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# Overtime Work as a Signaling Device

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## Abstract

This paper provides an explanation for the empirically proven relationship between overtime and future benefits. We suggest an internal signaling model, in which a worker signals his value to the employer by supplying unpaid overtime. In our empirical analysis, we examine whether overtime has in fact a signaling component. Variations in collectively bargained hours between industries are exploited, as they imply different overtime thresholds for workers with the same number of actual hours. Using data from the German Socio-Economic Panel Study for the years 1993 to 2004, a positive signaling value of unpaid overtime is found for West German workers.

**Keywords:** Unpaid Overtime, Internal Signaling, Asymmetric Information

**JEL classification:** J22, D82, J41

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## **1. Introduction**

In virtually all modern economies a considerable fraction of the working population performs overtime hours, and many workers supply their extra hours for free<sup>1</sup>. Unpaid work is a fascinating form of working time, as the supply of uncompensated working hours is at first glance conflicting with both standard economic theory and intuition. Consequently, the question arises as to why many workers offer unpaid hours. We add to the various explanations why workers might want to provide extra hours, and suggest an internal signaling model, in which workers may signal a higher value to the firm by supplying unpaid overtime. The possible benefits from signaling by means of longer hours might be pay raises, promotions or job retention, i.e. not being laid off. In this study, we investigate empirically, whether overtime, and in particular unpaid overtime, can be an effective signaling device for a higher worker value. This might have important implications for the structure of the workforce and firm hierarchies, and explain wage differentials that may not be attributed to differences in productivities. If overtime has a signaling component, worker groups who are constrained in their signaling abilities, such as women with family responsibilities, workers with health constraints, or persons in workplaces which do not allow for voluntary extra hours, would be disadvantaged even if they were equally productive. In addition, overtime signaling implies potential inefficiencies, since the signaling component of overtime does not add to productivity. Therefore, a reduction in overtime by its signaling part may have welfare-enhancing effects.

## **2. Theoretical Considerations**

### **2.1. Unpaid Overtime and Future Returns**

The remarkable increase in unpaid overtime, which can be observed in Germany, and to an even greater extent in the U.K. raises the question as to why workers are willing to supply

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<sup>1</sup> According to data from the German Socio-Economic Panel Study (SOEP), about 15% of the German full-time employees worked unpaid overtime in 2004. This percentage is even higher for the U.K. (European Commission, 2003).

uncompensated hours. Bell and Hart (1999) provide various reasons for the existence of unpaid overtime hours. An additional explanation is that worker might consider overtime as an investment and increase their working hours in order to improve career prospects. Our focus on the investment character of overtime is supported by empirical findings for Great Britain by Campbell and Green (2002) who reveal that there are positive though diminishing long-term returns from working longer hours, unpaid hours having the greatest impact. Empirical evidence for the investment character of overtime has been also provided by Booth, Francesconi, and Frank (2003) who show for the U.K. that the amount of overtime correlates with subsequent promotions in a significantly positive way. Supportive empirical evidence for the investment character of unpaid extra hours is given by Pannenberg (2005) who investigates long-term effects of unpaid overtime work in West Germany. He finds that there are substantial long-term labor earnings effects associated with cumulative average unpaid overtime, which is evidence for the importance of investing in current working hours beyond the standard workweek to enhance real earnings prospects. He shows that workers with at least some incidence of unpaid overtime experience the highest wage growth. Meyer and Wallette (2005) do not find evidence for future benefits from working overtime. Their analysis on temporary workers in Sweden reveals that overtime has no effect on the transition from temporary jobs to open-ended jobs. Therefore, it might only pay for some worker groups to invest in extra hours in order to get some future benefit. The analysis of regional unemployment and overtime by Anger (2005a) shows a positive relationship between regional unemployment rates and unpaid overtime hours for male workers in West Germany. This might indicate that these workers provide unpaid overtime to prevent a job loss, and that their labor supply may hence be forward-looking. Evidence for the investment character of overtime was also found by Anger (2005b), which revealed a weak, but positive relationship between unpaid hours and the probability of promotion and pay rise for West German male workers.

Even though the relationship between working hours and positive future outcomes has been confirmed by many studies, it is not clear how the link between overtime hours and future payoffs exactly looks like. It might be simply the cost aspect that leads firms to choose overtime workers to be promoted or retained in the firm, since they provide cheap labor to their employer. This is not only true for the case of unpaid overtime, but also for paid overtime, since by using overtime, firms can adjust labor at the inner margin, and therefore save fixed or sunk costs that would arise in the case of additional hirings. Furthermore, higher wages for overtime workers might be interpreted as a reward in the sense of gift exchange. Some studies even use the amount of overtime, or working hours more generally, as direct measure of effort (Engellandt and Riphahn, 2005; Bratti and Staffolani, 2007), which may result in future payoffs in form of deferred compensation. Another explanation mentioned in the literature is that extra working time in the firm might not only be used for additional productive hours, but also to acquire specific human capital (Booth et al., 2003) which yields a return later on. Lastly, overtime hours might be neither fully productive nor entirely used for human capital accumulation, but serve as a signal for motivation, flexibility, productivity, or loyalty to the employer (Meyer and Wallete, 2005). Campbell and Green (2002) point out that a positive link between past hours and current earnings is consistent with either a human capital or a signaling model.

## **2.2. Overtime Signaling**

In this study, we take up the idea of extra hours serving as a signal, suggesting that overtime does not necessarily add to the production of output, nor does it need to be used for human capital accumulation, and still might yield positive future returns to workers. To expound this argument, we provide a signaling framework to explain the link between unpaid overtime work and future payoffs.<sup>2</sup> By working long hours, the employee may signal to his employer that he is of high value,

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<sup>2</sup> For the formal analysis of the overtime signaling model, see Anger (2006).

which might take the form of high effort, commitment, or motivation. We argue that these extra hours do not have to be used productively in the firm, and at the extreme, might be regarded as leisure at the workplace. This view is closely related to the notion of presenteeism or ‘display overtime’, which means that employees work excessive hours in order to be seen, even if there is no extra work to do (Simpson, 1998).

The extension of Spence’s (1973) signaling model leads us to an internal signaling game in the firm with unpaid overtime as signaling device for the high value of a worker. The basic assumption is, therefore, that unpaid overtime signals the worker’s value to the firm. This value may be derived from a number of worker characteristics, one of them being productivity, measured by human capital and unobserved ability. However, even high-ability workers might be of low value if they have a low taste for work, which may result in low effort, motivation, and commitment to the job. Moreover, there is evidence for a low disutility of work being related to worker productivity, as high-ability workers find it easier to work an extra hour than do low-ability workers. “A behavioral explanation for this view is that people who like their job tend to be good at it, and vice versa” (Sousa-Poza and Ziegler, 2002). Accordingly, overtime might serve as a signaling device to select both productive and motivated workers instead of workers with long hours per se. The negative relationship between the cost of working overtime and the value of a worker is crucial for the overtime signaling model. Only then, a separating equilibrium can be achieved, in which high levels of unpaid overtime deter low-value workers from pretending to be of high-value type.

### **3. Empirical Testing**

One testable prediction is the implication of the model that in a separating equilibrium, overtime signaling leads to payoffs in the form of higher wages. Therefore, one might investigate whether firms take unpaid overtime in fact as a signal to derive a worker’s value, and pay higher wages to workers with overtime hours. Yet, this implication of the overtime signaling model is shared with

other theories. The human capital model and the theory of deferred compensation both predict a positive relationship between hours and current or future benefits. According to these theories, working hours are, however, used productively, either to increase the worker's stock of human capital, or output. Hence, an empirical test might aim at separating the two effects, the signaling and the productive component, of overtime. The finding of a signaling component of extra hours would yield empirical evidence for the overtime signaling theory.

### **3.1. Earnings Effects of Unpaid Overtime**

Data from the German Socio-Economic Panel Study (SOEP) show that male white-collar workers in West Germany earned on average 3,940€ per month in 2004, whereas the average was 4,508€ for those who worked unpaid overtime. Table 1 presents estimates of an earnings regression, which reveal that workers with unpaid overtime earn indeed more than non-overtime workers, even if individual and firm characteristics are controlled for. Workers with unpaid overtime have on average about 15% higher monthly earnings. Yet, a positive association between unpaid overtime and current or future wages is also consistent with the human capital model or the theory of deferred compensation. These models have the same implications as the overtime signaling theory, as overtime workers will yield a higher output and receive higher wages. However, while working hours are used to raise individual productivity in the human capital theory and to increase overall output in the theory of deferred compensation, the signaling framework uses overtime merely to identify valuable workers. The question is therefore whether the effect of overtime on wages only reflects a rise in output during an overtime hour, or whether it reflects, at least in part, unobserved value of the worker. These effects could, in theory, be separated by measuring a worker's overall output with and without working overtime hours separately. Evidence for the human capital or deferred compensation theory could be found if the product with overtime work was higher. This testing strategy is however difficult to implement. Another way of separating productive and signaling effects is to find workers of equal output and randomly assign overtime to them.

According to the signaling hypothesis, the overtime worker should receive higher earnings. Therefore, support for overtime signaling would be a positive price of the signal in equilibrium, even when the signal itself has no impact on productive output.

[Table 1 about here]

### **3.2. A Quasi-Experiment with Unpaid Overtime**

In order to discriminate the signaling implication against predictions of the human capital theory and the theory of deferred compensation, we need to investigate whether unpaid overtime hours are in fact used to identify high-quality workers. This requires a random assignment of the signal to workers, which have otherwise identical expected productivity. To achieve this, we exploit variations in collectively bargained hours between industries as well as changes in contractual hours within industries over time.<sup>3</sup> Differences in the standard workweek result in differences in the overtime threshold, faced by workers if they wish to supply overtime. For instance, a worker in the transport industry, which agreed to 39 hours, has to work 40 weekly hours to perform one overtime hour, whereas a worker in manufacturing with the same actual workweek, performs three overtime hours, if the manufacturing industry agreed to a standard of 37 weekly hours. Consequently, workers who would work overtime in some industries, would not work overtime in others. Therefore, we propose a quasi-experiment, in which we assume random assignment of the overtime signal to workers with the same actual working hours across different industries. A pure signaling effect may be identified by determining who these „marginal“ workers, i.e. the workers with overtime in one but not in another industry, are. The comparison of these workers' earnings might give information on whether overtime has a signaling value. Actual working hours might increase

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<sup>3</sup> This identification strategy is similar to the one used by Tyler, Murnane, and Willett (2000) in the education signaling context.



both, the overall output of the worker, and the signaling value of the worker. Whereas human capital theory predicts that all workers in the same industry with the same actual working hours should receive the same earnings later on, according to the overtime signaling theory, workers with marginal actual hours are predicted to earn more, when they work overtime. Figure 1 depicts the distribution of actual and contractual working hours for male full-time employees in West Germany to illustrate the identification strategy. If two workers are observed to work the identical number of actual hours, it may be the case that they differ in their agreed working time. While worker A might have a standard workweek of 39 hours, the agreed working time might be only 38.5 hours for worker B. Consequently, worker B performs overtime, whereas worker A does not, although he works the same weekly hours. The situation that only some of the workers provide unpaid overtime can be interpreted as separating market equilibrium, in which workers obtain the signal if the payoff is higher than the cost, and do not obtain it otherwise. Consequently, employers presume a high worker value, and therefore pay a higher wage, if they observe unpaid overtime. In the following, we focus on the relationship between current unpaid hours and current wages in order to separate the signaling value from effects which might arise from deferred compensation. However, we will investigate the link between current unpaid overtime and future earnings in an extension of the model.

[Figure 1 about here]

### **3.3. Econometric Strategy**

To identify overtime signaling effects we use a difference-in-differences approach, where the treatment is overtime and the treatment group are “marginal” workers, i.e. those who would work overtime in one industry, but not in another. The control group are workers with average working time above the standard hours of all considered industries. Therefore, these workers provide

overtime regardless of the industry which they are working in. Table 2 shows the research design of the overtime treatment. To take up the example of the workers with 39 weekly hours, we may assume an overtime threshold of 39 weekly hours, i.e. some industries have collectively agreed on 39 or more hours (high, H), and some others below (low, L). Consequently, workers with 39 hours are part of the treatment group, as they would perform overtime in industries with a low standard workweek, but not in industries with a high level of standard hours. We have seven quasi-experiments that are denoted by the particular overtime threshold, which range from 39 to 45 weekly hours. The outcome measure is mean earnings of the four different worker groups,  $\bar{Y}$ , which according to the signaling theory, depend on whether the worker has obtained the overtime signal or not. The difference between workers of the treatment group in different industries is the earnings differential of overtime and no overtime workers who have the same amount of weekly hours ( $\Delta \bar{Y}^T$ ). The difference between workers of the control group in different industries is the earnings differential of “non-marginal” overtime workers with the same actual hours across industries ( $\Delta \bar{Y}^C$ ). As a result, industry differentials can be netted out by differencing ( $\Delta \bar{Y}^T$ )-( $\Delta \bar{Y}^C$ ), which leads to the difference-in-differences estimate.

[Table 2 about here]

The treatment effect is therefore equal to  $(\Delta \bar{Y}^T) - (\Delta \bar{Y}^C) = (\bar{Y}_L^T - \bar{Y}_H^T) - (\bar{Y}_L^C - \bar{Y}_H^C)$ . The same result is obtained by using a regression framework, which allows the inclusion of additional control variables. Therefore, earnings are estimated with a difference-in-differences estimator of the following structure:<sup>4</sup>

$$\ln Y_{i,t}^Z = \alpha_i + \beta' T_{i,t}^Z + \delta' T_{i,t}^Z \cdot L_{i,t}^Z + \gamma' L_{i,t}^Z + \eta' X_{i,t} + \varepsilon_{i,t}, \quad (16)$$

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<sup>4</sup> See e.g. Wooldridge (2002).

where  $\ln Y_{i,t}$  is the log of monthly earnings of the individual  $i$  at time  $t$ .  $T_{it}$  is a dummy variable which equals one if the worker is in the treatment group, i.e. works “marginal” hours, and zero if the worker is in the control group.  $L_{it}$  is a dummy variable which indicates that the industry has “low” standard hours, i.e. an agreed workweek of below the overtime threshold. The interaction term  $T_{it} \cdot L_{it}$  is the treatment effect, and  $X_{it}$  are worker and firm characteristics.  $\alpha_i$  is the individual specific effect,  $\beta$ ,  $\delta$ ,  $\gamma$ , and  $\eta$  are parameters to be estimated, and  $\varepsilon_{it}$  is an error term which is distributed with mean 0 and variance  $\sigma_\varepsilon^2$ .  $Z$  denotes the overtime threshold of the quasi-experiment:  $Z = 39, \dots, 45$ . The crucial parameter is the coefficient on the interaction term,  $\delta$ , since this gives the true effect of the treatment:  $\hat{\delta}_{DD} = \bar{Y}_L^T - \bar{Y}_H^T - (\bar{Y}_L^C - \bar{Y}_H^C)$ . The parameter  $\gamma$  accounts for average permanent differences between workers with different contracted hours, and  $\beta$  captures the treatment group specific effects. The identification of the difference-in-differences estimator requires that the differences in overtime thresholds across industries and contracts generate exogenous variation in the overtime signal. Hence, the interaction and the error terms are required to be independent:  $\text{cov}(\varepsilon_{i,t}, T_{i,t} \cdot L_{i,t}) = 0$ .<sup>5</sup>

In addition to the worker and firm characteristics, we can control for individual heterogeneity by taking advantage of the panel structure of the dataset. Cross-sectional analyses might be biased by unobserved heterogeneity, which can be partially solved by differencing out individual fixed effects. In addition to a pooled OLS model, we will hence estimate the difference-in-differences by a random effects model, which assumes the individual specific effect  $\alpha_i$  to differ across individuals but to be constant over time. Furthermore,  $\alpha_i$  is assumed to be randomly distributed across individuals and not to be correlated with the set of explanatory variables. To allow for correlation between  $\alpha_i$  with the explanatory variables, a fixed effects model will be estimated.

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<sup>5</sup> This assumption is also known as the parallel-trend assumption (Meyer, 1995).

### 3.4. Treatment and Control Group

The treatment group includes all workers with actual working hours identical to the overtime threshold. However, the treatment, which is the assignment of the unpaid overtime signal, is only effective for those whose contracted hours are below the overtime threshold and whose extra hours are not compensated. In contrast, workers whose contractual hours equal the overtime threshold or who work other compensation forms of overtime, are considered to be non-treated. Hence, we want to contrast the value of one unpaid overtime hour with a working hour of any other compensation form. In order to include these other types of overtime workers in the non-treated part of the treatment group we have to recode overtime which is compensated with a wage payment or with time-off to obtain a true picture of the relation between monthly earnings and actual hours worked.<sup>6</sup> Hence, we presume that both employers and workers have agreed on any paid or leisure compensated extra hour, and consider overtime agreements as an extension to the standard contract. We therefore add paid overtime hours to the agreed standard hours, which implies that the contracted working time of paid overtime workers equals actual working time. Furthermore, since leisure compensated extra hours are supposed to be taken as time-off at a later point in time, we do not count them as definite overtime hours. Therefore, we subtract leisure compensated overtime from actual working hours so that the actual working time of leisure compensated overtime workers equals contracted working time. This implies a strong test of the signaling value, since doing so eventually leads to the earnings comparison of workers with one unpaid hour with workers who might possibly perform several leisure compensated overtime hours a week. We could easily relax this assumption and consider hours in working time accounts, like paid overtime, as part of the contracted working hours, which we will do in the robustness check section.<sup>7</sup> For partially paid, partially leisure compensated overtime hours, we apply a mixed procedure. We consider 40% of

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<sup>6</sup> Unfortunately, data on monthly earnings excluding overtime pay, if there is any, is not available.

<sup>7</sup> Furthermore, there are strong guesses that not all of the leisure compensated overtime is indeed compensated with time-off later on, and turn out to be unpaid hours. However, there is no empirical evidence on this issue.

these overtime hours to be paid and add them to the contractual time, whereas we subtract the 60% of extra hours, which are supposed to be taken as time-off, from actual hours.<sup>8</sup> Hence, the generated contractual hours equal the generated actual hours for this worker group. An alternative way of forming the non-treated part of the treatment group would be to consider only workers without any overtime hours. However, this would mean to exclude all other workers from the study. The comparison of workers with unpaid overtime with workers without any overtime hours is likely to reveal huge earnings differences, which however may probably not measure the signaling effect of unpaid hours, but rather the stark discrepancies in unobserved characteristics between these worker groups. Reducing the non-treated group to no overtime workers would therefore restrict any conclusion on the productive value and the signaling value of unpaid overtime substantially. Still, we will try this alternative approach for comparison.

To form the comparison group we use all individuals with unpaid overtime and actual hours greater than the overtime threshold. Therefore, we grouped all unpaid overtime workers of higher actual hours together. The reason is that restricting the comparison group to one level of actual working hours would involve an arbitrary decision on which number of actual hours should be used. Furthermore, only using unpaid overtime workers with one exact level of actual working hours would shrink the comparison group considerably. While some of the workers in the control group belong to an industry with low standard hours, i.e. have low hours contracts, others have contracts with high working hours. However, all of them perform unpaid overtime.

### **3.5. Data**

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<sup>8</sup> This is consistent with information from the SOEP since 2002, as on average around 40% of the partly paid, partly leisure-compensated overtime hours were paid.

The data used in this study were made available by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW) in Berlin.<sup>9</sup> We use information from 1993 to 2004 for male and female workers in East and West Germany aged between 20 and 60. Workers older than 60 were dropped because their contracts often specify a lower standard workweek due to (early) retirement plans. Furthermore, we exclude foreigners, civil servants, self-employed persons, and workers employed in the agricultural sector. To deal with a homogeneous group with respect to working hours, we only use full-time employees. Although East Germans took part in the survey since 1991, we only use the waves from 1993 on, since some variables are not available for the East sample before that year. We dropped workers with more than 45 contractual hours in order to exclude obvious outliers. Furthermore, respondents with missing information on working hours or on other variables included in the estimates were not included in the sample. We include respondents who participated in at least two waves of the survey in order to be able to control for individual unobserved heterogeneity by using panel estimators. In total, the sub-sample consists of about 27,300 person-year-observations, of which 16,800 are from West Germany, and 10,500 are from East Germany.

Our dependent variable is monthly labor income, which reflects the true value of the worker to the firm. The information on working hours provided by the SOEP is central to our study to construct the quasi-experiment. Detailed information is available on overtime hours worked during the last month before the survey, and can be combined with information on the compensation form to obtain the amount of unpaid overtime hours per week. Furthermore, overtime hours can be calculated by differencing actual and contractual hours usually worked. Since the distinction between actual and contractual hours is crucial to our study, we use the latter method together with the information on compensation of extra hours to determine the amount of unpaid overtime. To control for heterogeneity between workers, we add a number of worker and firm characteristics

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<sup>9</sup> For more details on the SOEP, see Haisken-DeNew and Frick (2005).

which might potentially affect labor income. Therefore, we include control variables for occupations, blue-collar and white-collar workers, firm size, whether a person works in the public sector, and whether he holds a temporary or a permanent job. Further socio-economic variables are age, sex, marital status, education, work experience, and tenure. All regressions additionally include industry, region, and year dummies as controls. Since the Chow test for structural change (Greene, 2000) revealed that the regression coefficients are significantly different in the subsets of the data, all regressions are run separately for East and West German workers, but for female and male workers together to ensure a sufficient number of observations in the particular treatment and comparison groups.

## **4. Results**

### **4.1. “Raw” Estimates**

Before we conduct the regressions with the control variables, we consider the estimate of the “raw” signaling effect of unpaid overtime with the example of an overtime threshold of 40 weekly hours. Table 3 shows the difference-in-differences estimate for West German workers. The industry differential between workers within the treatment group shows that workers with unpaid overtime have on average higher earnings than workers with the same amount of actual hours but without unpaid overtime. The differential within the control group also shows slightly higher earnings for workers in the industry or in the contract with lower specified hours, although both groups work unpaid overtime. Netting out the industry differentials leads to a positive difference-in-differences estimate, suggesting that for workers who are on the 40 hours margin of working unpaid overtime, the signaling value of unpaid work increases earnings by 12%. However, as these earnings differentials are likely to be influenced by worker and firm characteristics other than unpaid hours, the following estimates include the full set of control variables.

[Table 3 about here]

## 4.2. Difference-in-Difference Estimates

The fully specified difference-in-differences estimates using a pooled OLS, a random effects and a fixed effects model are displayed in Table 4 for different levels of overtime thresholds. For the West German sample, the difference-in-differences estimate is significantly positive for unpaid overtime at the 40 hours margin, but negative at the 43 hours margin in the pooled OLS estimation. A negative signaling value is also found for East German workers who perform unpaid overtime at the 42 hours threshold. However, the inclusion of worker and firm characteristics as control variables is unlikely to be sufficient, since unobserved effects might drive the results. Therefore, panel estimators are used to control for person-specific unobserved heterogeneity. While the random effects specification does not reveal any statistically significant results, some of the fixed effects estimates are highly significant. For the West German sample, the positive effect of unpaid hours at the 40 hours threshold disappears, when unobserved heterogeneity is controlled for. However, by eliminating individual fixed effects, the formerly negative effect turns out to be significantly positive and implies an increase in earnings of about 10%. An even stronger result is found for unpaid overtime at the 44 hours threshold. The positive and highly significant difference-in-differences estimate suggests that working the 44<sup>th</sup> hour as unpaid overtime is associated with 17% higher earnings. This result is strongly in favor of the signaling hypothesis. Without any signaling value, workers with the same actual hours should achieve the same output or firm-specific human capital, and therefore receive similar wages. The positive differential indicates that unpaid overtime has a signaling component.

The contrary seems to be true for East German workers, for whom only the difference-in-differences estimate at the 45 hours threshold is significant, but negatively associated with earnings. For unpaid overtime workers with 45 actual hours, the signaling value of unpaid work leads to a decrease in earnings by 22%. Therefore, by working unpaid hours, East German workers may send



a negative signal of their value to the firm. All of the applied models above have been tested against each other. The Breusch and Pagan multiplier test revealed for all estimates superiority of the random effects over the pooled OLS model, whereas the result of the Hausman specification test was in favor of the fixed effects model. To sum up, evidence can be found for a signaling component in overtime hours, which however does not necessarily signal a positive value of the worker. While for West German workers at the margin of 43 and 44 actual working hours, the signaling value of unpaid overtime is associated with an increase in earnings by 10% and 17%, workers in East Germany at the 45 hours margin find the signaling value of unpaid overtime to lower their monthly income by 22%.

[Table 4 about here]

### **4.3. Robustness Checks and Extensions**

#### **4.3.1. The Endogeneity of Contractual Hours**

The results of the difference-in-differences estimator of a strong positive signaling value of unpaid work at some overtime thresholds for West German workers, and of even stronger, though negative effects on earnings at the 45 hours margin for East Germans are quite striking. The more is it important to exclude any alternative explanations and to extend the analysis to test their robustness. The first and most important issue is the problem of a possible endogeneity bias. Workers might self-select into jobs with certain contractual hours, and may therefore directly influence their overtime threshold.<sup>10</sup> Similarly, the collectively bargained hours level could be affected by endogenous determinants, and therefore systematically shift industry overtime thresholds. The marginal hours might therefore no longer be randomly assigned to workers in different industries or contracts, which leads variations in the overtime signal to be endogenous. Furthermore, the

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<sup>10</sup> Evidence on self-selection of workers into long-hours jobs in the U.K. is provided by Bell and Hart (2003) who, however, do not differentiate between paid and unpaid long hours.

differences in overtime thresholds might influence individual behavior in a systematic way. A worker's decision on whether to supply hours at all and on the amount of supplied actual hours might be dependent on the contractual hours available to the worker. Therefore, unobserved characteristics might not be the same for workers in the treatment group and in the comparison group, or between the treated and the non-treated workers. In formal terms, this refers to the violation of the parallel-trend assumption, as the error term may be correlated with the other variables in equation (16), which might bias the results.

The least problematic source of endogeneity bias can be resolved by the assumption that the level of standard hours in the particular industries themselves are exogenous. As argued by Hunt (1999), the collectively agreed working hours in Germany are agreed to several years in advance, and cannot be easily modified in response to unforeseen changes in the economy or other reasons. Another issue is that the participation decision might be influenced by available standard hours, as high contractual hours might deter some workers from entering the labor market which have only access to long hours contracts. However, as these workers are unlikely to be of a high value for their firms, this selection implies an overestimation of the mean earnings in the industries with high standard hours, and a resulting downward bias in the estimated signaling effect of unpaid overtime. However, participating workers might still self-select in industries, which meet best their desired working hours. By migrating to other industries, they might realize lower contractual working hours and therefore increase the probability of obtaining the unpaid overtime signal. This is a problem if high-value workers migrate to industries with low contractual hours, since this leads to an upward bias in the estimated effect of unpaid overtime on earnings. Therefore, we examine patterns of job changers in our sample to investigate whether systematic changes can be found. Among the West German job changers who performed unpaid overtime in their new job, only 16% came from a job with higher contractual hours, whereas 27% even increased their standard hours in the new job, and 57% started in a new workplace at the same level of contractual hours as in the old job. In contrast, among the

workers without unpaid overtime in the new job, 26% managed to reduce their contractual hours. The percentage of workers who had higher standard hours in the new job was the same as among overtime workers, and 47% restarted at the same contractual hours level as in the old workplace. The detailed mobility patterns of West German workers are displayed in Table 5.

[Table 5 about here]

Systematic movement of unpaid overtime workers from contracts with a high level of hours to low level contracts would be visible by relatively more migration out of the lower left-hand cells, and relatively few changes out of the upper left-hand cells to the right. However, there is no evidence of such a systematic movement to jobs with lower contractual hours. Therefore, mobility patterns do not seem to cause an endogeneity problem. However, it might still be the case that the decision on the amount of supplied actual hours is systematically influenced by the prevailing overtime threshold. This is a problem if high-value workers just work slightly above the threshold. In this case the treatment group would be contaminated with high-value workers who eventually would supply more hours if the threshold was higher. Consequently, their value is higher than indicated by the unpaid overtime signal, and an upward bias arises.

#### **4.3.2. Variations in the Counterfactual**

As another check of robustness, we try variations in the treatment group. While treated workers are still unpaid overtime workers with hours on the margin, we change the group of non-treated workers to which the unpaid overtime workers are directly compared to. First, as the redefinition of contractual and actual hours of workers with any form of compensated overtime is somewhat arbitrary, we investigate whether changes in this redefinition affect our results. Therefore, in an additional estimation, we consider hours in working time accounts as part of the contracted working hours, and consequently treat leisure compensated extra hours in the same way as paid overtime.

This means that contractual hours of all workers who work some form of compensated overtime are set equal to the actual hours (Treatment Group II). Second, one might argue that workers with some form of compensated overtime hours are not the adequate counterfactual. Whereas workers without any overtime can possibly decide to work unpaid hours, this is not the case for workers who already perform paid or leisure compensated extra hours, since the corresponding responses are mutually exclusive in the SOEP questionnaire. Therefore, to form Treatment Group III, we exclude other compensation forms of overtime, and consider only no overtime workers to be non-treated.

Results of the random effects and fixed effects difference-in-differences estimates are displayed in Table 6. With both alternative treatment groups, the random effects estimates now are significant for the West German sample, and show a positive signaling value of unpaid overtime hours on the margin. However, the Hausman test again reveals superiority of the fixed effects model. The fixed effects results are fairly similar to the estimates of the original specification. In the estimates with treatment group II, the unpaid hours at the overtime threshold of 43 hours are not significant any more, but the coefficient of the treatment effect at the 44 hours threshold for West German workers is almost identical to the one in the main part of the analysis. For East Germans, the negative signaling effect of unpaid overtime hours on the 45 hours margin persists, but is slightly smaller. In treatment group II, only no overtime workers are considered as the counterfactual. The fixed effects specification reveals a strong and positive signaling value for unpaid work on the 43 hours margin for West German workers, whereas there is no estimate at the 44 hours due to insufficient observations in the group of non-treated workers. The signaling value of working unpaid hours at the 43 hours margin is associated with an increase in earnings by almost 70%. Therefore, excluding all compensated overtime hours from the analysis, and comparing the value of an unpaid overtime hour only to contractual hours seems to lead to an overestimation of the signaling effect. However, the signaling value is again negative, and even stronger than in the main part of the analysis, for unpaid extra hours worked by East Germans at the 45 hours threshold. To sum up, the variation in

the counterfactual slightly changes some of the estimates, but the main results, the positive signaling value of unpaid work for West Germans at the 43 and 44 hours threshold, and the negative value at the 45 hours threshold for East German workers, seem to prevail.

[Table 6 about here]

#### **4.3.3. Future Earnings and Deferred Compensation**

To avoid underestimating the impact of unpaid overtime by measuring earnings too close to the receipt of the signal, we additionally estimate the effect of unpaid overtime on future earnings. This is relevant, since it might take a while until the signal is received by the employer and possibly reflected in the worker's earnings. A positive relationship between current overtime and future earnings was predicted by the overtime signaling model, but is also consistent with the theory of deferred compensation. To analyze future effects of marginal unpaid overtime hours we have to restrict the sample to job stayers or at least to firm stayers, as for firm changers these earnings arise in new workplaces, where previous overtime levels cannot be observed. Table 7 shows estimates of the unpaid overtime treatment on earnings in the subsequent period.<sup>11</sup>

[Table 7 about here]

For West German workers, unpaid hours on the 39 hours margin and next year's earnings are positively associated in the pooled OLS and in the random effects specification. However, the results of the fixed effects model are only significant at the 10% level for unpaid overtime at the 44 hours threshold. For East German workers, the negative signaling effect of unpaid extra hours at the

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<sup>11</sup> We additionally estimated the signaling effect of unpaid overtime on average earnings within the two and three subsequent years. Since the coefficients were comparable in size and significance, the particular results are not displayed here.

45 hours threshold prevails, leading to a 28% decrease in earnings in the subsequent year. This result is not in line with the overtime signaling model. Yet, unpaid overtime might still contain a short-term signaling component, which does not last to the following year. The evidence is stronger against the theory of deferred compensation, according to which current unpaid hours should be compensated in the future. This is clearly rejected by these results, which reveal no deferred compensation for a marginal unpaid extra hour, and even a “deferred punishment” for East German workers.

#### **4.3.4. White-Collar Workers**

An additional extension is the focus on white collar workers, since unpaid overtime hours are more prevalent among this worker group. This might be attributed to the fact that blue-collar workers are more strongly affected by binding wages and collectively bargained working hours. The incidence and number of unpaid hours of blue-collar workers might also be relatively low due to their different job characteristics, since these workers are less likely to have leadership roles and a higher certainty about the time to complete job tasks. Since there is more certainty on their value to the firm, there is not as much scope for signaling as it might be for white-collar workers. This reasoning is consistent with Cowling (2001) who finds that performance-related pay systems are implemented in workplaces, where output can be easily measured. He points out that blue-collar workers, such as plant and machine operators, and workers with short and repetitive tasks are more likely to receive performance-related pay, which restricts the possibilities to signal high value to the firm. Table 8 shows that the random effects specification yields a positive signaling effect for West German workers with unpaid overtime on the 39 hours, 40 hours, and 44 hours margin. However, in the fixed effects model, which is according to the Hausman test the preferred specification, the results are very similar to the main part of the analysis above. Evidence for overtime signaling is found for West German white-collar workers at the 44 hours threshold, which implies an increase in monthly

income by 22%. However, in East Germany, working unpaid hours at a level of 45 weekly hours, seems to be a negative signal, which is associated with a 20% reduction in monthly earnings.

[Table 8 about here]

#### **4.3.5. Workers with Short Tenure**

Another check of robustness is to conduct the analysis only for workers with short tenure, since a signal is likely to be of greater value in the early period of an employment relationship, when there is greater uncertainty about the worker's true product. Since we cannot restrict our sample to recent job changers due to the problem of too few observations, we conduct the analysis for workers who changed their job recently within the last five years. In the West German sample, about 37% of the workers have five or less years of tenure, whereas this percentage is 48% in the East German sample. The estimates for workers with short tenure in Table 9 show that the restriction of the sample to workers who are relatively new in their firms leads to a change in the size and significance of some of the coefficients.<sup>12</sup>

In the estimates for West German workers, the formerly highly significant treatment effect on the 44 hours margin is now merely significant at the 10% level. At the same time, unpaid overtime now has a positive signaling value at the 40 hours threshold, and is linked to 10% higher monthly earnings. Unpaid overtime on the 45 hours margin now has a positive and strong signaling value for East German workers in the random effects model, but becomes negative and insignificant in the fixed effects specification, which is again superior to the random effects model according to the

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<sup>12</sup> We also included interaction terms of tenure and the treatment effect, which were however barely significant and very close to zero.

Hausman specification test. This indicates that unobserved characteristics which are correlated with the unpaid overtime have a positive earnings effect for East German workers with short tenure.

[Table 9 about here]

## **5. Conclusion**

The aim of the analysis was to find out empirically whether overtime, and in particular unpaid overtime, has a signaling component. We used variations in collectively bargained hours between industries, which imply different overtime thresholds for workers with the same number of actual hours. To net out any industry differentials reflected in earnings, we applied a difference-in-differences estimator. Using data from the SOEP for the years 1993 to 2004, we found support for the signaling hypothesis for West German workers, whereas negative signaling was found to prevail in East Germany. While for West German workers on the margin of 43 and 44 actual working hours, the signaling value of unpaid overtime is associated with an increase in earnings by 10% and 17%, workers in East Germany at the 45 hours margin find the signaling value of unpaid overtime to lower their monthly income by 22%. These findings were fairly robust to variations in the treatment group and to restricting the sample to white-collar workers only. However, no effects were found in the analysis of workers with short tenure, and on future earnings. Although we did not find evidence of systematic movements of workers from high to low hours jobs, potential endogeneity bias remains an issue. In addition to workers self-selecting into jobs with certain contractual hours, individual behavior might be directly influenced by the differences in overtime thresholds in a systematic way. Further investigation of this bias includes observing how workers with a stable amount of actual hours at the same employer react to exogenous changes in their contracted working time.



The findings of a positive relationship between marginal unpaid hours and earnings for West German workers revealed that the theory of human capital, deferred compensation, or gift exchange are not capable of entirely explaining earnings differentials between workers with a different amount of working hours. The component of overtime hours, which is not used productively, but still yields an earnings premium, is evidence against the human capital explanation. Furthermore, the findings are not in line with the theory of deferred compensation, according to which there should be no correlation between current unpaid hours and current earnings, but significant effects on earnings in future periods. The finding that the value of an unpaid overtime hour is higher than of a contractual working hour might also be interpreted as gift exchange. However, according to the theory of gift exchange, the firm pays a higher wage to induce the worker to increase his working hours, effort and productivity, and overall output. Therefore, actual working hours should be roughly remunerated with the same earnings, as there is no explanation why firms should provide a greater gift to their workers than the one they receive. The overall finding is, therefore, that the hypothesis of a signaling component in unpaid overtime hours cannot be rejected.

Still, the puzzle that unpaid overtime workers in East Germany send a negative signal to their employers, while their West German colleagues are rewarded for unpaid extra hours, remains to be solved. The value of unpaid overtime hours being lower than that of contractual hours worked by East German workers might also indicate that different types of working hours are not equally productive, regardless of the value-type of the worker. This would be consistent with the hypothesis that workers use unpaid hours merely to “present” themselves at the workplace. Furthermore, it might be the case that unpaid and paid working hours are equally productive, but that their productivity is not equally remunerated. One reason could be that unpaid overtime hours on the margin are more prevalent in firms which are close to a shut down, where workers are more likely to make wage concessions. Therefore, the consideration of firm characteristics would be required for a further analysis of the negative effect of marginal unpaid overtime in East Germany.

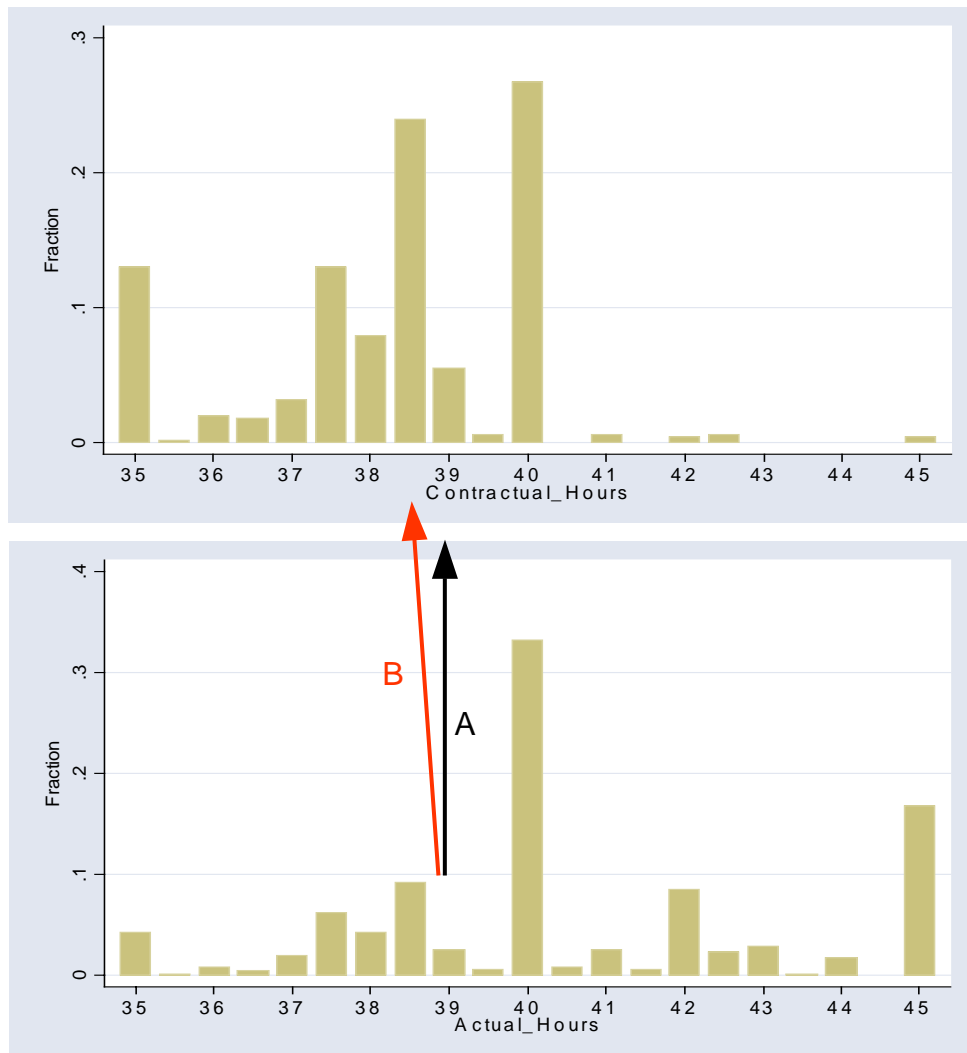
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## Figures and Tables

Figure 1: Hours Distribution of West German Full-time Male Employees (2004)



Source: SOEP, 2004

Note: Workers with contractual or actual hours greater than 45 are not depicted in the graph.

Table 1: Pooled OLS Wage Regression for West German Full-time Male Employees

Dependent variable:		
Log monthly earnings	Coefficient	Standard Error
Unpaid overtime	0.149	(0.007)**
Contractual hours	0.012	(0.002)**
Age	0.002	(0.001)
Married	0.055	(0.007)**
Education in years	0.018	(0.010)
Education in years <sup>2</sup>	0.001	(0.000)*
Tenure	0.009	(0.001)**
Tenure <sup>2</sup>	0.000	(0.000)**
Experience	0.029	(0.001)**
Experience <sup>2</sup>	-0.001	(0.000)**
Public Sector	-0.066	(0.009)**
Intercept	6.244	(0.094)**
Observations	11,032	

Source: SOEP, 1993-2004

Note: Industry, region, job, firm size, and year dummies included

Adjusted R-Squared= 0.57, Prob > F = 0.0000

\* significant at 5%; \*\* significant at 1%.

Table 2: Research Design: Difference-in-Differences

Actual working hours	Contractual hours agreement in the industry		
	Low (L)	High (H)	
Low	overtime	no overtime	→ Treatment group (T)
High	overtime	Overtime	→ Control group (C)

Outcome Variable:

	Earnings (Y)		
Treatment group	$\bar{Y}_L^T$	$\bar{Y}_H^T$	→ ( $\Delta \bar{Y}^T$ )
Control group	$\bar{Y}_L^C$	$\bar{Y}_H^C$	→ ( $\Delta \bar{Y}^C$ )

Table 3: Raw DD Estimate of the Impact of Unpaid Overtime on Earnings  
(Overtime Threshold: 40 Hours per Week, West German Workers)

Actual working hours	Contractual hours agreement in the industry		Low-high-contrast
	Low (<40)	High (≥40)	
Low (=40): Treatment Group	2894.49 (82.80)	2481.82 (24.22)	412.67
High (>40): Control Group	3788.32 (49.77)	3670.63 (65.83)	117.69
Difference-in-Differences			294.98* (125.25)

Source: SOEP, 1993-2004

Note: Standard errors are in parenthesis, \* significant at the 5% level

Table 4: DD Estimates of the Impact of Unpaid Overtime on Earnings

	West German Sample			East German Sample		
	Pooled OLS	Random Effects	Fixed Effects	Pooled OLS	Random Effects	Fixed Effects
Overtime Threshold: 39	0.082 (1.83)	0.058 (1.85)	0.040 (1.25)	-	-	-
Observations	6,555					
Overtime Threshold: 40	0.050 (2.39)*	0.029 (1.78)	0.018 (1.04)	-0.034 (0.70)	-0.024 (0.65)	-0.022 (0.57)
Observations	5,031			6,691		
Overtime Threshold: 41	-0.017 (0.35)	-0.020 (0.54)	-0.015 (0.35)	-0.054 (0.78)	-0.063 (1.19)	-0.081 (1.40)
Observations	2,431			1,943		
Overtime Threshold: 42	-0.052 (1.18)	0.013 (0.35)	0.051 (1.19)	-0.080 (1.98)*	-0.025 (0.78)	-0.024 (0.65)
Observations	2,344			2,103		
Overtime Threshold: 43	-0.111 (2.04)*	0.026 (0.62)	0.095 (2.08)*	-0.085 (1.59)	-0.052 (1.23)	-0.073 (1.46)
Observations	1,980			1,623		
Overtime Threshold: 44	-0.044 (0.61)	0.091 (1.76)	0.155 (2.76)**	0.067 (1.08)	-0.019 (0.40)	-0.056 (1.10)
Observations	1,735			1,629		
Overtime Threshold: 45	-0.081 (1.03)	0.005 (0.10)	0.017 (0.27)	0.133 (1.67)	-0.043 (0.67)	-0.243 (3.11)**
Observations	1,883			1,582		

Source: SOEP, 1993-2004

Sample: German full-time employees, age 20-60

Note: The regression model is full-specified, independent variables include worker and firm characteristics as well as region and year dummies. Absolute value of t statistics in parentheses, \* significant at 5%; \*\* significant at 1%.

Table 5: Mobility Patterns of Job Changers (West German Workers)

Contractual Hours Before Job Change	Contractual Hours After Job Change: Workers with Unpaid Overtime										
	35	36	37	38	39	40	41	42	43	44	45
35	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	56.6	43.4	0.0	0.0	0.0	0.0	0.0
37	0.0	7.1	81.4	1.7	3.4	6.4	0.0	0.0	0.0	0.0	0.0
38	3.8	0.0	6.1	38.5	13.4	38.2	0.0	0.0	0.0	0.0	0.0
39	0.0	1.6	0.0	18.3	42.9	37.2	0.0	0.0	0.0	0.0	0.0
40	3.2	0.7	1.8	6.5	18.2	67.5	0.3	1.9	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0	28.4	0.0	0.0	71.6	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0	0.0	64.6	0.0	0.0	35.4	0.0	0.0
Total	2.4	1.1	6.9	15.4	22.2	50.1	0.1	1.8	0.1	0.0	0.0
Observations	171										

Contractual Hours Before Job Change	Contractual Hours After Job Change: Workers without Unpaid Overtime										
	35	36	37	38	39	40	41	42	43	44	45
35	36.1	0.6	10.8	12.2	7.7	32.8	0.0	0.0	0.0	0.0	0.0
36	14.3	22.7	11.6	18.9	8.0	24.5	0.0	0.0	0.0	0.0	0.0
37	3.8	6.0	10.3	27.5	23.3	24.9	0.0	0.0	0.0	0.0	4.2
38	4.9	2.3	5.5	47.6	20.2	18.9	0.0	0.0	0.0	0.0	0.6
39	1.5	1.5	2.4	15.5	55.5	17.3	3.5	0.1	2.1	0.6	0.1
40	7.7	0.4	0.7	13.9	19.0	57.1	0.2	0.6	0.0	0.0	0.5
41	23.5	0.0	0.0	32.7	0.0	37.8	6.0	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	5.6	2.8	91.6	0.0	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	32.4	0.0	64.1	0.0	3.5	0.0	0.0	0.0
44	0.0	22.2	0.0	77.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	0.0	3.7	0.0	87.9	0.0	0.9	0.0	4.5	0.0	0.0	2.9
Total	6.8	2.5	4.0	23.6	30.4	29.7	1.3	0.2	0.7	0.2	0.5
Observations	899										

Source: SOEP, 1993-2004

Sample: West German full-time employees, age 20-60

Note: Rows add up to 100%. Data are weighted using cross-sectional sample weights.

Table 6: DD Estimates of the Impact of Unpaid Overtime and Variations in the Treatment Group

	Treatment Group II				Treatment Group III			
	West Germany		East Germany		West Germany		East Germany	
	RE	FE	RE	FE	RE	FE	RE	FE
Overtime Threshold: 39	0.069 (2.05)*	0.038 (1.10)	-	-	0.083 (2.33)*	0.046 (1.25)	-	-
Observations	4,669				3,225			
Overtime Threshold: 40	0.038 (2.53)*	0.024 (1.54)	-0.048 (1.25)	-0.054 (1.35)	0.057 (2.92)**	0.040 (1.90)	0.004 (0.10)	0.000 (0.00)
Observations	5,985		5,069		2,794		2,901	
Overtime Threshold: 41	-0.008 (0.21)	-0.025 (0.59)	-0.047 (0.88)	-0.088 (1.43)	-0.093 (1.14)	-0.115 (0.98)	-0.052 (0.47)	0.029 (0.16)
Observations	2,366		1,844		1,884		1,499	
Overtime Threshold: 42	0.036 (1.09)	0.059 (1.65)	0.014 (0.46)	0.024 (0.73)	0.074 (0.81)	-	-0.016 (0.26)	-0.010 (0.11)
Observations	2,958		2,449		1,822		1,489	
Overtime Threshold: 43	0.031 (0.77)	0.066 (1.54)	-0.043 (1.09)	-0.072 (1.60)	0.258 (2.93)**	1.525 (5.97)**	0.060 (0.81)	-0.004 (0.04)
Observations	2,222		1,904		1,658		1,367	
Overtime Threshold: 44	0.068 (1.35)	0.156 (2.92)**	0.004 (0.09)	-0.061 (1.09)	0.071 (0.32)	-	-0.048 (0.52)	-0.134 (1.17)
Observations	1,824		1,571		1,522		1,276	
Overtime Threshold: 45	0.030 (0.53)	0.071 (1.19)	-0.003 (0.05)	-0.208 (2.89)**	0.063 (0.83)	0.032 (0.34)	0.001 (0.01)	-0.294 (2.27)*
Observations	2,876		2,470		1,462		1,223	

Source: SOEP, 1993-2004

Sample: German full-time employees, age 20-60

Note: The regression model is full-specified, independent variables include worker and firm characteristics as well as region and year dummies. Absolute value of t statistics in parentheses, \* significant at 5%; \*\* significant at 1%.



Table 7: DD Estimates of the Impact of Unpaid Overtime on Future Earnings (Subsequent Year)

	West German Sample			East German Sample		
	Pooled OLS	Random Effects	Fixed Effects	Pooled OLS	Random Effects	Fixed Effects
Overtime Threshold: 39	0.122 (2.34)*	0.068 (2.09)*	0.004 (0.11)	-	-	-
Observations	3,216					
Overtime Threshold: 40	0.056 (2.43)*	0.027 (1.55)	0.007 (0.37)	-0.011 (0.17)	-0.015 (0.31)	-0.037 (0.74)
Observations	3,928			3,351		
Overtime Threshold: 41	-0.005 (0.08)	0.015 (0.34)	-0.030 (0.60)	-0.107 (1.32)	-0.080 (1.28)	-0.080 (1.08)
Observations	1,537			1,235		
Overtime Threshold: 42	-0.082 (1.63)	-0.027 (0.73)	-0.010 (0.24)	-0.067 (1.41)	0.018 (0.48)	0.059 (1.47)
Observations	1,951			1,688		
Overtime Threshold: 43	-0.092 (1.48)	-0.015 (0.33)	-0.015 (0.29)	-0.102 (1.73)	-0.090 (1.97)*	-0.070 (1.32)
Observations	1,455			1,275		
Overtime Threshold: 44	0.010 (0.12)	0.065 (1.10)	0.112 (1.62)	0.040 (0.53)	-0.003 (0.06)	0.007 (0.09)
Observations	1,185			1,062		
Overtime Threshold: 45	-0.044 (0.52)	0.025 (0.38)	0.027 (0.33)	0.133 (1.15)	-0.079 (0.84)	-0.327 (2.45)*
Observations	1,878			1,643		

Source: SOEP, 1993-2004

Sample: German full-time employees, age 20-60

Note: The regression model is full-specified, independent variables include worker and firm characteristics as well as region and year dummies. Absolute value of t statistics in parentheses, \* significant at 5%; \*\* significant at 1%.

Table 8: DD Estimates of the Impact of Unpaid Overtime on Earnings for White-Collar Workers

	West German Sample		East German Sample	
	Random Effects	Fixed Effects	Random Effects	Fixed Effects
Overtime Threshold: 39	0.080 (2.32)*	0.045 (1.26)	-	-
Observations	3,766			
Overtime Threshold: 40	0.037 (2.39)*	0.020 (1.22)	-0.024 (0.52)	-0.013 (0.29)
Observations	4,359		3,222	
Overtime Threshold: 41	0.007 (0.17)	-0.027 (0.62)	-0.044 (0.73)	-0.102 (1.50)
Observations	2,150		1,501	
Overtime Threshold: 42	0.052 (1.40)	0.074 (1.78)	0.003 (0.08)	-0.007 (0.19)
Observations	2,524		1,860	
Overtime Threshold: 43	0.054 (1.23)	0.082 (1.78)	-0.032 (0.74)	-0.062 (1.27)
Observations	1,960		1,540	
Overtime Threshold: 44	0.122 (2.17)*	0.195 (3.29)**	0.007 (0.14)	-0.052 (0.88)
Observations	1,655		1,272	
Overtime Threshold: 45	0.083 (1.22)	0.098 (1.39)	-0.025 (0.39)	-0.225 (2.90)**
Observations	2,308		1,651	

Source: SOEP, 1993-2004

Sample: German full-time employees, age 20-60

Note: The regression model is full-specified, independent variables include worker and firm characteristics as well as region and year dummies. Absolute value of t statistics in parentheses,

\* significant at 5%; \*\* significant at 1%.

Table 9: DD Estimates of the Impact of Unpaid Overtime on Earnings for Workers with Short Tenure

	West German Sample		East German Sample	
	Random Effects	Fixed Effects	Random Effects	Fixed Effects
Overtime Threshold: 39	0.018 (0.29)	-0.040 (0.51)	-	-
Observations	1,713			
Overtime Threshold: 40	0.072 (2.50)*	0.093 (2.86)**	-0.028 (0.47)	-0.045 (0.62)
Observations	2,408		2,310	
Overtime Threshold: 41	0.033 (0.52)	0.029 (0.37)	-0.037 (0.46)	0.014 (0.13)
Observations	1,037		964	
Overtime Threshold: 42	-0.050 (0.95)	-0.021 (0.32)	0.035 (0.76)	0.037 (0.65)
Observations	1,238	1238	1,203	
Overtime Threshold: 43	-0.045 (0.69)	0.009 (0.12)	-0.038 (0.64)	-0.093 (1.20)
Observations	999		1,003	
Overtime Threshold: 44	0.025 (0.30)	0.156 (1.56)	0.015 (0.21)	0.010 (0.11)
Observations	827		827	
Overtime Threshold: 45	-0.036 (0.43)	0.078 (0.78)	0.322 (3.13)**	-0.026 (0.93)
Observations	1,285		1,277	

Source: SOEP, 1993-2004

Sample: German full-time employees, age 20-60

Note: The regression model is full-specified, independent variables include worker and firm characteristics as well as region and year dummies. Absolute value of t statistics in parentheses, \*significant at 5%; \*\* significant at 1%.