Unpaid Overtime in Germany:
Differences between East and West

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Abstract

Although the standard work week is longer in East than in West Germany, there is a higher incidence and average amount of unpaid overtime in the East. We try to explain the striking differences in unpaid overtime by analyzing the labor supply side. We focus on the investment character of overtime and examine whether workers use unpaid extra hours to signal higher productivity so as to reduce the risk of losing their jobs. Using panel data from the SOEP and approximating the risk of unemployment with regional unemployment rates, we find partial evidence for the unemployment-overtime hypothesis.

JEL Classifications: J22, D80, C23

1. Introduction

Although the standard work week in East Germany is about two hours longer than in the West, the "new" states of the East have a higher incidence and average amount of unpaid overtime, which refers to the time actually worked in excess of the contractual hours that is neither paid nor compensated with time off. This raises the question as to what causes the different allocation of time between East and West Germany. Do West Germans simply have a higher preference for leisure or are there other underlying reasons? Taking the demand for overtime work as given, we focus on one of the possible explanations why individuals might want to work more than their contractual hours and even offer them for free: they might regard overtime work as an invest-

ment and therefore voluntarily increase their labor supply to obtain a payoff in the future. Therefore, the question is whether unpaid overtime can be interpreted as a means by which a worker signals that he or she is productive in order to get some future benefit. Examples of such potential benefits might include larger or more rapid salary increases, a higher probability of promotion, and a lower probability of being laid off. In this study, we investigate whether workers use unpaid extra hours to signal higher productivity so as to reduce the risk of losing their jobs.

Among the sparse literature on unpaid overtime work there is almost none focusing on the investment character of extra hours. One of the recent studies on unpaid overtime is by Bell and Hart (1998), who find that adjusting wages for unpaid hours leads to a decrease in returns to education, experience, and tenure in Great Britain. In a continuative study, Bell, Hart, Hübler, and Schwerdt (2000) show that in Germany less overtime and far less unpaid overtime is worked than in the U.K., and that the wage gap between the two countries widens when effective hourly wage rates are compared. Hübler (2002) finds that managers who use a computer work more unpaid extra hours than others in Germany.

Initial evidence on the investment character of working hours is given by Bell and Freeman (2001). They compare actual working hours in the U.S. and in Germany, and conclude that the larger number of hours worked by Americans can be explained in terms of forward-looking labor supply responses to differences in earnings inequality. Booth, Francesconi, and Frank (2002) show that the amount of overtime correlates with subsequent promotions in a significantly positive way. Supportive evidence for the investment character of unpaid extra hours is given by Pannenberg (2004). He finds that workers with some incidence of unpaid overtime experience the highest wage growth, which is evidence for the importance of investing in current working hours beyond the standard work week to enhance real earnings prospects. In this paper we test the forward-looking labor supply model by investigating the relationship between the perceived risk of job loss, which we proxy with regional unemployment rates, and unpaid overtime. Using data from the SOEP for the years 1993 to 2002, we find a significant effect of regional unemployment on the supply of unpaid overtime for West German men, while the effect in the estimations for East German men and women is not significant.

2. Data

The data used in this study were made available by the German Socio-Economic Panel Study (SOEP) which is a representative longitudinal micro-database (see Haisken-DeNew and Frick, 2003). We use data from 1993 to 2002 for male and female East and West German full-time employees aged between

20 and 65, excluding foreigners, civil servants, self-employed persons, and the agricultural sector. In our unbalanced panel, we include respondents who participated in at least two waves of the survey in order to be able to control for individual unobserved heterogeneity. In total, the sub-sample consists of 22,238 person-observations.

The SOEP provides detailed information on overtime work, which is combined to obtain the amount of unpaid overtime hours per week, the dependent variable in our study[1]. As an independent variable, we use regional unemployment rates provided by the Federal Statistical Office in Germany which are available on the state level and used to proxy a worker's risk of losing his job. Furthermore, we include unemployment rates by employment office district ("Arbeitsamtbezirk") that we assign to the households according to their zip codes, which are available since 1993[2]. Due to the limited mobility of workers, these are better suited to represent the perceived unemployment situation. Therefore, district unemployment rates are more appropriate to proxy an individual's subjective risk of dismissal.

Furthermore, we add monthly gross earnings to the covariates and also include extra payments such as holiday pay and income from profit sharing. Since monthly labor income overstates the remuneration of workers with excessive hours, it would be appropriate to use the effective hourly wage rate by dividing earnings by actual working hours. However, hourly wages might understate the earnings of workers who work long hours. Furthermore, using a wage measure that includes actual working hours would cause an endogeneity problem, since actual weekly hours is the sum of the contractual work week plus overtime. Therefore, this study uses the wage rate obtained by dividing gross earnings by contractual hours plus paid overtime hours. To take into account the distortion of labor supply caused by fiscal policy, we include a proxy for each individual's tax rate. We use the ratio of the tax burden, which is the difference between gross and net earnings, to the gross labor income[3]. In addition, the SOEP provides information on the income of a person's partner as well as on dependent children living in the household, which we also include as control variables. Further independent variables are job tenure, recent

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[1] The original questions in the SOEP read as follows: *"Do you work overtime?"* [Yes / No / Not applicable because I am self-employed]; *"If you work overtime, is the work paid, compensated with time-off, or not compensated at all?"* [Compensated with time-off / Partly paid, partly compensated with time-off / Paid / Not compensated at all]; *"How was your situation with regard to overtime last month? Did you work overtime? If yes, how many hours?"* [Yes, _____ hours / No].

[2] Due to the sensitivity of the data analysis at the zip code level, all analyses involving such data have been conducted at the German Institute for Economic Research (DIW Berlin), under special data protection requirements.

[3] Here, tax refers not only to direct taxes to the government, but also to social security payments.

job change, whether a worker holds a temporary job, and desired working hours. All regressions include control variables such as education, experience, age, marital status, and firm size, occupation, industry, and year dummies. All regressions are run separately for men and women as well as for East and West German workers.

3. Descriptive Evidence

The contractual weekly working hours for the workers in our sample were about 38.7 hours in 1991 in West Germany, and decreased only slightly in the 1990s to 38.5 hours in 2002[4]. In the same period, the standard work week in the East fell from 40.6 hours to 39.5 hours, which led to a slight narrowing of the gap. However, not only contractual hours differ between East and West Germany, but also the amount of overtime work. Despite their longer weekly contractual hours, the number of overtime hours worked by East German workers is slightly higher in most of the years. Both the differences in standard hours and the amount of overtime work led to a substantial gap in working hours. Average actual working time per week in East Germany exceeds the average time worked by West German employees by almost 2 hours a week.

When considering unpaid overtime, it is important to take a closer look at the subgroups of workers, since it has already been shown by other studies that especially white-collar workers engage in unpaid overtime (Bauer und Zimmermann 1999). This is clearly because blue-collar workers are more strongly affected by binding wages and working hours that result from collective bargaining. The percentage of white-collar and blue-collar workers supplying unpaid overtime as well as the amount of unpaid overtime hours are shown in Table 1. As a percentage of the total number of employees, about 20 percent of the white-collar workers in the West work extra hours for free, while this incidence is as high as 25 percent in the East. In both East and West Germany, a much lower percentage of blue-collar workers contribute unpaid hours. However, while this percentage is around 2 percent in the West, it is about 4 percent in the East. With regard to the amount of overtime, both blue-collar and white-collar workers from East Germany work more unpaid overtime hours on average than their West German counterparts over almost all of the observed years. The differences seem to be small, but one should keep in mind that without those extra hours, the standard work week is already almost two hours longer in East Germany.

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[4] All descriptive statistics are weighted using the cross-sectional sample weights.

Table 1

**Unpaid Overtime Incidence (in Percent) and Amount of
Unpaid Overtime Hours (Average Weekly Hours)**

| | White-Collar Workers | | | | Blue-Collar Workers | | | |
| | West Germany | | East Germany | | West Germany | | East Germany | |
Year	Incidence	Weekly hours	Incidence	Weekly hours	Incidence	Weekly hours	Incidence	Weekly hours
1991	20.0	4.92	22.6	4.45	1.2	3.69	1.1	10.85
1992	18.4	4.41	21.2	5.62	0.9	5.04	3.6	2.21
1993	21.3	4.79	23.5	5.20	2.0	3.93	3.5	2.45
1994	19.9	5.41	24.2	5.42	2.0	4.24	4.6	2.80
1995	20.3	5.06	23.2	5.51	1.6	2.61	3.7	3.01
1996	21.0	5.33	24.7	5.61	1.2	2.20	4.8	2.89
1997	22.6	5.32	24.5	6.27	0.5	1.67	2.8	3.57
1998	20.3	6.48	19.6	5.90	1.7	3.58	4.1	4.58
1999	20.2	5.41	23.2	6.38	3.0	4.31	3.5	4.50
2000	17.6	6.71	22.2	5.86	1.5	4.93	5.0	4.30
2001	21.1	6.92	23.9	5.54	3.4	3.72	4.4	5.38
2002	21.4	5.31	17.2	6.25	2.3	4.25	5.4	8.39
∅	20.3	5.51	22.5	5.67	1.8	3.68	3.9	4.58

Sample: German male and female full-time employees, age 20–65, civil servants and self-employed persons excluded. The incidence refers to the percentage of all employees, the amount of weekly hours is averaged on all workers with unpaid overtime. Data are weighted using the cross-sectional sample weights.

Source: SOEP, 1991–2002 (own calculations).

4. Theoretical Considerations and Econometric Analysis

We investigate the investment character of unpaid overtime and suggest a forward-looking labor supply model. Our explanation follows the signaling theory of Spence (1973), arguing that even after the hiring process, the firm does not have full information on the productivity of a worker. This information asymmetry leads to the phenomenon that decisions on promotions, pay raises, or layoffs are made on the basis of characteristics that are easier to observe than productivity. Workers are aware of this decision-making process and might use unpaid extra hours to signal higher productivity. By working longer hours and even providing them for free, they might try to decrease the probability of being laid off during recessions, when the least-productive workers are generally asked to leave first[5]. An equivalent line of reasoning is

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[5] One might argue that the firm's decision to dismiss the least-productive workers is restricted by the German protection against dismissal, which compels employers by law

found in rat-race models (Landers, Rebitzer, and Taylor 1996), where unequal outcomes in success versus failure lead to a positive relationship between future payoffs and current efforts. Our hypothesis is that the risk of losing a job acts as one of the driving forces in a higher labor supply, taking the form of more unpaid overtime hours worked. Therefore, we proxy perceived job insecurity by regional unemployment rates and investigate their effect on the supply of unpaid overtime. Given the much higher unemployment rates in East Germany, this hypothesis would help to explain the discrepancy in unpaid overtime between the East and the West as reaction to differing unemployment risks.

Since a relatively large proportion of workers report zero overtime hours, we estimate the effect of the perceived job loss risk on the supply of unpaid overtime hours by using a Tobit model (Greene 2000) with the following structure:

$$(1) \qquad ov_{it}^* = \alpha_i + \beta' x_{it} + \gamma' u_{regt} + \varepsilon_{it} ,$$

where ov_{it}^* is the latent number of weekly unpaid overtime hours worked by individual i at time t, x_{it} vector of individual and employer characteristics, u_{regt} the regional unemployment rate at that time, α_i the individual-specific effect, β and γ parameters to be estimated, and ε_{it} the error term which is distributed with mean 0 and variance σ_ε^2. As ov_{it}^* is a latent variable, it is not observable. What one observes is:

$$(2) \qquad ov_{it} = \begin{cases} ov_{it}^* & \text{if } ov_{it}^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

The model will be estimated with two different specifications: a pooled Tobit model and a random effects Tobit model. In this paper, we only include unemployment rates by employment office district, which are considered to be more appropriate to proxy an individual's risk of dismissal, whereas state unemployment rates are used as well in an extended version of this paper.

5. Results

The following tables show pooled and random effects Tobit estimates with the coefficients and marginal effects of the regional unemployment rate on unpaid overtime. The marginal effects are evaluated at the mean of the inde-

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to decide which employees to dismiss according to social criteria. However, when choosing among workers with similar social characteristics, the firm will try to keep the more productive ones.

pendent variables. When unpaid overtime hours are regressed on the regional unemployment rate and other exogenous variables, the control variables have the expected signs[6]. A strong positive impact on the probability and amount of unpaid overtime comes from the coefficients on wages, education, and desired working hours. Furthermore, there is a positive relationship between holding a temporary job and unpaid overtime, and also a positive effect of increasing work experience for male workers. A statistically significant negative effect on unpaid overtime arises from working in the public sector and from job tenure.

Table 2 shows pooled Tobit estimations of unpaid overtime hours with the district unemployment rate and control variables for East and West German, male and female workers, and additionally for white-collar employees[7]. The unemployment coefficient is positive in all estimations, except for West German women. However, it is highly statistically significant only for West German males and East German females. In all the estimations, a rise in the district unemployment rate by 1 percentage point is associated with a less than 1 percent increase in the probability to work unpaid hours. The highest marginal effects are found in the estimation for East German white-collar women: An increase in the unemployment rate by 1 percentage point entails an overall increase in unpaid hours of 5.2 percent, and a 1.6 percent increase for those who already worked unpaid overtime.

Second, a random effects Tobit model is estimated to capture unobserved individual characteristics, for example intrinsic differences in tastes regarding unpaid overtime work. Results are shown in Table 3, which presents estimates with the district unemployment rate. Using the likelihood ratio test to check the pooled against the random effects model supports the random effects Tobit model in all estimations. When controlling for unobserved heterogeneity of the workers, the sign of the unemployment coefficient does not change, except for East German men. However, it is statistically significant at the 1 percent level only for West German men, and insignificant for all others. For West German white-collar men, the probability to work unpaid overtime resulting from a 1 percentage point increase in unemployment rises to 1 percent in the random effects Tobit model. While this change in unemployment implies an overall increase in weekly unpaid overtime hours of 4.7 percent for this group, the increase is only of 3.2 percent for all West German male workers.

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[6] The coefficients are not reported here, but are available from the author on request.

[7] We only show estimates with the unemployment rate at the district level, which is expected to be more appropriate to proxy a worker's perceived risk of dismissal. Estimates with state unemployment rates are available in a longer version of the paper.

Table 2: **Pooled Tobit Model: Unpaid Overtime Incidence and Hours with District Unemployment Rates**

	West Sample				East Sample			
	Pooled Tobit Coefficient	Marginal Effects			Pooled Tobit Coefficient	Marginal Effects		
		$E(Ov)$	$E(Ov\|Ov > 0)$	$\Pr(Ov > 0)$		$E(Ov)$	$E(Ov\|Ov > 0)$	$\Pr(Ov > 0)$
Men								
U_District	0.2796** (0.0643)	0.0148	0.0392	0.0033	0.0984 (0.1150)	0.0054	0.0139	0.0011
Log-Likelih.	−5516.6				−3032.8			
Observations	9316				4831			
Women								
U_District	−0.1052 (0.0892)	−0.0052	−0.0145	−0.0013	0.3580** (0.1061)	0.0220	0.0523	0.0052
Log-Likelih.	−2053.0				−2169.5			
Observations	4328				3763			
White-Collar men								
U_District	0.2659** (0.0660)	0.0430	0.0533	0.0074	0.2019 (0.1344)	0.0525	0.0497	0.0070
Log-Likelih.	−4991.8				−2432.2			
Observations	5061				1756			
White-Collar women								
U_District	−0.1645 (0.0873)	−0.0114	−0.0248	−0.0027	0.4247** (0.1146)	0.0336	0.0667	0.0075
Log-Likelih.	−1986.0				−2003.6			
Observations	3681				3038			

Sample: German full-time employees, age 20 – 65, civil servants and self-employed persons excluded.
Note: The regression model is full-specified, independent variables include additional individual and job characteristics as well as year dummies.
* significant at the 5 percent level. ** significant at the 1 percent level. Robust standard errors in parentheses. For all estimations: Prob > Chi^2 = 0.0000.
Source: SOEP, 1991 – 2002 (own calculations).

Table 3: **Random Effects Tobit Model: Unpaid Overtime Incidence and Hours with District Unemployment Rates**

| | West Sample | | | | East Sample | | | |
| | Pooled Tobit Coefficient | Marginal Effects | | | Pooled Tobit Coefficient | Marginal Effects | | |
		$E(Ov)$	$E(Ov\|Ov > 0)$	$\Pr(Ov > 0)$		$E(Ov)$	$E(Ov\|Ov > 0)$	$\Pr(Ov > 0)$
Men								
U_District	0.4361**	0.0261	0.0632	0.0051	−0.0082	−0.0005	−0.0012	−0.0001
	(0.0845)				(0.1576)			
Log-Likelih.	−5032.9				−2817.3			
Observations	9316				4831			
Women								
U_District	−0.1042	−0.0051	−0.0143	−0.0013	0.1778	0.0117	0.0265	0.0026
	(0.0856)				(0.1416)			
Log-Likelih.	−2052.0				−2010.6			
Observations	4328				3763			
White-Collar men								
U_District	0.3978**	0.0674	0.0812	0.0100	0.0054	0.0013	0.0013	0.0002
	(0.0791)				(0.1911)			
Log-Likelih.	−4543.1				−2277.7			
Observations	5061				1756			
White-Collar women								
U_District	−0.1608	−0.0110	−0.0242	−0.0027	0.2639	0.0221	0.0422	0.0046
	(0.0846)				(0.1463)			
Log-Likelih.	−1982.4				−1854.8			
Observations	3681				3038			

Sample: German full-time employees, age 20–65, civil servants and self-employed persons excluded.
Note: The regression model is full-specified, independent variables include additional individual and job characteristics as well as year dummies.
* significant at the 5 percent level. ** significant at the 1 percent level. For all estimations: Prob > Chi^2 = 0.0000.
Source: SOEP, 1991–2002 (own calculations).

In contrast, women and East German male workers do not seem to adjust their unpaid overtime supply to the perceived unemployment situation. In order to check the orthogonality assumption of the random effects specification, we compare the random effects Tobit model with a linear fixed effects panel model for all observations with a positive amount of unpaid overtime hours. We find that in the fixed effects model, a 1 percentage point increase in the district unemployment rate entails a 4 percent rise in unpaid overtime hours for all West German male workers, and a 6 percent rise for West German white-collar men. Therefore, the fixed effects model only slightly overestimates the effects relative to the effects found in the random effects Tobit model[8]. As a result, while it seems to be true for West German men that a higher risk of job loss leads workers to increase unpaid extra hours, the hypothesis does not seem to hold for East Germans and female workers.

6. Conclusion

The objective of our study is to analyze the discrepancy in unpaid overtime work between East and West Germany. Taking the demand side as given, we focus on the investment character of unpaid overtime that might lead to the voluntary supply of unpaid extra hours. The future payoff upon which this study concentrates is the avoidance of being laid off. The higher the perceived risk of losing a job, which is approximated by regional unemployment, the more extra hours a worker is expected to invest. Using data from the SOEP for the years 1993 to 2002, we find empirical evidence of a positive relationship between the regional unemployment rate and the supply of unpaid overtime hours for male workers in West Germany, but no statistically significant effect in the estimations for women and male workers in East Germany. The results of the pooled and random effects Tobit estimations reveal that only for West German male workers might unpaid overtime be used as a means to signal productivity as a reaction to a high unemployment risk. We conclude that the higher number of unpaid overtime hours worked by East Germans than by their West German counterparts is only partially driven by the much higher unemployment rates in the East.

A number of extensions to the model are necessary to check the robustness of the empirical results and to provide further evidence on how unpaid overtime hours function as a signal within firms. First, a worker's perceived risk of unemployment can also be derived from the expectation of losing his or her job, a variable which is provided by the SOEP for some years only. Therefore, further evidence on the effect of the subjective risk of dismissal on the supply

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[8] Moreover, we find evidence that the regressors affect both the incidence and the level of unpaid overtime with the same sign, as it is assumed in the Tobit model.

of unpaid overtime work might be found. Second, further research should investigate whether unpaid overtime serves as a signal for both sides of the labor market, i.e., whether the supply of extra hours is in fact used by firms to make decisions on dismissals. This requires an analysis of the effect of unpaid overtime on the subsequent probability of job loss.

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