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RÉSUMÉ

Dans cet article, nous analysons la corrélation entre les revenus de travail contemporains et les conditions sur le marché du travail, à savoir le taux de chômage mesuré à différents moments pendant la durée du contrat de travail. Les données que nous utilisons proviennent du Panel Socio-économique Allemand et comprennent la période 1984-1994. Contrairement aux résultats pour le marché américain, nous trouvons que l'état actuel du marché du travail est un important facteur, même en contrôlant pour le taux de chômage en vigueur au début de la relation d'emploi. Les élasticités estimées varient entre 9 et 15 pourcent pour l'élasticité des revenus de travail par rapport au taux de chômage contemporain et entre 6 et 10 pourcent par rapport au taux de chômage en début de contrat. Notamment, tandis que le taux de chômage régional affecte le niveau des revenus d'emploi, le taux national influence la variation dans les revenus. Ces résultats sont cohérents avec la présence simultanée de conventions collectives et de contrats individuels, tels les modèles de contrats implicites, qui expliquent une partie de la variance de revenus de travail et des mouvements de revenu à long terme. En plus de la variation régionale, nous étudions l'hétérogénéité des contrats selon certaines caractéristiques des travailleurs et des emplois. En particulier, nous constatons que les contrats de travail diffèrent selon la taille de l'entreprise et le type de travailleur. Un travailleur dans une grande entreprise est remarquablement plus isolé de fluctuation du marché de travail qu'un travailleur dans toute autre taille d'entreprise, suggérant l'importance des marchés du travail internes pour ces firmes.

Mots clés : courbe de salaire, contrats implicites, structure des salaires, Allemagne

ABSTRACT

In this paper, we look at how labor market conditions at different points during the tenure of individuals with firms are correlated with current earnings. Using data on individuals from the German Socioeconomic Panel for the 1985-1994 period, we find that both the contemporaneous unemployment rate and prior values of the unemployment rate are significantly correlated with current earnings, contrary to results for the American labor market. Estimated elasticities vary between 9 and 15 percent for the elasticity of earnings with respect to current unemployment rates, and between 6 and 10 percent with respect to unemployment rates at the start of current firm tenure. Moreover, whereas local unemployment rates determine levels of earnings, national rates influence contemporaneous variations in earnings. We interpret this result as evidence that German unions do, in fact, bargain over wages and employment, but that models of individualistic contracts, such as the implicit contract model, may explain some of the observed wage drift and longer-term wage movements reasonably well. Furthermore, we explore the heterogeneity of contracts over a variety of worker and job characteristics. In particular, we find evidence that contracts differ across firm size and worker type. Workers of large firms are remarkably more insulated from the job market than workers for any other type of firm, indicating the importance of internal job markets.

Key words : wage curve, implicit contracts, wages structure, Germany

Wage Flexibility and Contract Structure in Germany

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Abstract

In this paper, we look at how labor market conditions at different points during the tenure of individuals with firms are correlated with current earnings. Using data on individuals from the German Socioeconomic Panel for the period 1985 to 1994, we find that both the contemporaneous unemployment rate and prior values of the unemployment rate are significantly correlated with current earnings, contrary to results for the American labor market. Estimated elasticities vary between 9 and 15 percent for the elasticity of earnings with respect to current unemployment rates, and between 6 and 10 percent with respect to unemployment rates at start of current firm tenure. Moreover, whereas local unemployment rates determine levels of earnings, national rates influence contemporaneous variations in earnings. We interpret this result as evidence that German unions do in fact bargain over wages and employment, but that models of individualistic contracts, such as the implicit contract model, may explain some of the observed wage drift and longer-term wage movements reasonably well. Furthermore, we explore the heterogeneity of contracts over a variety of worker and job characteristics. In particular, we find evidence that contracts differ across firm size and worker type. Workers of large firms are remarkably more insulated from the job market than workers for any other type of firm, indicating the importance of internal job markets.

Dans cet article, nous analysons la corrélation entre les revenus de travail contemporains et les conditions sur le marché du travail, à savoir le taux de chômage, mesuré à différents moments pendant la durée du contrat de travail. Les données que nous utilisons proviennent du Panel Socio-économique Allemand, et comprennent la période 1984-1994. Contrairement aux résultats pour le marché américain, nous trouvons que l'état actuel du marché du travail est un important facteur même en contrôlant pour le taux de chômage en vigueur au début de la relation d'emploi. Les élasticités estimées varient entre 9 et 15 pourcent pour l'élasticité des revenus de travail par rapport au taux de chômage contemporain, et entre 6 et 10 pourcent par rapport au taux de chômage en début de contrat. Notamment, tandis que le taux de chômage régional affecte le niveau des revenus d'emploi, le taux national influence la variation dans les revenus. Ces résultats sont cohérents avec la présence simultanée de conventions collectives et de contrats individuels, tels les modèles de contrats implicites, qui expliquent une partie de la variance de revenus de travail et des mouvements de revenu à long terme. En plus de la variation régionale, nous étudions l'hétérogenéité des contrats selon certains caractéristiques des travailleurs et des emplois. En particulier, nous constatons que les contrats de travail diffèrent selon la taille de l'entreprise et le type de travailleur. Un travailleur dans une grande entreprise est remarquablement plus isolé de fluctuation du marché de travail qu'un travailleur dans toute autre taille d'entreprise, suggérant l'importance des marchés du travail internes pour ces firmes.

KEYWORDS: Wage curve, Implicit contracts, Wage structure, Germany.

JEL: J41 (Contracts), J31 (Wage Level and Structure), J23 (Employment Determination)

MOTS-CLÉS: Courbe de salaire, contrats implicites, structure des salaires, Allemagne.

JEL: J41 (Contrats), J31 (Niveau et structure des salaires), J23 (Détérmination de l'emploi)

1 Introduction

Earnings constitute a large fraction of household income, and factors affecting earnings thus have a major impact on the distribution of income. The secular rise in unemployment in recent years in Europe and Canada has renewed interest in the interaction between labor market conditions and earnings. In the present paper, we report results from an analysis of German panel data in the view of a set of wage models. The results shed new light on some aspects of the dynamics of German earnings with respect to labor market conditions, and underlines the fact that labor markets in Europe are different from North American markets.

Specifically, we look at how measures of labor market conditions at different points during the tenure of individuals with firms affect their current earnings. These measures are chosen to approximate different types of contractual models. In a simple model of implicit contracts, if workers are not mobile, their wage will depend on their alternative (employment) utility at the start of the current job if employers can commit to long-term contracts. On the other hand, if they are mobile, current wages will depend on their best alternative utility since the start of their job. Here as in other papers, the alternative utility at a point in time is approximated by the rate of unemployment. In contrast hereto stand models in which the current wage will depend exclusively on current labor market conditions. This may be consistent with a number of models, including a standard labor demand model, an efficiency wage model, as well as a union bargaining model. Given the German institutional background, we argue that the most likely interpretation is the latter.

Using data on individuals from the German Socioeconomic Panel for the period 1985 to 1994, we find that both the contemporaneous unemployment rate and prior values of the unemployment rate are significantly correlated with current earnings. We interpret this result as evidence that German unions do in fact bargain over wages and employment, but that models of individualistic

contracts, such as the implicit contract model, may explain some of the observed wage drift and longer-term wage movements reasonably well. The elasticity of earnings with respect to contemporaneous unemployment is between 9 and 15 percent, on par with previous studies of the German labor market. The effect of initial unemployment lies between 6 and 9 percent. Decomposing the unemployment measure into regional components reveals that regional labor market conditions determine the (initial) level of earnings, and national labor market conditions affect contemporaneous variations.

Furthermore, we explore the heterogeneity of contracts over a variety of worker and job characteristics. In particular, we find evidence that contracts differ across industries and across firm size. Workers of large firms are remarkably more insulated from the job market than workers for any other type of firm, indicating the importance of internal job markets. Blue collar workers are more strongly affected by contemporaneous labor market conditions than white collar workers.

The results obtained in this paper provide empirical evidence in line with previous articles on implicit contracts in the United States (Beaudry & DiNardo 1991). It augments and qualifies results reported in the literature on the wage curve (Blanchflower & Oswald 1994, Wagner 1994), where current earnings are correlated with current unemployment. Beaudry & DiNardo (1991) showed that this empirical result is not robust to the inclusion of unemployment rates appropriately chosen during the current employment spell. Our results bridge this gap, implying that the latter result may be an artifact specific to the U.S. economy, and only partially true for Germany.

The paper is organized as follows. Section 2 gives an overview of the models that we use to obtain predictions as to the correlation between the history of labor market conditions and current earnings. As we briefly mentioned above, institutions are relevant to interpreting the results, and we briefly describe some institutional background in Section 3. In Section 4, we describe the data used. Section 5 describes the results obtained and some of the econometric issues relating to these. In

Section 6, we test the robustness of the results from the previous section across different dimensions of worker and job characteristics. Section 7 concludes and offers an outlook to further analysis.

2 Theoretical background

The relationship between wages and unemployment has often been discussed in the literature. The robust empirical relationship between contemporaneous unemployment and wages (the "wage curve") has been amply documented and the possible models underlying this phenomenon discussed in Blanchflower & Oswald (1994). An IAB publication sums up recent results on German wage curves (*Mitteilungen aus der Arbeitsmarkt- und Berufsforschung* (1996), see also Pannenberg & Schwarze (1998) and Wagner (1994)).

A number of models have implications linking contemporaneous unemployment to wages, ranging from compensating differentials to incentive contracts. Others, predominantly based on contracts, link past measures of labor market tightness to current earnings. We will expose here the salient characteristics of the most important ones.

Implicit contracts

The basic idea in the literature on implicit contracts is that risk-averse workers can only insure themselves with their risk-neutral employers against shocks to labor productivity. The resulting labor contracts contain an 'implicit' insurance clause, and will depend on the mobility assumptions for both workers and firms. Suppose that productivity follows an AR(1) with parameter α. Assume further that firms can commit to contracts, and that they compete for workers, for whom mobility will initially be assumed to be costly. Then it can be shown (Beaudry & DiNardo 1991) that wages

are rigid during tenure, and will depend on the alternative wage $\underline{w}$ and expected productivity ϕ^*:

$$\log w_{t,t(0)} = \delta_1(\alpha, \beta, \mu) \log \underline{w}_t + \delta_2(\alpha, \beta, \mu) \log \phi^* + k \tag{1}$$

where δ_j are reduced form functions of the structural parameters α, discount rate β and the worker's survival probability μ, and $t(0)$ the point in time at which current tenure started. A general equilibrium argument relating the change in the worker's reservation wage to the participation wage establishes the link with unemployment, leading to a estimable form of (1):

$$\log w_t = X_t'\beta + \gamma u_t \tag{2}$$

with

$$u_t = U_{t(0)}, \tag{3}$$

where we denote by u_t the relevant measure of unemployment determining wages at time t, by U_t the level of the unemployment rate at time t. The vector X_{it} includes the usual human capital controls thought to affect a worker's productivity (in logs). Since workers are not mobile, their wages will be a function only of unemployment at the start of the job, as denoted by (3).

Renegotiation-proof contracts

If workers are mobile but firms can still commit to the employment contract, then the optimal contract resulting from the above setup will be upward flexible, being renegotiated every time the worker's alternative utility becomes binding (Harris & Holmstrom 1982). Linking as before alternative utility to unemployment implies that the lowest level of unemployment since the start

of the current contract will be the principal determinant of the current wage. Thus,

$$u_t = \min_{p \in [t(0),t]} U_p \tag{4}$$

replaces (3). Once renegotiated, the initial level of unemployment does not influence current wages anymore, and wages will be function only of unemployment rates at the time of renegotiation.

One critique of the above model is the lack of incentive compatibility for the employer. The employer is assumed to be able to commit to long-term contracts. If however the employer's outside option in a contractual relationship becomes binding, it is optimal to renegotiate. MacLeod & Malcomson (1989)[1] have pointed out that if one increases the contract space by allowing for discretionary bonuses, then any allocation of the surplus from a relation may be consistent with an equilibrium. The efficient contract will fix a wage at the beginning of a relationship according to a split of the surplus. Since this split is the result of some bargaining process between the two parties and thus Pareto-efficient, no party will want to renegotiate afterwards, except if one party's outside option is larger than the utility obtained from continuing the present contract. If this constraint becomes binding, both parties will renegotiate, and the new contract will reflect the split of the surplus at the time of renegotiation.

If the worker's outside options are a decreasing function of unemployment, then the wage in the current contract will reflect the best labor market conditions since the start of the contract as in the implicit contract model, with the supplementary condition that the employer's outside option was never binding in the meantime, and conditional on the value of the best labor market conditions, occurring say at time $t > t(0)$, having been higher not only than the value of the outside option at time $t(0)$, but also higher than the value of the contract at time t. Hence, the same conditions

[1] See also MacLeod & Malcomson (1993).

derived from the costless mobility version of the implicit contract model are consistent with the contract model here, but are neither a necessary nor a sufficient condition for this model. Thus, though we may find that our results are consistent with this model, we cannot test it formally, as our regressions cannot falsify its implications.

Efficiency wage

Turning to links between contemporaneous labor market conditions and wages, one model frequently drawn upon to explain such a correlation is the efficiency wage model. Efficiency wage models of the shirking type[2] suggest that incentives to furnish effort derive from the threat of losing a surplus extant in a relationship. This surplus may be generated by direct mobility costs, the presence of specific human capital or a number of other reasons. The link most commonly studied is the one proposed (not exclusively) by Shapiro & Stiglitz (1984). There, unemployment implies a loss in utility since the probability of immediate re-employment is less than unity. Thus, there is a benefit to the employee of staying with the current employer. The model thus directly links unemployment to effort levels and wages. Wages are the carrots and unemployment the stick to achieve an equilibrium in which no shirking occurs.

Effort e can be either high or low, and can be detected with probability q. If caught shirking, the employee is fired, in which case he receives unemployment benefits w_0 while unemployed. In every period that he is unemployed, he will be re-employed with probability a. The incentive compatible wage derived from the model is then

$$w = e + w_0 + e(a + b + r)/q \tag{5}$$

[2]The most frequently cited paper is Shapiro & Stiglitz (1984). See Carmichael (1990) and Lang & Kahn (1990) for a critical look at efficiency wage models.

where r is the discount rate. In equilibrium, the flows out of unemployment $a(N-L)$ must be equal to flows out of employment bL, so that $a+b=b/u$. Substituting in (5) obtains

$$w = e + w_0 + \frac{e}{q}\left(\frac{b}{u} + r\right) \tag{6}$$

which shows a negative relationship between wages and unemployment. Note however that due to the forward-looking character of the incentive constraint, the appropriate measure u is the expected value of future unemployment. If unemployment follows a unit root process, the current unemployment rate is sufficient to form expectations of future unemployment rates. Thus, past values should not influence current wages once contemporaneous unemployment has been controlled for, and the efficiency wage model implies

$$u_t = U_t. \tag{7}$$

Union bargaining models

In models of collective bargaining, a union with a well-defined concave utility function is assumed to bargain over wages and possibly employment with a profit-maximizing firm. If the bargaining agenda only covers wages, the resulting contract locus will coincide with the labor demand curve, implying a negative relationship between wages and employment, and thus a positive correlation between unemployment and wages.

If the bargaining agenda covers both elements and bargaining powers on each issue are equal,[3] the slope of the contract locus will depend on the union's risk aversion. If the union is risk-averse, the contract locus will have a positive slope in wage-employment space, thus implying a negative correlation between unemployment and wages. Heterogeneity in relative bargaining powers allows

[3] See Manning (1987) for an analysis of when bargaining powers are not equal on each issue.

identification of this curve. The relative bargaining powers of union and firm are reflected in the position along this curve. If unions and/or firms differ in their relative bargaining powers, a cross-section of contracts will identify the slope of the contract curve.

Estimation

The model estimated is

$$\log w_t = X_t'\beta + u_t'\gamma \tag{8}$$

where u_t is now a vector with the three elements described by (3), (4) and (7). Conditional on the "right" unemployment rate, other measures of unemployment do not predict wages, and a test of the three alternative hypotheses resulting from the above theoretical models is equivalent to a test on the coefficients on the different measures of unemployment. Note however that not all the above models are mutually exclusive. If only one element of γ is significant, then we can exclude some, but not all models. As we will find, results are more equivocal.

3 Institutional background

Our aim in this paper is to characterize the contract structure of wages, and in this respect, labor institutions matter. The particular importance of trade unions in the German model has often been pointed out. This section describes some pertinent aspects of German labor market institutions.[4]

The German economy is characterized by a high degree of coverage by collective agreements. Although union membership is around 40 percent,[5] union coverage by either industry-wide or firm-level contracts lies at around 90 percent of the eligible population.[6] Most contracts are negotiated

[4]For a good introduction see f.i. Flanagan, Soskice & Ulman (1983), for some recent developments in collective bargaining Thelen (1991).

[5]Author's tabulation from years in which this question was asked for in the GSOEP. See also Carruth & Schnabel (1993).

[6]Bundesministerium für Arbeit und Sozialordnung (1994). Industries with little coverage are predominantly in

at the level of a regional industry. Thus, collective agreements on wages and earnings are defined for 1 200 region-industry cells in Western Germany and 250 in Eastern Germany (Bundesministerium für Arbeit und Sozialordnung 1994). The number of firms having individual contracts with unions outside of the industry-wide agreement has been slightly increasing in recent years, but it is unclear whether the number of workers covered by these contracts has increased.

Regional and cross-industry differences exist, but there is informal coordination by the German Federation of Unions (*Deutscher Gewerkschaftsbund, DGB*). Informal evidence for spill-over effects is widespread. Furthermore, the Minister of Labor can legally extend contracts to the whole industry under certain circumstances. Thus, in 1994, the wage and earnings contracts were actually extended in 75 of the above region-industry cells (Bundesministerium für Arbeit und Sozialordnung 1994, pg. 32)[7]. It has been shown that when firms face a high enough probability of extension, they will act as if they were actually covered by the collective bargaining agreement (Margolis 1992). For these reasons, our data does not distinguish whether or not workers are covered by collective bargaining agreements. Some variation nevertheless exists, and for many firms, the industry-wide agreement only acts as a wage floor (Bellmann 1995), allowing us to perform a more detailed analysis in Section 6.

The duration of collective agreements on wages and earnings is usually one year. However, in 1988 and 1989, a significant part of the collective agreements signed had minimum durations of up to three years. This was apparently a one-time phenomenon linked to the ongoing negotiations over hours reductions, and most of the three-year contracts expiring were followed by the usual one-year contracts.

A feature that Germany shares with other European economies is the severely restricted use of

the services sector. Only workers contributing to the social insurance system are covered by collective agreements.

[7] These extensions occur predominantly in retail trade and in the cleaning industry.

fixed-length contracts. Over most of the sample period, German law restricted fixed-length contracts to 6 months. Though the law allows for renewal, utilization seems to be quite low.[8] Only about 4.5 percent of workers declaring themselves as working full-time are on fixed length contracts, compared to 6.9 percent of part-time workers. Women are slightly more likely to be on fixed length contracts then men (7.2 and 4.5 percent respectively).

Finally, the relevant compensation variable we consider are earnings. Contrary to North America, where blue-collar workers tend to receive hourly compensation, German blue-collar workers tend to be compensated like white-collar workers, on a monthly or bi-weekly basis. Thus, 11 percent of workers (in Western Germany) are covered by contracts which do not differentiate between blue and white collar workers, and in which both categories are paid a monthly salary invariant in hours. For a further 40 percent of blue collar workers, the collective agreement, though separate from that for white collar workers, specifies a fixed monthly salary (Bundesministerium für Arbeit und Sozialordnung 1994).

4 Data and estimation

The data used comes from the German Socio-Economic Panel (GSOEP). We will briefly describe some aspects this dataset that are of importance to the present study. Wagner, Burkhauser & Behringer (1993) and Burkhauser (1991) provide a more detailed description of the public use file available outside Germany.

The GSOEP is a longitudinal panel data set first created in 1984. Respondents are reinterviewed each year. Response rates are quite high. Children are followed separately once they leave the original household, providing for some non-random compensation for panel attrition. The questions

[8] The degree of utilization in our sample is actually decreasing over the sample period, though this may be a result of the non-random sampling nature of the GSOEP. Hunt (1995) describes the changes and estimates the effect on employment. For the role of fixed-length contracts in France, see Abowd, Corbel & Kramarz (1996).

asked are not restricted to economic questions, ranging from social to political subjects. Through the structure has varied from year to year, a great deal of homogeneity has been preserved, facilitating comparison over the years. A new, East German panel was started after German unification in 1990.

The survey instrument for the GSOEP was modeled after the PSID, and tries to avoid some of the problems the latter dataset had. Thus, the question on job tenure is fairly unambiguous,[9] asking respondents the month and year they started working for their current employer.[10] Some problems nevertheless occur. For example, in some waves, a number of questions relating to the job market and the current job were only asked of job changers. If this occurs, or data is missing, we carry forward information obtained in the previous wave conditional on the worker reporting no change in his job situation w.r.t. the previous year. Furthermore, if an individual reports conflicting data on the year she started working with the present employer, we use and carry forth the earliest report of a date. In this manner, we force tenure to be consistent across year.

Throughout, results are reported for net and gross real earnings. We would expect net earnings to be the variable of interest to workers, and thus the pertinent variable in union bargaining, though gross earnings are closer to the true cost of labor to the employer, and thus more appropriate in models imposing a zero profit condition. Hence, it is not clear which to use, and we avoid having to choose by using both variables.

We restrict our sample to blue and white collar workers with contracts of indeterminate length who are working full-time, and are German nationals living in Western Germany. We exclude workers with fixed length contracts at this stage due to ambiguity inherent to such contracts in the

[9] See Altonji & Shakotko (1987) and Topel (1991) for a treatment of the problems with the tenure data in the PSID.

[10] This author has worked with both the English translation and the original German questionnaires, and has found that in some waves, the English translation of the tenure question renders ambiguous what is not in German. More information is available from the author upon demand.

context of the theoretical models.[11] Due to the unavailability of data on contract duration in 1984, our sample is restricted to the years 1985 to 1994, and due to unavailability of regional unemployment rates prior to 1972, only workers having started their jobs since are included. As a glance at Figure 1 on page 38 shows, though there is still considerable variation in the unemployment rates, there is a significant upward trend over this period. In Section 6, this will subject of discussion.[12] Excluding workers in agriculture and in the public sector as well as civil servants scattered in other industries leaves us with 10 349 observations on 2 459 individuals.[13] Of these, 10 268 have valid observations on net income. Finally, we eliminate individuals who have only one observation in the sample, since at least two observations are necessary to be able to eliminate individual-specific effects. Table 1 gives a summary of the reductions made. Sample statistics are given in Table 2.

Contemporaneous unemployment rates are merged into the GSOEP using the month preceding the interview month, for which earnings are reported. Initial unemployment rate is taken from the quarter the current job is reported to have started if available. Otherwise, the average unemployment rate over the year in which the job started is used. Minimum unemployment is computed by searching between the starting date of the employment relation and the current date. For part of the analysis, regional unemployment rates were used, either in levels, in deviations from the national average, or in proportional deviation from the national average.[14] A more complete description of the data is given in a separate appendix.

[11] Separation for these contracts is exogenous, except if the contract is transformed into one of indeterminate length. It is unclear whether renegotiation will occur during the short duration of the contract. Furthermore, our data does not allow us to determine whether a fixed length contract in two consecutive years is with the same employer, and the tenure question may be ambiguous in these cases. Most previous studies seem to not have excluded these workers. Results obtained here when including them are not drastically different.

[12] An earlier version of this paper used only national unemployment data reaching back to 1958.

[13] About half of the eliminations for missing variables are due to missing initial experience.

[14] See Figure 1 on page 38.

5 Results

The main results of this paper are reported in Table 3 on page 29. To estimate Equation (8), we have controlled for experience and tenure up to squared terms, education as measured in years, dummies for industry, marital status,[15] a linear trend.[16] Errors reported here are not corrected for heteroskedasticity, but results using the White (1980)-correction yielded very similar results. Fixed effects were flushed out by using deviations from individual specific means.[17, 18]

Rows 1 to 3 show results obtained when including only measures of past labor market tightness. Note that unemployment is measured in percent, and thus the reported coefficient implies that an increase in the unemployment rate of one point reduces net monthly earnings by 1.1 percent (in specification (3)). When including each measure individually, the estimated coefficients have the predicted signs, but the effect of minimum unemployment is not very precisely estimated. Including both reveals a positive and significant effect of the lowest unemployment rate. In Rows 4 to 7, the current unemployment is included in various combinations with the two previous measures. Row 4 corresponds to the typical "wage curve" regression (Blanchflower & Oswald 1994). The estimated coefficient on current unemployment is stable across all specifications, and precisely estimated, suggesting that it is orthogonal to the other two measures.[19] When again including only one or the other measure of past labor market performance, the same scenario as before is produced.

[15] We use an indicator for the status of being single. Other dummy variables led to comparable results.

[16] Other specifications were tested, especially up to cubic terms in experience and tenure. Nested F-tests cannot reject a quadratic against the null of a cubic specification at the 5 percent level, but can reject a linear against a cubic specification. However, the linear specification cannot be rejected against the null of a quadratic specification at 1 percent level. It is thus not clear, based upon these tests, which specification to choose.

[17] We tested fixed effects against random effects in a variety of specifications. A Hausman (1978) test always rejected the random effects specification by a large margin. For instance, for the regression reported in Table 5 on page 30, Column (b), $\chi^2 = 242.13$ with 38 degrees of freedom, thus soundly rejecting the hypothesis that random effects are the correct specification.

[18] Note that we are not including regional effects. Geographical mobility is very low in our data - only 60 moves are observed -, and any regional effects are flushed out by the individual fixed effects.

[19] A well-know problem in the data as used here is aggregation bias. The results presented in the main text are not corrected for aggregation bias, but tests in a number of specifications showed that the results are not sensitive to a correction. For reasons of comparability with results presented in the literature, we present micro-level regression results throughout. Appendix A.1 on page 34 gives more details.

The positive sign of the lowest unemployment rate since the start of a job is surprising, and does not fit any one of the models of Section 2. One possible explanation may be a selection model. Generally, higher unemployment is correlated with a higher separation rate. Employers have less liberty of laying off individual workers than in the United States, and it is in fact easiest to lay off a worker for "economic reasons". If employers at that time select to keep only higher productivity workers, and if earnings reflect productivity, than those having experienced periods of high unemployment and are still unemployed will tend to be in more productive matches,[20] leading to the observed sign.

Row 7 captures the main result of this paper. There is a strong effect on current earnings through current unemployment. However, previous conditions in the labor market are also significantly correlated with current earnings. The elasticities corresponding to the point estimates in Row 7 are about 9.3 percent for contemporaneous unemployment and about 11 percent for initial unemployment. Neither a model that correlates only the contemporaneous unemployment rate with earnings, such as the simpler efficiency wage models as well as rent-sharing and spot market models, nor the implicit contract models are sufficient by themselves to explain the dynamics of earnings.

However, the fact that there is a strong correlation between initial and lowest unemployment in our sample may cast some doubt on the result that it necessarily be the initial unemployment rate that influences unemployment. The average time elapsed between start of the job and occurrence of the lowest unemployment rate in the sample is 15 months (27 months conditional on being strictly positive), and for only 40 percent of the observations, this value is larger than 12 months. Thus, it is possible that we cannot distinguish the two effects. Section 6 will pursue this point further.

Table 4 on page 30 reports equivalent results using gross instead of net earnings as dependent

[20]Note that this must be match-specific effect, since individual effects have been flushed out. See f.i. Gibbons & Katz (1991).

variable. Coefficients are generally of smaller magnitude, possibly due to the progressive German income tax schedule.

Turning our attention to Table 5 on page 30, we report separate results for men. Our sample is disproportionately composed of men, furnishing 67 percent of sample observations and 61 percent of the sample population. Tenure for men is longer, the distribution across industries is different, and men are more likely to be blue-collar workers. Furthermore, since the participation decision is not modeled here, it is a standard result that coefficients may be biased.[21] Part of the results in Tables 3 and 4 seems to be driven by the female part of the sample. Male earnings are more strongly correlated with current unemployment, whereas measures of past labor market performance are smaller in absolute values. In what follows, we concentrate only on the male subsample.[22] However, all previous patterns apparent in different specifications, in particular the positive sign on minimum unemployment, carry over to the analysis of the male sample.

Row (BD) at the bottom of Table 3 reports the results obtained by (Beaudry & DiNardo 1991) for the United States. In PSID data, the effect of minimum unemployment rate clearly dominates the effect of contemporaneous and of initial unemployment rate, the latter not being significantly different from zero. The German case is more nuanced, lending support to a mixture or simultaneous presence of two mechanisms. The first affects current earnings through the current state of the labor market. A number of models can be consistent with this result, as we have expounded in Section 2. However, the institutional background outlined in Section 3 would lend credence to a rejection of a simple spot market model in favor of a model of rent-sharing. The negative effect of unemployment

[21] Heckman (1976), Mroz (1987). Groot, Mekkelholt & Osterbeek (1992) show in the case of the Netherlands that estimates of the effect of contemporaneous unemployment for women may be severely biased if no self-selection correction is done, and that current unemployment affects not only the wage but also the participation decision. See also Strøm & Wagenhals (1991) on female labor supply in Germany.

[22] In regressions not reported here, female earnings are strongly correlated with the initial unemployment rate. It might be interesting to study the effect of local labor market conditions on long-term labor participation rates of women.

can then be interpreted as evidence of risk-averse unions bargaining over both employment and wages, if bargaining powers are heterogeneous across industries. The resulting bargaining outcome then feeds imperfectly into individual contracts, still allowing for aspects of implicit contracts to have effect. It may be seen as corroborating evidence that unions have in recent years put a stronger emphasis on reduction of hours in order to maintain or increase employment. Our results are consistent with this.

In the next section we study the robustness of the above results before drawing a final conclusion.

6 Robustness of results

In this section, we consider different subsamples in order to test the robustness of the results obtained in the previous section. Since labor markets may function differently for individuals characterized by the size of the firm or the industry they work in, or by particular characteristics of their labor market history, not only may this characteristic influence his level of earnings, but may in fact alter the compensation structure. Furthermore, the results may be sensitive to the particular time period considered, picking up some time-specific artifact rather than a general phenomenon.

6.1 Firm size

A number of models have shown that the labor market may be segmented into tiers of jobs that function as a ladder, for a number of reasons.[23] Conceivably, progression up the ladder is associated with increasing firm size. On the other hand, these jobs may be within one large firm, and constitute an internal hierarchy of jobs. Furthermore, some studies have shown that firm size affects earnings and wages not only through worker quality - which we capture with fixed effects - but through

[23] A recent example is Jovanovic & Nyarko (1997), and see Soskice (1994) for such an explanation for the German market for apprentices.

firm-worker matches (Abowd, Kramarz & Margolis forthcoming). If firms are homogeneous within size categories, this will again be reflected in differences in the remuneration structure.

It could be argued that firm size is a bad instrument for job ladders, as collective bargaining agreements cover all companies within an industry, irrespective of their size, as outlined in Section 3. However, variations do exist, and as we will see, are important.

Results are reported in Table 7 on page 31.[24] A dichotomy appears between very large firms (more than two thousand employees) and smaller ones. Whereas contemporaneous labor market tightness has no significant effect on wages in the former, smaller firms are remarkably homogeneous as to the effect of contemporaneous unemployment. Note that the coefficient decreases as firm size increases, reduced to insignificance for very large firms. Coefficients on previous labor market performance exhibit the same pattern as before, but the magnitude is much larger for very small firms. In large firms, net earnings are unaffected by any labor market conditions, but as Table 8 on page 32 reports, there is a marginally significant effect in gross earning.

Thus, both with respect to variation in ongoing contracts as well as for initial conditions, smaller firms seem to be a lot more sensitive to market conditions than very large firms. It is worth noting that in results not reported here,[25] the return to initial experience is stronger relative to firm-specific experience for tiny firms. This fits well with the fact that firms with less than 10 employees are not subject to the fairly stringent German layoff regulations,[26] allowing them to participate more actively in search activities. Workers' tenure at these also is lower than elsewhere, also suggesting that job security is less than perfect, and that adjustment not only occurs on the wage margin.

At the other extreme, and markedly different from the intermediate categories, lie the very large companies. Initial experience finds no remuneration, whereas firm-specific experience is more

[24] Firm size is reported in five categories. Table 6 on page 31 reports frequencies and the average tenure of jobs in each type of firm.

[25] Results available from the author upon request.

[26] See f.i. Hunt (1995) on the effects of layoff costs on employment in Germany.

highly remunerated. Again, one might find this consistent with the view that large firms have a more strongly hierarchical structure, and provide for stable internal career paths. This finds support in the observation that average tenure is increasing and initial experience decreasing in firm size in Table 6.

6.2 Blue vs. white collar

As pointed out earlier, blue-collar pay in Germany is much more similar to white-collar remuneration than in North America. However, since we cannot distinguish between hourly pay and monthly remuneration, the distinction according to status serves as a proxy. Alternatively, the method of remuneration may not be the only aspect affecting remuneration dynamics.

Accepting status as a proxy for remuneration methods, it is still not clear whether blue-collar pay should vary more or less with labor-market conditions. In an implicit contract model, earnings are consumption, and should, if perfectly insured, not vary with contemporaneous unemployment. However, if firms can adjust hours as well as pay, then wage rates may well change. The labor market institutions outlined in Section 3 seem to imply that for most white-collar workers, remuneration does not vary with hours, and this applies to a significant portion of blue-collar workers as well. However, given the extant discrepancies, we would expect more variance in blue-collar wage rates, rather than earnings, when compared to white-collar wage rates.

Table 9 on page 32 reports results on separate regressions for blue and white-collar workers. The results are qualitatively similar to those previously obtained. However, the effect of the contemporaneous unemployment rate is weaker for white collar workers than for blue collar workers, and the coefficients on previous labor market performance are larger (in absolute value) for white collar workers, though not significant for either worker type.[27] For both worker types, the impact

[27] In other regressions, results were not different when using wage rates instead of earnings.

of the implicit contract type measures is weakened, but the results suggest nevertheless that white collar earnings depend to a larger degree on labor market conditions at the start of the present employment, and to a lesser degree on contemporaneous fluctuations.

6.3 Regional and temporal variation

Nearly 90 percent of reported earnings refer to the first quarter of the survey year, and thus there is very little intra-year variation in the unemployment rates. Though a linear time trend is included in all regressions, capturing the upward trend over the time period of earnings (see Figure 2 on page 39), the inclusion of year dummies mimics the path of the unemployment rate. In order to separate pure year effects from effects related to labor market conditions, some other dimension of variation is necessary.

In our case, we used two approaches to take this possibility into account. First, we use data on regional unemployment rates at the "Bundesland" (state) level instead of the national averages as the relevant unemployment measures. Results are reported in Table 10 on page 33, Column (b), whereas Column (a) takes up the results from Table 5 on page 30. The results are qualitatively the same as for the national measures, but the magnitude of the coefficient on contemporaneous unemployment is reduced, whereas those on contractual measures are increased. Thus, the addition of intra-year variation does not alter the general conclusion.

A second approach splits the sample into subperiods. A glance at the upper left panel of Figure 1 on page 38 shows that although a substantial increase in unemployment followed the oil crisis of the early 70s, mean unemployment in the 70s lies below mean unemployment in the 80s. If in fact the coefficients on unemployment do not reflect pure year effects, than the estimates should not be (overly) sensitive to the period chosen. Column (c) in Table 10 presents results for a sample of jobs starting after 1983 only, using regional unemployment rates. Note that for this subsample, average

initial unemployment will be higher, but there is still substantial variation in the unemployment rate over the period to identify any effect of contemporaneous unemployment on changes in earnings. Again, though point estimates are higher, the qualitative results do not change.

This approach can also be viewed from a different angle. Given the upward trend in unemployment in the data, a substantial percentage of persons in our sample will have experienced their best labor market conditions at the start of the job: their minimum unemployment rate is equal to their initial unemployment rate. In the sample used for Columns (a) and (b), this is the case for around 40 percent of all observations. If this is in fact driving our results, then curtailing the sample to those individuals in jobs that started within a period in which the unemployment rate does not have a (linear) trend, and thus this coincidence occurs less frequently, should yield very different results. For the sample in Column (c), the coincidence of initial and minimum occurs only for 24 percent of observations. The results can be taken as evidence against that hypothesis, since they remain qualitatively the same. This is also in line with the results presented in Tables 3 on page 29 and 4 on page 30, when one or the other of the contractual measures is included.

Up until this point, a job contributed more than one observation to the analysis. All the models predictions collapse to the same one, that of a negative correlation between wages and alternative utilities, when we consider only starting wages, since this first observation is necessarily also current and minimal.[28]

This may serve as a check on our previous estimates. Column (d) reports results from a regression of starting wages on unemployment at the time of the contract start. The coefficient is negative and signficant. Furthermore, taking Column (c) as the comparison group, the coefficient is on the same order of magnitude as the sum of all three coefficients in the more general specification.

Columns (e) and (f) split the sample again into blue and white collar workers, and the results

[28]Since earnings are observed only once yearly in the GSOEP, this is not exactly true, but close enough.

are clearer than in Table 9. For blue collar workers, the predominant influence is contemporaneous, whereas white collar workers are strongly affected by initial conditions, though some contemporaneous variation persists. It thus seems that the implicit contract model is a better description of the earnings evolution of white collar workers, whereas some contemporaneous model better explains the variation in the earnings of blue collar workers.

We had argued in Section 3 that there is substantial coordination or spill-over between regional bargaining units in Germany. If bargaining is what determines the contemporaneous correlation between earnings and unemployment, than one would expect that regional variations should not matter. On the other hand, regional mobility of Germans is low [ref here], and so local labor market may matter for *individual* decisions, such as are modeled in the implicit contracting models as well as in efficiency or spot market models. Thus, if efficiency wages determine contemporaneous correlation, one would expect regional variations to affect earnings. A similar argument goes for initial and lowest unemployment rate in the implicit contract models, where, if geographical mobility influences economic mobility, the relevant outside options are local.

Table 11 on page 33 reports results for several different specifications. Columns (a) and (b) are identical to the same columns in Table 10 on page 33, where unemployment is measured in levels. In column (c), the appropriate regional measures are computed in deviations from national means. The only coefficient now significantly affecting earnings is the measure of initial unemployment. For workers starting jobs in regions with lower than average unemployment, wages stay lower for the rest of their careers, consistent with the implicit contract model. No contemporaneous variation at the regional level affects their earnings. However, when we reintroduce the level of national unemployment measured at the same time in column (d), the level of contemporaneous unemployment affects earnings in much the same way as in the "original" model in column (a). Notice also that the point estimate on minimum unemployment is still about equal to the one in column (a), but is

less precisely estimated.

The results in column (d) point to the simultaneous presence of and complicated interplay of several levels of wage and earnings determination. What it suggest is that at the micro level, employers give immobile workers insurance contracts against fluctuations in their idiosyncratic productivity. This wage guarantee is dampened by aggregate fluctuations in productivity (or whatever shock may translate into increased unemployment), which will affect anybody's earnings. This is consistent with circumstantial evidence on union influence in Germany. Note that what is often called profit sharing is consistent with a union model where bargaining occurs over wages and employment levels (efficient contracting), and this seems to be a plausible scenario for Germany.

7 Concluding Remarks

The main result of this paper is twofold. First, we have shown that earnings dynamics in Germany are influenced by both previous and current labor market conditions. This contrasts with findings for the American labor market indicating the preponderance of previous labor market conditions, and it puts a caveat to the analysis in the wage curve literature, where wages are only correlated to current unemployment. No single model is able to entirely explain microeconomic movements of earnings in Germany.

But, and this is the second result, a caveat applies. The above result is not universally valid in all parts of the labor market. A blue collar worker in a small firm will be much more affected by contemporaneous conditions than, say, a white collar worker in a large firm, controlling for other aspects of productivity. Whereas the former's earnings move in a way consistent with spot market models, the latter's earnings behave if anything according to an implicit contract model.

Furthermore, and quite importantly, local labor markets matter for individual contracts, for

which an implicit contract model or a contracting model seems consistent with the data, but national unemployment covaries with individual earnings, as might be expected in a union bargaining context if unions bargain over earnings and employment. Thus, different labor markets seem to vary substantially as to the sensitivity of earnings to labor market conditions.

We find that the elasticity of current earnings with respect to contemporaneous unemployment varies between 9.3 percent (full sample) and 15.6 percent (for men only, using regional and national unemployment rates), which is comparable in magnitude to coefficients found in previous studies.[29] Furthermore, we find the elasticity of current earnings with respect to initial unemployment to be between 6 percent (men only) and 10 percent (full sample), again depending on the specifications. White collar worker earnings are more sensitive to initial unemployment rates than blue collar earnings, and vice-versa with respect to contemporaneous correlation.

The positive sign obtained on the coefficient on the best labor market conditions since start of the job is puzzling in the present context, but disappears once both national and regional variations in unemployment rates are included in the model.

Comparing with previous results for the U.S. labor market (Beaudry & DiNardo 1991), we find that the elasticity of earnings with respect to the initial labor market conditions since the start of the current job are similar in both economies, if slightly higher in the United States. Elasticity with respect to current unemployment is higher in Germany, the U.S. value of approximately 4 percent being about a third to half of the corresponding German one. From this, it is fairly difficult to draw conclusions as to which labor market shows the "higher" flexibility. However, a tentative conclusion is that earnings in Germany seem to show no less flexibility with respect to labor market conditions than U.S. earnings.

Finally, though most of the above discussion is couched in the vocabulary of implicit contracts,

[29] Blanchflower & Oswald (1994), Wagner (1994).

it is important to point out that other models may well be consistent with the above findings. We have pointed out several in Section 2. Our findings as to the size of the firm seem to show that contracts in smaller firms are sensitive to market than those at very large firms. One possible interpretation is that small firms are too small to support internal labor markets, and thus substitute the marketplace for it. Large firms, on the other hand, offer a more stable environment in which internal labor market and hierarchical incentive systems may function. Support is also to be found in the observation that average tenure in our sample is higher for large firms, implying lower turnover.

Given the particular institutional structure of the German labor market, we hypothesize that some model superimposing collective bargaining agreements and individual contract models may be able to explain our results. We do not supply such a model, but establish stylized facts which such a model must be able to explain.

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A Appendix

	Observations	Persons
Full GSOEP dataset used	107 252	18 185
Missing data	45 371	9 129
Starting year > 1972	33 197	7 172
Germans living in W Germany	23 035	4 896
Employed	21 386	4 587
Only FT working persons	17 288	3 834
Only unlimited contracts	12 621	2 833
Restricting to white/blue collar	11 399	2 643
Excluding agriculture, public sector	10 349	2 459
of which with:		
Valid gross income	10 100	2 432
and > 1 observation	9 537	1 869
Valid net income	10 268	2 452
and > 1 observation	9 698	1 882
of which:		
Men	6 524	1 160

Table 1: Sample reduction

Variable	Full sample		Men	
Mininum national unemployment rate	5.61	(2.31)	5.50	(2.35)
Maximum national unemployment rate	9.02	(0.55)	9.04	(0.54)
Nat. unemployment rate, start of tenure	6.26	(2.61)	6.15	(2.66)
Nat. unemployment rate, time of interview	8.09	(1.01)	8.07	(1.01)
Mininum regional unemployment rate	5.50	(2.87)	5.42	(2.85)
Maximum regional unemployment rate	9.06	(2.40)	9.09	(2.38)
Reg. unemployment rate, start of tenure	6.18	(3.09)	6.09	(3.14)
Reg. unemployment rate, time of interview	7.99	(2.46)	7.99	(2.48)
Contractual hours	39.12	(2.84)	39.29	(2.73)
Actual weekly hours	42.61	(8.23)	43.72	(8.74)
Desired hours per week	37.35	(7.16)	38.93	(6.63)
Net Income in 1994 DM, 1000s	2.78	(1.20)	3.12	(1.24)
Gross Income in 1994 DM, 1000s	4.18	(1.76)	4.62	(1.83)
Blue-collar	0.45		0.55	
Years of education	11.44	(2.19)	11.55	(2.30)
Age	35.80	(10.34)	36.76	(10.02)
Single dummy (1/0)	0.38		0.31	
Female	0.33		1.0	
On-the-job Tenure (months)	79.55	(59.72)	83.83	(60.95)
Initial experience	11.54	(9.62)	12.07	(9.44)
Number of obs.	10268		6524	

Standard deviations in parenthesis.

Table 2: Means

NET EARNINGS

		Unemployment Rate at Start of Tenure	**Contemporaneous Unemployment Rate**	**Minimum Rate over Tenure**
		(a)	**(b)**	**(c)**
	Means	6.26	8.09	5.61
(1)	Fixed Effects	-0.0055**	–.–	–.–
		(0.0023)		
(2)	Fixed Effects	–.–	–.–	-0.0010
				(0.0022)
(3)	Fixed Effects	-0.0110**	–.–	0.0071*
		(0.0035)		(0.0034)
(4)	Fixed Effects	–.–	-0.0115**	–.–
			(0.0020)	
(5)	Fixed Effects	-0.0054*	-0.0115**	–.–
		(0.0023)	(0.0020)	
(6)	Fixed Effects	–.–	-0.0120**	0.0020
			(0.0021)	(0.0023)
(7)	Fixed Effects	-0.0175**	-0.0115**	0.0156**
		(0.0037)	(0.0022)	(0.0036)
(BD)	Fixed effects	-0.006	-0.007	-0.029
		(0.007)	(0.0025)	(0.008)

Significance at ** 1% level and * 5% level. Standard errors in parentheses. All regressions include experience and tenure up to squared terms, education in years, hours in logs, dummies for industry, marital status (single), and a time trend. Row (BD) is taken from Table 2, row 10 in Beaudry & DiNardo (1991).

Table 3: Net earnings specifications

Gross Earnings

		Unemployment Rate at Start of Tenure	**Contemporaneous Unemployment Rate**	**Minimum Rate over Tenure**
		(a)	**(b)**	**(c)**
	Means	6.26	8.09	5.61
(1)	Fixed Effects	-0.0068**	–.–	–.–
		(0.0024)		
(2)	Fixed Effects	–.–	–.–	-0.0029
				(0.0023)
(3)	Fixed Effects	-0.0107**	–.–	0.0050
		(0.0036)		(0.0035)
(4)	Fixed Effects	–.–	-0.0081**	–.–
			(0.0021)	
(5)	Fixed Effects	-0.0067**	-0.0080**	–.–
		(0.0024)	(0.0021)	
(6)	Fixed Effects	–.–	-0.0079**	0.0009
			(0.0022)	(0.0024)
(7)	Fixed Effects	-0.0152**	-0.0102**	0.0101**
		(0.0038)	(0.0022)	(0.0037)

Significance at ** 1% level. Standard errors in parentheses. For regression details see footnote to Table 3.

Table 4: Gross earnings specifications

	Net earnings		Gross earnings	
Unemployment	All (a)	Men (b)	All (c)	Men (d)
First	-0.0175**	-0.0101*	-0.0152**	-0.0099*
	(0.0037)	(0.0045)	(0.0038)	(0.0046)
Current	-0.0115**	-0.0169**	-0.0102**	-0.0126**
	(0.0022)	(0.0026)	(0.0022)	(0.0027)
Minimum	0.0156**	0.0107*	0.0101**	0.0064
	(0.0036)	(0.0044)	(0.0037)	(0.0045)

Significance at ** 1% level, * 5% level. Standard errors in parentheses. For regression details see footnote to Table 3.

Table 5: Full sample and men

Firmsize	Freq	Mean tenure	Mean initial exp
under 5	760	9.77	9.88
	12.36 %	(7.89)	(10.52)
5 to 20	1477	10.90	11.61
	24.03 %	(7.16)	(10.57)
20 to 200	1519	12.43	11.58
	24.71 %	(7.78)	(9.75)
200 to 2000	1595	13.92	9.08
	25.95 %	(8.04)	(9.05)
2000 and more	796	15.34	8.11
	12.95 %	(8.20)	(8.45)

Standard errors in parentheses. Men only.

Table 6: Tenure and initial experience by firmsize

	Firmsize				
	< 5	5 to 20	20 to 200	200 to 2000	> 2000
Initial	-0.0773**	-0.0462**	-0.0233*	-0.0308**	-0.0287
	(0.0157)	(0.0108)	(0.0108)	(0.0114)	(0.0207)
Current	-0.0248**	-0.0231**	-0.0160**	-0.0089*	0.0073
	(0.0093)	(0.0054)	(0.0044)	(0.0041)	(0.0054)
Minimum	0.0523**	0.0500**	0.0203*	0.0288*	0.0212
	(0.0150)	(0.0103)	(0.0102)	(0.0112)	(0.0173)

Significance at ** 1% level and * 5% level. Standard errors in parentheses. For regression details see footnote to Table 3.

Table 7: Results by firm size, net earnings

	Firmsize				
	< 5	5 to 20	20 to 200	200 to 2000	> 2000
Initial	-0.0771**	-0.0443**	-0.0202+	-0.0222+	-0.0386+
	(0.0158)	(0.0108)	(0.0108)	(0.0115)	(0.0202)
Current	-0.0305**	-0.0238**	-0.0167**	-0.0110**	0.0059
	(0.0091)	(0.0054)	(0.0044)	(0.0041)	(0.0054)
Minimum	0.0521**	0.0488**	0.0193+	0.0249*	0.0253
	(0.0151)	(0.0103)	(0.0102)	(0.0114)	(0.0172)

Significance at ** 1% level, * 5% level and + at 10% level. Standard errors in parentheses. For regression details see footnote to Table 3.

Table 8: Results by firm size, gross earnings

	Net earnings		Gross earnings	
	Blue collar (a)	White collar (b)	Blue collar (c)	White collar (d)
Initial	-0.0058	-0.0103	-0.0046	-0.0107
	(0.0060)	(0.0067)	(0.0063)	(0.0066)
Current	-0.0215**	-0.0130**	-0.0183**	-0.0082**
	(0.0037)	(0.0037)	(0.0038)	(0.0036)
Minimum	0.0097	0.0073	0.0062	0.0024
	(0.0059)	(0.0064)	(0.0062)	(0.0064)
Observations	3575	2949	3497	2949

Significance at ** 1% level. Standard errors in parentheses. For regression details see footnote to Table 3.

Table 9: Results by worker class

	Net earnings, men					
	National	Regional				
		Job start		Starting wage	Blue collar	White collar
	≥ 1972 (a)	≥ 1972 (b)	≥ 1983 (c)	(d)	(e)	(f)
Initial	-0.0101*	-0.0126**	-0.0206*	n.a.	-0.0046	-0.0185**
	(0.0045)	(0.0040)	(0.0099)		(0.0055)	(0.0060)
Current	-0.0169**	-0.0108**	-0.0275**	-0.0209**	-0.0151**	-0.0072*
	(0.0026)	(0.0021)	(0.0048)	(0.0048)	(0.0030)	(0.0030)
Minimum	0.0107*	0.0110**	0.0312**	n.a.	0.0044	0.0144*
	(0.0044)	(0.0041)	(0.0091)		(0.0057)	(0.0060)
Observations	6524	6524	2847	712	3575	2949

Significance at ** 1% level and * 5% level. Standard errors in parentheses. For regression details see footnote to Table 3.

Table 10: Regional unemployment rates

	Net earnings, men			
	Levels		Detrended	Detrend. reg. + nat. level
	(a)	(b)	(c)	(d)
Initial unemployment				
- Regional		-0.0126**	-0.0200**	-0.0146+
		(0.0040)	(0.0072)	(0.0076)
- National	-0.0101*			0.0044
	(0.0045)			(0.0084)
Current unemployment				
- Regional		-0.0108**	0.0003	0.0025
		(0.0021)	(0.0041)	(0.0039)
- National	-0.0169**			-0.0193**
	(0.0026)			(0.0047)
Minimum unemployment				
- Regional		0.0110**	0.0092	0.0003
		(0.0041)	(0.0090)	(0.0080)
- National	0.0107*			0.0103
	(0.0044)			(0.0085)

Significance at ** 1% level, * 5% level and + at 10% level. Standard errors in parentheses. For regression details see footnote to Table 3.

Table 11: Regional and national effects

A.1 Group effects

As initially pointed out by Moulton (1986), the standard errors reported by OLS for variables which are constant within groups are biased downwards. Their bias depends on the average group size and the intraclass correlation of the errors. Coefficient estimates themselves are unbiased. The aggregate variables in our case are the unemployment rates. Note however that whereas the coefficient on contemporaneous unemployment is estimated off fairly large cells, the minimum and initial unemployment rates vary widely across individuals, and cells are thus more numerous and smaller, diminishing the bias in the standard errors. For the period under consideration here (1972-1994), there are 22 years * 4 quarters per year * 10 regions = 880 possible cells for initial unemployment, with approximately 10 000 observations. On the other hand, since most interviews are completed within a three-month period, all contemporaneous unemployment observations come from within a single quarter per year, leaving 10 years x 10 regions =100 cells. The case for minimum unemployment will lie between these two extremes.

All regressions in the main test control for fixed effects. Given the low geographical mobility in the data (only 60 moves are observed), the fixed effects absorb any regional effects. The initial unemployment rate entering the typical regression is thus the deviation of the initial unemployment rate at the current job from the average initial unemployment rate for the individual. This measure thus depends on the entire employment history of an individual, further reducing the likelihood of aggregation bias. The same applies to minimum unemployment. On the other hand, contemporaneous unemployment is still subject to aggregation bias in a fixed effect specification, since all individuals in the panel will be subject to the same average over the observation period, and thus also to the same deviation from this average.

One possible correction for aggregation bias is to adjust the degree of aggregation on both sides of the regression equation. We have therefore regressed the dependent variable on the individual regressors (including minimum and initial unemployment rate), industry dummies, and a full set of 100 year-by-region dummy variables. The coefficient estimates on the year-region dummies are thus regression-adjusted regional means.

Note that this specification is also more general in its treatment of the time effects, which in the results reported in the main text are constrained to be linear.

An auxiliary regression of these coefficients on year dummies, region dummies, and on regional unemployment rates was then run. The coefficient on unemployment from this regression is not subject to the aggregation bias described above.

Column (c) in Table 12 on the next page reports the relevant results from the two regressions. Column (a) of that table repeats the parameter estimates from Column (b) of Table 5 on page 30, for the male sub-sample. Column (b) reports results when not controlling for fixed effects in the same sample. Coefficients are higher, indicating that part of the observed effects are actually due to individual heterogeneity, but the general pattern is fairly similar.

In all columns, the first two rows report parameter estimates from the micro-level regressions. The third row, the parameter estimate for the effect of contemporaneous unemployment, reports the estimate from the auxiliary regression in Column (c), but from the micro-level regression in Columns (a) and (b). The parameter estimates when correcting for aggregation bias lie between the fixed effect and cross-sectional estimates. The relative magnitudes of the estimates are similar in Columns (a) and (c), pointing to the fact that regional fixed effects may account for some of the variation otherwise captured by individual fixed effects. All parameter estimates are significantly different from zero irrespective of the specification chosen.

Correcting for aggregation bias and specifiying a more general treatment of time effects do

	Net earnings		
Unemployment	(a)	(b)	(c)
First	-0.0101*	-0.0235**	-0.0182**
	(0.0045)	(0.0050)	(0.0048)
Minimum	0.0107*	0.0232**	0.0158**
	(0.0044)	(0.0051)	(0.0059)
Current	-0.0169**	-0.0200**	-0.0226**
	(0.0026)	(0.0061)	(0.0047)
Corrected for Aggregation bias	No	No	Yes
Controlling for Fixed effects	Yes	No	No

Men only. Significance at ** 1% level, * 5% level. Standard errors in parentheses. For regression details see text.

Table 12: Correcting for aggregation bias.

not change the general results in this subsample. For reasons of parsimony and comparability, we therefore only report results from micro-level regressions throughout the main text.

A.2 Data description

Hours. Hours are reported as contractual hours (HRS_WK_C) and actual hours worked (HRS_WK) in the week preceding the interview. If available, actual hours are used, otherwise contractual.

Earnings. The earnings reported is the monthly amount received in the previous month (INCM_NET and INCM_GRS). Information is also reported on average monthly earnings in the previous year as computed by respondents, which we may use this in a later step to control for representativeness of the answer to INCM.

We computed average hourly earnings including overtime pay, where we used the reported actual hours in the week (HRS_WK) prior to the interview if overtime is paid (OVER_RUL), and contractual hours (HRS_WK_C) otherwise, multiplying it by the number of weeks in a month (4.5). Since wage contracts in Germany usually specify monthly earnings (for white-collar workers) or at least a monthly income w.r.t. hours, we use in our regressions a specification with monthly earnings. Unfortunately, though actual overtime last month is reported, overtime pay is not (except for 1986).

Firm size. is employee-reported, in 5 categories, referring to the firm, not the establishment.

Years of education. is calculated by the data providers from information given in the interview, translating into years of education. Information is also available on highest degree obtained.

Foreigner. The usual control for race in regressions on North American data does not make sense in Germany. We do have information about the immigration status (i.e. if the person is a foreigner or not) and residence according to the old political divisiono of the country (i.e. if the person resides in East or West Germany), SAMPLE. In all regressions, we exclude both foreigners and East Germans.

Union status. is available only for respondents present in the 1985, 1989 and 1993 waves. We

construct the union status for years in between for those respondents who have not changed jobs as far back as this can be followed, but we run regressions without this constructed variable, since it is too incomplete.

MARRIED STATUS. We use a dummy for single status. Experiments for married status yielded similar results.

UNEMPLOYMENT RATES Unemployment rates are taken from yearly volumes of the *Statistisches Jahrbuch ((1957-1990),(1991-1996)*, which from 1972 on provides national and regional averages. Initial unemployment is taken from the quarter in which the present job started, and the lowest unemployment is computed by searching over the time between then and the interview date. Note that since jobs contribute multiple (yearly) observations, the minimum unemployment rate may differ from one year to the next for the same job.

EXPERIENCE. Wave 3 contained questions about the start of professional life, excluding apprenticeships. For respondents not present in Wave 3, or not having responded to these questions, we control for exit from school/apprenticeship and entry into the labor market when setting true experience.

The labor market history supplement in 1986 asked questions on earlier jobs. Specifically, the age when first gainful employment was entered (CP1001) and whether there any professional changes have occurred since (CP1301, CP1302: age) are reported. The second question may be misleading: The question pertains to "Beruf", meaning profession, which may very well be changed while remaining with the same employer. Though tempting to use as a measure for tenure, we opt for the cautious side, and only use CP1001 for potential labor market experience. (One possible use is to control for *occupation specific* tenure.) We retain this variable for all years, controlling in 1984 and 1985 if the start year thus set is later than the wave year. For job starters in subsequent years, we fill in this variable in the year they first report their job start (which may be for the *two* past years).

Nevertheless, the information is not always available, and in the paper we only use POTENTIAL EXPERIENCE. However, for those individuals for whom the comparison is possible, the two variables have a high degree of correlation.

TENURE. The respondents are asked the year and month when they started working for their current employer.[30] This gives a precise notion of tenure. However, the question was only asked of job changers in waves 3 and 4. For these, we construct the tenure variable as follows. In a first step, we fill in 'from below' for those that have not changed jobs, carrying forward the response given in wave 2. In a second step, if the respondents did not answer 'No' to the question 'Have there been changes in your professional circumstances?', we check to see if they have started a job for the first time. Though answering this question is an experience question rather than a tenure question, we use it to control for consistency in the tenure question. Specifically, if the tenure answer is missing, we fill in from the answer to the job start question. The year is also checked for consistency, the reply to the job start question serving to correct tenure in case of disagreement. This might conceivably

[30] The version in all waves is

> Seit wann sind Sie bei Ihrem jetzigen Arbeitgeber beschäftigt? (Falls Sie Selbständiger sind, geben Sie bitte an, seit wann Sie Ihre jetzige Tätigkeit ausüben.)

to which the correct translation would be

> Since when have you been employed by your present employer? (If you are self-employed, please state since when you have been in your current occupation.)

Note that this is translated in some waves in the English version as "... been employed in your present job". The latter translation may be ambiguous.

overstate tenure, though not experience.

In a third step, we control for consistency of the variables thus filled in. If the respondent specifically replies that she has changed employers, we force the start year variable to be consistent with the response. Otherwise, if the job situation has not changed,[31] we force the start year (SYEAR) to be consistent with the once-lagged value of this variable.

INDUSTRY. Earlier years of the survey only asked the industry variable of job changers. Later years filled it in for all respondents. We do this as well for the earlier years, conditional in all cases on no job change having occured.

DEFLATION. The inflation rate used is the official German index as reported by the BLS.[32] Inflation rates are only available on a monthly base starting in 1990. We use the year-end averages throughout to deflate net and gross earnings, expressing them in 1994 DM. Base year is 1982.

[31] The exact question is "Has your job situation/professional life ("*berufliche Situation*") changed since the beginning of [wave year-1]? Please enter if any of the following applies to you, and if yes, when." The categories are *(1) Took up a job for the first time in my life. (2) Gone back to work after a break. (3) Have a job with a new employer. (4) Became self-employed. (5) Have changed position within the firm. (6) No, none of these.* Possible answers to the first five are the month of the year preceding the interview and the month of the interview year in which that change occured.

[32] ftp://stats.bls.gov/pub/

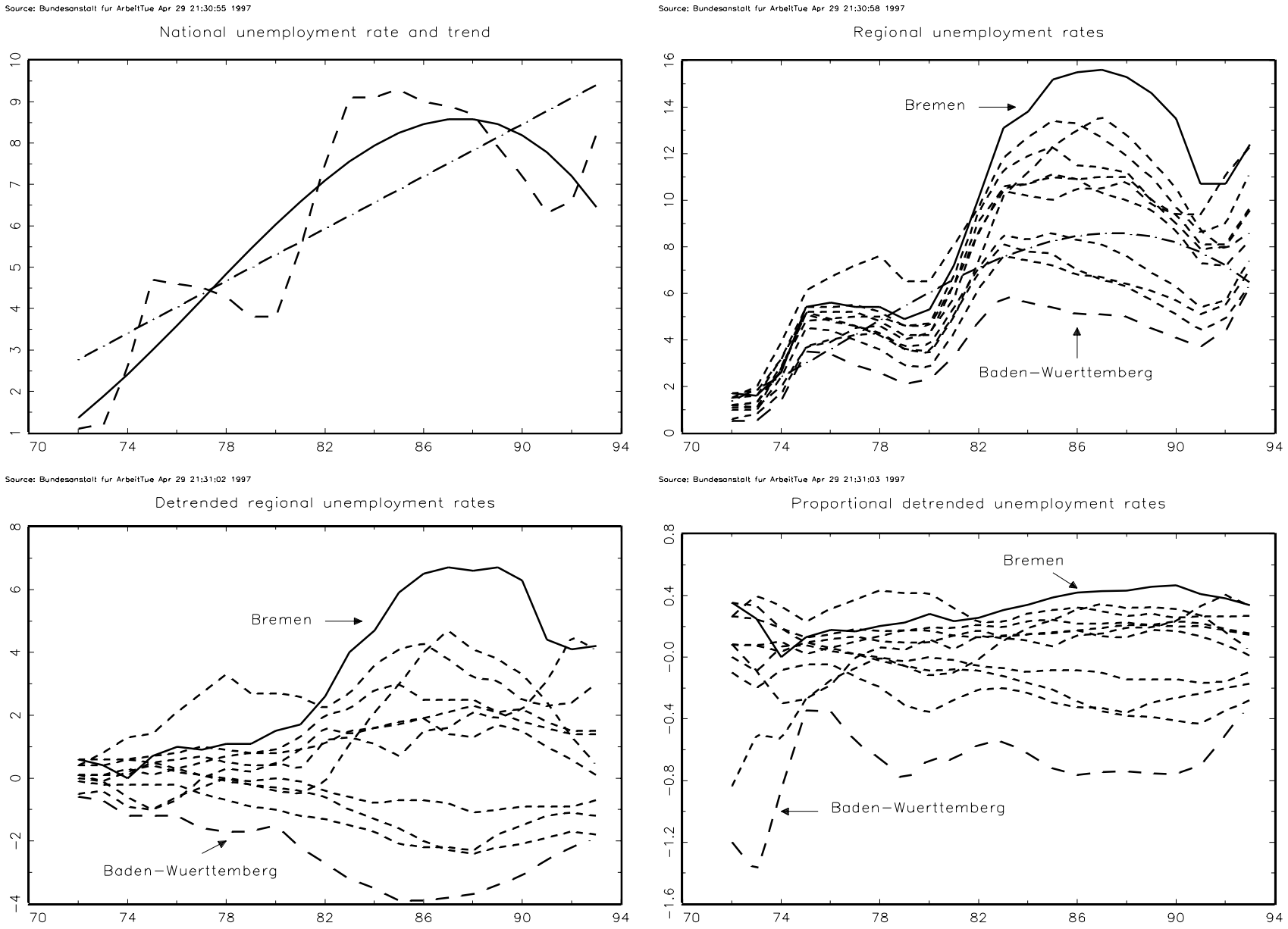

Figure 1: Regional and national unemployment rates

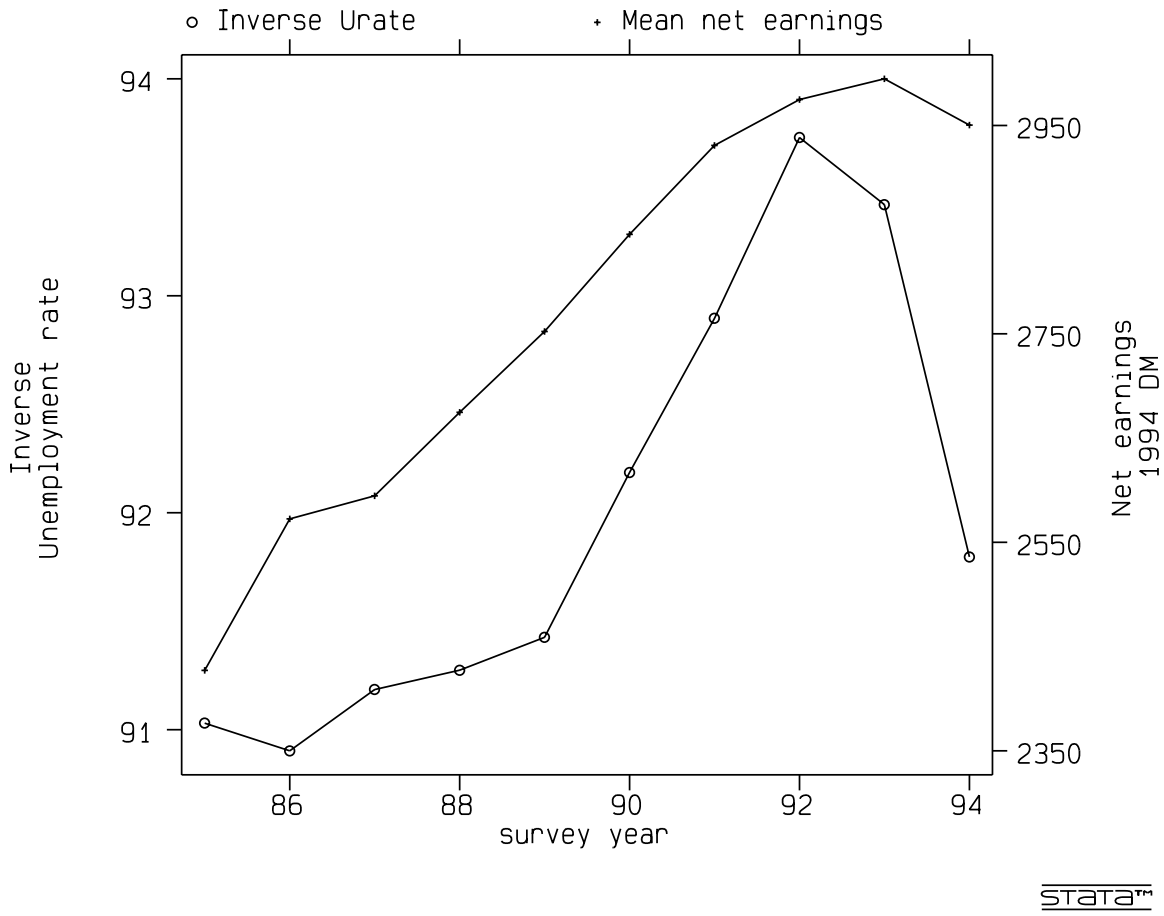

Figure 2: Comovement of inverse unemployment and earnings