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Seniority in Germany: New Evidence on Returns to Tenure for Male Full-time Workers

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**Seniority in Germany:
New Evidence on Returns to Tenure for Male Full-time Workers**

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This study uses recent data taken from the German Socioeconomic Panel (2002-2006) to evaluate the extent of and heterogeneity in returns to tenure for men in East and West Germany, employed in both the private and the public sector. We find significantly different wage patterns in East- and West Germany as well as between the private and public sector. Independent of the particular subsample, the application of the Altonji-Shakotko estimation approach yields minute and insignificant returns to tenure and more substantial returns to experience. The profile of the East German wage structure is surprisingly flat: after the first ten years of experience - and in contrast to the situation in West Germany - there appear to be no returns to additional general human capital.

Keywords: returns to tenure, seniority, earnings patterns, private and public sector

JEL Categories: J31, J24

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1. Introduction

In 2000 European governments agreed to raise labor force participation rates by 2010 to an average of 70 percent in order to keep pace with the economic development of dynamic economies such as the United States or Asian nations. In Germany, labor force participation is particularly subdued among older workers (for an international comparison of population employment rates among men by age group see Figure 1). In addition, German unemployment disproportionately falls on older workers. Older workers suffer a major economic disadvantage in a labor market where their employment opportunities are limited particularly when population aging imposes additional savings requirements for old age. This research asks whether poor labor market conditions for older workers in Germany might be a consequence of high returns to seniority. If older workers receive wages beyond their productivity and if, in consequence, they base their reservation wages on the experience of high earnings this might be the major culprit behind the observed labor market outcome of nonemployment among older workers.

This investigation of the most recent returns to tenure in Germany builds on a large literature. Different arguments justify the expectation that wages increase with time on the job. On the one hand, returns to seniority or steep age-earnings profiles may derive in a deferred compensation context (Lazear 1979). Also, returns to tenure may go back to human capital growth that is associated with both, general labor market experience and firm-specific work experience, i.e. tenure. Both, experience and tenure would thus generate a positively sloped age-earnings-profile. The main challenge in measuring the returns to job seniority is to identify the relevant causal mechanism and to separate it from the mere sorting of workers in jobs that best match their characteristics. Altonji and Shakotko (AS, 1987) as well as Topel (1991) suggest estimation approaches that account for this potential endogeneity of tenure.

Most of the literature on the German wage structure applied these estimators or variations thereof. Of key interest for our analyses are three studies: Dustmann and Meghir

(2005) investigate the returns to experience and tenure for a sample of young men up to age 35 in two skill groups using West German data from 1975 through 1995. They look at displaced workers to identify the effects of interest. Conditional on returns to experience and to sector specific human capital they find large returns to tenure of 4 and 2.5 percent *per year* in the first five years for unskilled and skilled workers, respectively. Dustmann and Pereira (2005) use panel data to compare German and UK wage structures, separately for different education groups. Applying various estimators in the spirit of AS and German Socioeconomic Panel (1984-1997) data on West German men aged 16-60 and working in the private sector, they find modest returns to tenure of about 2 percent in ten years.

Finally, Amann and Klein (2006) recently analyzed the wages of privately employed men in West Germany, observed from 1984 to 2003 in the German Socioeconomic Panel. Unfortunately, these authors do not predict tenure effects comparable to those in the literature. They find IV elasticities of wages to tenure of .045 and of 0.03 when they control for differences across worker types. The authors point out that unobserved worker heterogeneity is a key factor.

Closely related to these studies on German data is the paper by Luchsinger et al. (2003) which applies the Altonji and Shakotko (1987) as well as the Topel (1991) estimators to Swiss panel data. The authors find the two estimation approaches to robustly yield quite different results: ten years of tenure are associated with a small wage increase of about 1.8 percent based on the AS procedure and of about 8 percent using Topel's approach.

The contribution of our study to this literature is threefold: First, we are the first to compare the returns to tenure for the East and West German labor markets. Second, using the GSOEP waves of 2002 – 2006 we use the most recent data available. Finally, we investigate wages structures for employees in the private and the public sector and - to our knowledge – provide the first analysis of the structure of public sector wages for Germany.

The literature on the wage structure in the public sector is rather sparse overall and particularly so for the case of Germany. Three recent contributions (Dustmann and van Soest 1998, Jürges 2002, Melly 2005, and Heitmueller and Mavromaras 2007) focus on decompositions of private-public wage gaps with particular attention to the selectivity of the labor force in the two sectors. An analysis of differential seniority and experience patterns in the public vs. private sector wages has not yet been provided so far.

Our analysis yields three main results. First, the returns to tenure virtually disappear when the potential endogeneity of tenure is accounted for using the approach of Altonji and Shakotko (AS 1987). Second, the life-cycle wage structures differ importantly between East and West Germany, as there appear to be no additional returns to experience after the first few years of labor market participation in East Germany. The East German wage profile is surprisingly flat and different from its West German counterpart even for young workers. Finally, wage structures hardly differ for the private and public sector in West Germany. However, we find the largest (though insignificant) returns to tenure in the public sector in East Germany, where returns to experience remain at the generally low East German level.

The paper proceeds as follows: this introduction is followed by a description of the empirical method applied in this study. Section three describes the available data, the sample and variables. The estimation results are presented and discussed in section four and the paper ends with a conclusion in section five.

2. Method

The AS approach to measuring the returns to tenure starts with the assumption that the log real wage (W) of individual i in job j in period t is linearly determined by

$$\ln W_{ijt} = b_0 X_{ijt} + b_1 T_{ijt} + b_2 T_{ijt}^2 + b_3 \text{OLDJOB}_{ijt} + e_{ijt} , \quad (1)$$

where X represents a vector of individual and job characteristics (e.g. education, labor force participation experience, marital status), T and T^2 are tenure and its square, OLDJOB

indicates whether job tenure is at least one year. AS introduce the latter indicator in order to allow for an unrestricted wage response to passing the first year on a new job.¹ The b_k are coefficients to be estimated and e_{ijt} is an error term. The error term is assumed to combine fixed individual effects (e_i), fixed job match effects (e_{ij}), and a random term η_{ijt}

$$e_{ijt} = e_i + e_{ij} + \eta_{ijt} . \quad (2)$$

The individual fixed effects might reflect unobserved permanent characteristics of the individual worker, such as ability, motivation or characteristics that caused prior job changes. The job match effect reflects permanent wage differences based on having person i in job j . At times, individuals are paid permanently above or below job standards, e.g. because they match the job requirements particularly well or particularly poorly.² In addition, any job match is the (endogenous) result of both employer and employee decisions.

The key endogeneity problem in the wage equation derives from the potential correlation of the tenure variables (including OLDJOB) with the error term. If low productivity individuals change jobs often we expect a positive correlation between observed tenure and the residual of the wage equation. Similarly, if a person is particularly productive in a given job match we expect the person to stay in this employment and to attain high tenure. This generates a positive correlation between tenure and the error term.

Altonji and Shakotko (1987) propose an instrumental variables solution to this endogeneity problem. In particular, they calculate for each endogenous covariate the difference between the period-specific observed variable and its average in a given job. Since this indicator is correlated with T and by construction uncorrelated with e_{ij} they use

$$\tilde{T}_{ijt} = T_{ijt} - \bar{T}_{ij} , \quad (3)$$

¹ In a similar spirit, Amann and Klein (2006) choose to completely omit observations with less than one year of tenure to reduce measurement error on the dependent variable in the first year of tenure. We follow the approach of AS (for one of many replications see e.g. Parent 2000), and allow for a discontinuity in the tenure effect after the first year.

² Other studies consider industry specific effects in the error term (see e.g. Dustmann and Meghir 2005). We test for systematic differences at the industry level by controlling for industry fixed effects.

as an instrument for tenure T , with \bar{T}_{ij} as the average value over all observations of person i in job j . We follow this approach to instrument the job tenure indicators (IV1). AS additionally control for the impact of labor force participation experience when determining the returns to tenure. We might expect individuals with many years of labor market experience and many opportunities to switch jobs ("job shopping") to have found better paying matches than those who just began employment. Also, experience might be correlated with the individual propensity to be active in the labor market. Therefore experience might well be endogenous as well. In additional estimations the endogeneity of the experience indicators (typically higher order polynomials are considered) is controlled for by the same type of instrument as presented above (IV2).

Below we present results based on three estimators. First, OLS results are presented with two alternative model specifications. Standard errors are clustered at the individual level to adjust flexibly for any random effects or heterogeneity structure in the unobservables. Second, we apply the classic AS estimator where tenure variables are instrumented and standard errors are adjusted using a random effects procedure (IV1, again two alternative model specifications are presented). The third estimator repeats the procedure of the second, only now instrumenting both, the tenure as well as the experience variables (IV2).

3. Data

We use the German Socio-Economic Panel (SOEP Group 2001), which collects annual information on individual and household demographic and economic circumstances since 1984. We study the most recent developments and use annual data from 2002 to 2006. The 2002 wave covers 23,892 individuals in 12,692 households with similar sample sizes in subsequent years.

Our sample consists of the male population, age 25 to 60, in full-time employment, i.e. with a contract on at least 35 working hours per week. Workers are excluded if they are

self-employed, in vocational training, in marginal jobs or if they are in special protected employment for the handicapped. In order to apply the AS estimator we consider only individuals who are observed at least for two subsequent years. We observed individuals in on-going employment relationships and censor observations when an employment relationship is interrupted. Contrary to most of the literature we (separately) consider individuals employed in the private and in the public sector. More than half of our workers are observed for the full period of our data, about 15 percent are observed for 3 and for 4 years each, and one fifth is available for only two subsequent observation periods. We excluded all cases in which the reported number of years of experience was below the reported current tenure as we cannot determine which of the variables is coded erroneously. After omitting observations with missing values on the dependent variable, our final sample contains 3,706 individuals with 14,625 person years.³ Of these workers 23.7 percent live in East Germany and a share of 22 percent is employed in the public sector.

Our dependent variable is the log of hourly wages, deflated to prices of 2002 by the annual consumer price index. Log hourly wages are generated from gross monthly incomes, which we divided by the *current* hours worked in the month of the interview. We use current working hours because monthly income includes overtime pay and thus likely responds to actual hours worked. Only in cases of missing information on actual hours worked, we use contracted hours. On average, males work 44.6 hours per week compared to 39.1 hours of contracted time. In our sample, the mean of the log gross hourly wage is 2.74 or 15.49 Euro.⁴ Figure 2 depicts the average development of log real gross hourly wages over the life-cycle.⁵ The wages in West Germany are substantially higher than in the East and the age-profile

³ Jointly the two conditions of experience not being lower valued than tenure and non-missing wages reduce the sample size considerably by about 27 percent, of which more than 75 percent is due to the poorly coded experience variable.

⁴ For four percent of our observations missing values for gross income were imputed based on net income information, marital status, and the number of children.

⁵ In the alternative dataset for the analysis of German wages, the IAB Beschäftigtenstichprobe, which is applied e.g. by Dustmann and Meghir (2005) for a sample of younger workers, more than 20 percent of earners in West German age groups above 50 and more than 10 percent of earners in the East German age groups above 45 would be censored due to top-coding of the data.

seems to be more pronounced in West than in East Germany. Figure 3 depicts the life-cycle wage profiles separately for workers in the public and private sector in East and West Germany. While the selection of workers into sectors of employment is not random as discussed by Dustmann and van Soest (1998), at a descriptive level it is interesting to see that first that wage profiles in West Germany run above those in East Germany for both sectors, second that the life-cycle wage structure in the West German private sector does not differ significantly from that of the public sector, third that the public sector pays higher real hourly wages in East Germany, and finally that the rising slope in West German life-cycle wages is not matched by East German developments. In East Germany we find rather flat wage developments after age 40. None of the observed patterns matches those predicted by Dustmann and van Soest (1998, p.1429), who find increasing wages in the public sector and a concave and downward bending age-wage profile for the private sector.

At each interview, individuals were asked whether and when they started a new job thus providing precise monthly information on tenure and experience. This contrasts with the measurement errors faced e.g. by Altonji and Shakotko (1987). In our sample individuals have an average of 10.5 years of tenure and 20.5 years of general labor market experience.

By international comparison, German job mobility is rather low. Table 1 shows that less than one quarter of all employees changed their job (excluding intra-firm changes) during the five year period considered here. Nineteen percent changed the job once and approximately five percent changed it more than once. Since firm-specific human capital is not lost when changing positions within a given firm, we define job changes as changes of employers.

Among the explanatory variables we consider the level of education measured as years of schooling and its square. An interaction term between experience and education captures that individuals with higher education had less opportunity to acquire work experience. A large set of indicators controls for additional demographic and economic

effects. We consider marital status (5), state of residence (15), industry (11), firm size (6), calendar year (5), whether an individual works abroad or in East Germany, and whether a person is born in Germany. Descriptive statistics on our main explanatory variables are presented in Table 2 for the various subsamples. Employees in East and West Germany differ in terms of wage levels and the much shorter tenure in East than in West German employments. Surprisingly, the wage levels between private and public sector employment are rather similar. As one might expect, employment in the public sector is much more stable, which results in an average tenure that is more than three years longer. The other explanatory variables are described in Appendix Table A1 for the full sample and the subsamples. It is interesting to note that the share of employees in the public sector is substantially higher in East than in West Germany.

4. Results

We estimate the wage model as presented in equation (1) using two specifications and three estimators for different samples and subsamples to study recent patterns of the German wage structure. The estimation results for our main model are presented in Table 3 for employees in the private sector in West Germany and in Table 4 for those in the East German private sector. In both cases, Panel A presents the coefficient estimates and standard errors, and Panel B illustrates the predicted wage effects of changes in tenure and experience.

Columns 1 and 2 of Table 3 provide the results of OLS regressions for the West German sample. The full model yields a good fit to the data and explains 45 percent of the variation in log wages. We find highly significant coefficient estimates for most of the variable groups. They indicate large positive associations of wages with education, with being born in Germany, working in a large firm, and with observations of more recent years. The simulations in Panel B show considerable returns to tenure of $(\exp(0.1217) - 1) = 13$ percent and returns to experience of 25 percent after the first ten years of employment. Once

we instrument the tenure variables applying the AS estimator, the predicted returns to tenure disappear almost completely (cf. columns 3 and 4 of Table 3). The predicted wage effect of the first ten years of tenure drops to about one percent and is no longer significantly different from zero. Instead, the returns to experience increase to a highly significant level of more than 35 percent. In column 5 we present the results of the estimation model where both, tenure and experience variables are instrumented. The general pattern is confirmed, tenure does not appear to affect wages at all, whereas returns to labor force participation experience are the main determinants of wage growth over time.

These results can be compared to those obtained by Dustmann and Pereira (2005) for German men aged 16-60 in the private sector. Their specification does not control for firm size, state and industry differences, for the region of work, country of birth, and the education-experience interaction. On the other hand, they consider higher (i.e. fourth) order polynomials in tenure and experience than our model. With GSOEP data from 1984 through 1997 they obtain similarly small predicted log returns to the first ten years of tenure of 0.0803 based on OLS, an insignificant value of 0.0224 for the IV1 estimate and also negative values when both, tenure and experience are instrumented. Their returns to experience are of the same order of magnitude as ours. These authors argue that in Germany returns to individual experience may be small because wage negotiations establish economy wide wage trends rather than steep individual experience profiles. We obtained large and significant positive year effects on wages which seems to confirm their argument.⁶

Next, we investigate the wage structure of private sector employment in East Germany (see Table 4), which to our knowledge has not been looked at in this literature so far. Our sample here contains repeated observations on 675 different individuals. Again, the OLS estimation explains a substantial share of the variation in the dependent variable. Most likely due to the relatively smaller number of observations, standard errors are larger than

⁶ Estimation results are not presented to save space but are available from the authors upon request.

those for the West German sample in Table 3. We find a substantial positive association of wages with a birth in Germany, with large firm size, and with more recent observation years.

The predicted effects of tenure and experience show somewhat different patterns for the East compared to the West German sample. Both, in the OLS as well as in the IV1 estimations the predicted tenure effect is – even though imprecisely estimated – larger in East than in West Germany. Based on the predictions in columns 1 – 4 the returns to experience are substantially higher in West than in East Germany. Only the predicted experience effect in the IV2 estimation is larger in East Germany. However, the large East German effect is insignificant, whereas the West German effect is highly significant at the one percent level.

One might suspect that the results in Tables 3 and 4 are affected by potentially endogenous explanatory variables in our specification, such as firm size, an individual's place of work, or industry. In order to test whether these control variables influence the predicted returns to tenure and experience we reestimated the models in Tables 3 and 4 without these potentially endogenous covariates. The newly predicted tenure and experience effects are summarized in Table 5. While some of the predicted effects differ slightly from those observed before, the general pattern is confirmed: the returns to tenure drop to close to zero as soon as the tenure variables are instrumented. The returns to experience are substantial and grow even larger in column 5 where the experience variables are instrumented as well. Again they are larger in West than in East Germany especially when predicting the returns to 30 years of experience. The predicted effects of 30 years of labor market experience in East Germany hardly grow beyond the returns to ten years experience. Only when experience is instrumented itself (see column 5), does the prediction generate a substantially larger return to 30 than to ten years of experience in East Germany. However, even then the effect is much below that predicted for West Germany.

This intriguing finding of a flat wage-experience profile in East Germany demands an explanation. One possible reason why the returns to labor market experience differ between

East and West Germany relates to the recent history of the East German labor market. After reunification most East German employment relationships underwent drastic changes. It is plausible to expect that the value of labor market experience that was gathered previously in the former German Democratic Republic suddenly depreciated when the market economy was introduced. In order to test whether this historic background matters, we reestimated our wage models now only considering those individuals in East and West Germany born in 1970 or later, who thus typically started their labor force career after unification.

If the difference in the returns to experience in East and West Germany goes back to the depreciation of the work experience accumulated in the former socialist system then the returns to tenure and experience should not differ for those workers in East and West Germany who started their work life after unification. The predicted effects for the two subsamples are presented in Table 6. The results immediately show that already for young workers the wage structures differ across the two regions even when accounting for state fixed effects. Independent of the estimator or model specification, returns to ten years of experience (except for the very last column) are always higher in West than in East Germany. This suggests that there are robust differences in the wage structures of the private sector in East and West Germany, which have not been pointed out previously and which demand future research.

Next, we consider the wage structure in the public sectors. Based on the evidence in Figure 3, we expect similar slopes for the public and for the private sectors in West Germany, and flatter wage-experience patterns in East German private than public sector. Table 7 presents the predicted tenure and experience effects for the public sectors in East and West Germany. The predictions based on the OLS results in columns 1 and 2 suggest that the

return to the first year of tenure is substantially different in the two regions.⁷ The coefficient of the OLDJOB indicator is large and highly significant only for the West German sample which is reflected in the predicted effects for the first ten years of tenure in columns 1 and 2.

When we compare the wage structure of the West German public sector with that found for the West German private sector (cf. Tables 3 and 5) we find the same insignificant returns to tenure (in columns 3-5) whereas the returns to experience appear to be larger in the private sector and equally significant in the public sector. Given that general labor market experience for individuals working in the public sector is likely to be somewhat "industry-specific" i.e. public sector-specific experience, the higher return to experience observed in the public compared to the private sector might be interpreted as including returns to industry specific human capital (for a discussion see Parent 2000, and Dustmann and Meghir 2005).⁸

Interestingly, this pattern does not hold for East German public sector workers. They differ from their private sector colleagues already in that their returns to tenure do not disappear when tenure is instrumented in columns 3-5. Certainly the estimates are not statistically significant, however, the magnitude of the predicted tenure effects are among the largest we find in all our analyses. Compared to both the OLS results in columns 1 and 2 as well as to the West German public sector workers the high returns to tenure in columns 3-4 come at the price of a reduced return to experience just as we found before for the private sector workers in East Germany. Also, reflecting private sector wage structures, the returns to experience again do not increase substantially when 30 vs. ten years of experience are considered. In conclusion, after controlling for its endogeneity there are considerable (insignificant) returns to tenure in the public sector in East Germany. Their positive effect on total wages however may well be mitigated by the relatively low returns to experience which characterize the overall East German wage structure. Any rationale explaining the high

⁷ The specification in column 1 contains an indicator for "tenure > 1", our OLDJOB variable, whereas the specification in column 2 does not.

⁸ Riphahn (2004) finds strong behavioral consequences of high employment protection legislation in the German public sector, which constitutes an incentives to stay in the public sector.

returns to West German public vs. private sector experience does not appear to hold for the case of East Germany.

5. Conclusions

This study evaluates the relevance of seniority pay as a possible determinant of the low level of labor market activity among German older workers. We apply the classic estimation approach of Altonji and Shakotko (1987) to the most recent available data on the German wage structure, taken from the German Socio-Economic Panel (2002-2006).

Overall our results do not support the hypothesis that excessive returns to tenure inhibit the employment of older workers in Germany. To the contrary, we find almost no case of significant effects of tenure on wages, once we use the instrumental variables estimator suggested by AS and frequently applied in this literature. This result is robust across various specifications of our estimation model and reappears in all subsamples, for the private and public sector and for the East and West German wage structures. Contrary to the minute returns to tenure we find substantial returns to general labor market experience in our estimations, particularly for West German workers. For those in the West German private sector we predict wage increases of about 35 percent for the first ten years of full-time labor force participation, the predictions for the West German public sector reach even 55 percent over the first ten years.

Our second main finding is that the East German wage structures both in the private and in the public sector has an extremely flat profile with very small returns to experience. The finding of flat East German wage profiles is robust to changes in the model specification, to alternative estimators, and to the choice of private or public sector samples. Even for workers born since 1970 wage profiles differ substantially between East and West Germany. We plan to investigate this issue further in future work, by extending the sample to the female labor force, by explicitly modeling returns to industry-specific experience, and by applying

the estimation approach proposed by Topel (1991). Current results do not point to the German wage structure as the main culprit behind low employment rates among older workers. In fact, we find surprisingly low wage increases over life-cycle in East Germany which is most strongly affected by un- and nonemployment problems.

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Table 1 Frequency of Job Changes

Number of Job Changes	Frequency	Percent
0	2,797	75.47
1	709	19.13
2	174	4.70
3	23	0.62
4	3	0.08
Total	3,706	100

Note: Intrafirm job changes are excluded
Source: Germans Socio-economic Panel (2002-2006).

Table 2 Descriptive Statistics for Full Sample and Subsamples

Variable	Germany	East-Germany	West-Germany	Public Sector	Private Sector
monthly gross income (in €)	3,352.01 (15.70)	2,624.94 (24.10)	3,574.10 (18.63)	3,419.34 (28.87)	3,342.66 (18.59)
log of hourly wage	2.7498 (.0037)	2.4881 (.0077)	2.8298 (.0039)	2.8187 (.0069)	2.7336 (.0043)
weekly hours worked	44.61 (.0615)	45.48 (.1246)	44.35 (.0705)	43.78 (.1256)	44.85 (.0710)
age	43.28 (.0724)	43.89 (.1503)	43.10 (.0825)	45.13 (.1576)	42.86 (.0817)
education (in years)	12.63 (.0234)	13.00 (.0451)	12.52 (.0272)	13.62 (.0562)	12.38 (.0254)
tenure (in years)	10.54 (.0707)	8.66 (.1173)	11.13 (.0843)	13.22 (.1661)	9.87 (.0775)
experience (in years)	20.46 (.0792)	21.06 (.1592)	20.28 (.0911)	21.59 (.1748)	20.22 (.0896)
job change (inter firm)	.3071 (.0098)	.3603 (.0215)	.2906 (.0109)	.1762 (.0169)	.3451 (.0117)
No. of obs.	14,625	3,422	11,203	3,047	11,310

Note: Presented are the variable means and standard deviations by subsample.
Source: Germans Socio-economic Panel (2002-2006).

Table 3 Estimation (A) and Prediction (B) Results: Log Real Hourly Wages in the Private Sector, West Germany (2002-2006)

	(1) (OLS)	(2) (OLS)	(3) (IV1)	(4) (IV1)	(5) (IV2)
Panel A					
Education	-0.00197 [0.02175]	-0.00211 [0.02178]	0.00821 [0.02179]	0.00792 [0.02157]	0.08653* [0.04452]
Education ² /100	0.18878** [0.07797]	0.18934** [0.07807]	0.18645** [0.07693]	0.18718** [0.07613]	0.06841 [0.15721]
Experience	0.01753** [0.00776]	0.01828** [0.00773]	0.03295*** [0.00644]	0.03289*** [0.00641]	0.10248*** [0.01662]
Experience ² /10	-0.01179*** [0.00336]	-0.01225*** [0.00334]	-0.01332*** [0.00267]	-0.01344*** [0.00266]	-0.01341*** [0.00319]
Experience ³ /100	0.00156*** [0.00052]	0.00163*** [0.00051]	0.00140*** [0.00041]	0.00143*** [0.00041]	0.00110** [0.00048]
Educ.*Exp.	0.00119*** [0.00026]	0.00119*** [0.00026]	0.00073*** [0.00023]	0.00075*** [0.00023]	-0.00270*** [0.00057]
Tenure	0.01111*** [0.00276]	0.01234*** [0.00259]	-0.00158 [0.00273]	-0.00108 [0.00243]	-0.00356 [0.00236]
Tenure ² /10	-0.00159* [0.00091]	-0.00192** [0.00088]	0.00242** [0.00107]	0.00229** [0.00100]	0.00256*** [0.00090]
Tenure >1	0.02642 [0.01762]	- [0.01604]	0.00391 [0.01018]	- [0.01343]	0.00903 [0.00888]
Born in Germany	0.12622*** [0.01604]	0.12610*** [0.01604]	0.07985*** [0.01351]	0.08108*** [0.01343]	-0.00705 [0.01785]
Single	-0.07638*** [0.01792]	-0.07666*** [0.01792]	-0.04284*** [0.01412]	-0.04374*** [0.01405]	0.02769 [0.01966]
Widowed	0.00834 [0.06248]	0.00748 [0.06264]	0.06104 [0.05383]	0.06043 [0.05374]	0.05784 [0.05713]
Divorced	-0.07902*** [0.02440]	-0.07943*** [0.02441]	-0.05648*** [0.01673]	-0.05677*** [0.01670]	-0.04811*** [0.01835]
Separated	-0.04706 [0.03328]	-0.04711 [0.03336]	-0.02186 [0.01890]	-0.02218 [0.01892]	-0.01184 [0.01817]
Workplace (East)	0.00937 [0.04160]	0.00763 [0.04148]	-0.06081*** [0.02277]	-0.06093*** [0.02283]	-0.06026*** [0.02064]
Workplace (Abroad)	-0.02755 [0.06552]	-0.02836 [0.06538]	-0.01998 [0.03735]	-0.02026 [0.03741]	-0.00946 [0.03547]
Firm size < 5	-0.31231*** [0.03087]	-0.31249*** [0.03096]	-0.20693*** [0.02120]	-0.20932*** [0.02119]	-0.06712*** [0.02263]
Firm size 5 - 19	-0.25059*** [0.02050]	-0.25065*** [0.02053]	-0.14594*** [0.01472]	-0.14797*** [0.01470]	-0.02566 [0.01634]
Firm size 20-99	-0.17082*** [0.01831]	-0.17041*** [0.01830]	-0.09664*** [0.01295]	-0.09816*** [0.01293]	-0.00399 [0.01438]
Firm size 100-199	-0.10364*** [0.02274]	-0.10295*** [0.02273]	-0.06269*** [0.01402]	-0.06343*** [0.01402]	-0.01003 [0.01452]
Firm size 200-1999	-0.06377*** [0.01539]	-0.06347*** [0.01539]	-0.03422*** [0.01044]	-0.03460*** [0.01044]	-0.00862 [0.01063]
Constant	2.08582*** [0.16091]	2.10057*** [0.16095]	1.92529*** [0.16198]	1.92911*** [0.16041]	0.67306 [0.42629]
Observations	8511	8511	8511	8511	8511
R2	0.45	0.45			
Panel B					
10 vs. 0 yrs Tenure	0.12166*** (0.01205)	0.10422*** (0.00866)	0.01238 (0.02220)	0.01213 (0.02249)	-0.00094 (0.02126)
10 vs. 0 yrs Experience	0.22355*** (0.02136)	0.22734*** (0.02135)	0.30309*** (0.02419)	0.30295*** (0.02425)	0.56054*** (0.08397)
30 vs. 0 yrs Experience	0.33697*** (0.02204)	0.33906*** (0.02198)	0.44735*** (0.03292)	0.44575*** (0.03183)	1.13995*** (0.21088)

Note: All models additionally control for sets of 8 state indicators, 4 year indicators, and 10 industry indicators, which we do not present to save space. Standard errors are presented in parentheses. Those in columns 1 and 2 are robust and clustered at the person-level. Those in column 3-5 use the two-stage least squares random effects estimator based on Balestra and Varadharanjan-Krishnakumar (1987), as implemented in the G2SLS option of Stata 10's xtivreg procedure. ***, ** and * indicate statistical significance at the 1, 5, and 10 percent level. Panel A presents the estimated coefficients and Panel B presents the predicted change in log real hourly wages when the value of the explanatory variables is changed as indicated. Standard errors in Panel B are bootstrapped. The estimations use 8,511 person-year observations for 2,254 different workers.

Source: German Socio-Economic Panel (2002-2006)

Table 4 Estimation (A) and Prediction (B) Results: Log Real Hourly Wages in the Private Sector East Germany (2002-2006)

	(1) (OLS)	(2) (OLS)	(3) (IV1)	(4) (IV1)	(5) (IV2)
Panel A					
Education	0.08279 [0.07741]	0.08156 [0.07755]	0.00661 [0.19174]	0.05179 [0.16383]	0.23287 [0.15597]
Education ² /100	-0.08383 [0.26543]	-0.07946 [0.26585]	0.08564 [0.63916]	-0.03758 [0.55682]	-0.63086 [0.53378]
Experience	0.02588 [0.01725]	0.02671 [0.01733]	-0.00069 [0.01844]	-0.00069 [0.01729]	0.06847*** [0.02618]
Experience ² /10	-0.01343* [0.00758]	-0.01397* [0.00762]	-0.00444 [0.00608]	-0.00525 [0.00604]	-0.00717 [0.00668]
Experience ³ /100	0.00183 [0.00116]	0.00193* [0.00117]	0.00030 [0.00094]	0.00044 [0.00093]	0.00063 [0.00103]
Educ.*Exp.	0.00018 [0.00058]	0.00018 [0.00058]	0.00173* [0.00094]	0.00158* [0.00089]	0.00194* [0.00117]
Tenure	0.01487*** [0.00516]	0.01805*** [0.00479]	0.00447 [0.00445]	0.00671* [0.00389]	0.00238 [0.00486]
Tenure ² /10	-0.00343** [0.00157]	-0.00433*** [0.00148]	-0.00309 [0.00225]	-0.00378* [0.00214]	-0.00294 [0.00245]
Tenure >1	0.05388 [0.03511]	- [0.03511]	0.01454 [0.01523]	- [0.01523]	0.01263 [0.01655]
Born in Germany	0.35873*** [0.10951]	0.35704*** [0.10951]	0.02721 [0.11225]	0.03977 [0.10992]	-0.00892 [0.11548]
Single	-0.03240 [0.03956]	-0.03100 [0.03971]	-0.15268*** [0.04085]	-0.14595*** [0.04016]	0.04090 [0.05920]
Widowed	-0.11233 [0.07544]	-0.10589 [0.07643]	0.17790 [0.12463]	0.16675 [0.12221]	0.06776 [0.12838]
Divorced	0.00786 [0.04419]	0.00815 [0.04440]	0.02343 [0.04263]	0.02466 [0.04217]	0.03990 [0.04465]
Separated	0.05147 [0.08775]	0.05074 [0.08846]	0.05733 [0.03951]	0.05839 [0.03931]	0.07825* [0.04227]
Workplace (West)	0.13966*** [0.02802]	0.13891*** [0.02808]	0.04226** [0.01800]	0.04297** [0.01800]	0.03864** [0.01934]
Workplace (Abroad)	0.31551 [0.20123]	0.31468 [0.20631]	0.04520 [0.07055]	0.04218 [0.07058]	0.02754 [0.07593]
Firm size < 5	-0.39539*** [0.05884]	-0.39672*** [0.05902]	-0.18859*** [0.04347]	-0.19661*** [0.04324]	-0.21390*** [0.04604]
Firm size 5 - 19	-0.35798*** [0.04448]	-0.35777*** [0.04454]	-0.16264*** [0.03423]	-0.16850*** [0.03404]	-0.19056*** [0.03624]
Firm size 20-99	-0.27877*** [0.03866]	-0.27861*** [0.03867]	-0.13854*** [0.02978]	-0.14126*** [0.02965]	-0.15306*** [0.03158]
Firm size 100-199	-0.15695*** [0.04406]	-0.15796*** [0.04413]	-0.08854*** [0.03111]	-0.08958*** [0.03104]	-0.09956*** [0.03316]
Firm size 200-1999	-0.04488 [0.04168]	-0.04553 [0.04170]	-0.04131 [0.02748]	-0.04204 [0.02749]	-0.04896* [0.02943]
Constant	1.22323** [0.58406]	1.25494** [0.58579]	1.91507 [1.42884]	1.59302 [1.19972]	-0.91590 [1.23563]
Observation	2.413	2.413	2.413	2.413	2.413
R2	0.44	0.44			
Panel B					
10 vs. 0 yrs Tenure	0.16749*** (0.02566)	0.13754*** (0.02050)	0.02995 (0.04858)	0.03110 (0.04891)	0.00932 (0.05168)
10 vs. 0 yrs Experience	0.16467** (0.06487)	0.16901** (0.06579)	0.15345* (0.08943)	0.14182 (0.46776)	0.77370 (0.55768)
30 vs. 0 yrs Experience	0.12810* (0.06774)	0.13146* (0.06870)	0.25457 (0.23131)	0.20284 (1.39362)	2.02970 (1.69524)

Note: All models additionally control for sets of 5 state indicators, 4 year indicators, and 10 industry indicators, which we do not present to save space. Standard errors are presented in parentheses. Those in columns 1 and 2 are robust and clustered at the person-level. Those in column 3-5 use the two-stage least squares random effects estimator based on Balestra and Varadharanjan-Krishnakumar (1987), as implemented in the G2SLS option of Stata 10's xtivreg procedure. ***, ** and * indicate statistical significance at the 1, 5, and 10 percent level. Panel A presents the estimated coefficients and Panel B presents the predicted change in log real hourly wages when the value of the explanatory variables is changed as indicated. Standard errors in Panel B are bootstrapped. The estimations control for sets of federal state (5), year (4), and sector fixed effects (10). The estimations use 2,413 person-year observations for 674 different workers.

Source: German Socio-Economic Panel (2002-2006)

Table 5 Prediction Results – Based on Reduced Specification: Effects on Log Real Hourly Wages in the Private Sector in West and East Germany (2002-2006)

	(1) (OLS)	(2) (OLS)	(3) (IV1)	(4) (IV1)	(5) (IV2)
PANEL A: West Germany					
10 vs. 0 yrs Tenure	0.16864*** (0.01908)	0.14789*** (0.01166)	0.01561 (0.02449)	0.01436 (0.02418)	0.00417 (0.02488)
10 vs. 0 yrs Experience	0.21731*** (0.02224)	0.22160*** (0.02222)	0.31214*** (0.03762)	0.31212*** (0.03603)	0.93594*** (0.13313)
30 vs. 0 yrs Experience	0.30836*** (0.02271)	0.31056*** (0.02249)	0.47652*** (0.05163)	0.47300*** (0.04563)	2.38533*** (0.37741)
PANEL B: East Germany					
10 vs. 0 yrs Tenure	0.18479*** (0.02941)	0.17220*** (0.02136)	0.00704 (0.03982)	0.00640 (0.03894)	-0.01383 (0.04220)
10 vs. 0 yrs Experience	0.20252*** (0.06491)	0.20409*** (0.06495)	0.24306*** (0.07043)	0.24179*** (0.08034)	0.52398 (0.61542)
30 vs. 0 yrs Experience	0.09518 (0.06403)	0.09625 (0.06389)	0.25998*** (0.07721)	0.25960** (0.12977)	1.08151 (1.85008)

Note: ***, ** and * indicate statistical significance at the 1, 5, and 10 percent level. Standard errors are bootstrapped. In contrast to the models presented in Tables 3 and 4 the estimations behind the predicted effects do not control for sets firm size effects (5), place of work (2), and industry (10). The entries present the predicted change in log real hourly wages when the value of the explanatory variables is changed as indicated. The estimations in Panel A on West Germany use 8,679 person-year observations for 2,275 different workers, those in Panel B on East Germany use 2,475 person-year observations for 679 different workers.

Source: German Socio-Economic Panel (2002-2006)

Table 6 Prediction Results – Based on Estimations of the Full Specification for Birth Cohorts since 1970: Effects on Log Real Hourly Wages in the Private Sector in West and East Germany (2002-2006)

	(1) (OLS)	(2) (OLS)	(3) (IV1)	(4) (IV1)	(5) (IV2)
PANEL A: West Germany					
10 vs. 0 years Tenure	0.13980*** (0.02956)	0.14553*** (0.02863)	0.07759 (0.05779)	0.07510 (0.05789)	0.07060 (0.06154)
10 vs. 0 years Experience	0.45083*** (0.06327)	0.44186*** (0.06207)	0.39932* (0.22507)	0.38516** (0.17870)	0.48879 (0.61181)
PANEL B: East Germany					
10 vs. 0 years Tenure	0.25610*** (0.06619)	0.23695*** (0.06204)	0.02060 (0.16592)	0.01518 (0.16870)	-0.02801 (0.20316)
10 vs. 0 years Experience	0.19176 (0.24256)	0.20676 (0.23955)	0.18407 (0.54983)	0.19629 (0.59972)	1.77223 (1.20539)

Note: Bootstrapped standard errors are presented in parentheses. ***, ** and * indicate statistical significance at the 1, 5, and 10 percent level. The entries present the predicted change in log real hourly wages when the value of the explanatory variables is changed as indicated. The estimations for West Germany use 1,537 person-year observations for 444 different workers, those for East Germany use 416 person-year observations for 132 different workers.

Source: German Socio-Economic Panel (2002-2006)

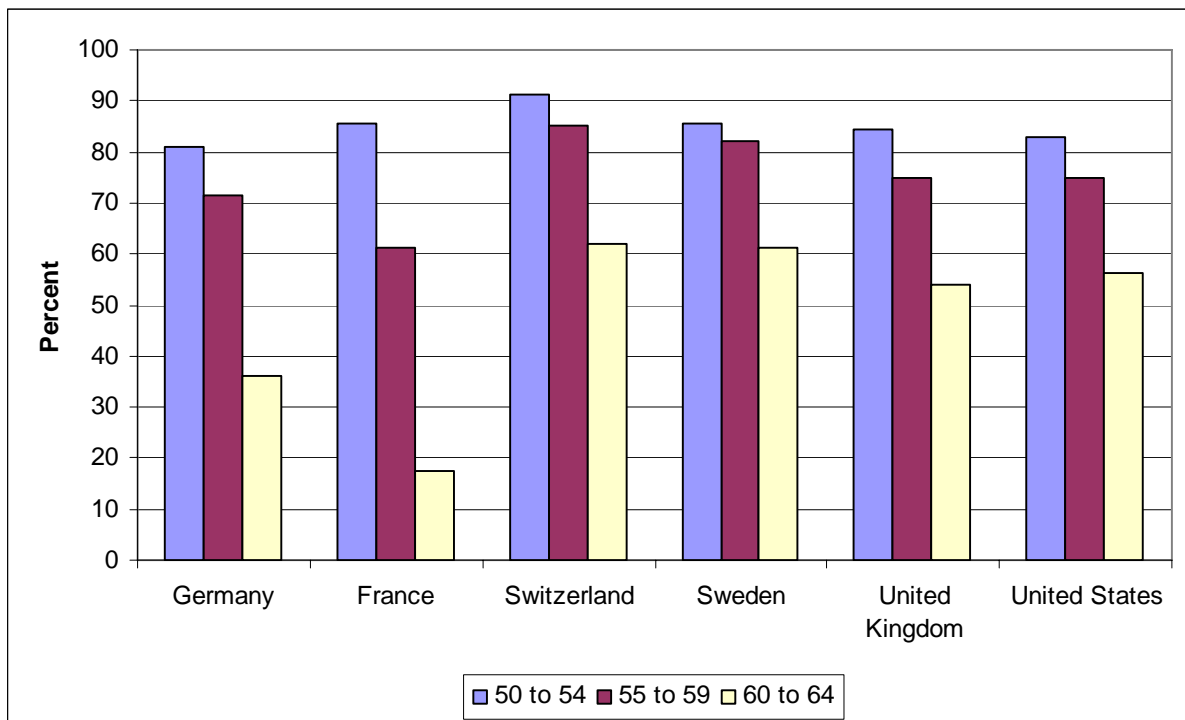
Table 7 Prediction Results – Based on Full and Reduced Specification: Effects on Log Real Hourly Wages in the Public Sector in West and East Germany (2002-2006)

	(1) (OLS)	(2) (OLS)	(3) (IV1)	(4) (IV1)	(5) (IV2)
PANEL A: West Germany - Full Specification					
10 vs. 0 yrs Tenure	0.19366*** (0.04614)	0.12279*** (0.02159)	-0.05988 (0.13777)	-0.07266 (0.13553)	-0.07959 (0.13676)
10 vs. 0 yrs Experience	0.26980*** (0.06410)	0.28258*** (0.06612)	0.44185*** (0.11720)	0.43198*** (0.10835)	0.98466 (0.67211)
30 vs. 0 yrs Experience	0.38123*** (0.07137)	0.38662*** (0.07217)	1.07636*** (0.34288)	1.04057*** (0.34161)	1.90279 (2.05104)
PANEL B: West Germany - Reduced Specification					
10 vs. 0 yrs Tenure	0.20502*** (0.04288)	0.13326*** (0.02230)	-0.07074 (0.11390)	-0.08626 (0.11062)	-0.09280 (0.11858)
10 vs. 0 yrs Experience	0.30175*** (0.05701)	0.31547*** (0.05737)	0.52923*** (0.12194)	0.52172*** (0.13306)	1.63767*** (0.36872)
30 vs. 0 yrs Experience	0.39744*** (0.05825)	0.40371*** (0.05881)	1.13758*** (0.28854)	1.10428*** (0.27647)	3.87058*** (1.01572)
PANEL C: East Germany - Full Specification					
10 vs. 0 yrs Tenure	0.12500** (0.05746)	0.13189*** (0.03824)	0.15378 (0.11216)	0.15007 (0.10992)	0.18626 (0.16616)
10 vs. 0 yrs Experience	0.48880*** (0.10102)	0.48707*** (0.10039)	0.19274 (0.13063)	0.23784* (0.12269)	2.60483** (1.14005)
30 vs. 0 yrs Experience	0.51741*** (0.11257)	0.51579*** (0.11123)	0.20265 (0.21442)	0.25994 (0.19702)	7.62180** (3.44623)
PANEL D: East Germany - Reduced Specification					
10 vs. 0 yrs Tenure	0.15805*** (0.04853)	0.15511*** (0.03364)	0.12275 (0.13537)	0.11276 (0.13521)	0.14473 (0.43680)
10 vs. 0 yrs Experience	0.39939*** (0.10055)	0.40010*** (0.10589)	0.17920 (0.15850)	0.26075* (0.15401)	2.55752 (1.00453)
30 vs. 0 yrs Experience	0.37813*** (0.10695)	0.37877*** (0.11172)	0.20109 (0.23256)	0.28442 (0.22420)	7.53893*** (2.95801)

Note: Bootstrapped standard errors are presented in parentheses. ***, ** and * indicate statistical significance at the 1, 5, and 10 percent level. The estimations underlying the predictions in Panels A and C are based on the specifications of Tables 3 and 4, those underlying the predictions in Panels B and D are based on the specifications of Table 5. It is notable that public sector employment similar to private sector employment is spread across various industries such that industry dummies continue to be considered. The entries present the predicted change in log real hourly wages when the value of the explanatory variables is changed as indicated. The estimations for West Germany use 2,175 person-year observations for 602 different workers, those for East Germany use 831 person-year observations for 217 different workers.

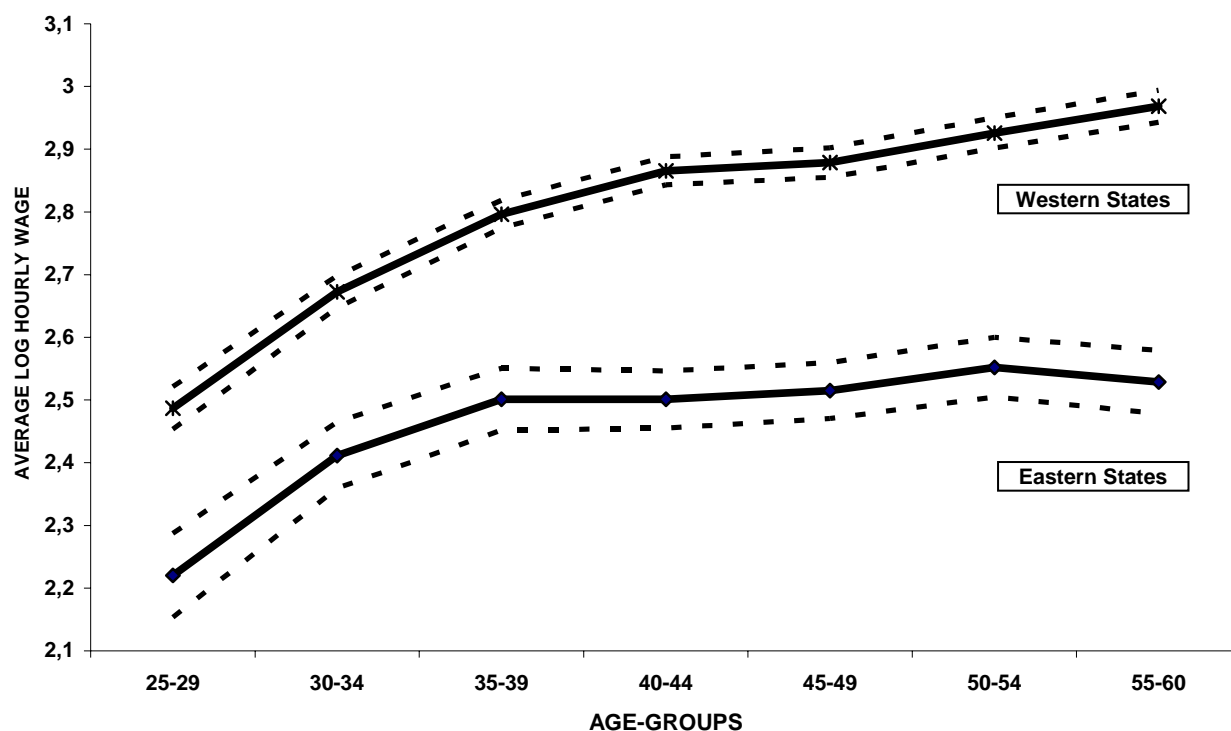
Source: German Socio-Economic Panel (2002-2006)

Figure 1 Employment / Population Rates - Men



Source: OECD, Labor Force Statistics 2005, Men.

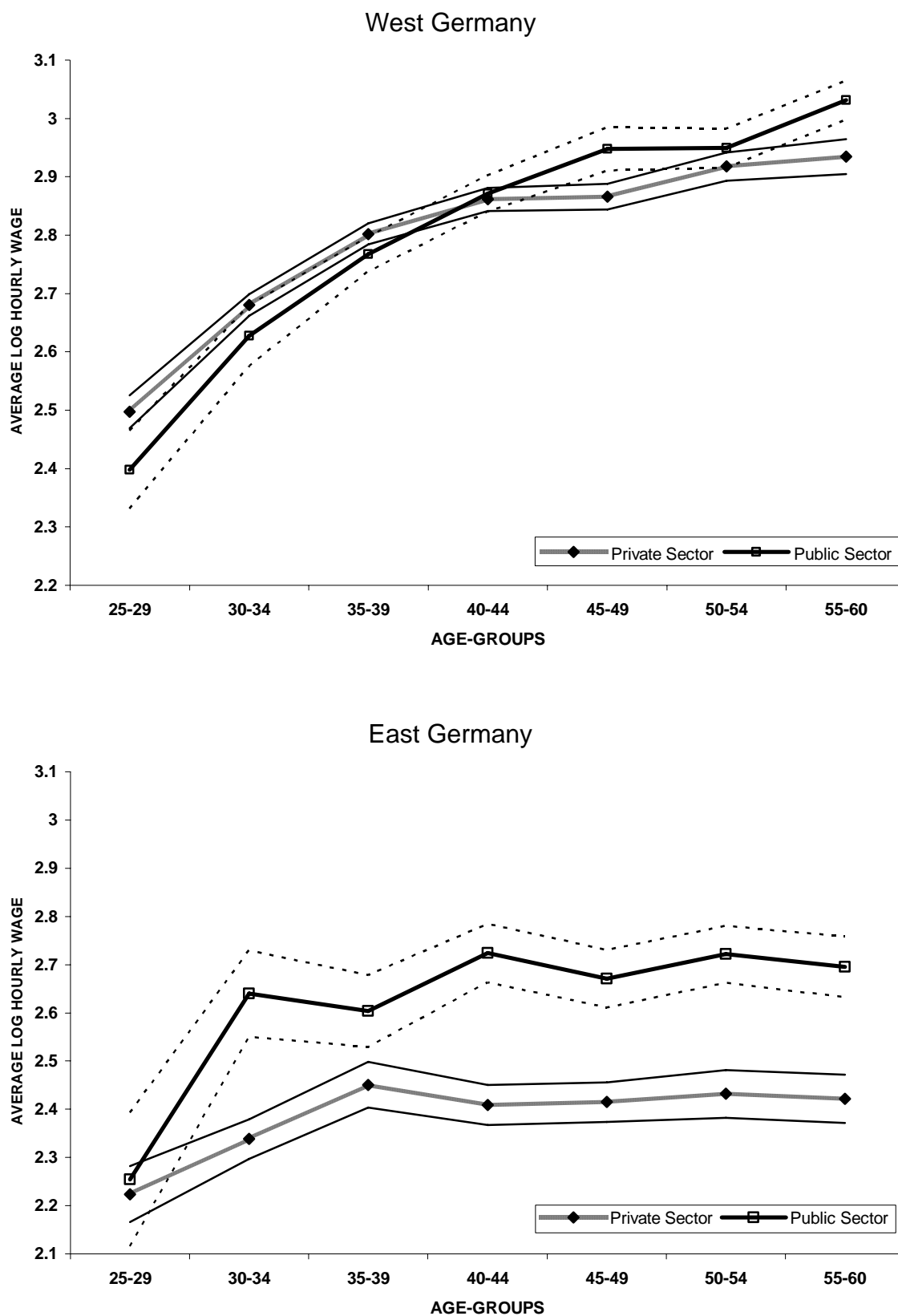
Figure 2 Joint Age-wage Profiles for the Public and Private Sectors in East and West Germany



Note: Real hourly wages are deflated to 2002 prices. Estimates were obtained by regressing real log hourly wages on a set of indicator variables for age group and year. The dashed lines are pointwise 95 percent confidence intervals obtained from least squares standard errors.

Source: Germany Socio-Economic Panel (2002-2006).

Figure 3 Age-wage Profiles for the Public and Private Sector in East and West Germany



Note: See Figure 3

Source: German Socio-Economic Panel (2002-2006).

Appendix Table A1 Description of Explanatory Variables for the Full Sample

Variable	Germany	East Germany	West Germany	Private Sector	Public Sector
Born in Germany	.8698 (.0028)	.9819 (.0023)	.8356 (.0035)	.8500 (.0034)	.9478 (.0040)
Marital Status:	.7292	.6745	.7459	.7291	.7374
Married	(.0037)	(.0080)	(.0041)	(.0042)	(.0080)
Single	.1725 (.0031)	.2060 (.0069)	.1623 (.0035)	.1730 (.0036)	.1638 (.0067)
Widowed	.0053 (.0006)	.0096 (.0017)	.0039 (.0006)	.0065 (.0008)	.0010 (.0006)
Divorced	.0693 (.0021)	.0853 (.0048)	.0645 (.0023)	.0696 (.0024)	.0689 (.0046)
Separated	.0237 (.0013)	.0245 (.0026)	.0233 (.0014)	.0218 (.0014)	.0289 (.0030)
Public Sector	.2122 (.0034)	.2515 (.0075)	.2003 (.0038)	—	—
Firm size: (1; 5]	.0391 (.0016)	.0544 (.0039)	.0345 (.0017)	.0472 (.0020)	.0093 (.0017)
(5; 20]	.1326 (.0028)	.1837 (.0067)	.1171 (.0030)	.1580 (.0034)	.0384 (.0035)
(20; 100]	.2133 (.0034)	.2647 (.0076)	.1977 (.0038)	.2265 (.0039)	.1668 (.0068)
(100; 200]	.1052 (.0026)	.1214 (.0057)	.1002 (.0029)	.1035 (.0029)	.1086 (.0057)
(200; 2,000]	.2582 (.0036)	.1810 (.0067)	.2815 (.0043)	.2402 (.0040)	.3237 (.0085)
(2,000+)	.2516 (.0036)	.1947 (.0069)	.2688 (.0042)	.2246 (.0039)	.3532 (.0087)
State:	.0294	—	.0384	.0241	.0502
Schleswig-Holst.	(.0014)	—	(.0018)	(.0014)	(.0040)
Hamburg	.0118 (.0009)	—	.0154 (.0012)	.0122 (.0010)	.0105 (.0018)
Lower Saxony	.0800 (.0022)	—	.1044 (.0029)	.0775 (.0025)	.0886 (.0051)
Bremen	.0069 (.0007)	—	.0090 (.0009)	.0068 (.0008)	.0079 (.0016)
N-Rhein-Westfa.	.2122 (.0033)	—	.2771 (.0042)	.2129 (.0038)	.2133 (.0074)
Hessen	.0705 (.0021)	—	.0921 (.0027)	.0729 (.0024)	.0650 (.0045)
R-Pfalz,Saarl.	.0654 (.0020)	—	.0853 (.0026)	.0672 (.0024)	.0607 (.0043)
Baden-Wuerttemb.	.1419 (.0029)	—	.1853 (.0037)	.1543 (.0034)	.0916 (.0052)
Bavaria	.1478 (.0029)	—	.1929 (.0037)	.1499 (.0034)	.1352 (.0062)

TABLE A1
(continued)

Variable	Germany	East Germany	West Germany	Private Sector	Public Sector
Berlin	.0334 (.0015)	.1426 (.0060)	—	.0271 (.0015)	.0558 (.0042)
Mecklenburg-V.	.0196 (.0011)	.0836 (.0047)	—	.0182 (.0013)	.0230 (.0027)
Brandenburg	.0353 (.0015)	.1508 (.0061)	—	.0312 (.0016)	.0519 (.0040)
Saxony-Anhalt	.03706 (.0016)	.1584 (.0062)	—	.0386 (.0018)	.0299 (.0031)
Thuringen	.0418 (.0017)	.1786 (.0065)	—	.0418 (.0019)	.0423 (.0036)
Saxony	.0669 (.0021)	.2861 (.0077)	—	.0652 (.0023)	.0742 (.0047)
Industry:	.0146	.0261	.0115	.0147	.0147
Not Applicable	(.0010)	(.0029)	(.0010)	(.0011)	(.0022)
Agriculture	.0368 (.0016)	.0346 (.0033)	.0374 (.0018)	.0457 (.0020)	.0030 (.0010)
Energy	.2260 (.0035)	.1666 (.0068)	.2421 (.0041)	.2842 (.0043)	.0077 (.0016)
Mining	.1149 (.0027)	.0851 (.0051)	.1229 (.0031)	.1447 (.0033)	.0040 (.0012)
Manufacturing	.1047 (.0026)	.1514 (.0065)	.0920 (.0027)	.1206 (.0031)	.0460 (.0038)
Construction	.0958 (.0025)	.1089 (.0057)	.0922 (.0027)	.1198 (.0031)	.0083 (.0017)
Trade	.1057 (.0026)	.0838 (.0050)	.1117 (.0030)	.0984 (.0028)	.1348 (.0062)
Transport	.1678 (.0031)	.1881 (.0071)	.1623 (.0035)	.0973 (.0028)	.4273 (.0090)
Bank, Insurance	.0799 (.0023)	.0937 (.0053)	.0762 (.0025)	.0253 (.0015)	.2835 (.0082)
Services	.0517 (.0019)	.0597 (.0043)	.0496 (.0021)	.0466 (.0020)	.0707 (.0047)
Other	.0021 (.0004)	.0020 (.0008)	.0022 (.0004)	.0026 (.0005)	—
No. of obs.	14,625	3,422	11,203	11,310	3,047