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**Underemployment, overemployment and deterioration of mental health: the role of job
rewards**

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Running head: Underemployment, overemployment and deterioration of mental health

**Underemployment, overemployment and deterioration of mental health: the role of job
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Abstract

Objectives Working more (overemployment) or less (underemployment) than preferred has been associated with poor mental health in cross-sectional studies, but longitudinal evidence is scarce. We investigate whether under- and overemployment is associated with two-year changes of mental health and whether associations vary by job rewards (i.e. high earnings, job security, promotion prospects and occupational prestige).

Methods We used two waves of the German Socio-Economic Panel (GSOEP), with information on mental health collected in 2006 and 2008. Workers in paid employment (3,266 men and 3,139 women) who did not change jobs between 2006 and 2008, aged 20-60 years were selected. Under- and overemployment was assessed using the discrepancy between the actual and preferred working hours. Mental health was assessed using the Mental Component Summary (MCS) score, a subscale from the Short Form 12 Health Survey. Questions on rewards at work were added and divided into tertiles. Conditional change models were estimated to predict change in MCS.

Results Findings indicate that overemployment and low reward at work (for men and women) were linked to a reduction in mental health. Underemployment was not related to a reduction in mental health. Albeit associations between under-/overemployment and mental health slightly differed across levels of reward, interactions did not reach statistical significance.

Conclusions Our findings demonstrate that overemployment was related to negative mental health change, and that this relationship held true both for people with high and with low reward at work.

Key terms: Underemployment, Overemployment, Job Rewards, Mental health, Socio-Economic Panel, Conditional Change Models

Introduction

Research on the health effects of working hours mostly concentrates on the effects of weekly hours that deviate from the industrial norm (35-40h per week). Specifically, studies either investigate part-time employment (Nylén et al. 2001; Bartoll et al. 2014) or long working hours (Virtanen et al. 2011; Artazcoz et al. 2013) and their links to different health outcomes. A more recent approach, though, uses the concept of ‘volition’ and compares the discrepancy between actual and preferred working hours (Maynard and Feldman 2011; Otterbach et al. 2016), instead of the number of working hours as such. From this perspective, a person can be underemployed (working less than preferred), overemployed (working more than preferred) or correctly matched (Pagan 2016). Data from the 6th wave of the European Working Conditions Survey show that, according to this definition, 14% of all workers in Europe are underemployed and 30% overemployed (Eurofound 2016).

Under- and overemployment can be considered psychosocial work stressors. Psychosocial work stressors are work characteristics that might cause chronic or repeated stress when there is no available response for the worker to cope with them (Mc Ewen 1998). In particular, under- and overemployment can hinder workers’ sense of control over the number of hours worked (Lyness et al. 2012). Cross-sectional studies have confirmed the link of under- and overemployment with poor mental health and poor mental well-being (Friedland and Price 2003; De Moortel et al. 2017), but longitudinal evidence is still rare (Angrave and Charlwood 2015; Otterbach et al. 2016). Because of the lack of previous longitudinal studies, the first aim of our study is to investigate whether both under- and overemployment are related to changes of mental health in a two year observation period.

Yet, any particular job can be conceived as a set of many different work characteristics and therefore, each worker is exposed differently to stressors. Some workers are able to deal better with stressors and this can counteract the negative effect on mental health and may ultimately activate individuals, resulting in learning or motivation (Bosmans et al. 2015). According to the Effort-Reward Imbalance (ERI) model, effort at work leads only to poor mental health if appropriate gratifications or ‘rewards’, like money, esteem or appraisal and status control, are absent (Siegrist 1996).

If under- and overemployed workers are able to cope with their situation, through the availability of job rewards, we expect the association of under- and overemployment with poor mental health to be weaker. Therefore, our second aim is to investigate the moderating effect

of job rewards on the change in mental health of under- and overemployed workers. Job rewards can, just like under- and overemployment, be conceived as employment conditions and relations (i.e. implicit and explicit conventions between the employer and the employee about the working conditions) (Eurofound 2013). We expect that poor conventions about working hours might be counteracted by better agreements about the other employment conditions and relations. Thus, the availability of job rewards (in the form of high earnings, job security, promotion prospects and occupational prestige) can act as buffers for the negative effects of under- and overemployment on mental health.

Methods

Study population

We used the German Socio-Economic Panel (GSOEP), a yearly repeated panel study among households in Germany that started in 1984 (Wagner et al. 2007). GSOEP is a representative longitudinal study of more than 20,000 respondents from nearly 11,000 households. From wave 19 (2002) onwards, a battery of questions on health was added biannually to the core questionnaire. We used information for the period 2006-2008, because in wave 23 (2006) a complementary battery of questions on job rewards was added to the core questionnaire. Then, the change in mental health was assessed during a two-year follow-up period. So, a baseline measurement, i.e. mental health in wave 23 (2006), is linked to a follow-up score two years later, i.e. in wave 25 (2008). Job change in waves 24 (2007) and 25 (2008) was used as an exclusion criterion, because job change could be used to solve under- or overemployment and may thus be associated with better mental health in the long term. The samples were restricted to 20-60 year olds. We also excluded those in (partial) retirement, in-service training, military service, voluntary service, and the self-employed – as their employment relations are different from those in standard salaried employment. Respondents working full-time, part-time and those who were marginally employed (mini-jobs) were included. This resulted in a sample with 4,432 men and 4,338 women. All variables but the dependent variable, are derived from wave 23.

Measurements

Mental health

Mental health was assessed using the Mental Component Summary (MCS), a subscale from the Short Form 12 Health Survey, Version 2. The MCS has four subscales: vitality, role limitation

due to emotional problems, social functioning and general mental health (Andersen et al. 2007). The sum-score ranges from 0 to 100 (100 representing the highest level of health) with a mean of 50 and a standard deviation of 10, using the German population in 2004 as a reference (Andersen et al. 2007).

Under- and overemployment

Employees reported how many hours they normally work in a week (overtime included) and how many hours they would choose to work in a week, bearing in mind that earnings would increase or decrease depending on the chosen number of working hours. We created a three-category variable: (1) ‘matched’: desired = actual hours; (2) ‘underemployed’: desired > actual hours and (3) ‘overemployed’: desired < actual hours (Pagan 2016).

Previous studies have shown that more than 60% of the German work force are overemployed (Wunder and Heineck 2013; Pagan 2016). Therefore, one can question whether there are a lot of false-positive cases in the overemployment-category. As a consequence, sensitivity analyses were conducted with two alternative definitions of overemployment. First, we distinguished those overemployed (i.e. desired < actual hours) with and without overtime work (defined as working more than the number of hours included in the work contract). It can be argued that workers with overtime work will benefit more from job rewards, as these job rewards counteract the imbalanced reciprocity between the employee and the employer caused by the disregard of the work hours described in the work contract. This variable distinguished between four categories: (1) ‘matched’; (2) ‘underemployed’; (3) ‘overemployed: overtime’; and (4) ‘overemployed: no overtime’. Second, only those workers with more than or equal to 4 hours deviation between desired and actual working hours are defined as being under- or overemployed (Bell et al. 2011).

Job rewards

A short version of the ERI questionnaire was included in the GSOEP wave 23 (Siegrist, 1996). The internal consistency of the scales was validated in a previous study using GSOEP-data (Siegrist, Wege, Pühlhofer, & Wahrendorf, 2009). The short version included seven items for rewards, including salary, esteem, job security and career opportunities: (1) I receive the respect I deserve from my superior or a respective relevant person; (2) My job promotion prospects are poor; (3) I have experienced or I expect to experience an undesirable change in my work situation; (4) My job security is poor; (5) Considering my efforts and achievements, I receive

the respect and prestige I deserve at work; (6) Considering all my efforts and achievements, my job promotion prospects are adequate; and (7) Considering all my efforts and achievements, my salary/income is adequate. This was asked in a two-stage procedure. First, for each item, respondents indicated whether they were confronted with it (yes or no). If so, they also indicated to what extent this bothered them (not at all, somewhat, heavily and very heavily). Seven dummies were created (one for each item): 0= those responding no or yes, but not at all bothered and 1= those confronted with the item and somewhat, heavily and very heavily bothered by the respective item. We created a sum scale (range 0 to 7) of all items and divided the sample in three equal parts using tertiles (low, medium and high job rewards).

Additional variables

We included five sociodemographic variables (partnership status, number of young children, income, education and age groups), the total number of weekly working hours and physical health in our models as control variables. Younger and older age, lower income, lower education, lower overall health status and not living with a partner are risk factors for mental health problems (Silva et al. 2016). Parenthood has also been associated with behaviors that are not beneficial to health (Umberson and Montez 2010). The number of working hours is a predictor of being over- or underemployed (Reynolds and Aletraris 2006). The presence of a steady partner was measured using a dummy variable with value 1 if respondents live with a partner (irrespective of the marital status) and 0 if not. The number of children in the household aged 14 or younger was grouped into ‘none’, ‘one’ and ‘more than one’. A variable for household income was constructed using tertiles (low, medium, high). Household income was based on the monthly household income, that was adjusted for household size in accordance with the OECD equivalence-scale (Hagenaars et al. 1994). The variable for educational level distinguished ‘no vocational training’, ‘vocational training’ and ‘higher education’. Age was grouped into four categories ‘job starters’ (20-29), ‘early midlife’ (30-39), ‘late midlife’ (40-49) and ‘older working life’ (50-60). The number of working hours was measured using the actual number of working hours per week (overtime included). Physical health was assessed using the question: ‘Does your health limit you in doing demanding everyday activities, such as heavy lifting’. Answer categories were: ‘greatly’, ‘somewhat’ and ‘not at all’.

Data analysis

Because of the on average lower working hours of women, all analyses were done for men and women separately. First, descriptive analyses were performed. We presented percentages,

means and standard deviations of all included variables. Then, we showed the mean MCS scores of 2006 and 2008 across the main independent variables. The significance of the differences between the means across years was tested using a paired t-test. Differences between means across under-/overemployment and level of job rewards were compared using one-way ANOVA. Throughout the descriptive analyses, data were weighted to correct for chances of unequal selection probability.

Afterwards, conditional change models (Aickin 2009) were estimated using Ordinary Least Squares (OLS) regressions with the change in MCS score after two years as dependent variable. These models allowed to examine whether change over time in mental health was related to under- and overemployment in 2006. The first model included the baseline MCS score of 2006. In Model 2 all confounders were added. This model was extended by the categorical variable on under- and overemployment in 2006 (model 3). Afterwards, model 3 was extended by job rewards (model 4). To formally test if reward modified the effect of under- and overemployment on mental health change, we included interaction terms between under-/overemployment and each level of reward in model 5. By comparing models without and with interactions on the basis of a likelihood-ratio (LR) test, we tested for significant interactions. At all steps, parameter effects of the covariates in relation with change in mental health were presented as unstandardized regression coefficients (B), with their related confidence intervals (CI). We applied complete case analyses, reducing the final sample to 3,266 men and 3,139 women. All calculations were done using Stata v14.2.

Results

The average MCS scores were slightly higher for men than for women, but comparable over the two-time points. Overemployed workers more often were men, while underemployed workers more often were women. Most respondents belonged to the age group of 40-49 year olds, had a partner and had vocational training. More women, than men reported to have no children (See Table 1).

[TABLE 1 HERE]

In Table 2, the mean MCS scores of 2006 and 2008 are shown. Under- and overemployed workers differed with respect to MCS scores, with significantly worse mean scores for under-

and overemployed workers compared with correctly matched workers. Underemployed workers reported significantly higher mean scores than overemployed workers. No significant changes in mean scores between 2006 and 2008 were found, except for overemployed women. For overemployed women, the mean scores increased significantly, indicating better mental health in 2008 than in 2006. Workers with low job rewards had significantly lower mean scores in mental health compared with workers with higher job rewards. Significant changes in mean scores were found for male workers with high job rewards and for female workers with low rewards. For female workers with low job rewards, the mean scores increased significantly, indicating better mental health in 2008, compared with 2006. For male workers with high job rewards the mean scores were lower in 2008 than in 2006. In all categories, the mean MCS scores for women were lower, compared to those of men.

[TABLE 2 HERE]

Table 3 presents results of our regression models for men and women. Models 1 show that, for men and women, an increase of 1 point in baseline MCS score resulted in a significant decrease in mental health change ($B=-0.52$; CI: $-0.55 - -0.49$ and $B=-0.53$; CI: $-0.56 - -0.50$, respectively). When additionally controlling for all confounders (Models 2), the explained variance of the models rose with 1.6 and 1.7 percentage points for men and women respectively. Models 3 show that overemployment (for men and women) was significantly related to a negative change in mental health, compared with workers who's actual and preferred hours match. Underemployment was not related to a negative change in mental health. Adding under- and overemployment to the models does not increase the explained variance of the models. When job rewards are added in models 4, for men and women, the significant negative association between overemployment and mental health change remained. From models 4 it is clear that, for both men and women, medium and high rewards were significantly related to a positive change in mental health, compared to low rewards. Adding job rewards very slightly increased the explained variance, compared to models 3. The interaction models (Models 5) show that there were no significant interactions between job rewards and under- and overemployment. For men, due to the added interaction, the significant negative association between overemployment and mental health disappeared. For women, due to the added interaction, the significant negative association between job rewards and mental health disappeared.

[TABLE 3 HERE]

Sensitivity analysis

The first alternative definition of overemployment distinguished those overemployed who worked more than agreed in their contracts (doing overtime), and those reporting to be overemployed, but did not work more hours than agreed upon in their contract (no overtime). Most overemployed workers worked more hours than agreed upon in their contract (see Appendix Table S1). These workers had significantly lower mean MCS scores, compared to overemployed workers without overtime (except for women in 2008). In Models 3 (Appendix Table S2), we see that, overemployment when doing overtime (for men and women) and overemployment without doing overtime (for men) led to a decrease in mental health. Secondly, we defined under- and overemployment as a deviation of four hours or more between the actual and the preferred working hours. Using this stricter definition, the group of under- and overemployed workers decreased considerably: nearly half of the workers now belong to the correctly matched group (see Appendix Table S1). Moreover, no statistically significant effects of under- and overemployment on mental health were found (See Appendix Table S3). Similar to the previous interaction models, the interaction models using the alternative definitions showed no significant effects.

Discussion

This study has produced three main findings, for both men and women: (1) Being overemployed was related to a reduction in mental health after two years. (2) Underemployment was not related to a reduction in mental health after two years. (3) Higher job rewards did not protect the mental health of under- and overemployed workers.

In line with previous, mostly cross-sectional research (Friedland and Price 2003; De Moortel et al. 2017), we found that overemployment is related with a reduction in mental health after two years. Underemployment was not related to a reduction in mental health after two years. However, when fitting models 3 without all confounders, there was a significant negative relation between underemployment and change in mental health (results not shown). Using stepwise inclusion of the control variables, showed that when controlling the model for household income, the effect of underemployment disappears (results not shown). This is in

line with previous research indicating that underemployed workers are overexposed to a lack of (financial) stability and low-skilled routine jobs (Stier and Lewin-Epstein 2003).

The second aim of this study was to investigate whether the mental health of under- and overemployed workers is protected by the availability of job rewards. We hypothesized that poor conventions about working hours might be counteracted with better agreements about the other employment conditions and relations (in the form of high job rewards). The overall interaction effects were not significant; thus, we could not confirm our second hypothesis. For women, the positive relation between job rewards and change in mental health disappeared when adding the interaction terms. This suggests that correct hours are more important for women, than job rewards. The lower importance of job rewards for female workers' mental health can be related to their lower average working hours. It can be assumed that the lower exposure time of these women leads to less strong effects of rewards on their mental health. However, difficulties in combining household and paid work responsibilities might also offer part of the explanation (Artazcoz et al. 2001). For men, in contrast, the negative relation between overemployment and change in mental health disappeared when adding the interaction terms. This could indicate a higher importance of job rewards for men, compared to correctly matched working hours.

The sensitivity analysis did not lead to different results concerning the second aim of our study. Moreover, irrespective of doing overwork, a negative relation between overemployment and change in mental health was found. In contrast, overemployment defined as more than or equal to 4 hours deviation between actual and preferred working hours was not related to mental health changes. This might indicate that small deviations between actual and preferred hours do matter. However, the group of under- and overemployed workers decreased considerably using this alternative definition, therefore the non-significant relations could also be due to a lack of statistical power.

This study has several limitations. The reference group (correctly matched workers) are a rather small group, which might explain the low statistical power of our models. To discover strong health effects of under- and overemployment, the delay between the two measurement points might also be too long. A recent study showed that the mental health penalty of under- and overemployment on mental well-being became manifest after a relatively short time (Angrave and Charlwood 2015). That study also showed the subjective well-being of the under- and overemployed quickly returning to pre-mismatch levels when mismatch came to an end

(Angrave and Charlwood 2015). Only overemployment during more than two years had a longer-lasting negative effect (Angrave and Charlwood 2015). Unfortunately, as mental health status was only asked every two years we were unable to reduce the time lag. Although, information on job rewards was also available in GSOEP wave 28 (2011), we did not reproduce our results using this wave and wave 29 (2012), because wave 28 did not contain information on (baseline) mental health. Another limitation of this study is that our sample only included workers that stayed in the same job for two years. Yet, this does not mean that the level or presence of under- and overemployment remained stable during this period. The exclusion of respondents who changed jobs during the observational period might have (disproportionally) selected workers less likely to change job (such as those with no work hours mismatch). This could lead to an underestimation of the mental health effects of under- and overemployment. However, comparing the models with and without the exclusion of those who changed jobs did not lead to different conclusions.

Despite its limitations, this study has some clear strengths as well. The use of conditional change models is a first strength. Under- and overemployed workers have lower mental health at baseline, compared to workers whose actual and preferred hours match. The conditional change model is seen as an attempt to remove baseline differences between different groups of workers (Aickin 2009). The use of the GSOEP is also a clear strength. The GSOEP provides a large longitudinal dataset representative of the German population.

In sum, this study is one of the first to shed light on the underlying mechanisms explaining the relation between under-/overemployment and mental health. The findings demonstrate that overemployment was related to a negative mental health change after two years, and that this relationship held true both for people receiving high and low reward at work. However, more research is needed to confirm our results in other countries.

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Compliance with Ethical Standards

Conflict of interest. The authors declare that they have no conflict of interest.

Ethical approval. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Tables

Table 1. Description (in %) of the population studied (Population in salaried employment, 20-60 years old, 3,108 men and 2,999 women, weighted, GSOEP wave 23-25).

	Men		Women	
	N	%	N	%
Baseline MCS 2006^a	3,108	51.1 (9.0)	2,999	49.0 (9.9)
Follow-up MCS 2008^a	3,108	51.0 (8.6)	2,999	49.3 (9.5)
Actual Working time (in hours)	3,108	43.0 (8.3)	2,999	32.4 (12.4)
Under- and overemployment				
Correctly matched	771	24.8	723	24.1
Underemployed	399	12.8	734	24.5
Overemployed	1,938	62.4	1,542	51.4
Job rewards				
Low	1,173	37.7	1,104	36.8
Medium	1,095	35.2	1,036	34.6
High	840	27.0	859	28.7
Age group				
< 30	371	11.9	420	14.0
30-39	744	24.0	763	25.5
40-49	1,142	36.7	1,058	35.3
50-60	851	27.4	758	25.3
Education				
No vocational	333	10.7	324	10.8
Vocational	2,127	68.4	2,094	69.8
Higher education	648	20.8	581	19.4
Partner (yes)	2,538	81.7	2,408	80.3
Presence of young children				
0	2,104	67.7	2,133	71.1
1	527	17.0	526	17.5
>1	477	15.4	340	11.3
Monthly household income (euro's)^a	3,108	1,698.1 (743.5)	2,999	1,701.9 (1,062.9)

^a Mean + standard deviation in parentheses

Table 2. Mean MCS scores in 2006 and 2008 by under- and overemployment and by level of job rewards (MCS scores range from 0–100, higher scores reflect better mental health, population in salaried employment, 20-60 years old, 3,108 men and 2,999 women, weighted, GSOEP wave 23-25).

		Men		Sig.^a	Women		Sig.^a
		MCS	MCS		MCS	MCS	
		2006	2008		2006	2008	
Under- and overemployment	Sig.^b	***	***		***	***	
Correctly matched		52.6	52.6		50.3	50.5	
Underemployed		51.0	50.8		49.6	49.4	
Overemployed		50.5	50.4		48.1	48.7	*
Job rewards	Sig.^c	***	***		***	***	
Low		48.4	48.8		46.0	47.3	***
Medium		51.5	51.4		49.8	49.6	
High		54.3	53.6	**	51.9	51.5	

^a Comparison of means 2006 versus 2008 in a paired t-test.

^b Comparison of means across under- and overemployment in one-way ANOVA.

^c Comparison of means across level of job rewards in one-way ANOVA.

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

Table 3. Conditional change models for change in MCS score (t_2-t_1) (population in salaried employment, 20-60 years old, 3,159 men and 3,038 women, GSOEP wave 23-25).*

	Men					Women															
	Model 1 ^a		Model 2 ^b		Model 3 ^c		Model 4 ^d		Model 5 ^e		Model 1 ^a		Model 2 ^b		Model 3 ^c		Model 4 ^d		Model 5 ^e		
	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	
Baseline MCS	-0.52	[-0.55,-0.49]	-0.54	[-0.57,-0.51]	-0.55	[-0.58,-0.52]	-0.57	[-0.60,-0.54]	-0.57	[-0.60,-0.54]	-0.53	[-0.56,-0.50]	-0.55	[-0.58,-0.51]	-0.55	[-0.58,-0.52]	-0.56	[-0.60,-0.53]	-0.56	[-0.60,-0.53]	
Under- and overemployment																					
<i>Matched (ref.)</i>																					
Underemployed					-0.87	[-1.76,0.03]	-0.77	[-1.66,0.12]	-0.46	[-1.89,0.98]					-0.59	[-1.45,0.26]	-0.39	[-1.25,0.47]	-0.61	[-2.13,0.90]	
Overemployed					-1.12	[-1.76,-0.48]	-1.06	[-1.70,-0.43]	-0.51	[-1.56,0.55]					-0.94	[-1.69,-0.18]	-0.86	[-1.62,-0.11]	-1.42	[-2.73,-0.11]	
Job rewards																					
<i>Low rewards (ref.)</i>																					
Medium rewards							0.98	[0.38,1.59]	1.55	[0.30,2.81]							1.02	[0.32,1.72]	0.44	[-1.04,1.92]	
High rewards							1.79	[1.12,2.46]	2.40	[1.15,3.66]							1.65	[0.88,2.41]	1.18	[-0.30,2.66]	
Interactions																					
Underemployed*medium rewards										-0.41	[-2.53,1.71]									0.61	[-1.43,2.65]
Underemployed*high rewards										-0.48	[-2.62,1.67]									-0.16	[-2.24,1.92]
Overemployed*medium rewards										-0.79	[-2.24,0.66]									0.77	[-0.97,2.51]
Overemployed*high rewards										-0.89	[-2.35,0.58]									0.93	[-0.84,2.71]
R-squared	0.286		0.302		0.305		0.311		0.311			0.288		0.305		0.306		0.311		0.311	
LR-test comparing Model 4 and Model 5									0.778											0.673	

^abaseline MCS score; ^bModel 1 + age groups, income, education, work hours, partner, children, physical health; ^cModel 2 + under- and overemployment; ^dModel 3 + job reward; ^eModel 4 + interactions

* unstandardized coefficients in bold are significant at $p \leq 0.05$.

Appendix

Table S1. Mean MCS scores in 2006 and 2008 by under- and overemployment measured using overtime and using 4 hours deviation (MCS scores range from 0–100, higher scores reflect better mental health, population in salaried employment, 20-60 years old, weighted, GSOEP wave 23-25).

	N	Men		Sig. ^a	N	Women		Sig. ^a
		MCS 2006	MCS 2008			MCS 2006	MCS 2008	
Under- and overemployment (with overtime)								
		***	***			***	***	
Correctly matched	752	52.6	52.6		762	50.3	50.5	
Underemployed	375	51.0	50.8		693	49.6	49.4	
Overemployed: overtime	1,420	50.3	50.3		1,022	47.9	48.8	**
Overemployed: no overtime	511	50.7	50.8		488	48.6	48.5	
Under- and overemployment (4 hours deviation)								
		***	*			***	*	
Correctly matched	1,413	52.1	51.7		1,338	49.5	49.8	
Underemployed	212	50.3	49.8		536	49.7	49.2	
Overemployed	1,500	50.2	50.5		1,153	48.0	48.8	**

^a Comparison of means 2006 versus 2008 in a paired t-test.

^b Comparison of means across under- and overemployment in one-way ANOVA.

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

Table S2. Conditional change models for change in MCS score (t_2-t_1) by under- and overemployment with and without overtime (population in salaried employment, 20-60 years old, 3,108 men and 3,004 women, GSOEP wave 23-25).*

	Men					Women																				
	Model 1 ^a		Model 2 ^b		Model 3 ^c		Model 4 ^d		Model 5 ^e																	
	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.																
Baseline MCS	-0.52	[-0.55,-0.49]	-0.55	[-0.57,-0.52]	-0.55	[-0.58,-0.52]	-0.57	[-0.60,-0.54]	-0.57	[-0.60,-0.54]	-0.53	[-0.56,-0.50]	-0.54	[-0.57,-0.51]	-0.55	[-0.58,-0.52]	-0.56	[-0.59,-0.53]	-0.56	[-0.59,-0.53]						
Under- and overemployment																										
<i>Matched (ref.)</i>																										
Underemployed					-0.86	[-1.77,0.02]	-0.78	[-1.67,0.12]	-0.46	[-1.90,0.98]					-0.59	[-1.44,0.27]	-0.39	[-1.25,0.48]	-0.62	[-2.14,0.90]						
Overemployed: overtime					-1.05	[-1.73,-0.36]	-0.97	[-1.65,-0.28]	-0.39	[-1.50,-0.72]					-1.10	[-1.93,-0.27]	-0.98	[-1.81,-0.15]	-1.86	[-3.23,-0.49]						
Overemployed: no overtime					-1.23	[-2.04,-0.41]	-1.20	[-2.01,-0.39]	-0.70	[-2.07,0.68]					-0.87	[-1.81,0.07]	-0.87	[-1.81,0.06]	-0.51	[-2.19,1.17]						
Job rewards																										
<i>Low rewards (ref.)</i>																										
Medium rewards							1.00	[0.39,1.61]	1.56	[0.30,2.82]							1.05	[0.35,1.75]	0.44	[-1.04,1.92]						
High rewards							1.78	[1.11,2.46]	2.41	[1.15,3.67]							1.63	[0.85,2.40]	1.18	[-0.30,2.66]						
Interactions																										
Underemployed*medium rewards																				0.60	[-1.43,2.64]					
Underemployed*high rewards																					-0.16	[-2.24,1.91]				
Overtime*medium rewards																						1.43	[-0.42,3.27]			
Overtime*high rewards																							1.53	[-0.42,3.49]		
No overtime*medium rewards																								-0.68	[-2.96,1.59]	
No overtime*high rewards																									-0.47	[-2.74,1.80]
R-squared	0.288		0.304		0.307		0.313		0.313		0.288		0.305		0.307		0.311		0.313							
LR-test comparing Model 4 and Model 5									0.929											0.305						

^abaseline MCS score; ^bModel 1 + age groups, income, education, work hours, partner, children, physical health; ^cModel 2 + under- and overemployment; ^dModel 3 + job reward; ^eModel 4 + interactions

*unstandardized coefficients in bold are significant at $p \leq 0.05$.

Table S3. Conditional change models for change in MCS score (t_2-t_1) by under- and overemployment with ≥ 4 hours deviation between actual and preferred working hours (population in salaried employment, 20-60 years old, 3,176 men and 3,066 women, GSOEP wave 23-25).*

	Men					Women																
	Model 1 ^a		Model 2 ^b		Model 3 ^c		Model 4 ^d		Model 5 ^e													
	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.	B	95% C.I.												
Baseline MCS	-0.52	[-0.55,-0.49]	-0.54	[-0.57,-0.51]	-0.54	[-0.57,-0.51]	-0.57	[-0.60,-0.54]	-0.56	[-0.59,-0.53]	-0.53	[-0.56,-0.50]	-0.55	[-0.58,-0.51]	-0.55	[-0.58,-0.52]	-0.57	[-0.60,-0.53]	-0.57	[-0.60,-0.53]		
Under- and overemployment																						
<i>Matched (ref.)</i>																						
Underemployed					-0.71	[-1.75,0.34]	-0.62	[-1.67,0.42]	-0.15	[-1.75,1.45]					-0.30	[-1.16,0.56]	-0.10	[-0.96,0.76]	-0.38	[-1.77,1.02]		
Overemployed					-0.55	[-1.15,0.04]	-0.56	[-1.15,0.03]	-0.12	[-1.03,0.78]					-0.32	[-1.02,0.38]	-0.34	[-1.04,0.36]	-0.73	[-1.83,0.37]		
Job rewards																						
<i>Low rewards (ref.)</i>																						
Medium rewards							0.99	[0.39,1.60]	1.27	[0.37,2.16]							1.02	[0.33,1.72]	0.90	[-1.16,1.96]		
High rewards							1.82	[1.16,2.49]	2.31	[1.37,3.25]							1.73	[0.97,2.49]	1.18	[0.07,2.29]		
Interactions																						
Underemployed*medium rewards										-0.83	[-3.25,1.59]									0.57	[-1.35,2.49]	
Underemployed*high rewards										-0.68	[-3.20,1.84]									0.08	[-1.92,2.08]	
Overemployed*medium rewards										-0.45	[-1.68,0.78]									-0.02	[-1.53,1.48]	
Overemployed*high rewards										-0.96	[-2.25,0.33]										1.47	[-0.12,3.06]
R-squared	0.285		0.301		0.302		0.309		0.309			0.289		0.306		0.306		0.311		0.312		
LR-test comparing Model 4 and Model 5									0.665											0.233		

^abaseline MCS score; ^bModel 1 + age groups, income, education, work hours, partner, children, physical health; ^cModel 2 + under- and overemployment; ^dModel 3 + job reward; ^eModel 4 + interactions

*unstandardized coefficients in bold are significant at $p \leq 0.05$.