployment spells, for example. We control for this by introducing missing-period dummies. Furthermore, time dummies and interactions of these with other regressors are included to allow each of the effects to vary over time.

3.3 Estimated determinants of union membership

Estimated coefficients for West and East Germany are reported in Tables 4 and 5 in the [online appendix](#). A comparison of the estimated model specifications in Section 5 of the [online appendix](#) rationalizes the choice of specification (A) as the preferred model.

In general, results for East and for West Germany are remarkably similar despite some notable exceptions. First, the baseline (TIME dummies) and the impacts of EARNINGS and UNEMPLOYMENT HISTORY are the only effects that vary significantly across time in the East, whereas some more effects vary in the West. On the one hand, this is to be expected given the shorter sample period for East Germany, which renders it more difficult to disentangle short-run and time-average effects. On the other hand, East-West convergence (Schnabel and Wagner 2003) is likely to be driven by changes in the East. Second, while MARRIED individuals *ceteris paribus* have a lower propensity to join a union in the West, the effect of MARRIED is significantly positive in the East. This finding reflects likely East-West differences in labor force participation but it could also result from different union objectives. For example, union policy tends to be more family-oriented in the East. Third, working PART-TIME shows the expected negative sign in West Germany, but an insignificant and positive effect in East Germany. Fourth, differences between sectors are stronger in East Germany, and most direct SECTOR effects are insignificant, possibly due to the relatively small number of observations in some sectors (compare Table 4) and to less within-individual variation.

The coefficients are generally allowed to vary over time. However, most of the effects do not change significantly. Those that do change mainly show a consistent, monotonic pattern. For instance, both the linear effect of AGE and the curvature effect of AGE SQUARED decrease in West Germany over some time, rendering the total impact less concave. In East Germany, the impact of EARNINGS also becomes less concave. Thus, in contrast to Beck and Fitzenberger (2004) and Schnabel and Wagner (2005), we find some clear patterns of changes. For East Germany, we find a significant positive time effect only for 1993, whereas for West Germany, there is a negative time trend throughout the entire sample period. Therefore, the estimated time

trend contributes to the continuous deunionization in West Germany but not in East Germany.

Turning to selected estimated determinants, we find that women are less likely to be union members. The effect of FOREIGNER is positive but insignificant in East Germany. In line with international evidence in Blanchflower (2007), we find a concave impact of AGE that may reflect cohort effects, as well as life cycle patterns (see footnote 6). Supporters of the Social Democrats (but not those of the Christian Democrats) have the expected higher propensity to join a union. Regarding education, ABITUR and UNIVERSITY have a sizeable negative impact relative to the omitted category of lower education, but the influence of APPRENTICESHIP is not significant. Compared to the omitted category SEMISKILLED, and even more strongly compared to SKILLED BLUE-COLLAR workers, CIVIL SERVANTS and WHITE-COLLAR workers show a significantly lower propensity. The effect for PART-TIME workers has the expected negative sign in West Germany, but is positive and insignificant in the East. The effect of UNEMPLOYMENT HISTORY is negative. The effect of average UNEMPLOYMENT HISTORY is strongly positive. Employees who have recently been unemployed are less likely to join a union due to their lower labor market attachment, whereas employees who are generally at a higher risk of unemployment have a higher need for protection. Job SATISFACTION shows virtually no effect in the West and only a limited effect in the East.

The concave effect of EARNINGS generally meets our expectations, and further analysis shows that the effect is positive for the major part of the earnings range observed. As discussed above, the impact also becomes flatter over time in East Germany. The EARNINGS effect is more sizeable in East Germany, being attenuated by converse effects through average EARNINGS and average EARNINGS SQUARED.¹⁰ The positive but small TENURE coefficient supports the human capital argument.

FIRM-SIZE shows a substantial positive impact. However, the positive effects for firms larger than 200 employees strongly decline over time for West Germany. This finding is in contrast to the results obtained by Biebeler and Lesch (2007). Nevertheless, large firms remain an important stronghold of unions both in West and East Germany. Considerable differences in unionization exist, finally, across industries. Compared to our reference SECTOR

¹⁰Since we already control for age, education, professional status, and proxies for firm-specific human capital, a referee questioned the interpretation of the earnings effect conditional on all the other variables. In order to assess this point, we run quantile regressions of earnings to determine quintiles of the conditional earnings distribution for each individual, and we used dummy variables for these quintiles as alternative earnings measures in our membership estimation (detailed results are provided in Section 8 of the [online appendix](#)). The findings confirm the mostly positive and highly nonlinear effect of earnings given the other observed variables.

“Miscellaneous Manufacturing (7),” the large positive effects of “Chemical Products (5)” and the formerly public industries “Transport and Communication (11)” are most striking. In contrast, “Hotels and Restaurants (10),” “Financial Intermediation (12),” or “Other Services (16)” show significantly lower union membership.

As a sensitivity check, we also estimate specifications (A) and (C) by OLS with (Chamberlain-Mundlak) and without time averages. Section 6 of the [online appendix](#) contrasts these estimates with the average marginal effects implied by our panel probit estimates. In sum, OLS and probit estimates are rather similar.

3.4 Heterogeneity in membership dynamics

For a deeper analysis of membership dynamics, we additionally run OLS regressions of the change in membership between 1993 and 2003 on membership status in 1993, covariates in 2003 (or 1993), and time averages of those covariates also used in our panel estimates in order to account for unobserved heterogeneity. Specifically, we estimate the model

$$y_{i,2003} - y_{i,1993} = \gamma_0 + y_{i,1993}\gamma_1 + x_{i,s}\gamma_2 + \bar{x}_i\theta + u_i, \quad (2)$$

where $y_{i,t}$ again denotes individual membership dummies for year t , and the time indices t, s equal 2003 or 1993. Despite potential standard econometric problems (misspecification of OLS, inconsistent coefficient estimates when there is remaining autocorrelation, etc.), these estimates pinpoint to important determinants of the decline in union membership.¹¹

Apart from the lagged dependent variable, only a small number of covariates prove significant. For West Germany, age, tenure, firm size, and long-term preference for social democrats significantly reduce the decline in membership. When using the covariates of 1993, the decline is also estimated to be significantly larger for females and for university graduates. For East Germany, the decline is significantly larger for females, for employees with a preference for the Christian Democratic Party, and for workers with a long-term job in smaller firms. A long-term attachment to the small sector 4 (woodwork, paper, and printing industry) shows a strong and significantly positive effect on the decline in union membership. The significant covariates indicate for which groups of employees the decline in union membership has been most prevalent.

¹¹Detailed estimation results are provided in Section 11 of the [online appendix](#).

4 Decomposition analysis

In the following, we project aggregate membership based on our model estimates and decompose the changes over time and the West–East differences into a characteristics effect and a coefficients effect. In order to assess how well our preferred model estimates (specification (A) of correlated random effects probit) replicate actual observed aggregate membership, we predict propensities to join a union for each of the individuals in our samples. These propensities are averaged to yield an estimator for NUD. Specifically, we estimate NUD_{rt} separately for regions $r \in \{\text{East, West}\}$ in each year t by

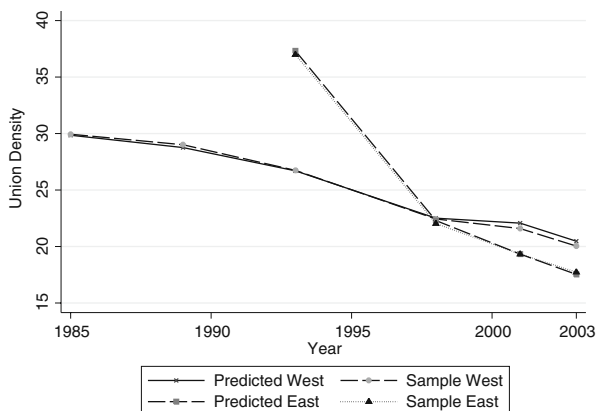
$$\widehat{NUD}_{rt} = N_{rt}^{-1} \sum_{i=1}^{N_{rt}} \Phi \left((1 + \hat{\sigma}_{\epsilon,r}^2)^{-1/2} \left(\hat{\mu}^r + x_{irt} \hat{\beta}^{rt} + \bar{x}_i \hat{\xi}^r \right) \right). \tag{3}$$

The predicted and the observed NUD are depicted in Fig. 2. In general, the predicted densities match the observed frequencies fairly well. Compared to the West, membership in East Germany started out at a higher level in the year 1993, but declined strongly afterwards. NUD for 1993 and 2003 were 37% and 18% in East and 27% and 20% in West Germany. Aggregate NUD is about 10 points lower than GUD (compare Section 2).

4.1 Implementation of decomposition

We investigate (1) the changes of NUD over time and (2) the differences in NUD between East and West Germany by means of the Blinder–Oaxaca decomposition technique (Blinder 1973; Oaxaca 1973), which we adapt to the nonlinear probit estimator similar to Fairlie (2005). In order to decompose

Fig. 2 NUD in East and West Germany. Sample frequencies and predicted densities in percent. Data source: GSOEP



the changes of NUD within the two regions between 1993 and 2003,¹² we write

$$\widehat{NUD}_{2003} - \widehat{NUD}_{1993} = \underbrace{\left(\widehat{NUD}_{2003} - \widehat{NUD}_{2003}^{1993} \right)}_{\text{coefficients effect}} + \underbrace{\left(\widehat{NUD}_{2003}^{1993} - \widehat{NUD}_{1993} \right)}_{\text{characteristics effect}} \quad (4)$$

$$= \underbrace{\left(\widehat{NUD}_{2003} - \widehat{NUD}_{1993}^{2003} \right)}_{\text{characteristics effect}} + \underbrace{\left(\widehat{NUD}_{1993}^{2003} - \widehat{NUD}_{1993} \right)}_{\text{coefficients effect}}, \quad (5)$$

where \widehat{NUD}_t are estimated as described in Eq. 3. Decompositions 4 and 5 differ with respect to the chosen counterfactual densities \widehat{NUD}_t^i . In Eq. 4, $\widehat{NUD}_{2003}^{1993}$ denotes the prediction for the 2003 sample of individuals (based on the characteristics in the year 2003), assuming that the coefficients stayed as in 1993. In Eq. 5, $\widehat{NUD}_{1993}^{2003}$ uses predictions for individuals in 1993 based on the coefficients of 2003. We compute both versions Eqs. 4 and 5 to investigate the sensitivity of the decomposition result.¹³ The characteristics effect involves the part of the overall change between 1993 and 2003, which can be attributed to changes in personal, workplace, and social characteristics of the individuals in the sample at given coefficients. The coefficients effect captures the part that is due to changes in the coefficients at given characteristics. The counterfactuals needed can be estimated as averages analogous to Eq. 3.

For the differences between East (E) and West (W) Germany in a given year, we use

$$\widehat{NUD}_W - \widehat{NUD}_E = \underbrace{\left(\widehat{NUD}_W - \widehat{NUD}_W^E \right)}_{\text{coefficients effect}} + \underbrace{\left(\widehat{NUD}_W^E - \widehat{NUD}_E \right)}_{\text{characteristics effect}} \quad (6)$$

$$= \underbrace{\left(\widehat{NUD}_W - \widehat{NUD}_E^W \right)}_{\text{characteristics effect}} + \underbrace{\left(\widehat{NUD}_E^W - \widehat{NUD}_E \right)}_{\text{coefficients effect}}, \quad (7)$$

where the involved counterfactual densities \widehat{NUD}_t^i are defined similar to the above case.

¹²It would also have been possible to analyze the change for West Germany over the even longer period 1985–2003. However, we opt for 1993–2003 in order to facilitate East-West comparisons in Table 1.

¹³It is well known that decompositions resulting from different counterfactuals do not necessarily yield identical results. Different approaches on how to deal with the non-uniqueness of decompositions have been proposed in the literature; see Oaxaca and Ransom (1994) and Silber and Weber (1999). Each of the decompositions relies on assumptions about the counterfactual of interest. Here, we report the two benchmark cases and we interpret possible differences in results.

When estimating the counterfactuals, we have to be specific about the treatment of the random effect. We take the correlated random effect as part of the individual and base our counterfactual membership predictions on the same averages \bar{x}_i as used in the estimation. However, we set the pure random effect, which is uncorrelated to the covariates, to zero because it is not systematically linked to the observed covariates. Standard errors to assess the accuracy of the decompositions are obtained by means of a parametric bootstrap through resampling from the estimated asymptotic distribution of the parameters $(\beta^{rt'}, \mu^{rt}, \xi^{rt'}, \sigma_{\epsilon}^{rt'})'$.

4.2 Decomposition results

The results of the different decompositions are reported in Table 1 for the probit estimates and in Table 5 in the Appendix for OLS. By and large, the order of magnitude of the decomposition effects is not sensitive to the choice of counterfactuals in Eqs. 4 and 5, nor in Eqs. 6 and 7. However, there are some noteworthy differences.

Table 1 Decomposition of differences in NUD based on estimation results

	NUD [%]		Change over time	Char. effect ^a	Coeff. effect ^a
	1993	2003			
Preferred correlated random effects probit model (specification A)					
West Germany	26.7 (0.58)	20.47 (0.61)	-6.23 (0.72)	-1.74 (0.62)	-4.49 (0.82)
				<i>-0.86 (0.58)</i>	<i>-5.37 (0.84)</i>
East Germany	37.32 (0.92)	17.52 (0.90)	-19.8 (1.13)	-3.57 (0.92)	-17.62 (0.90)
				<i>-0.19 (1.16)</i>	<i>-19.39 (1.41)</i>
West-East Difference	-10.62 (1.07)	2.95 (1.06)			
Char. effect ^b	3.45 (4.71)	<i>8.06 (0.69)</i>	4.98 (2.86)	5.87 (0.58)	
Coeff. effect ^b	-14.07 (4.80)	<i>-18.68 (1.19)</i>	-2.03 (3.13)	-2.92 (1.24)	
Benchmark random effects probit model (specification C)					
West Germany	25.81 (0.59)	19.29 (0.60)	-6.52 (0.73)	-3.05 (0.51)	-3.47 (0.78)
				<i>-2.7 (0.51)</i>	<i>-3.82 (0.82)</i>
East Germany	37.35 (1.02)	17.18 (0.86)	-20.17 (1.15)	-3.05 (1.49)	-17.12 (1.64)
				<i>0.26 (1.04)</i>	<i>-20.43 (1.37)</i>
West-East Difference	-11.54 (1.18)	2.11 (1.07)			
Char. effect ^b	3.33 (4.67)	<i>5.58 (0.69)</i>	5.5 (5.5)	5.43 (0.60)	
Coeff. effect ^b	-14.87 (4.79)	<i>-17.12 (1.30)</i>	-3.39 (2.88)	-3.32 (1.20)	

Standard errors in parentheses estimated by 1000 bootstrap resamples. Data source: GSOEP

^aCounterfactual with: first row (arial font) characteristics-of-2003-coefficients-of-1993 (Eq. 4); second row (*italic font*) characteristics-of-1993-coefficients-of-2003 (Eq. 5)

^bCounterfactual with: first column (arial font) characteristics-of-WEST-coefficients-of-EAST (Eq. 6); second column (*italic font*) characteristics-of-EAST-coefficients-of-WEST (Eq. 7)

4.2.1 Correlated random effects probit

The (horizontal) decompositions of the changes in NUD over time (−6.2 ppoints decline in West Germany and −19.8 ppoints decline in East Germany) show that both characteristics and coefficients effects contribute to the observed deunionization and that the coefficients effect dominates.

The characteristics effect explains less than a third of the decline in West Germany and less than a fifth in the East. This finding is in line with the recent results of Schnabel and Wagner (2007), who also conclude that changes in the composition of the workforce cannot explain recent trends towards deunionization.¹⁴ The strong coefficients effect reflects both the negative time trend and changing slope coefficients for some covariates. In particular, the firm size effect for West Germany has become less important over time such that the differential between small and large firms has declined. The average marginal effect of the dummy variables for firms with more than 2,000 employees has fallen by 4.2 ppoints, and by 2.9 ppoints for firms with 200–1,999 employees.¹⁵ For East Germany, there is no significant change in the firm size effect, and the coefficients effect almost exclusively involves the uniform negative time trend affecting all employees. These results are broadly in accordance with the above analysis of membership dynamics (Section 3.4), where only a small number of covariates proved significant.

The small impact of the characteristics effect in East Germany is quite remarkable in light of the strong composition changes during the 1990s (see Table 4). The characteristics effect in West Germany is explained by changes in political attitudes and satisfaction,¹⁶ the increase in the share of female employees, the fall in the share of employees in large firms, and the fall in the share of blue-collar employees (see Table 3). All of these changes work towards a reduction in membership.

Comparing the decomposition results in the upper part of Table 1 for the changes over time with respect to the involved counterfactuals (first row in arial font: “characteristics-in-2003-coefficients-in-1993”; second row in *italic* font: “characteristics-in-1993-coefficients-in-2003”) reveals some noteworthy differences. When the differences in characteristics are evaluated at coefficients of 2003 (second row), the characteristics effect becomes negligible and insignificant both for West and East Germany. Thus, the change in coefficients over time occurs in such a way that the changes in characteristics are basically

¹⁴The finding is in contrast to a result of Beck and Fitzenberger (2004), who study union membership for an earlier time period. Rationalizing stability of regression coefficients over time, they conclude that the decline in union density in West Germany between the 1980s and 1990s was mainly driven by changes in the composition of the work force.

¹⁵This finding is somewhat in contrast to the results reported by Biebeler and Lesch (2007). Detailed results with estimated average marginal effects are provided in Section 7 of the [online appendix](#).

¹⁶This is in line with the results reported by Biebeler and Lesch (2007).

irrelevant for overall union membership in 2003. Put differently, with 2003 coefficients, overall union membership would not have been significantly higher even if employees still exhibited 1993 characteristics. This observation strengthens the finding that it is the change in coefficients that drives the decline in union membership.

Regarding the (vertical) West-East comparison, the characteristics effect and the coefficients effect work in opposite directions. The characteristics effect implies a 3.5 to 8 pppts higher NUD in West Germany, i.e., the composition of the workforce in West Germany is more pro-union. Thus, the much higher union membership in East Germany in 1993 is attributed to the coefficients effect, which amounts to 14.1 and 18.7 pppts. The coefficients effect is strongly reduced over time, which reflects a strong convergence of membership at given characteristics. The fact that East Germans were more strongly unionized than West Germans in 1993 reflects the strong recruitment in East Germany after unification. Yet, the high membership rate in East Germany could not be sustained over time and, by 2003, union density had fallen below the West German level. Nevertheless, East Germans are still slightly more pro-union in 2003 compared to West Germans with the same characteristics.¹⁷

4.2.2 Sensitivity analysis

We investigate the sensitivity of the decomposition results with respect to using different estimates. First, the lower part of Table 1 reports the results based on the benchmark random effects model. Leaving out the correlated random effects, this model implies larger characteristics effects for West Germany. However, this is not the case for East Germany, where the characteristics effect is actually weaker than for the correlated random effects model. For West Germany, the average characteristics capture permanent effects on union membership and, apparently, the distribution of these changed less over time than the distribution of current period characteristics. So there is some persistence in membership despite changes in characteristics. In East Germany, the situation is the opposite, reflecting the transitory nature of the strong union membership shortly after German unification. The characteristics effect for the West-East difference evaluated at coefficients from West Germany (right column) amounts to 5.6 pppts in 1993. This number is lower than the corresponding number in the upper panel. In 2003, the characteristics effect

¹⁷As the membership equation is less precisely estimated for East Germany compared to West Germany, the decomposition results using East German coefficients to evaluate the differences in characteristics (left column) are also less precise than the decomposition, which uses coefficients for West Germany (right column). We do not interpret the differences between the two columns because they are not significant. Based on coefficients for West Germany, both the characteristics effect and the coefficients effect tend to be somewhat larger in absolute value.

is almost unchanged (5.4 ppoints) and, basically, does not differ any more from the characteristics effect reported in the upper panel.¹⁸ Apparently, the benchmark model misses the declining importance of the characteristics effect over time and, therefore, overestimates the coefficients effect in 1993.

Second, Table 5 in the [Appendix](#) displays decomposition results based on OLS estimates both with and without correlated random effects. The OLS results show the same pattern as those based on the probit models. In particular, the OLS results confirm that the coefficients effect dominates in explaining the change over time, that the characteristics effect and the coefficients effect work in opposite directions for the West-East comparison, and that the coefficients effect for the West-East comparison is strongly negative in 1993 and declines by more than 14 ppoints over time. Regarding the change over time, the OLS characteristics effect tends to be slightly smaller in absolute value. However, the opposite holds for the West-East characteristics effect in 2003: in this case, the decline of the characteristics effect is smaller for OLS.

5 Conclusions

The importance of unions in the German labor market is undisputed. However, the question why people join a union is anything but beyond dispute. This study uses detailed micro-panel data to provide insights into the determinants of individual union membership. We use the GSOEP to estimate membership equations for West (1985–2003) and for East Germany (1993–2003). The application of a Chamberlain-Mundlak correlated random effects probit model controls for unobserved heterogeneity and allows for a correlation between individual-specific effects and observed characteristics. Our findings quantify the influence of socio-demographic personal characteristics, such as age or marital status; the influence of workplace characteristics, i.e., match-, firm-, or industry-specific effects, and the influence of attitudinal factors for the individual choice to be or not to be a union member. The membership equations are allowed to differ between East and West Germany and over time.

Projections of NUD based on our estimates consistently trace the trends towards deunionization in both parts of the country. Compared to the West, membership in East Germany declines strongly from a higher level at the beginning of the 1990s. By 2003, NUD is even lower in East Germany than in the West. The decline in labor union membership coincides with firms leaving employer associations and a growing share of firms not recognizing collective agreements. This erosion of collective bargaining coverage is also stronger in East Germany compared to West Germany.

¹⁸Again, we put less emphasis on the less precisely estimated decomposition results based on coefficients from East Germany.

A decomposition analysis analogous to Fairlie (2005) sheds light on both the changes in unionization over time and the differences in NUD between the two parts of the country. Changes in the composition of the work force do in no case explain more than one third of the observed decline in NUD over time. In fact, using the most recent coefficient estimates to evaluate the impact of the change in characteristics, we find that basically the entire decline in NUD is associated with changing coefficients. In East-West comparison, the West German work force exhibits attributes more in favor of higher union membership. The higher union density in East Germany in the year 1993 and the stronger subsequent decline thus reflect a lower quality of membership matches resulting from the widespread, transitory membership recruitment after unification.

The recent decline in union membership does not merely reflect changes in the composition of the workforce, such as skill upgrading, changing labor market participation of women, changing firm size, or industrial change and tertiarization. As our analysis suggests, deunionization would have occurred even without such compositional changes. Then, why has union membership declined? In recent years, one observes more heterogeneous work environments, more flexible work organization, and higher—national and international—mobility of both capital and workers. Attitudes of workers towards self-responsibility and collective intervention have changed towards a stronger emphasis of economic freedom (Biebeler and Lesch 2007). Using traditional modes of action, unions find it increasingly difficult to provide satisfactory solutions to these challenges. Wages set in collective agreements have presumably been too high as compared to relative productivity, and too rigid to allow for the necessary flexibility of wages. This argument particularly holds for East Germany, where a large part of the existing capital stock became obsolete and labor productivity plummeted in the aftermath of German unification. Inflexible collective agreements not only led employers to leave employers' associations and to abolish recognition of agreements, but they also contributed to higher rates of unemployment and to dissatisfaction among the workforce, both of which decreased the popularity of union action. As a result, more and more former union members chose to quit and less and less labor market entrants chose to join a union—and this effect holds across the board and beyond observable changes in the structure of the workforce.

This assessment is corroborated by the observation that the deunionization trend in Germany parallels rising wage dispersion since the mid-1990s. The rise in wage dispersion has also been more pronounced in East Germany than in West Germany (Kohn 2006; Dustmann et al. 2009). As the erosion of union membership is likely to weaken the bargaining power of unions and therefore unions' impact on the labor market (Fitzenberger et al. 2008), the results of wage bargaining are likely to deteriorate from the perspective of union members. At the same time, the development might increase labor market efficiency and result in higher employment. It is beyond the scope of this paper to explore whether this interpretation is consistent with the empirical evidence on wage and employment trends.

Acknowledgements We thank the editor and two anonymous referees for helpful comments, which led to major improvements of the paper. We are also grateful to Martin Biewen and participants of the EALE meeting 2006 in Prague and the International Symposium on Contemporary Labor Economics 2006 in Xiamen for fruitful discussions, as well as to Andrej Gill and Alexander Lembcke for excellent research assistance. The paper was written as part of the research project “Collective Bargaining and the Distribution of Wages: Theory and Empirical Evidence” within the DFG research network “Flexibility in Heterogeneous Labor Markets” (FSP 1169). Financial support from the German Science Foundation (DFG) is gratefully acknowledged. The usual disclaimer applies.

Appendix

A.1 Data description

Table 2 Definition of variables

	= 1 if true
Dummy variables	
MEMBER	Being a union member
FEMALE	Being female
MARRIED	Being married
FOREIGNER	Being a foreigner
Education:	
ABITUR	“Abitur” is the highest educational attainment
APPRENTICESHIP	Apprenticeship or a similar vocational training is the highest professional degree
UNIVERSITY	Person has obtained a technical college or a university degree
Political Orientation:	
CHRISTIAN-DEMOCRAT	Person feels close to the Christian Democratic Party
SOCIAL-DEMOCRAT	Person feels close to the Social Democratic Party
Vocational Status:	
PART-TIME	Working part-time
SEMISKILL-BLUE	Being an unskilled or a semi-skilled blue-collar worker
SKILL-BLUE	Being a skilled blue-collar worker
WHITE-COLLAR	Being a white-collar worker
CIVIL SERVICE	Being employed in the civil service
TRAINEE	Being currently in professional training
UNEMPLOYMENT HISTORY	Person has been unemployed at least once during past 5 years (10 years for 1985 wave)
Firm Size:	
FIRM-SIZE19	Firm has less than 20 employees
FIRM-SIZE199	Firm has 20–199 employees
FIRM-SIZE1999	Firm has 200–1999 employees
FIRM-SIZE_MORE	Firm has more than 1999 employees
SECTOR j :	Working in sector j^a
MISSING t :	Person is not observed in year t
TIME t :	Observation is in year t
Other variables	
AGE	Age of person in years divided by 10
EARNINGS	Total earnings last month in thousands of DM, at constant prices of 1985
TENURE	Duration of employment in the current firm, in years
SATISFACTION	Satisfaction of the worker with her/his job, scaled from 0 (not satisfied) to 10 (very satisfied)

^a The employed industry classification and grouping of sectors is provided in the [online appendix](#)

Table 3 Summary statistics, selected variables, West Germany

Variable	... all employees union members non-members ...		
	1985	1993	2003	1985	1993	2003	1985	1993	2003
MEMBER	29.94	26.74	20.04	100.00	100.00	100.00	0.00	0.00	0.00
FEMALE	38.04	41.67	45.32	23.20	27.86	29.79	44.37	46.72	49.21
CHR-DEM	11.50	10.06	12.83	7.84	7.56	10.30	13.07	10.97	13.46
SOC-DEM	30.15	21.09	21.18	40.72	28.76	31.54	25.64	18.29	18.59
PART-TIME	11.05	13.40	17.53	4.05	4.85	11.41	14.05	16.52	19.06
SEMISKILL-BLUE	29.52	26.60	18.51	33.86	34.02	21.55	27.67	23.90	17.75
SKILL-BLUE	20.68	18.10	15.24	30.00	26.79	25.52	16.70	14.93	12.67
WHITE-COLLAR	34.94	41.48	53.89	21.96	25.72	38.03	40.49	47.23	57.86
CIVIL SERVICE	8.26	7.67	7.59	10.78	10.02	13.15	7.18	6.81	6.20
TRAINEE	6.59	6.15	4.76	3.40	3.45	1.74	7.96	7.14	5.52
FIRM-SIZE19	18.55	21.05	21.63	4.51	4.77	6.02	24.55	26.99	25.54
FIRM-SIZE199	26.96	26.01	25.63	20.72	21.04	18.54	29.63	27.83	27.40
FIRM-SIZE1999	22.30	25.46	22.99	29.41	31.88	32.33	19.27	23.12	20.65
FIRM-SIZE_MORE	27.88	27.17	24.04	43.40	42.07	39.78	21.25	21.74	20.10
MISS_FIRM-SIZE	4.30	0.31	5.72	1.96	0.25	3.33	5.31	0.33	6.31
AGE	3.76	3.78	3.98	3.97	3.95	4.27	3.67	3.72	3.91
EARNINGS	2.58	2.95	3.25	2.82	3.23	3.69	2.48	2.84	3.15
SATISFACTION	7.40	7.26	7.07	7.35	7.14	6.98	7.42	7.31	7.09
N. of Obs.	5111	4552	3149	1530	1217	631	3581	3335	2518

Mean values of variables. See the text for details on the selected sample
 Summary statistics for all variables can be found in the [online appendix](#)
 Data source: GSOEP

Table 4 Summary statistics, selected variables, East Germany

Variable	All employees		Union members		Non-members	
	1993	2003	1993	2003	1993	2003
MEMBER	36.99	17.73	100.00	100.00	0.00	0.00
FEMALE	47.03	49.56	47.46	37.63	46.78	52.12
CHR-DEM	7.91	14.74	8.02	8.24	7.85	16.14
SOC-DEM	10.48	9.97	14.30	12.90	8.24	9.34
PART-TIME	7.22	14.55	6.42	13.62	7.69	14.75
SEMISKILL-BLUE	12.76	11.25	11.76	10.39	13.34	11.43
SKILL-BLUE	30.02	24.78	32.49	35.84	28.57	22.39
WHITE-COLLAR	48.22	52.16	50.80	44.44	46.70	53.82
CIVIL SERVICE	1.68	4.45	1.34	5.38	1.88	4.25
TRAINEE	7.32	7.37	3.61	3.94	9.50	8.11
FIRM-SIZE19	24.48	24.71	14.04	14.70	30.61	26.87
FIRM-SIZE199	33.68	31.39	30.88	25.45	35.32	32.66
FIRM-SIZE1999	22.45	19.63	30.21	26.88	17.90	18.07
FIRM-SIZE_MORE	18.74	16.96	24.33	27.96	15.46	14.59
MISSING_FIRM-SIZE	0.64	7.31	0.53	5.02	0.71	7.80
AGE	3.72	3.94	3.97	4.38	3.57	3.84
EARNINGS	2.07	2.59	2.11	2.89	2.05	2.53
SATISFACTION	6.42	6.55	6.39	6.49	6.43	6.56
N. of Obs.	2022	1574	748	279	1274	1295

Mean values of variables. See the text for details on the selected sample
 Summary statistics for all variables can be found in the [online appendix](#)
 Data source: GSOEP

A.2 Sensitivity analysis of decompositions

Table 5 Decomposition of differences in NUD based on OLS results

	NUD [%]		Change over time	Char. effect ^a	Coeff. effect ^a
	1993	2003			
OLS correlated random effects model (specification analogous to correlated random effects probit specification A)					
West Germany	26.74 (0.61)	20.04 (0.63)	-6.70 (0.77)	-1.33 (0.69) <i>-0.42 (0.74)</i>	-5.37 (0.92) <i>-6.28 (0.96)</i>
East Germany	36.99 (0.95)	17.73 (0.90)	-19.26 (1.17)	-2.95 (1.66) <i>-0.39 (1.52)</i>	-16.31 (1.79) <i>-19.65 (1.71)</i>
West-East Difference	-10.25 (1.12)	2.31 (1.12)			
Char. effect ^b	7.07 (5.46)	<i>8.22</i> (0.89)	8.41 (3.60)	7.05 (0.94)	
Coeff. effect ^b	-17.32 (5.58)	<i>-18.47</i> (1.39)	-6.1 (3.85)	-4.74 (1.56)	
OLS (specification analogous to random effects probit benchmark specification C)					
West Germany	26.74 (0.59)	20.04 (0.66)	-6.70 (0.77)	-2.58 (0.63) <i>-1.81 (0.67)</i>	-4.12 (0.92) <i>-4.89 (0.96)</i>
East Germany	36.99 (1.00)	17.73 (0.89)	-19.26 (1.18)	-2.72 (1.48) <i>0.69 (1.32)</i>	-16.54 (1.73) <i>-19.95 (1.61)</i>
West-East Difference	-10.00 (1.12)	2.56 (1.11)			
Char. effect ^b	7.17 (5.28)	<i>6.57</i> (0.77)	8.51 (3.34)	5.24 (0.90)	
Coeff. effect ^b	-17.42 (5.43)	<i>-16.82</i> (1.30)	-6.2 (3.63)	-2.93 (1.39)	

Standard errors in parentheses estimated by 1,000 bootstrap resamples. Data source: GSOEP

^aCounterfactual with: first row (arial font) characteristics-of-2003-coefficients-of-1993 (Eq. 4); second row (*italic font*) characteristics-of-1993-coefficients-of-2003 (Eq. 5)

^bCounterfactual with: first column (arial font) characteristics-of-WEST-coefficients-of-EAST (Eq. 6); second column (*italic font*) characteristics-of-EAST-coefficients-of-WEST (Eq. 7)

References

- Akerlof G (1980) A theory of social custom, of which unemployment may be one consequence. *Q J Econ* 94(4):749–775
- Beck M, Fitzenberger B (2004) Changes in union membership over time: a panel analysis for West Germany. *Labour* 18(3):329–362
- Biebeler H, Lesch H (2007) Zwischen Mitgliedererosion und Ansehensverlust: Die deutschen Gewerkschaften im Umbruch. *Ind Bezieh* 14(2):133–153
- Bispinck R, Schulten T (2003) Verbetrieblischung der Tarifpolitik? Aktuelle Tendenzen und Einschätzungen aus Sicht von Betriebs- und Personalräten. *WSI-Mitt* 3/2003:157–166
- Blanchflower D (2007) International patterns of union membership. *Br J Ind Relat* 45(1):1–28
- Blinder A (1973) Wage discrimination: reduced form and structural estimates. *J Hum Resour* 8(4):436–455
- BMWA (2004) Tarifvertragliche Arbeitsbedingungen im Jahr 2003. Bundesministerium für Wirtschaft und Arbeit. <http://www.bmwa.bund.de/Navigation/Arbeit/arbeitsrecht.html>
- Booth A (1985) The free rider problem and a social custom model of trade union. *Q J Econ* 100(1):253–261

- Booth A, Chatterji M (1995) Union membership and wage bargaining when membership is not compulsory. *Econ J* 105(428):345–360
- Bosch G (2004) The Changing nature of collective bargaining in Germany—coordinated decentralization. In: Katz H, Lee W, Lee J (eds) *The new structure of labor relations—tripartism and decentralization*, chap 4. Cornell University Press, Ithaca, pp 84–118
- Brenke K (2004) Ostdeutsche Industrie: Weitergehende Abkehr von der kollektiven Lohnfindung. *DIW Wochenbericht* 13/2004:152–158
- Card D, Lemieux T, Riddell W (2003) Unions and the wage structure. In: Addison J, Schnabel C (eds) *International handbook of trade unions*, chap 8. Edward Elgar, Cheltenham, pp 246–292
- Chamberlain G (1984) Panel data. In: Griliches Z, Intriligator M (eds) *Handbook of econometrics*, vol 2. North Holland, Amsterdam, pp 1247–1318
- Dustmann C, Schönberg U (2009) Training and union wages. *Rev Econ Stat* 91(2):363–376
- Dustmann C, Ludsteck J, Schönberg U (2009) Revisiting the German wage structure. *Q J Econ* 124:843–881
- Ebbinghaus B (2003) Die Mitgliederentwicklung deutscher Gewerkschaften im historischen und internationalen Vergleich. In: Schroeder W, Weßels B (eds) *Die Gewerkschaften in Politik und Gesellschaft der Bundesrepublik Deutschland*. Westdeutscher Verlag, pp 174–203
- Fairlie R (2005) An extension of the Blinder-Oaxaca decomposition technique to logit and probit models. *J Econ Soc Meas* 30(4):305–316
- Fichter M (1997) Trade union members: a vanishing species in post-unification Germany? *Ger Stud Rev* 20(1):83–104
- Fitzenberger B, Kohn K (2005) Gleicher Lohn für gleiche Arbeit? – Zum Zusammenhang zwischen Gewerkschaftsmitgliedschaft und Lohnstruktur in Westdeutschland 1985–1997. *Z Arbmarktforsch* 38(2/3):125–146
- Fitzenberger B, Haggenev I, Ernst M (1999) Wer ist noch Mitglied in Gewerkschaften? Eine Panelanalyse für Westdeutschland. *Z Wirtsch-Sozialwiss* 119(2):223–263
- Fitzenberger B, Kohn K, Lembcke A (2008) Union density, collective bargaining, and individual coverage: the anatomy of union wage effects. Discussion paper 3356, IZA
- Fitzenberger B, Kohn K, Wang Q (2006) The erosion of union membership in Germany: determinants, densities, decompositions. Tech Rep 2193, IZA
- Franz W (2006) *Arbeitsmarktökonomik*, 6th edn. Springer, Berlin
- Frege C (1996) Union membership in post-socialist East Germany: who participates in collective action? *Br J Ind Relat* 34(3):387–413
- Goerke L, Pannenberg M (2004) Norm-based trade union membership: evidence for Germany. *Ger Econ Rev* 5(4):481–504
- Haisken-DeNew J, Frick J (eds) (2003) *Desktop companion to the German Socio-Economic Panel study (GSOEP)*, ver 7.0. DIW Berlin
- Hassel A (1999) The erosion of the German system of industrial relations. *Br J Ind Relat* 37(3):483–505
- Heinbach W (2006) Bargained wages in decentralized bargaining regimes. Discussion paper 26, IAW Tübingen
- Keller B (2005) Union formation through merger: the case of Ver.di in Germany. *Br J Ind Relat* 43(2):209–232
- Kohaut S, Schnabel C (2003a) Tarifverträge – nein danke!?! Ausmaß und Einflussfaktoren der Tarifbindung west- und ostdeutscher Betriebe. *Jahrb Natlökön Stat* 223(3):312–331
- Kohaut S, Schnabel C (2003b) Zur Erosion des Flächentarifvertrags: Ausmaß, Einflussfaktoren und Gegenmaßnahmen. *Ind Bezieh* 10(2):193–219
- Kohn K (2006) Rising wage dispersion, after all! The German wage structure at the turn of the century. Discussion paper 2098, IZA
- Lorenz W, Wagner J (1991) Bestimmungsgründe von Gewerkschaftsmitgliedschaft und Organisationsgrad – eine ökonomische Analyse auf Mikrodatenbasis für die Bundesrepublik Deutschland. *Z Wirtsch-Sozialwiss* 111(1):65–82
- Moreton D (1998) An open shop trade union model of wages, effort and membership. *Eur Z Polit Ökon* 14(3):511–527
- Oaxaca R (1973) Male-female wage differentials in urban labour markets. *Int Econ Rev* 14(3):693–709

- Oaxaca R, Ransom M (1994) On discrimination and the decomposition of wage differentials. *J Econom* 61(1):5–21
- OECD (ed) (2004) OECD employment outlook. Organisation for Economic Co-operation and Development, Paris
- Olson M (1965) The logic of collective action. Harvard University Press, Cambridge
- Riley NM (1997) Determinants of union membership: a review. *Labour* 11(2):265–301
- Schnabel C (2003) Determinants of trade union membership. In: Addison J, Schnabel C (eds) International handbook of trade unions, chap 2. Edward Elgar, Cheltenham, pp 13–43
- Schnabel C (2005) Gewerkschaften und Arbeitgeberverbände: Organisationsgrade, Tarifbindung und Einflüsse auf Löhne und Beschäftigung. *Z Arbmarktforsch* 38(2/3):181–196
- Schnabel C, Wagner J (2003) Trade union membership in Eastern and Western Germany: convergence or divergence? *Appl Econ Q* 49(3):213–232
- Schnabel C, Wagner J (2005) Determinants of trade union membership in Western Germany: evidence from micro data, 1980–2000. *Socio-Economic Review* 3(1):1–24
- Schnabel C, Wagner J (2007) The persistent decline in unionization in Western and Eastern Germany, 1980–2004: what can we learn from a decomposition analysis? *Ind Bezieh* 14(2): 118–132
- Silber J, Weber M (1999) Labour market discrimination: are there significant differences between the various decomposition procedures? *Appl Econ* 31(3):359–356
- Statistisches B (ed) (various issues) Statistisches Jahrbuch für die Bundesrepublik Deutschland. Metzler-Poeschel, Stuttgart
- Traxler F (2004) Employer associations, institutions and economic change: a crossnational comparison. *Ind Bezieh* 11(1):42–60
- Traxler F, Blaschke S, Kittel B (2001) National labour relations in internationalized markets—a comparative study of institutions, change and performance. Oxford University Press, Oxford
- Wallerstein M, Western B (2000) Unions in decline? What has changed and why. *Annu Rev Pol Sci* 3(1):355–377
- Windolf P, Haas J (1989) Who joins the union? Determinants of trade union membership in West Germany 1976–1984. *Eur Sociol Rev* 5(2):147–165
- Wooldridge J (2002) *Econometric analysis of cross section and panel data*. MIT, Cambridge