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# Work Hours Constraints and Health

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*(forthcoming in: Annales d'Économie et de Statistique)*

**Abstract:** The issue of whether employees who work more hours than they want to suffer adverse health consequences is important not only at the individual level but also for governmental formation of work time policy. Our study investigates this question by analyzing the impact of the discrepancy between actual and desired work hours on self-perceived health outcomes in Germany and the United Kingdom. Based on nationally representative longitudinal data, our results show that work-hour mismatches (i.e., differences between actual and desired hours) have negative effects on workers´ health. In particular, we show that "overemployment" – working more hours than desired − has negative effects on different measures of self-perceived health.

Keywords: Work Time, Hours Constraints, Health, Germany, United Kingdom

JEL Classification: I10, J21, J22

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# Work Hours Constraints and Health

## 1 Introduction

Numerous studies show that many workers face hours constraints in that their *desired* work time does not correspond to their *actual* work time [e.g., Euwals and van Soest (1999), Jacobs and Gerson (1998), Kahn and Lang (1995), Otterbach (2010), Sousa-Poza and Henneberger (2002), Stewart and Swaffield (1997)]. Such constraints are widespread in mature economies, with more than one third of workers in the United States, Japan, France, Germany, Portugal, and Spain reporting them. There is also evidence that in some countries, such as Germany, France, and Portugal, such constraints have become more prevalent in recent decades [Otterbach (2010), p. 149]. Several reasons have been offered for the existence of hours constraints, including long-term contracting [Kahn and Lang (1992)], asymmetric information about workers' productivity [Landers, Rebitzer, and Taylor (1996), Sousa-Poza and Ziegler (2003)], income inequality [Bell and Freeman (1995)], mismatches [Altonji and Paxson (1988), Kahn and Lang (1996)], wage rigidity [Kahn and Lang (1996)], job insecurity [Stewart and Swaffield (1997)], and labor market regulations [Rottenberg (1995)]. However, despite the vast interest in the causes of hours constraints, surprisingly little research examines their consequences.

The purpose of this study is to analyze the effect that hours constraints may have on workers' health. The state of workers' health has been receiving increased attention among public officials and also in the business community. As pointed out in a recent *Economist* article (July 8th, 2010), annual check-ups and company wellness programs

have become a familiar part of the corporate landscape. More than half of larger U.S. companies offer advice on health issues and over a third have gyms. Although such attention to workers' physical and psychological well-being may stem from an employer belief that healthier workers are more productive and have lower levels of absenteeism, showing concern for worker well-being may also enhance a firm's reputation, reducing turnover and improving the quality of job applicants.

One important link between a firm's work environment and workers' health is the length of the work week, as well as minimum safety and health requirements for the organization of work time. In Europe, this latter is defined by the Working Time Directive of the European Union (see Directive 2000/34/EC of the European Parliament and of the Council of 22 June 2000), which considers a work week that exceeds 48 hours in 7 days to be detrimental to health. Not surprisingly, a large body of literature (primarily in the medical field) examines the relationship between work time and health and does indeed show that the length of the work week can have an adverse effect on a worker's physical as well as mental health [see, for example, Sparks et al. (1997), Spurgeon, Harrington, and Cooper (1997), van der Hulst (2003)].[1] A related concept is that of "time poverty" (Vickery, 1977), i.e. a situation in which individuals do not have enough discretionary time to engage in leisure, educational, and other activities that improve their well-being [Kalenkoski, Hamrick and Andrews, 2010]. Such poverty is often associated with long working hours and it can affect health outcomes.

[1] Sparks et al. (1997), in a meta-analysis of 21 studies, conclude that their results "offer support for a link between long work hours and ill-health" [p. 406]. In another meta-analysis Spurgeon, Harrington, and Cooper (1997) conclude that "there is currently sufficient evidence to raise concerns about the risks to health and safety of long working hours" [p. 367]. Van der Hulst's (2003) review of 27 empirical studies concludes "that there is evidence of a link between long work hours and ill health" [p. 183].

Another important, yet largely neglected, issue is the potential effect on health outcomes of individual choices and preferences for the length of the work week. That is, if individuals recognize the effects that long hours may have on their health, then such considerations will enter into their calculations of the opportunity cost of leisure and their evaluation of a desirable work week: the opportunity cost of hours worked in excess of desired hours will exceed the wage. Such imbalance may result in adverse consequences, such as poorer health outcomes. It is also possible to construct an opportunity cost schedule in which workers may suffer adverse effects on their well-being if actual hours worked are *less* than desired hours. Only few studies exist that focus on the well-being outcomes of such hours constraints [for example, Wooden, Warren, and Drago (2009), Friedland and Price (2003), and Grözinger, Matiaske, and Tobsch (2008)].

In this paper, we contribute to this literature by analyzing the effect that hours constraints have on different measures of workers' health in Germany and the UK. Our choice of countries is motivated not only by the availability of two interesting and comparable longitudinal surveys; namely, the British Household Panel Survey (BHPS) and the German Socio-economic Panel Survey (GSOEP). Moreover, these two countries differ substantially with regards to working hours: as of 2008, workers in the UK averaged a total of 1,638 working hours per year as opposed to 1,344 in Germany [see OECD (2010)]. The UK labour market is considered as one with the longest working hours in Europe [see Warren (2003) p. 734] and decisive institutional differences with respect to the regulation of working time compared to Germany. In Germany, collective bargaining by trade unions and works councils has a strong impact on working time agreements. On the other hand, trade unions in Britain are comparatively weak and the regulation of working time is limited [see Bell et al.

(2000) p. 1 and Fagan (2001) p. 246]. In 2011, the UK was one of 16 EU member states using an "opt out" of the 48-hour maximum work week stipulated by the EU's Working Time Directive. Specifically, workers "opt out" of the 48 hour maximum by providing a written voluntary statement of their wish to do so, which can be cancelled at any time. Workers that choose not to opt out, however, are protected from unfair treatment. Such arrangements are not available in Germany. Thus, our analysis additionally provides valuable insights on how different levels of working time regulation affect the extent of hours constraints and their impact on health.

The paper proceeds as follows: section 2 outlines the literature documenting the relationship between working time and health, section 3 describes the data and methods, section 4 presents the results, and section 5 concludes the paper.

## 2 Relevant Research

The large body of literature on the relationship between work hours and health indicates that adverse health effects are extensive and range from such medical disorders as general exhaustion, fatigue, stress, unhappiness, and depression to diabetes, impairment of the immune system, hypertension, and severe cardiovascular risk and disease [see Caruso (2006)]. Additional studies also imply that the length of the work week influences health-related factors like smoking behavior and alcohol consumption [Eriksen (2005); Radi, Ostry, and LaMontagne (2007); Steptoe et al. (1998)], unhealthy eating habits and weight gain [Shields (1999)], and lack of exercise [Artazcoz et al. (2009)]. This literature is extensively reviewed in Belkic et al. (2004), Iwasaki, Takahashi, and Nakata (2006), Sparks et al.

(1997), Spurgeon, Harrington, and Cooper (1997), van der Hulst (2003), Virtanen et al. (2010). The focus in this paper is not on the length of the work week *per se*, but, instead on the (health) effects of the difference between actual working hours and desired working hours. We are not aware of much research on this topic.

Wooden et al. (2009), using the first five waves of the Household, Income, and Labour Dynamics in Australia (HILDA) panel data, relate hours constraints to measures of subjective well-being like job satisfaction and life satisfaction. More specifically, they show that both over- and underemployment have a negative effect on job and life satisfaction but these are unaffected by the *number* of work hours if this is consistent with worker preferences. Thus, rather than the absolute number of work hours *per se*, work hours *mismatch* may be the decisive factor in determining whether long hours reflect undesirable work overload and whether short hours indicate a lighter workload [Wooden et al. (2009, p. 172)]. This finding is consistent with workers, whose health and well-being may be differentially affected by working time, selecting into different lengths of workweek to avoid adverse health and well-being consequences. Based on their findings, the authors strongly recommend further research to shed light on the question of whether work hours mismatch is also related to adverse health effects.

Friedland and Price (2003), drawing on the first two waves (1986 and 1989) of the Americans´ Changing Lives Study, examine the relationship between health and four different types of underemployment − based on work hours, income, skills, and status − as well as overemployment. In contrast to Wooden et al. (2009), they find only moderate evidence for the hypothesis that underemployment (versus adequate employment) defined by work hours mismatch is associated with lower levels of

physical health and psychological well-being. Moreover, although they find no significant impact of overemployment on life satisfaction and self-image, they do show that overemployed workers report lower levels of job satisfaction and more chronic disease [see Friedland and Price (2003, p. 39 f.)].

Similar outcome variables, including job satisfaction, life satisfaction, and health satisfaction are examined by Grözinger et al. (2008) using a 2004 cross-section of GSOEP data. The authors show that the difference between actual and desired work time (in absolute terms, i.e., over- and underemployment) does have a significantly negative effect on all these outcome variables. They also find that, in line with Wooden et al.'s (2009) observation of larger effects for job than for life satisfaction, the magnitude of the effect is highest with respect to job satisfaction and lowest with respect to health satisfaction [see Grözinger et al. (2008, p. 95)]. Based on their findings overall, they conclude that work hours mismatch in terms of over- and underemployment significantly decreases workers´ quality of life.

## 3 Data and Methodology

Even though past research suggests a link between long work hours and adverse health outcomes, most previous studies have methodological shortcomings that make it difficult to draw definite conclusions. Specifically, as van der Hulst (2003) points out, “there is a serious shortage of well-controlled studies that confirm and strengthen the evidence” [p. 183]; most particularly, because such research fails to address confounding variables that could potentially moderate the effects of long working hours on health. The author therefore suggests that investigation should also

include demographic variables, work and home characteristics, and personality factors as covariates. Such studies are also criticized on the grounds that most use cross-sectional data and small and often non-representative samples [e.g., males in certain occupational groups – see Wooden et al. (2009, p. 151)].

In our extension of the previous literature, we analyse the impact of work hours mismatch on health in Germany and the United Kingdom. We employ two large panel data sets, the German Socio-economic Panel (GSOEP) and the British Household Panel Survey (BHPS),[2] which are nationally representative data sources and contain extensive information at the household and individual level. The GSOEP, a longitudinal panel survey of private households in Germany administered annually since 1984, currently encompasses around 12,000 households with approximately 21,000 persons. For our analysis, we use the 17 waves subsequent to German reunification from 1992 to 2008. The BHPS, repeated annually since 1991, includes about 10,000 households across the UK. This present analysis draws on all available 17 waves of the BHPS, encompassing the 1991 to 2007 period, excluding self-employed respondents but including all employees aged 16 to 65. We use an unbalanced panel in which individuals were observed for an average period of 5.46 (GSOEP) and 5.73 (BHPS) years, respectively.

In addition to socio-demographic variables and information on work time and employment, both data sources contain measures of worker preferences with regard to working time. It is important to note, however, that although the items asking respondents about their preferred working hours explicitly refer in both surveys to an adjustment of earnings, they differ in terms of the exact question format and wording.

[2] For more information on the GSOEP and the BHPS, see Wagner, Frick, and Schupp (2007) and Lynn (2006), respectively.

Whereas GSOEP respondents are asked to state the number of preferred working hours, respondents in the BHPS are asked to indicate whether they would like more, the same, or fewer hours than their current hours. More specifically, respondents are asked the following questions:[3]

> *GSOEP:* If you could choose your own number of working hours, taking into account that your income would change according to the number of hours:
>
> How many hours would you want to work? ___ , __ hours per week

> *BHPS:* Thinking about the number of hours you work, assuming that you would be paid the same amount per hour, would you prefer to:
>
> o Work fewer hours than you do now
>
> o Work more hours than you do now
>
> o Or carry on working the same number of hours?

To provide a meaningful comparison of Germany and the UK, we first calculate the difference between actual weekly work hours (including overtime) and desired work hours for GSOEP respondents. We then assign workers to three different categories of hours constraints: (i) *overemployed workers*, whose actual work time exceeds desired work time by 4 hours; (ii) *unconstrained workers*, for whom the difference between actual and desired work hours is in the range of -4 hours to +4 hours; and (iii) *underemployed workers*, whose desired work time exceeds the actual working time by 4 hours.[4] The attribution of BHPS respondents to these categories, in

[3] Lang and Kahn (2001) compare a number of surveys in Europe and the U.S. and show that the phrasing of the questions relating to hours constraints is important and that different wordings can give rise to very different results. The use of two very different measures of hours constraints in the BHPS and GSOEP data sets thus offers a type of robustness check of our results.

[4] Using an approach similar to that employed by Bell and Freeman (2001) in their comparison of GSOEP data with the U.S. Current Population Survey (CPS), we allow for a 4 hours tolerance with

contrast, is based directly on the answers on preferred work hours given in the questionnaire. In a third step, we categorise workers by their work hours (including paid overtime) and then assign them to the three hours constraint states described above. That is, we build an interaction variable between actual work hours categories, the occurrence, and the direction of hours constraints [c.f. Wooden et al. (2009)] in order to distinguish the *desired* hours preferences of workers who *actually* work short or long hours. This method allows us to test whether health outcomes are different for someone who works 25 hours a week and wishes to work fewer hours and someone who works 55 hours a week and wishes to work fewer hours.

Both data sets provide self-reported variables describing respondents´ overall health. Our multivariate analysis thus includes information about self-assessed health and health satisfaction. The self-reported health variables in our analysis may be influenced by unobserved and time-invariant personal characteristics such as personality and motivation. The panel structure of the data enables us to hold these influences constant and control for unobserved heterogeneity. Initially, we treat all health outcomes as cardinal variables and estimate fixed-effects models of the following form:

$$HO_{it} = \alpha X_{it} + \beta Y_{it} + \mu_i + \varepsilon_{it} \qquad \text{with } i = 1,\ldots,N \text{ and } t = 1,\ldots,T$$

where $HO_{it}$ denotes individual *i´*s level of health outcome reported at time *t*. As described above, $X_{it}$ is the categorical interaction variable between actual working time category and workers' hours preferences (overemployed, unconstrained, or underemployed). $Y_{it}$ contains a set of time-variant control variables such as age,

respect to the discrepancy between actual and desired work hours in order to account for substantial mismatches.

age$^2$, job tenure, marital status, number of children, net wage, household income, and a variable that indicates whether workers´ overtime is unpaid. We also control for the disability grade (GSOEP) or disability status (i.e., whether or not a person is disabled) (BHPS), respectively. Finally, we include year dummies and a set of dummy variables based on two-digit occupational codes that allow us to control for job-specific characteristics that might also influence health outcomes. The unobservable individual specific effects are captured by $\mu_i$, and $\varepsilon_{it}$ denotes the disturbance term.

As our dependent variable is ordinal, we also estimate a fixed-effects ordered logit model. A general formulation of this model is:

$$y^*_{it} = x'_{it}\beta + \alpha_i + \varepsilon_{it} \qquad \text{with } i = 1,...,N \text{ and } t = 1,...,T$$

where $y^*_{it}$ is a latent variable for individual *i* at time *t*, $x_{it}$ an index of observed characteristics and $\alpha_i$ the unobservable characteristics. The latent variable is related to the observed ordered variable $y_{it}$ as follows:

$$y_{it} = k \quad \text{if } \tau_k < y^*_{it} \leq \tau_{k+1} \qquad \text{with } k = 1,...,K$$

A number of estimators have been developed for such models [Chamberlain (1980), Das and van Soest (1999), Ferrer-i-Carbonell and Frijters (2004)]. In essence, these models simplify the estimation problem by collapsing the categorical responses into two classes and then implementing a fixed-effects binary logit. The models differ in the way the cut-off point for this dichotomization is determined. However, in a recent study, Baetschmann, Staub, and Winkelmann (2011) show with Monte Carlo simulations that those estimators based on an endogenous dichotomization, i.e. where the cut-off point is determined as a function of the outcome of the dependent variable, are inconsistent. Baetschmann, Staub, and Winkelmann (2011) propose a

new estimator, the “Blow-Up and Cluster” (BUC) estimator, that estimates all possible dichotomizations jointly using different cut-off points. The name of the estimator also describes the way it is implemented: every observation in the sample is replaced by K-1 copies of itself, i.e. the sample is “blow-up”, and every K -1 copy of the individual is dichotomized at a different cut-off point. A conditional maximum likelihood logit is then estimated on the entire “blown-up” sample. Since some individuals contribute to several terms in the log-likelihood, standard errors are clustered at the individual level. Baetschmann, Staub, and Winkelmann (2011) show that this estimator is not only easy to implement[5], it clearly outperforms existing estimators – especially if the ordered dependent variable displays very low frequencies in certain categories (as is the case in most subjective well-being variables).

An issue that has not received much attention in the predominantly medical literature on working time and health is reverse causality. It is conceivable that working hours constraints are determined by health status [see Geyer and Myck (2010)]. Thus, deterioration in health could reduce desired working time which in turn could give rise to overemployment. This would imply that employers and employees cannot agree on a new contract to accommodate changed health status. Issues of the costs to employers of re-contracting, employee beliefs about the permanence of the new health state, employee discount rates, etc., will influence the likelihood of a new contract being formed.

Ex ante, workers’ choose between contracts on the basis of their perceptions of job characteristics. One job attribute which the employer must stipulate in the job

[5] We use the STATA code provided by Baetschmann, Staub, and Winkelmann (2011).

contract is normal working hours. Employee's current and prospective state of health may influence their choice between different lengths of the work week.

Workers will be less well informed about work intensity. If the intensity of work is underestimated, workers may argue that they are overemployed, irrespective of the level of their contracted hours of work. Similarly, if it is underestimated, their response to a question on desired working time is likely to be that they are under-employed. Workers who perceive that their employment requires effort beyond their initial expectations may suffer adverse health consequences.

On the other hand, workers who receive a health "shock" may argue that their working hours are constrained if the costs of re-contracting outweigh the benefits. Whether due to health concerns, or to some other cause, these costs would include those of finding a new job with hours that the worker would categorise as "unconstrained".

The argument for reverse causality is that workers' state of health affects their response to a question about whether their preference is for more, or for fewer working hours. This implies that workers' health is exogenous. Factors exogenous to the workplace may certainly play an important role in determining perceived health states. For example, the origins of smoking behaviour may, for many workers, lie outside the workplace.

If workers know their state of health with certainty, perhaps because of chronic illness, they will take this into account when selecting between contracts offering different levels of normal working hours. There is no reason to believe that healthy

workers and unhealthy workers differ in their levels of asymmetric information about the nature of the contract. Under these conditions, health status will not drive responses to questions on hours constraints. However, an unexpected change in health status may cause workers to believe that their current working hours are sub-optimal. We do not rule out such reverse causality effects, and therefore we cannot be certain that the stronger effect is from hours constraints to health status rather than vice-versa.

Interestingly, our results for the effects of hours constraints on self-assessed health in the BHPS are similar to those for health satisfaction in the BHPS and for both health variables in the GSOEP. The difference is that the BHPS self-assessed health question asks respondents to consider their state of health over the last twelve months, while the other questions implicitly ask about current health status. If a twelve month assessment dilutes the role of health surprises in the analysis, then the similarity of response across all four relationships suggests that such health surprises do not have a prominent role in determining hours constraints.

A further methodological issue is related to the use of subjective variables on both the right and left-hand side of the equation: hours constraints are partially subjective (desired working time) and we use self-reported health as an explanatory variable. The finding that hours constraints is related to subjective health may be driven by unobserved 'third factors' such as personality traits [for example, neuroticism, hardiness, extrovertism, or negative affectivity; see Brief, Burke, George, Robinson and Webster (1988); Watson, Clark and Carey, (1988)]. The fixed-effects in our model are particularly important in order to capture these unobserved characteristics.

## 4 Results

Our initial descriptive analysis illustrates the distributions of the dependent variables and the hours constraints variables pooled over all waves (see tables 1 and 2). Table 1 shows the distributions for the health variables in both the BHPS and the GSOEP. A comparison of the health satisfaction variable in the two data sets is difficult as the variables are coded differently. The self-assessed health variable is, however, coded on a 5-point scale in both the BHPS and the GSOEP, thus making a comparison possible. An interesting observation is that Germans assess their health substantially worse than the British – respondents in the BHPS were two times more likely to report a "very good" health than individuals in the GSOEP (11% vs. 27%). As there is little evidence that objective health (e.g. life expectancy) differs between these two countries, this difference is most probably being driven by cultural differences in reporting behaviour.

As shown in table 2, 41.5% and 31.8% of the German and British work force, are overemployed, respectively. In both countries, overemployment is more pronounced among men than women with 44.9% and 34.2% of German and British men being overemployed compared to 37.6% and 29.6% of German and British women, respectively. Moreover, the fraction of overemployed workers within each workload category rises monotonically as work hours increase. Interestingly, in Germany substantially more individuals (13.55%) work very long (50+) hours than in the UK (3.92%). An overview of the outcome variables with respect to the question format, as well as the coding, is given in appendix table A, and the summary statistics are provided in appendix table B. It is important to note that tenure, which we include as a control variable is measured in years with the same employer and years in the

same job, in Germany and the UK, respectively. This may explain the large tenure differences between the two countries. In this analysis, some variables are recoded in order to consistently interpret negative coefficients as negative impacts on health (see appendix table A).

**Table 1: Relative frequency distributions of dependent variables**

**GSOEP**

| | | Health satisfaction | | | | Self-assessed health | | |
|---|---|---|---|---|---|---|---|---|
| Scale | | Full sample | Men | Women | Scale | Full sample | Men | Women |
| Completely dissatisfied | 0 | 0,43 | 0,38 | 0,48 | Bad 1 | 1,16 | 1,08 | 1,26 |
| | 1 | 0,46 | 0,46 | 0,46 | Poor 2 | 8,77 | 7,97 | 9,71 |
| | 2 | 1,56 | 1,51 | 1,63 | Satisfactory 3 | 30,03 | 29,44 | 30,72 |
| | 3 | 3,63 | 3,47 | 3,82 | Good 4 | 48,76 | 49,75 | 47,61 |
| | 4 | 4,7 | 4,55 | 4,87 | Very Good 5 | 11,27 | 11,77 | 10,69 |
| | 5 | 11,43 | 10,68 | 12,31 | | | | |
| | 6 | 9,95 | 10,17 | 9,69 | | | | |
| | 7 | 18,65 | 18,93 | 18,33 | | | | |
| | 8 | 27,17 | 27,52 | 26,77 | | | | |
| | 9 | 13,57 | 13,67 | 13,45 | | | | |
| Completely satisfied | 10 | 8,44 | 8,66 | 8,18 | | | | |
| Total | | 100 | 100 | 100 | | 100 | 100 | 100 |
| Number of observations | | 127.017 | 68.332 | 58.685 | | 127.071 | 68.351 | 58.720 |

**BHPS**

| | | Health satisfaction | | | | Self-assessed health | | |
|---|---|---|---|---|---|---|---|---|
| | | Full sample | Men | Women | | Full sample | Men | Women |
| Not satisfied at all | 1 | 1,5 | 1,27 | 1,72 | Bad 1 | 0,69 | 0,59 | 0,77 |
| | 2 | 3,08 | 2,77 | 3,36 | Poor 2 | 4,4 | 3,66 | 5,09 |
| | 3 | 8,58 | 8,14 | 8,98 | Satisfactory 3 | 17,96 | 17,34 | 18,53 |
| | 4 | 13,18 | 12,14 | 14,13 | Good 4 | 49,47 | 48,79 | 50,1 |
| | 5 | 24,99 | 25,96 | 24,11 | Very Good 5 | 27,48 | 29,63 | 25,51 |
| | 6 | 32,69 | 33,97 | 31,53 | | | | |
| Completely satisfied | 7 | 15,98 | 15,75 | 16,18 | | | | |
| Total | | 100 | 100 | 100 | | 100 | 100 | 100 |
| Number of observations | | 68.425 | 32.654 | 35.771 | | 99.589 | 47.653 | 51.936 |

Note: Number of observations is based on the regression samples
Data are pooled over all waves included in the regression analysis

**Table 2: Relative frequency distributions of workload categories and hours constraints by gender**

| GSOEP | Full sample | Men | Women |
|---|---|---|---|
| < 20h: underemployed | 3,85 | 1,27 | 6,86 |
| <20h: unconstrained | 4,24 | 1,03 | 7,99 |
| <20h: overemployed | 0,40 | 0,09 | 0,76 |
| 20-35 h: underemployed | 3,39 | 1,18 | 5,96 |
| 20-35 h: unconstrained | 7,02 | 1,10 | 13,91 |
| 20-35 h: overemployed | 2,63 | 0,33 | 5,31 |
| 35-40 h: underemployed | 2,42 | 3,27 | 1,42 |
| 35-40 h: unconstrained | 27,22 | 32,42 | 21,16 |
| 35-40 h: overemployed | 10,73 | 8,61 | 13,20 |
| 41-49 h: underemployed | 0,92 | 1,42 | 0,33 |
| 41-49 h: unconstrained | 7,38 | 10,03 | 4,30 |
| 41-49 h: overemployed | 16,25 | 18,89 | 13,18 |
| 50+ h: underemployed | 0,27 | 0,45 | 0,07 |
| 50+ h: unconstrained | 1,76 | 2,92 | 0,41 |
| 50+ h: overemployed | 11,52 | 17,00 | 5,13 |
| Total | 100 | 100 | 100 |
| N | 127.071 | 68.351 | 58.720 |

| BHPS | Full sample | Men | Women |
|---|---|---|---|
| < 20h: underemployed | 3,02 | 1,41 | 4,49 |
| <20h: unconstrained | 9,99 | 2,87 | 16,53 |
| <20h: overemployed | 1,16 | 0,32 | 1,93 |
| 20-35 h: underemployed | 1,73 | 0,93 | 2,47 |
| 20-35 h: unconstrained | 10,79 | 3,08 | 17,86 |
| 20-35 h: overemployed | 3,37 | 0,77 | 5,75 |
| 35-40 h: underemployed | 2,88 | 4,60 | 1,30 |
| 35-40 h: unconstrained | 34,40 | 43,62 | 25,94 |
| 35-40 h: overemployed | 21,67 | 24,09 | 19,45 |
| 41-49 h: underemployed | 0,28 | 0,50 | 0,08 |
| 41-49 h: unconstrained | 3,53 | 5,88 | 1,37 |
| 41-49 h: overemployed | 3,27 | 5,13 | 1,57 |
| 50+ h: underemployed | 0,11 | 0,22 | 0,00 |
| 50+ h: unconstrained | 1,48 | 2,68 | 0,38 |
| 50+ h: overemployed | 2,33 | 3,92 | 0,87 |
| Total | 100 | 100 | 100 |
| N | 99.589 | 47.653 | 51.936 |

Note: Number of observations is based on the regression samples. Data are pooled over all waves included in the regression analysis.

In the subsequent multivariate analysis, we run all regressions for both the full sample and for men and women separately.[6] Table 3 reports the GSOEP regression results for the two subjective health measures, health satisfaction and self-assessed health. The analysis of the GSOEP data excludes waves 1993 and 1996 because some variables are not available for these waves. Satisfaction with one's own health is measured on an 11-point scale, ranging from 0 (completely dissatisfied) to 10 (completely satisfied), while self-assessed health is measured on a 5-point scale, which (after recoding) ranges from 1 (bad) to 5 (very good).

One notable insight from this fixed-effects model is that overemployed employees in both the full sample and the female sample are significantly and generally (i.e., regardless of their actual workload) less satisfied with their own health than unconstrained full time workers whose actual work hours are between 35 and 40 hours (reference category). Only for overemployed men is this effect not significant when actual work hours are between 20 and 35 hours per week. The magnitude of these negative health effects can be exemplified as follows: overemployed workers in the full sample with a workload of 35 to 40 hours per week are on average 0.098 of a point less satisfied with their own health than unconstrained workers in the same workload category. The magnitude of this effect is thus comparable to an increase in disability grade of 7 percentage points. A very similar pattern with respect to the sign and significance of the coefficients is observed in the fixed-effects ordered logit model. Only for overemployed men working less than 20 hours per week we do not observe a significant effect in the fixed-effects ordered logit model opposed to the fixed-effects estimates.

[6] We also estimate random-effects models (not reported here) that correspond to the fixed-effects models and carry out a Hausman test. In all regression estimations, the results favor the fixed-effects models.

**Table 3: GSOEP - Fixed-effects and fixed-effects ordered logit models**

| | Health satisfaction | | | | | | Self-assessed health | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fixed-effects | | | Fixed-effects ordered logit | | | Fixed-effects | | | Fixed-effects ordered logit | | |
| | Full sample | Men | Women | Full sample | Men | Women | Full sample | Men | Women | Full sample | Men | Women |
| < 20h: underemployed | -0,044 | -0,107 | -0,038 | -0,049 | -0,153 | -0,048 | -0,038*** | -0,052* | -0,044** | -0,132** | -0,213* | -0,159** |
| <20h: unconstrained | -0,033 | 0,079 | -0,057 | -0,039 | 0,134 | -0,079 | -0,024 | 0,007 | -0,038** | -0,092 | 0,029 | -0,148** |
| <20h: overemployed | -0,303*** | -0,427* | -0,300*** | -0,412*** | -0,637 | -0,408*** | -0,111*** | -0,082 | -0,125*** | -0,409*** | -0,080 | -0,488*** |
| 20-34 h: underemployed | 0,009 | -0,080 | 0,017 | 0,021 | -0,109 | 0,027 | -0,007 | -0,056** | -0,002 | -0,026 | -0,198* | -0,014 |
| 20-34 h: unconstrained | -0,032 | 0,037 | -0,048 | -0,037 | 0,136 | -0,071 | -0,022* | -0,060** | -0,024* | -0,073 | -0,184 | -0,086 |
| 20-34 h: overemployed | -0,154*** | -0,122 | -0,170*** | -0,216*** | -0,163 | -0,244*** | -0,080*** | -0,056 | -0,088*** | -0,285*** | -0,237 | -0,314*** |
| 35-40 h: underemployed | -0,008 | -0,011 | -0,009 | -0,009 | -0,022 | 0,002 | 0,014 | 0,010 | 0,021 | 0,034 | 0,014 | 0,076 |
| 35-40 h: overemployed | -0,098*** | -0,088*** | -0,107*** | -0,137*** | -0,132*** | -0,142*** | -0,048*** | -0,049*** | -0,049*** | -0,171*** | -0,180*** | -0,170*** |
| 41-49 h: underemployed | -0,033 | -0,088 | 0,240* | -0,036 | -0,125 | 0,326* | -0,029 | -0,058** | 0,128** | -0,112 | -0,224** | 0,385** |
| 41-49 h: unconstrained | -0,002 | -0,007 | 0,019 | -0,014 | -0,023 | 0,017 | -0,007 | -0,008 | 0,003 | -0,033 | -0,039 | 0,007 |
| 41-49 h: overemployed | -0,096*** | -0,089*** | -0,105*** | -0,141*** | -0,131*** | -0,150*** | -0,046*** | -0,036*** | -0,061*** | -0,172*** | -0,132*** | -0,217*** |
| 50+ h: underemployed | -0,007 | -0,063 | 0,397 | -0,034 | -0,111 | 0,541 | -0,083** | -0,081** | -0,030 | -0,278* | -0,266 | -0,101 |
| 50+ h: unconstrained | 0,004 | -0,002 | 0,118 | -0,010 | -0,026 | 0,169 | -0,019 | -0,013 | -0,006 | -0,060 | -0,031 | -0,053 |
| 50+ h: overemployed | -0,092*** | -0,068*** | -0,152*** | -0,138*** | -0,103** | -0,213*** | -0,052*** | -0,037*** | -0,082*** | -0,178*** | -0,122*** | -0,274*** |
| Constant | 9,240*** | 9,489*** | 9,074*** | | | | 4,829*** | 5,132*** | 3,369*** | | | |
| Number of observations | 127.017 | 68.332 | 58.685 | 415.592 | 220.774 | 194.818 | 127.071 | 68.351 | 58.720 | 165.482 | 87.798 | 77.684 |
| log L | | | | -152.452 | -80.248 | -72.050 | | | | -59.559 | -31.162 | -28.297 |
| F | 49,601 | 33,331 | 18,316 | | | | 60,959 | 40,785 | 22,866 | | | |
| R2 | 0,067 | 0,078 | 0,056 | | | | 0,092 | 0,106 | 0,081 | | | |

note: *** p<0.01, ** p<0.05, * p<0.1

The dependent variables are health satisfaction and self-assessed health, respectively.
Model also includes socioeconomic control variables for age, tenure, marital status, number of children, net wages, household income, the grade of disability, unpaid overtime, wave dummies, and dummies for 2-digit occupational codes.

Likewise, self-assessed health is in general significantly and negatively affected by overemployment for the full sample and the female sample, but in the male sample it appears only if actual work hours exceed 35 hours per week. Females are more likely to have other binding time constraints related to family care, which perhaps explains why their adverse effects occur across all ranges of actual hours worked, whereas for men the effects are only significant when actual working hours are longer. This gender difference has also been highlighted in a number of studies relating to time poverty [see, for example, Merz and Rathjen, 2009]. Women (especially in households with children) are much more likely to face time stress and have less discretionary time for leisure activities [Harvey and Mukhopadhyay (2007)]. Underemployed men who work <20, 20−34, 41−49, and 50+ hours per week also exhibit a lower general health state than the reference category. For underemployed women, however, this is only the case when the work hours are fewer than 20 per week. Thus, with respect to self-assessed health, underemployment seems to be a more severe problem among German men than among German women. This finding may relate to the association between work time and self-image. In particular, gender identity [see Akerlof and Kranton (2000)] and traditional gender roles may influence male preferences for full-time employment. The psychological consequences of underemployment may therefore be more adverse for males than females if these preferences are not being met and if men are involuntary employed part-time. Again, in the fixed-effects ordered logit model we observe nearly the same pattern with respect to the sign and significance of the coefficients (except for the unconstrained who work 20-34 hours and underemployed men working 50 hours and more).

In the BHPS, satisfaction with health is surveyed on a 7-point scale, ranging from not satisfied at all (1) to completely satisfied (7). It should also be noted that BHPS data

**Table 4: BHPS - Fixed-effects and fixed-effects ordered logit models**

| | Health satisfaction | | | | | | Self-assessed health | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fixed-effects | | | Fixed-effects ordered logit | | | Fixed-effects | | | Fixed-effects ordered logit | | |
| | Full sample | Men | Women | Full sample | Men | Women | Full sample | Men | Women | Full sample | Men | Women |
| < 20h: underemployed | -0,020 | -0,033 | -0,039 | -0,071 | -0,132 | -0,154* | -0,005 | -0,057* | -0,002 | 0,008 | -0,230 | 0,056 |
| <20h: unconstrained | 0,012 | 0,003 | -0,018 | 0,078 | 0,100 | -0,042 | -0,005 | -0,014 | -0,016 | 0,036 | -0,008 | 0,025 |
| <20h: overemployed | -0,013 | -0,012 | -0,049 | 0,088 | 0,034 | -0,036 | -0,027 | 0,026 | -0,052* | -0,004 | 0,200 | -0,066 |
| 20-34 h: underemployed | 0,018 | -0,068 | 0,023 | -0,038 | -0,111 | -0,035 | 0,030 | -0,010 | 0,033 | 0,059 | -0,062 | 0,087 |
| 20-34 h: unconstrained | -0,023 | -0,014 | -0,054** | -0,040 | -0,061 | -0,092 | -0,006 | 0,005 | -0,021 | -0,040 | -0,042 | -0,059 |
| 20-34 h: overemployed | -0,102*** | -0,091 | -0,139*** | -0,161* | -0,030 | -0,263*** | -0,081*** | -0,053 | -0,101*** | -0,225*** | -0,130 | -0,266*** |
| 35-40 h: underemployed | 0,014 | 0,053 | -0,088 | -0,047 | 0,058 | -0,342** | 0,007 | 0,005 | 0,012 | -0,006 | -0,026 | 0,015 |
| 35-40 h: overemployed | -0,103*** | -0,068*** | -0,147*** | -0,180*** | -0,112** | -0,157*** | -0,042*** | -0,022** | -0,067*** | -0,146*** | -0,098** | -0,195*** |
| 41-49 h: underemployed | 0,025 | 0,008 | 0,294 | 0,095 | 0,104 | 0,245 | -0,009 | -0,028 | 0,136 | 0,100 | 0,003 | 0,731 |
| 41-49 h: unconstrained | -0,012 | 0,025 | -0,104* | 0,044 | 0,158* | -0,237 | 0,012 | 0,017 | 0,013 | 0,088 | 0,111 | 0,068 |
| 41-49 h: overemployed | -0,057* | -0,025 | -0,102* | -0,106 | -0,054 | -0,158 | -0,024 | -0,005 | -0,054* | -0,094 | -0,061 | -0,115 |
| 50+ h: underemployed | 0,177 | 0,132 | 1,348* | 0,229 | 0,154 | --- | 0,170** | 0,178** | 0,010 | 0,526 | 0,491 | --- |
| 50+ h: unconstrained | -0,053 | -0,055 | 0,051 | -0,137 | -0,173 | 0,083 | 0,022 | 0,039* | -0,044 | 0,009 | 0,052 | -0,131 |
| 50+ h: overemployed | -0,082** | -0,051 | -0,137* | -0,187* | -0,077 | -0,301 | -0,034* | -0,017 | -0,067* | -0,121 | -0,028 | -0,320* |
| Constant | 7,964* | 18,712*** | -12,894 | | | | 5,646*** | 5,915*** | 5,462*** | | | |
| Number of observations | 68.425 | 32.654 | 35.771 | 187.879 | 86.305 | 101.570 | 99.589 | 47.653 | 51.936 | 105.670 | 48.967 | 56.701 |
| log L | | | | -35.603 | -16.030 | -27.509 | | | | -37.909 | -17.382 | -20.447 |
| F | 11,115 | 7,195 | 5,939 | | | | 27,779 | 15,806 | 13,558 | | | |
| R2 | 0,022 | 0,030 | 0,022 | | | | 0,037 | 0,044 | 0,035 | | | |

note: *** p<0.01, ** p<0.05, * p<0.1

The dependent variables are health satisfaction and self-assessed health, respectively.
Model also includes socioeconomic control variables for age, tenure, marital status, number of children, net wages, household income, being disabled, unpaid overtime, wave dummies, and dummies for 2-digit occupational codes.

--- Categories are omitted due to a small number of observations in these cells.

on this variable are available only from 1996 to 2000 and from 2002 to 2007. Self-assessed health is collected on a 5-point scale, ranging from bad (1) to very good (5), and available in all waves except 1999. The results of the fixed-effects models (see table 4) indicate that, compared to the reference category, overemployment in the 35−40 hours workload category has a significant and negative effect on both health satisfaction and self-assessed health. In this workload category, these negative effects of overemployment are consistent for both the full sample and the male and female subsamples. For the remaining workload categories, health satisfaction is only affected by overemployment when workers in the full sample and the female sample work 20 hours per week or more. Women's self-assessed health is significantly negatively affected by overemployment if they work 20 hours per week or more. We also find significantly negative effects of overemployment on self-assessed health for the full sample in the 20−34 hours and 50+ hours per week workload categories. The main results of the fixed-effects models are confirmed by the fixed-effects ordered logit models. That is, with respect to both health measures we find significant negative effects of overemployment in the workload categories 35 to 40 hours per week (full sample, male and female sample) and in the categories 20 to 35 hours (full sample, female sample). However, if work hours exceed 40 hours per week, the negative effects of overemployment are only supported in the workload category of 50 hours and more.

## 5 Concluding Comments

This study provides additional evidence of a relationship between work time and health. However, in contrast to the wide body of literature on the health effects of work time, we focus on the health effects of the mismatch between desired and actual work time. Thus, following Spurgeon et al. (1997, p. 370), we argue that the effects of work time on health depend on whether individuals opt for long work hours voluntarily or whether the combination of work intensity and hours prevailing in their job does not meet their preferences. Because work time preferences differ substantially among individuals (especially among women), the associated health implications may be related to the extent to which such preferences are met. Overall, our results provide evidence that overemployment (actual hours exceeding desired hours) has a significantly negative effect on workers' health. This is true even when the actual weekly hours are relatively short. Moreover, although the possibility of reverse causation cannot be fully eliminated, we would argue that the information advantage that workers have over their own health characteristics compared to the characteristics of their job makes it more likely that the effects we observe are driven by the impact of mismatches between actual and desired hours on health rather than vice-versa.

In contrast to the majority of studies that analyze the relationship between work time and health, our study has the advantage of using nationally representative data that cover almost the entire workforce and contain a rich set of controls and several different measures of perceived health. The existence of a panel also allows us to control for potentially omitted unobservable personal traits, such as psychic constitution or early childhood experiences.

The results of our study indicate that labour market and work time policies meant to address health consequences should not only take into account the absolute length of the work week but also the mismatches between actual and preferred work time. Since a good health state is essential for human manpower, understanding work hours constraints is particularly crucial for employers. These restrictions not only affect workers' health but also serve as a measure of job and life satisfaction. Thus, employer efforts to reduce mismatches between actual and desired work hours could reduce absenteeism due to health problems and improve job performance by means of increased employee motivation and productivity.

Successful strategies for maintaining and improving workers´ health are especially important in the context of demographic change and ageing societies. Germany, for example, faced with massive ageing of the workforce, has increased the statutory retirement age from 65 to 67 to attenuate its shrinking labour force and the resulting shortage of skilled labour. A fortiori, therefore, it is crucial to establish new and enhance existing work time policies in order to assure workers' physical and mental health until old age. To do so successfully, policy-makers must take into account this potential mismatch between actual and desired work hours.

## Appendix

**Table A: Overview of dependent variables**

| Variable | Data source | Question format | Coding scheme |
|---|---|---|---|
| **Health satisfaction** | **GSOEP** | How satisfied are you with… your health? | **11-point scale**, [totally unhappy (0) to totally happy (10)] |
| | **BHPS** | How dissatisfied or satisfied are you with...your health? | **7-point scale** [not satisfied at all (1) to completely satisfied (7)] |
| **Self-assessed health**[1] | **GSOEP** | How would you describe your current health? | **5-point scale** [bad (1) to very good (5)] |
| | **BHPS** | Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been ... | **5-point scale** [very poor (1) to excellent (5)] |

[1] Variables are recoded

**Table B: Summary statistics**

**GSOEP**

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| Health satisfaction | 7,05 | 1,97 | 0 | 10 |
| Self-assessed health | 3,60 | 0,84 | 1 | 5 |
| Age | 39,99 | 11,47 | 16 | 65 |
| Age2 | 1730,98 | 926,56 | 256 | 4225 |
| Tenure | 10,16 | 9,70 | 0 | 58 |
| Married | 0,62 | 0,49 | 0 | 1 |
| Number of children | 0,69 | 0,95 | 0 | 10 |
| Grade of disability | 2,55 | 11,73 | 0 | 100 |
| Net wage | 8,54 | 5,29 | 0,04 | 361,63 |
| ln (household income) | 7,88 | 0,48 | 3,83 | 11,53 |
| Unpaid overtime | 0,13 | 0,34 | 0 | 1 |

**BHPS**

| | | | | |
|---|---|---|---|---|
| Health satisfaction | 5,19 | 1,39 | 1 | 7 |
| Self-assessed health | 3,99 | 0,83 | 1 | 5 |
| Age | 37,44 | 12,19 | 16 | 65 |
| Age2 | 1550,09 | 949,03 | 256 | 4225 |
| Tenure | 4,30 | 5,84 | 0 | 51 |
| Married | 0,54 | 0,50 | 0 | 1 |
| Number of children | 0,68 | 0,96 | 0 | 8 |
| Disabled | 0,02 | 0,12 | 0 | 1 |
| Net wage | 6,71 | 4,37 | 0,00 | 332,56 |
| ln (household income) | 7,85 | 0,57 | 4,10 | 11,20 |
| Unpaid overtime | 0,20 | 0,40 | 0 | 1 |

Note: Number of observations is based on the regression samples
Data are pooled over all waves included in the regression analysis

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