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Working hours mismatch and well-being: comparative evidence from Australian and German panel data

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Working hours mismatch and well-being: comparative evidence from Australian and German panel data

Abstract

This study uses subjective measures of well-being to analyze how workers perceive working hours mismatch. Our particular interest is in the question of whether workers perceive hours of underemployment differently from hours of overemployment. Previous evidence on this issue is ambiguous. We call attention to the level of well-being in the absence of hours mismatch that serves as a reference state for comparison purposes and to the consequences of restrictive functional form assumptions. Using panel data from Australia and Germany, this study estimates the relationship between working hours mismatch and well-being as a bivariate smooth function of desired hours and mismatch hours by tensor product p-splines. The results indicate that well-being is highest in the absence of hours mismatch. In general, the perception of overemployment is statistically significantly different from the perception of underemployment in both countries. In Australia, workers tolerate some underemployment, as their well-being tends to be unaltered in the presence of short hours of underemployment. However, the marginal loss from underemployment appears to be larger than that from overemployment once the mismatch exceeds approximately ten hours. In Germany, on the contrary, underemployment is clearly more detrimental for well-being than overemployment. German males with preferences for full-time hours hardly respond to overemployment.

Keywords: life satisfaction, job satisfaction, working hours mismatch, semi-parametric regression, bivariate smoothing

JEL Classification: I31, J21, J22

1 Introduction

Many workers all over the world want to adjust their hours of work but are not able to do so. They experience a working hours mismatch between actual and desired hours of work.¹ Only recently, researchers focused increased attention to the question of how workers subjectively perceive a situation in which they are not able to realize their desired hours of work. However, the findings of previous studies for different countries are inconclusive, as there is evidence for negative, insignificant, or positive relationships between well-being and hours mismatch (Friedland and Price 2003, Wooden et al. 2009, Başlevent and Kirmanoğlu 2013, Wunder and Heineck 2013). Even studies that agree on the sign of the correlation are still ambiguous as to whether overemployment or underemployment is more strongly related to well-being. On the one hand, different results for different countries may reflect true differences, for example, in institutional settings or attitudes. Such knowledge may help to shed light on the mechanisms through which hours mismatch impinges on well-being. On the other hand, however, different results may be an artifact of different modeling approaches. Furthermore, applying particular functional form assumptions, studies may be overly restrictive to depict the underlying relation.

This study examines the subjective perception of working hours mismatch using information about workers' subjective well-being (SWB). Our particular interest is in the question of whether workers perceive hours of underemployment differently from hours of overemployment. We argue that measurement of the perception of hours mismatch should be based on a precise definition of the level of well-being in the absence of hours mismatch that serves as

¹ A large body of empirical research reports working hours mismatch for many countries (e.g., Altonji and Paxson 1988, Dickens and Lundberg 1993, Stewart and Swaffield 1997, Euwals and Van Soest 1999, Bell and Freeman 2001). Otterbach (2010) provides evidence on mismatches between actual and desired hours of work in 21 countries, including France, Germany, the UK, Russia, and the US.

a reference state for comparison purposes. Previous studies use (implicitly defined) different reference states, which may be a further source of ambiguity in empirical findings.

This paper contributes to the literature by providing first comparative evidence from longitudinal data on the perception of mismatches for two countries within a unified analysis framework. We explicitly discuss the reference state for comparison, which determines the measurement of the well-being penalty of hours mismatch, and employ a semiparametric estimation approach that does not rely on functional form assumption about the relationship between well-being and hours mismatch. This approach avoids overly-restrictive functional form assumptions by modeling this relationship as a bivariate smooth function of desired hours and mismatch hours. Furthermore, using smooth functions allows us to measure the well-being penalty in greater detail than previous studies while the graphical representation of results is easy to interpret.

In this paper, we focus on a comparison between Australia and Germany—two countries for which rich longitudinal panel data sets, the Household, Income and Labour Dynamics in Australia (HILDA) Survey and the German Socio-Economic Panel (SOEP), gather information about actual and desired hours of work.² In general, the results indicate that well-being is highest in the absence of hours mismatch. We find some evidence for an asymmetrical perception of underemployment and overemployment among Australians. Their well-being is stable between the onset of underemployment and approximately five hours of underemployment. However, the well-being function tends to be steeper for underemployment than overemployment once the ten-mismatch hours threshold is exceeded, pointing to a larger marginal loss in well-being from underemployment than from overemployment in the region of many mismatch hours. In contrast, underemployment is clearly more detrimental for well-being than overemployment in

² Such detailed information is not available, for instance, in the British Household Panel Survey (BHPS), which only asks whether individuals want to work longer (or shorter) hours.

Germany over the entire distribution of mismatch hours. In particular, well-being declines immediately with the onset of underemployment. The finding that German males hardly respond to overemployment may explain the large share of approximately 60% of overemployed male workers in Germany. Since their expected utility gains from adjusting their working hours are rather small, they do not have strong incentives to leave overemployment.

2 Literature review

Labor market-related factors are among the most extensively investigated characteristics in the literature on SWB. Previous research has provided ample evidence on the role played by individual unemployment (e.g., Clark and Oswald 1994, Gerlach and Stephan 1996, Winkelmann and Winkelmann 1998), unemployment duration (Clark 2006), unemployment rates (Di Tella et al. 2003, Luechinger et al. 2010), and earnings (Clark et al. 2009, Wunder and Schwarze 2009, Card et al. 2012). Further evidence indicates that long working hours are correlated with a decline in SWB (Clark et al. 1996, Sousa-Poza and Sousa-Poza 2003, Fahr 2011) and health (e.g., Sparks et al. 1997, Amagasa and Nakayama 2012, Virtanen et al. 2012).

Recent research has started to focus attention on working hours mismatch. Table 1 provides an overview of the studies reviewed. In general, studies find worse health among mismatched workers than among those with working hours match. For instance, Friedland and Price (2003) report an increased number of chronic conditions among mismatched workers in the US. Using German and British panel data, Bell et al. (2011) find negative effects of working hours mismatch, in particular of overemployment, on health satisfaction and self-assessed health. For Great Britain, Constant and Otterbach (2011) detect negative consequences of working hours mismatch for mental health measures, with overemployment appearing to be a more severe problem than underemployment.

There is also a growing body of international literature on the relationship between working hours mismatch and job or life satisfaction. For the US, Friedland and Price (2003) reveal lower job satisfaction among overemployed workers whereas underemployed workers are, surprisingly, more satisfied than matched ones. Life satisfaction appears to be unaffected by mismatches. For the UK, results based on data from the British Household Panel Survey (BHPS) suggest that overemployment lowers job and life satisfaction by more than underemployment (Green and Tsitsianis 2005). In Japan, overemployment is associated with lower job satisfaction whereas underemployment is not significantly correlated with job satisfaction among females (Boyles and Shibata 2009). Using data from the European Social Survey, Başlevent and Kirmanoğlu (2013) show that the reduction in life satisfaction associated with working hours mismatch is smaller in countries with higher unemployment rates.

Using data from the first wave of the HILDA Survey in 2001, Wilkins (2007) finds a negative correlation of underemployment and life (job) satisfaction for part-time employees. In contrast, underemployment does generally not matter for SWB of full-time employees. However, underemployed male full-time employees are an exception, as they report lower life satisfaction than matched male full-time employees. Wooden et al. (2009) estimate individual fixed effects models of life and job satisfaction with HILDA data from 2001 to 2005.³ The study reveals that well-being in general varies only little with the actual hours of work per week, once working time mismatches are taken into account. Overemployed males suffer a well-being penalty of up to 0.4 points on the 11-point scale, on average. The penalty is even larger for overemployed females and overemployed workers who already work long hours (more than 41 hours per week). Underemployed part-time employees experience a considerable decline in job and life satis-

³ Their econometric model includes a set of indicator variables that represent categories of actual hours of work by working hours mismatch (i.e. for persons who want to work more than, less than or in accordance with their desired hours of work).

faction while underemployed males with standard or above standard hours do not report lower well-being than matched workers (with standard hours). Interestingly, underemployed women working 41 to 49 hours per week report even higher job satisfaction than those with working hours match in the category between 35 and 40 hours per week. This suggests that underemployment is especially detrimental for those with short working hours. In a refined model specification that includes variables measuring the extent of the mismatch in hours (instead of indicator variables), the study reports that the (negative) coefficients of underemployment and overemployment are not statistically different, at least for job satisfaction. Nevertheless, the authors conclude that overemployment is a more serious problem than underemployment for Australian workers.

For Germany, the empirical evidence indicates lower job satisfaction among mismatched workers than among matched workers. Using data from the SOEP for 1985 to 2002, Green and Tsitsianis (2005) find that overemployment is more detrimental for job satisfaction than underemployment in West Germany while underemployment has a stronger negative effect in East Germany. A cross-section analysis for 2004 reveals significant negative correlations between mismatch hours and life, job and health satisfaction (Grözinger et al. 2008). Likewise, using SOEP data for 1984 to 2003, Cornelißen (2009) shows that an increase of mismatch hours results in a decline of job satisfaction. Hanglberger (2010) estimates the effects of hours of underemployment and overemployment separately with SOEP data from 2005 and 2007. Job satisfaction is lower among underemployed part-time employees than among overemployed part-time employees, though the difference may not be significantly different. The coefficients of the mismatch variables are insignificant among full-time employees. Using SOEP data covering the period 1985 to 2011, Wunder and Heineck (2013) show that the decline in life sat-

isfaction is clearly larger for underemployment than for overemployment. Also, they provide evidence on spillovers from the partner's mismatch onto the other partner's well-being.

The studies reviewed for Germany and Australia could be improved in several aspects. In particular, the following drawbacks call into question the validity of results and limit comparability. First, applying a rather restricted specification with indicator variables for underemployment and overemployment, studies only capture the average difference between mismatched workers and matched workers. The average loss in well-being is, however, determined by the (average) extent of underemployment or overemployment. The observation that the coefficient of the overemployment indicator variable is larger (in absolute terms) than that of the underemployment indicator is not informative about the marginal loss (i.e. the loss per mismatch hour). Hence, a larger coefficient may just reflect that the average number of hours of overemployment is higher than the average number of hours of underemployment. Second, using only one variable measuring the difference between actual and desired hours as an explanatory variable, studies ignore potentially differential roles played by underemployment and overemployment, respectively. Third, the comparability of evidence is considerably limited because studies look at different population subgroups and results are based on different model specifications. Finally, studies might be too inflexible by assuming that a linear estimation equation is sufficient to describe the relationship between working hours mismatch and well-being.

3 Conceptual framework and estimation model

3.1 Measuring well-being change: what is the reference state?

This section introduces a framework for measuring how SWB changes when mismatch hours change. The key idea is that measurement requires a comparison between SWB in the presence of mismatch and SWB in the absence of mismatch. The latter represents the reference state for

comparison purposes. We discuss two possible reference states that lead to different measures for the SWB change: the first reference state defines the absence of mismatch as a state in which a counterfactual choice set of work hours includes the worker's observed desired hours of work. Thus, one compares SWB between states that have the same desired hours but different actual hours. The second reference state defines the absence of mismatch as a state in which counterfactual desired hours are consistent with the observed hours choice. Thus, one compares SWB between states that have the same actual hours but different desired hours.

Figure 1 illustrates our considerations using a conventional neoclassical labor supply framework. The worker's preferences are represented by a utility function $U(G, H, e)$, where G is a composite good and H denotes actual hours of market work. The parameter e represents interpersonal differences in preferences for consumption and work. Hence, two workers may reach different utility levels from the same consumption-hours bundle.

[Insert Figure 1 about here]

The worker chooses hours of work subject to the budget constraint to maximize well-being (or utility). If working time is continuous over the interval $[0, T]$, the worker achieves the optimal level of well-being at desired hours of work H_1 , where the indifference curve I_1 is just tangent to the budget constraint. However, firms may offer only jobs with fixed hours because of legal regulations, firm-specific requirements, or collective bargaining agreements, for instance. Therefore, the choice set is restricted to a discrete set of hours.⁴ For parsimony of explanation, we assume that firms offer only jobs with actual hours H_0 . The difference between desired

⁴ Among others, Altonji and Paxson (1988) and Dickens and Lundberg (1993) develop frameworks where workers receive job offers consisting of fixed wage-hours combinations. In this case, workers adjust their working time by selecting wage-hours combinations across employers offering different job packages. Working time mismatches may be persistent over time when the worker has, for example, imperfect information about job opportunities and changing jobs is costly. In such a situation, the worker will only change the job if the utility gain exceeds search and mobility costs. As a consequence, we may observe persistent mismatches in the labor market unless utility gains are sufficiently large (Altonji and Paxson 1992).

hours and actual hours indicates the hours mismatch $M = H_1 - H_0$. If $M > 0$, the worker is underemployed, as he or she accepts a job offer with shorter working time than the desired hours of work. If $M < 0$, the worker is overemployed, as he or she accepts a job offer with longer working time than the desired hours of work.

A first candidate measure of the change in SWB associated with the hours mismatch compares the utility level of the mismatched worker, as indicated by I_0 in Figure 1, with the utility level the mismatched worker would have reached, had he or she been able to choose the working time according to desired hours, as indicated by I_1 . The reference state is defined by the SWB level when $M = 0$ while holding desired hours fixed in the comparison. Since $M = H_1 - H_0$, changes in actual hours, H_0 , are the only source of variation in mismatch hours, M . Thus, the change in SWB is indicative for the effect of hours constraints that determine actual hours but not desired hours.

Empirical studies, however, almost exclusively use a second candidate measure for the change in SWB, as they hold fixed actual hours of work. That is, the second measure compares the utility of the mismatched worker, as indicated by I_0 , and the utility level the worker would have reached, had his or her desired hours of work been equal to actual hours offered, as indicated by I_2 . The reference state is defined by the SWB level when $M = 0$ while holding fixed actual hours of work. Here, changes in desired hours are the source of variation in mismatch hours. In consequence, the change in SWB is indicative about the association between SWB and working time preferences.

Which reference state is appropriate to measure the loss in well-being associated with hours mismatch? We propose that it is more interesting to use the first measure that holds desired hours (or preferences) fixed. In this case, the mismatch results from restrictions in hours of work choices because these are the only source of variation in mismatch hours when desired

hours are controlled for. Thus, we may obtain an idea for a re-design of working time arrangements: should we re-design working time arrangements to primarily avoid underemployment or overemployment or both?

3.2 Estimation model

In this section, we translate our considerations into an econometric model. We employ a semi-parametric regression approach that allows flexible estimation of the relationship between well-being and working hours mismatch. In doing so, we ensure that the results of our analysis do not depend on the parameterization, particularly not on whether we hold desired hours or actual hours fixed. Our model has the following structure:

$$SWB_{it} = \beta_0 + f(H_{1it}, M_{it}) + g(A_{it}) + (\mathbf{x}_{it} - \bar{\mathbf{x}}_i)' \boldsymbol{\beta} + \bar{\mathbf{x}}_i' \boldsymbol{\delta} + \mathbf{z}_i' \mathbf{b} + \alpha_i + \varepsilon_{it}, \quad (1)$$

where the well-being of the i -th worker at time t , SWB_{it} , is explained by desired and mismatch hours (H_{1it} and M_{it} , respectively), age (A_{it}), and further time-varying and time-invariant socioeconomic characteristics (denoted by \mathbf{x}_{it} , $\bar{\mathbf{x}}_i$, and \mathbf{z}_i , respectively). The nonparametric component $f(H_{1it}, M_{it})$ models the relationship between the response variable, SWB_{it} , and the working time mismatch, M_{it} , accounting at the same time for the desired working hours H_{1it} . The relationship between desired and mismatch hours and well-being is thus allowed to be nonlinear and no a priori assumptions about the functional form are imposed. The second nonparametric model component, $g(A_{it})$, controls for the age-related variation of well-being, which is inadequately described by a polynomial of low degree (Wunder et al. 2013). In addition to the idiosyncratic error ε_{it} , the regression includes an individual-specific random intercept α_i for each individual $i \in \{1, \dots, N\}$ to account for unobserved heterogeneity between the workers. To model potential correlations between the random intercept and the socioeconomic covariates, we include linear

fixed effects of the individual-specific average values $\bar{\mathbf{x}}_i$ of the time-varying covariates, such as household income, marital status of the worker, or type of occupation, as was suggested, e.g., by Mundlak (1978). For each worker i , the vector $\bar{\mathbf{x}}_i$ is given by $\frac{1}{T_i} \sum_{t=t(i,1)}^{t(i,T_i)} \mathbf{x}_{it}$, where T_i is the number of observations of worker i and $t(i,1), \dots, t(i,T_i)$ denote the ordered observation times of this worker. To obtain a better interpretability, we simultaneously include the demeaned covariate vector $(\mathbf{x}_{it} - \bar{\mathbf{x}}_i)$. Finally, there are some linear effects of time-invariant covariates \mathbf{z}_i , including period effects.

The model is a linear additive mixed model with a normally distributed random intercept $\boldsymbol{\alpha} = (\alpha_1, \dots, \alpha_N)'$, i.e., we assume $\boldsymbol{\alpha} \sim \mathcal{N}(\mathbf{0}, \sigma_\alpha^2 \mathbb{I}_N)$, where \mathbb{I}_N is the $N \times N$ identity matrix and $\mathbf{0}$ is a vector of zeros of the corresponding length. The errors ε_{it} are also assumed to be independent and identically distributed random quantities, each following a normal distribution with mean 0 and variance σ_ε^2 . Hence, the error vector $\boldsymbol{\varepsilon}$ follows the multivariate normal distribution $\boldsymbol{\varepsilon} \sim \mathcal{N}(\mathbf{0}, \sigma_\varepsilon^2 \mathbb{I}_n)$, where $n = \sum_{i=1}^N T_i$. Moreover, we assume that $\boldsymbol{\alpha}$ and $\boldsymbol{\varepsilon}$ are independent from each other and are not correlated with the covariates.

The smooth function g is modeled as a cubic regression spline with 9 basis functions defined according to Wood (2006, section 4.1.2), while the bivariate function f is represented by a 200 dimensional tensor product spline based on marginal cubic regression splines. We estimate both smooth functions as penalized splines (so-called p-splines), which can be represented in the mixed model framework. Therefore, we estimate all model components simultaneously as empirical best linear predictors of the corresponding linear mixed model with restricted maximum likelihood (REML) estimation for the variance components, which yields consistent estimates of all model components. For further details about the underlying statistical methodology, see, e.g., Fahrmeir et al. (2013, Chapter 8) or Wood (2006, Chapter 6).

As we are particularly interested in the question whether over- and underemployment are associated with subjective well-being in the same way, we furthermore reformulate the model in Equation 1 as follows

$$SWB_{it} = \beta_0 + f_1(H_{1it}, |M_{it}|) + f_2(H_{1it}, M_{it}^+) + g(A_{it}) + (\mathbf{x}_{it} - \bar{\mathbf{x}}_i)' \boldsymbol{\beta} + \bar{\mathbf{x}}_i' \boldsymbol{\delta} + \mathbf{z}_i' \mathbf{b} + \alpha_i + \varepsilon_{it}, \quad (2)$$

where $|M_{it}|$ denotes the absolute value of M_{it} , while M_{it}^+ equals M_{it} when $M_{it} > 0$ and is zero otherwise. This reformulation allows us to test whether underemployment (corresponding to $M_{it} > 0$) is associated with well-being in a different way than overemployment. If the smooth term f_2 contributes to the model in a significant way, we conclude that workers perceive hours of underemployment differently from hours of overemployment. All models are fit within the statistical software environment R (R Core Team 2013) by the function `gamm()` of the `mgcv`-Package (Wood 2013) with option REML.

4 Data

We use longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey and the German Socio-Economic Panel (SOEP). For detailed information about the surveys, see Wooden and Watson (2007) and Wagner et al. (2007), respectively. Since working time issues are at the core of this analysis, we restrict the estimation samples to individuals of main working age (20 to 60 years) who are employed at the time of the survey. To ensure comparability of the Australian and the German data, we further restrict the samples to the period 2001 to 2012 that is covered in both surveys. After deleting cases with incomplete data on the variables of interest, the Australian samples consist of 7,768 females and 8,047 males, and the German samples consist of 11,597 females and 12,047 males. Both surveys provide detailed information on the socio-economic characteristics of respondents, including

age, disability status, relationship status, citizenship, education, job characteristics (branch of industry, occupation), income, and household size. Tables 2 and 3 provide descriptive statistics for subsamples by gender.

We use questions about life satisfaction to measure well-being of workers. The respective questions are formulated similarly in the HILDA Survey and the SOEP. Life satisfaction is ascertained by asking: “All things considered, how satisfied are you with your life?” Answers are collected on 11-point scales ranging from 0 (completely dissatisfied) to 10 (completely satisfied). Figure 2 shows the gender-specific distribution of life satisfaction for both Germany and Australia. In the SOEP, female (male) respondents report an average level of 7.1 (7.1) for life satisfaction. The corresponding values in the HILDA Survey are 7.9 (7.8). In both surveys, the median is 7, and the most frequent score (mode) in the sample is 8.⁵

Next, we describe the distribution of actual hours of work. Table 4 reports the percentage of the employed workforce in five working hours categories. In general, female labor supply is concentrated in lower categories of actual hours of work while male labor supply is clustered in upper categories (≥ 36). Interestingly, short (< 20) and very long (> 52) hours of work are reported more frequently by Australians than by Germans. The dispersion in hours is higher in Australia than in Germany while hours of work tend to be more concentrated around 40 hours per week in Germany.

Desired hours of work are also recorded in a comparable fashion in both surveys: “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?” Using the

⁵ We provide additional results for job satisfaction in the Appendix. The job satisfaction question is: “How satisfied are you with your job?” In the SOEP, female (male) respondents report an average level of 7.0 (7.0) for job satisfaction. The corresponding values in the HILDA Survey are 7.7 (7.5).

information about the actual and desired hours, we calculate the hours mismatch. Figures 3 and 4 graphically summarize the bivariate distribution of desired hours of work and hours mismatch.

Australian females want to work around full-time and part-time hours. Roughly 40% of the female workforce reports mismatch: 27% are overemployed, 15% are underemployed. For Australian males, desired hours are concentrated around full-time hours, though long and short hours are also desired. Also about 40% of the male workforce reports mismatch: 30% are overemployed, 12% are underemployed. German females, similar to Australian females, want to work full-time or part-time hours, but longer hours are hardly desired. With 72% of the female workforce reporting hours mismatch, German females are clearly more often unable to realize their working hours preferences than Australian females. 51% are overemployed, 21% are underemployed. German males predominantly want to work full-time hours while they desire neither long nor short hours. More than 70% of the male workforce reports hours mismatch, with 61% being overemployed and 12% being underemployed.

5 Results

5.1 Interpretation of contour plots and general pattern

This section discusses the results from the bivariate smoothing. Figures 5 to 8 show the estimation results for the model in Equation 1 in the form of contour plots of the bivariate smooth functions by country and gender. In addition, the figures show a univariate plot of the level of life satisfaction as a function of mismatch hours holding fixed desired hours at values of 30 and 40 hours for females and males, respectively.⁶ The bivariate smooths estimate the well-being for different combinations of desired hours of work and hours mismatch. The SWB levels are

⁶ Tables A1 to A4 in the Appendix show the full estimation results for the parametric components.

represented by a color gradient from yellow to red, with yellow indicating higher well-being and red indicating lower well-being.

The plots offer three interpretations. (1) A horizontal movement from left to right first shows well-being of overemployed workers ($M < 0$), then well-being of underemployed workers ($M > 0$). Since desired hours of work are constant along the horizontal direction, the horizontal movement compares states with identical working time preferences but different actual hours. Thus, the results are indicative about changes in SWB associated with constraints in hours of work choices. (2) A diagonal movement along a 45 degree line shows the change in SWB associated with mismatches holding actual hours fixed. In this way, the plots allow to compare SWB in states with equal actual hours of works and different working time preferences. However, as we argue in section 3, it is more interesting to learn about the changes in SWB from restricted choices because choice sets may be changed by policy intervention and firms' working time regulations. (3) A vertical movement indicates the well-being for simultaneous changes in actual hours of work and desired hours of work, holding hours mismatch constant.

In general, well-being is highest across all subsamples in the absence of mismatch. The vertical movement at zero mismatch hours provides some evidence for negative relationship between SWB and working hours for Australian workers (Figures 5.1 and 6.1). Their life satisfaction declines until approximately 30 hours but does not change for working hours of more than 30 hours. Among German females, SWB does virtually not change over the entire range of working hours (Figure 7.1). For German males, the empirical evidence shows even a positive trend in SWB for long working hours (Figure 8.1).⁷ Overall, the small variation in SWB in the absence of hours mismatch suggests that working hours appear to be rather unimportant

⁷ For clarification, Figures A1.1 to A1.4 in the Appendix show univariate functions of the level of life satisfaction and working hours, setting hours mismatch to zero.

for SWB, as long as workers are able to realize their desired hours of work. Previous studies provide similar evidence of either no or a positive relationship between actual hours and SWB once the hours mismatch is controlled for (e.g., Friedland and Price 2003, Green and Tsitsianis 2005). In contrast, studies that do not control for hours mismatch usually report a negative relationship between working hours and SWB (e.g., Clark et al. 1996).

Regarding the relationship between SWB and hours mismatch, a test of differences in the perception of hours of underemployment and hours of overemployment provides convincing evidence that workers generally perceive hours of underemployment differently from hours of overemployment. The test assesses the statistical significance of the smooth term f_2 in Equation 2 (see section 3.2), which is significant in all subsamples with p -values < 0.000 . Generally, SWB tends to decline as one moves from the area of matched hours (center) to the area of overemployment (left) or the the area of underemployment (right). The decline in well-being is more pronounced in the regions where preferences are concentrated (i.e. for average desired hours) while the decline is less pronounced for short and long working hours preferences.

5.2 Australian females

The analysis shows two noteworthy results for the well-being of mismatched Australian females. First, in the area of part-time working hours between 20 and 30 hours, short hours of overemployment appear to be more detrimental for well-being than short hours of underemployment among Australian females (see, Figure 5.1). While the level of life satisfaction associated with overemployment of five hours (given a working time preference of 30 hours) is significantly lower than that of a matched worker (i.e. 7.75 vs. 7.84, with non-overlapping 90% confidence intervals (CIs) of [7.699, 7.801] and [7.802, 7.886], respectively), the level associated

with five hours of underemployment is 7.82 (90% CI: [7.781, 789]), which is not significantly different from the SWB of matched workers.

[Insert Figure 5 about here]

Second, this pattern is reversed for longer mismatch hours, as the decline in life satisfaction is stronger for underemployment than for overemployment once a threshold of approximately ten mismatch hours is crossed. Assuming average desired hours of about 30, we cross seven contour lines in the area of underemployment and only four in the area of overemployment when we move beyond ten hours of mismatch. In correspondence, the spacing of the contour lines is closer in the area of underemployment than in the area of overemployment. Therefore, the decline in life satisfaction associated with an increase in underemployment is higher than that associated with an increase in overemployment once the ten-hours threshold is exceeded.

Figure 5.2 depicts the mismatch-SWB relationship given a working time preference of 30 hours. For ten or less mismatch hours, the decline in life satisfaction is stronger in the area of overemployment than in the area of underemployment. Once the ten-hours threshold is exceeded, we observe the reverse pattern, as the curve is steeper for underemployment than overemployment.

Since the SWB penalty of overemployment occurs already at a low number of hours mismatch, overemployed females experience lower well-being than underemployed females over a wide range of hours mismatches. Females with overemployment of, e.g., 10 hours are less satisfied with their lives than females with equal-sized underemployment. For average working hours preferences of 30 hours, overemployed females who actually work 40 hours are at the 7.7

contour line while underemployed females who actually work 20 hours are at the 7.8 contour line.⁸

5.3 Australian males

Australian males reach the highest level of life satisfaction when they are able to work their desired number of hours. A vertical movement in Figure 6.1 shows that a simultaneous increase in actual hours and desired hours of work correlates with a decline in life satisfaction in the region of preferences for short working hours (below 20). Then, well-being is unchanged when hours further increase, suggesting that the hours of work hardly affect well-being as long as working hours preferences are met.

[Insert Figure 6 about here]

As with Australian females, the decline in well-being occurs earlier in the case of overemployment than with underemployment among Australian males. Thus, we observe a stronger decline in life satisfaction among overemployed workers than among underemployed workers. For example, with a preference for full time employment of 40 hours per week and a mismatch of five hours, life satisfaction of overemployed workers is statistically significantly lower than that of matched workers (7.68 vs. 7.77, with non-overlapping 90% CIs of [7.636, 7.718] and [7.731, 7.801], respectively). In contrast, we do not find significant differences between underemployed workers, who want to increase their working time by five hours, and matched workers.

This result is also evident from the univariate plot in Figure 6.2, which reveals the mismatch-SWB relationship holding fixed working time preferences at 40 hours. The curve has a steeper

⁸ In general, the analysis of job satisfaction provides qualitatively equivalent results (see, Figure A2 in the Appendix).

slope for short hours of overemployment than for short hours of underemployment, suggesting that Australian males are more sensitive towards overemployment than underemployment for hours mismatch of up to approximately ten hours.

5.4 German females

The evidence for German females clearly shows that underemployment is more detrimental for well-being than overemployment. This result is in contrast to the evidence provided for Australia. For working hours preferences of 30 hours and ten mismatch hours, for example, underemployed females reach a level of life satisfaction of 7.02 (90% CI: [6.966, 7.063]) whereas overemployed females with an equal-sized hours mismatch reach a level of 7.11 (90% CI: [7.069, 7.150]).

[Insert Figure 7 about here]

Well-being of mismatched female workers is characterized by two findings. First, the decline in well-being starts already at a small number of hours of underemployment. Second, the decline in well-being is stronger for underemployment than overemployment, as we move over more contour lines in the right part than in the left part of Figure 7.1. The mismatch interval between zero and ten hours covers four contour lines in the right part (underemployment) and only two in the left part (overemployment), given average desired hours. The alternative graphical representation in Figure 7.2 also depicts the asymmetrical perception of underemployment and overemployment for fixed working time preferences of 30 hours. Thus, the partial effect

of constraints in work hours choice appears to be larger for underemployment than for overemployment.⁹

5.5 German males

The most striking result emerges from the data for German males. Here, evidence for lower well-being among overemployed workers is scarce or nonexistent. In particular, workers with preferences for long working hours hardly respond to overemployment. In Figures 8.1, the contour lines in the upper left (representing overemployed workers with preferences for long hours) tend to be horizontal, suggesting almost unchanged life satisfaction with varying overemployment hours.

[Insert Figure 8 about here]

This pattern clearly changes in the area of underemployment where contour lines tend to be vertical, indicating declining well-being with further increases in underemployment (see right part of Figure 8.1). Thus, the decline in SWB is clearly stronger for underemployed workers than for overemployed workers. In consequence, a worker who wants to work 40 hours but actually works 50 hours reaches a level of life satisfaction of 7.09 (90% CI: [7.056, 7.132]) while a worker with the same preference (i.e. who also wants to work 40 hours) but whose actual working hours are 30 hours has life satisfaction of 6.85 (90% CI: [6.783, 6.925]). Among male workers, overemployment seems to be important only when the worker has preferences for short hours.

⁹ For job satisfaction, the evidence very clearly confirms that underemployment is more detrimental than overemployment. However, in contrast to life satisfaction, the decline associated with underemployment start at a higher number of the hours of underemployment. Thus, tolerance against underemployment appears to be higher in terms of job satisfaction than in terms of life satisfaction. Interestingly, we do not find any response in job satisfaction to overemployment for females with preferences for long working hours. The contour lines are almost horizontally for 40 or more desired hours (see, Figure A2.3 in the Appendix).

Figure 8.2 shows the response to mismatch hours holding fixed working time preferences at 40 hours. The curve is almost flat in the area of overemployment ($M < 0$) while it has a steep slope in the area of underemployment ($M > 0$).

6 Conclusion

This study leads to several conclusions. First, we conclude that previous research has drawn too little attention to the nonlinear nature of the relationship between SWB and hours mismatch. This study used highly flexible semiparametric regressions to measure the SWB penalty of hours mismatch in new detail. The findings demonstrate that the relative effects of underemployment and overemployment cannot be reliably measured in a model framework that uses overly-restrictive functional form assumptions. Model specifications that use only indicator variables for overemployment and underemployment obviously do not reveal with precision how workers perceive working hours mismatch.

Second, we conclude that the measurement of the SWB penalty of hours mismatch depends on the assumption about the reference state in the absence of mismatch used for comparison purposes. Our conceptual framework provides arguments for comparing SWB between states that have the same desired hours but different actual hours. Hence, we argued to assess the SWB penalty of hours mismatch holding fixed desired hours. Because the choice of the reference state has consequences for measuring the SWB penalty from hours mismatch, this paper hopefully starts a discussion on the choice of the reference state, which previous research did not make clear.

Third, our findings provide an explanation for the large share of about 60% of overemployed males in Germany. Overemployed German males do not experience substantially lower life satisfaction than matched ones. We conclude that only small gains in utility will arise from

eliminating or reducing overemployment. In consequence, overemployed workers do not have incentives to leave the mismatch due to the small (expected) increase in SWB.

Fourth, the finding that overemployment is less important than underemployment in Germany while the opposite applies to Australia leads us to the conclusion that internal labor markets are a more important vehicle for career advancement in Germany than in Australia (Lazear and Oyer 2004). If high level jobs are allocated through internal labor markets, then overemployed workers will accept long hours of work although job offers do not match their working time preferences.

Overall, our analysis shows that hours mismatch resulting from hours of work restrictions is related to substantial losses in SWB. Therefore, an assessment of the labor market conditions should take account of the extent to which workers are able to adjust their hours of work according to their preferences. We propose to improve matches between actual and desired hours of work, as there are potential increases in workers' well-being. From a worker's point of view, reducing hours mismatch could contribute to enhancing the work-life-balance and the reconciliation of work and family life. From an employer's view, reducing hours mismatch could comprise the advantage that more satisfied employees are healthier, more productive, and more committed to the firm. To achieve this, employers could, for example, offer more flexible working time schemes to meet workers' desired hours.

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Appendix: Figures and Tables

Figure 1: Labor supply and hours mismatches

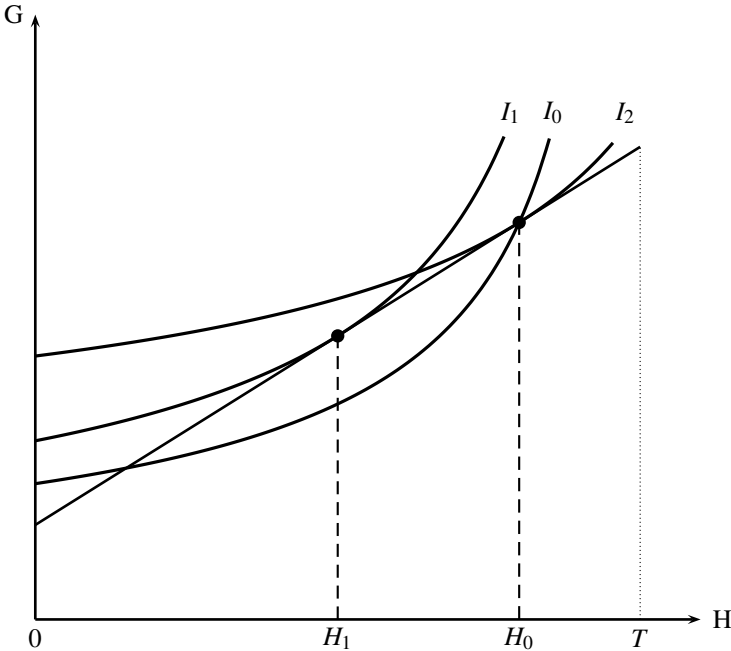
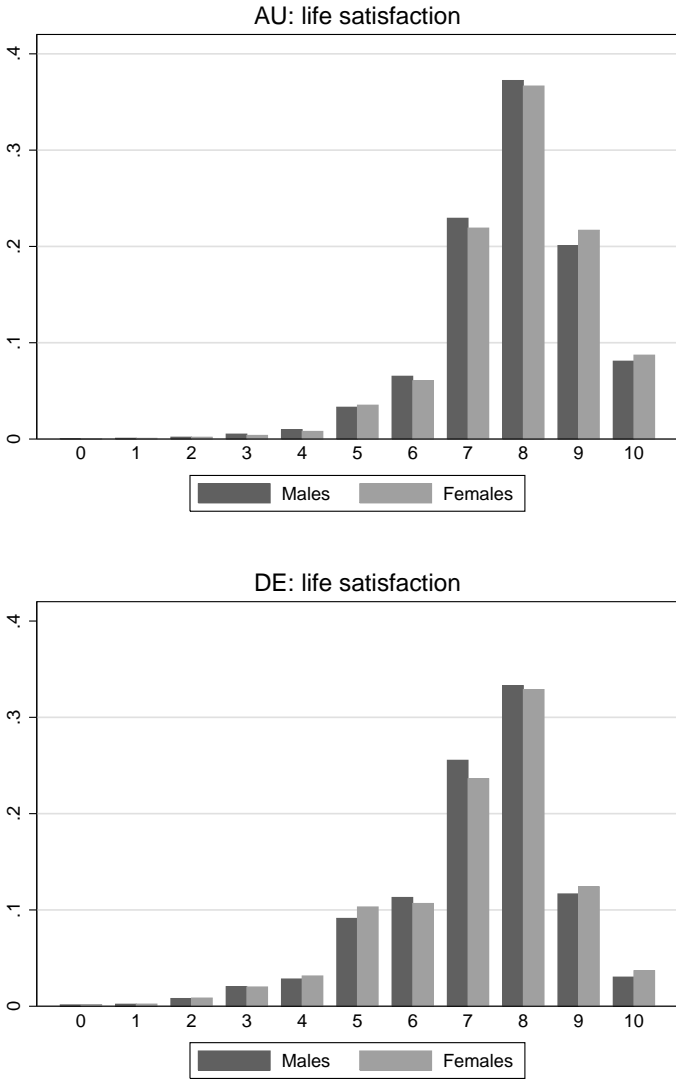


Figure 2: Distribution of life satisfaction in Australia and Germany



Source: HILDA v12, SOEP v29, 2001-2012.

Figure 3: Distribution of desired hours and mismatches in Australia

Fig. 3.1 Females

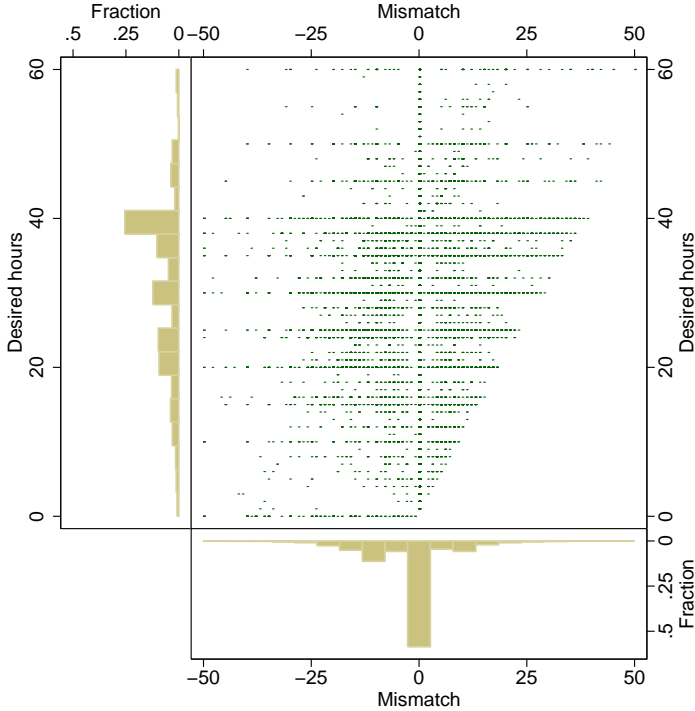
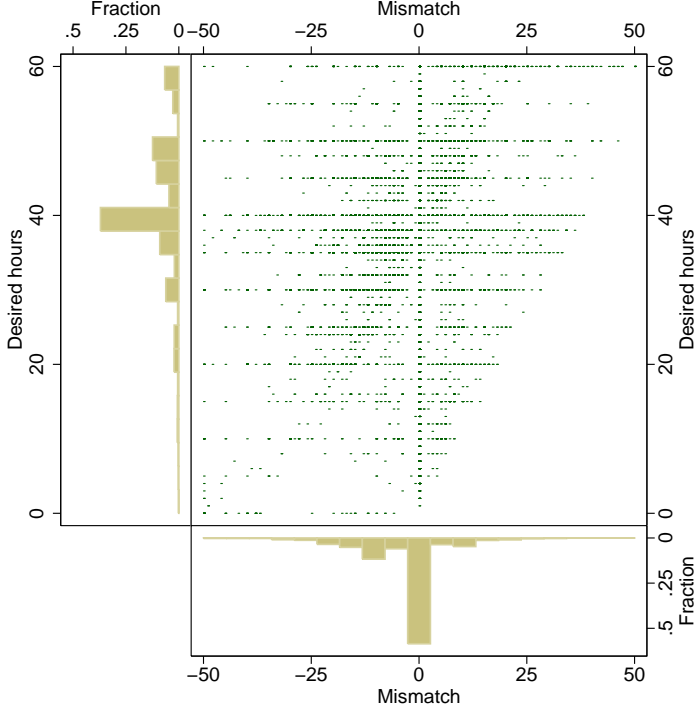


Fig. 3.2 Males



Note: To improve readability, the Figures show censored distributions of mismatch hours with censoring points at -50 and 50 and censored distributions of desired hours with a censoring point at 60.
Source: HILDA v12, 2001-2012.

Figure 4: Distribution of desired hours and mismatches in Germany

Fig. 4.1 Females

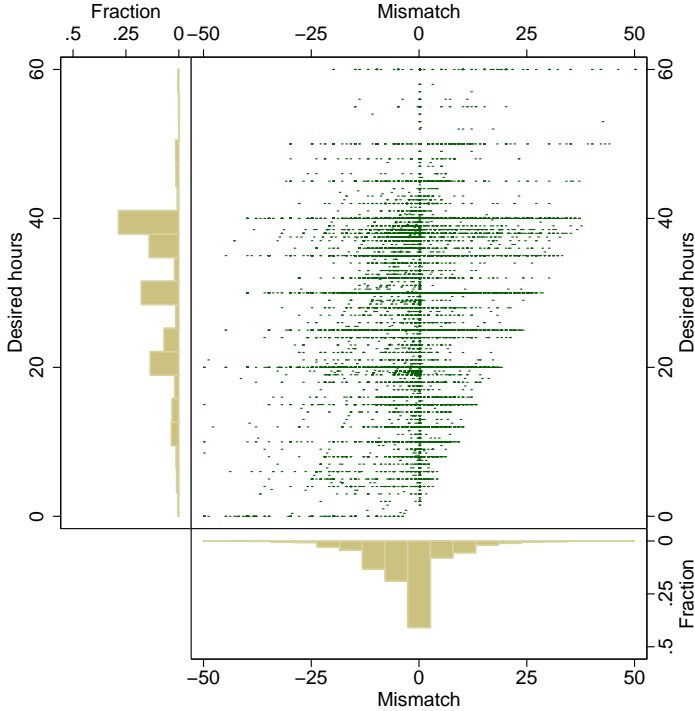
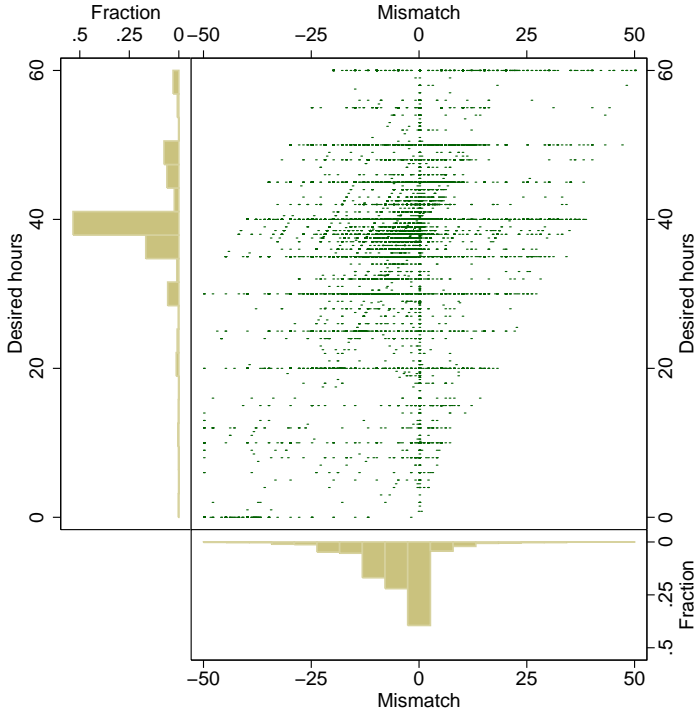


Fig. 4.2 Males



Note: To improve readability, the Figures show censored distributions of mismatch hours with censoring points at -50 and 50 and censored distributions of desired hours with a censoring point at 60.
Source: SOEP v29, 2001-2012.

Figure 6: Results for Australian males

Fig. 6.1: Bivariate smooth of desired hours and mismatch hours

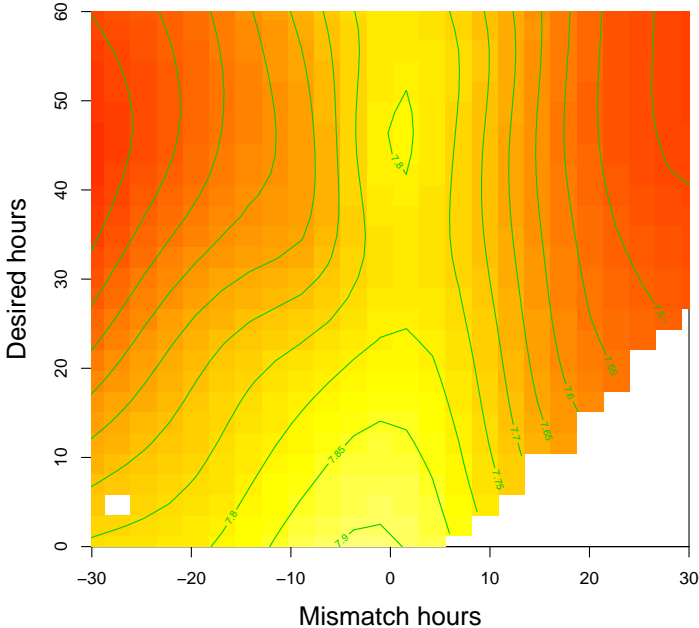
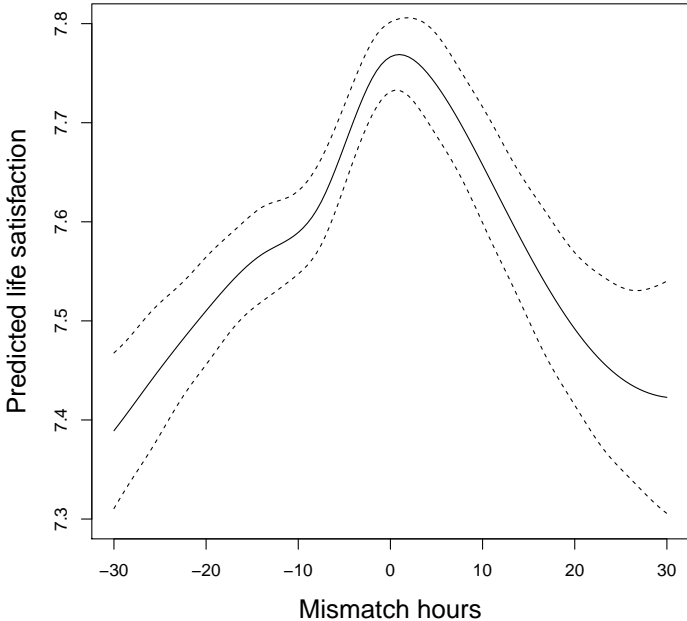


Fig. 6.2: Life satisfaction and mismatch hours holding fixed desired hours at 40



Note: Contour plots of bivariate smooth functions estimated on the basis of Equation 1. In the upper graph, the SWB levels are represented by a color gradient from yellow to red, with yellow indicating higher well-being and red indicating lower well-being. Negative mismatch hours ($M < 0$) indicate overemployment while positive mismatch hours ($M > 0$) indicate underemployment. In the lower graph, the dotted lines indicate 90% approximate point-wise confidence intervals.

Source: HILDA v12, SOEP v29, 2001-2012.

Figure 7: Results for German females

Fig. 7.1: Bivariate smooth of desired hours and mismatch hours

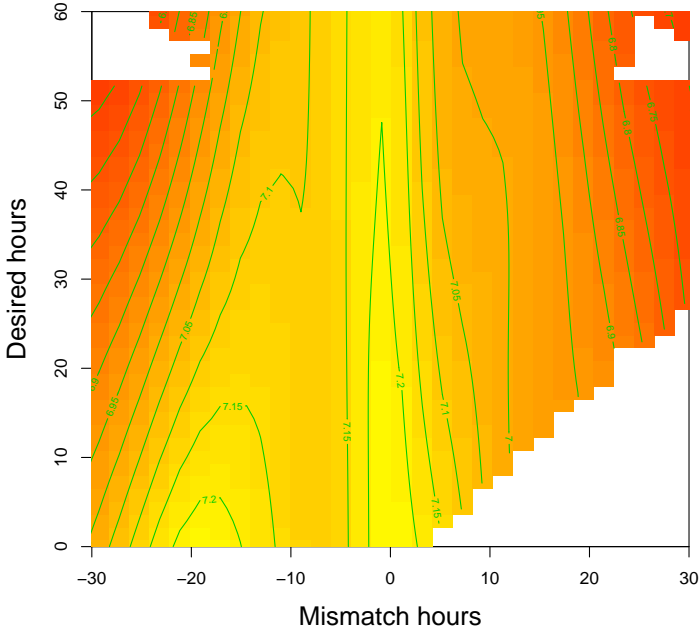
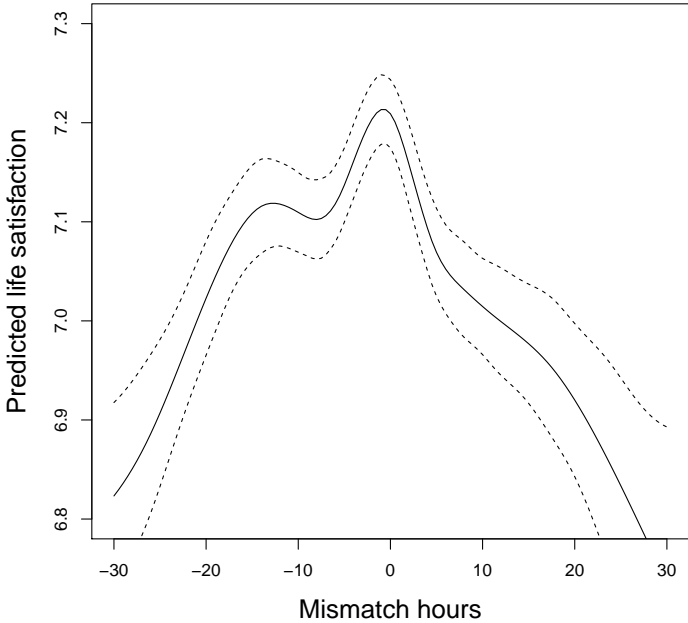


Fig. 7.2: Life satisfaction and mismatch hours holding fixed desired hours at 30



Note: Contour plots of bivariate smooth functions estimated on the basis of Equation 1. In the upper graph, the SWB levels are represented by a color gradient from yellow to red, with yellow indicating higher well-being and red indicating lower well-being. Negative mismatch hours ($M < 0$) indicate overemployment while positive mismatch hours ($M > 0$) indicate underemployment. In the lower graph, the dotted lines indicate 90% approximate point-wise confidence intervals.

Source: HILDA v12, SOEP v29, 2001-2012.

Figure 8: Results for German males

Fig. 8.1: Bivariate smooth of desired hours and mismatch hours

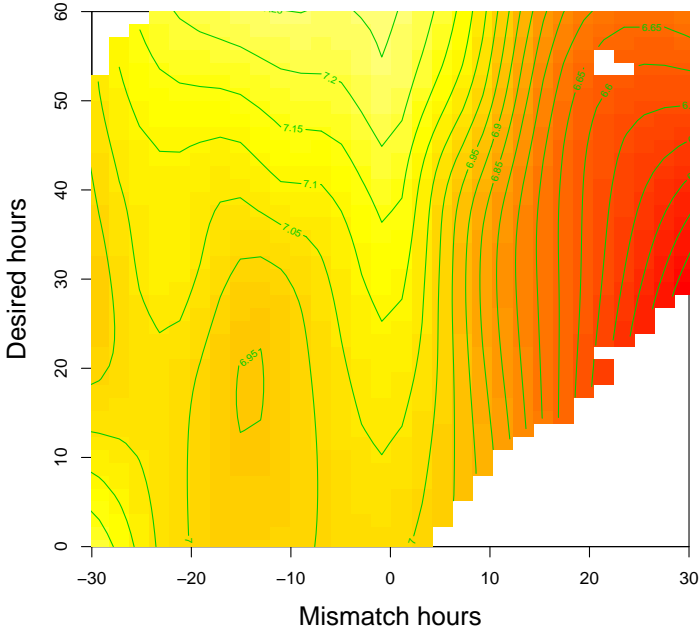
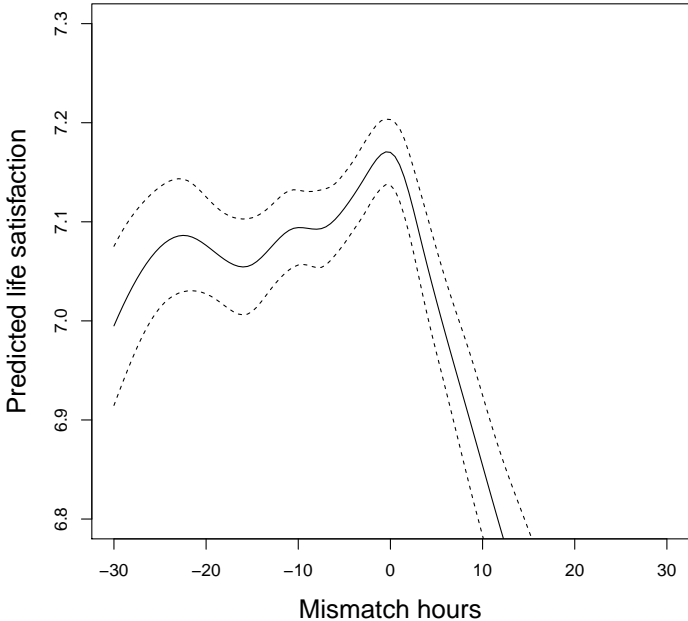


Fig. 8.2: Life satisfaction and mismatch hours holding fixed desired hours at 40



Note: Contour plots of bivariate smooth functions estimated on the basis of Equation 1. In the upper graph, the SWB levels are represented by a color gradient from yellow to red, with yellow indicating higher well-being and red indicating lower well-being. Negative mismatch hours ($M < 0$) indicate overemployment while positive mismatch hours ($M > 0$) indicate underemployment. In the lower graph, the dotted lines indicate 90% approximate point-wise confidence intervals.

Source: HILDA v12, SOEP v29, 2001-2012.

Table 1: Overview of studies on working hours mismatch

Study	Data	Outcome(s)	Model and estimation	Results
Başlevent and Kirmanoğlu (2013)	Europe, European Social Survey 2010, employees only	life satisfaction (11-point scale)	hours of underemployment and hours of overemployment, ordered logistic model	<ul style="list-style-type: none"> • underemployment: -0.02 • overemployment: -0.01 • smaller effects if high unemployment rate
Bell et al. (2011)	Germany, SOEP 1992 - 2008	health satisfaction (11-point scale), self-assessed health (5-point scale)	indicator variables that represent categories of actual hours of work by working hours mismatch type (underemployment, overemployment or match), linear fixed effects regression, fixed effects ordered logit	<ul style="list-style-type: none"> • underemployment: -0.0 to -0.3 (self-assessed health) • overemployment: -0.0 to -0.5 (health satisfaction and self-assessed health)
Boyles and Shibata (2009)	Japan, data collected by Japan Institute of Life Insurance in 1991, married women (20 - 44 years)	job satisfaction (4-point scale)	dummy for underemployment, dummy for overemployment, logistic regressions	<ul style="list-style-type: none"> • underemployment: insignificant • overemployment: -0.2
Constant and Otterbach (2011)	UK, BHPS 1991 - 2007	mental health (depression, stress)	indicator variables that represent categories of actual hours of work by working hours mismatch type (underemployment, overemployment or match), linear fixed effects regressions	<ul style="list-style-type: none"> • underemployment: -0.05 to -0.12 (depressions), -0.03 to -0.05 (stress) • overemployment: -0.06 to -0.13 (depressions), -0.07 to -0.21 (stress)
Cornelißen (2009)	Germany, SOEP, 1985, 1987, 1989, 1995, 2001, employees, West German workers (16-60 years)	job satisfaction (11-point scale)	number of mismatch hours, pooled ordered probit, linear fixed effects regression	<ul style="list-style-type: none"> • mismatch hours: job satisfaction (-0.01)
Friedland and Price (2003)	US, Americans' Changing Lives (ACL) study 1986, 1989, 25 years and older, persons in the labor force	health measures, psychological well-being, job and life satisfaction	dummy for underemployment, dummy for overemployment, hierarchical regressions	<ul style="list-style-type: none"> • underemployment: -0.043 (positive self-concept), 0.075 (job satisfaction), insignificant (life satisfaction) • overemployment: +0.049 (chronic disease), -0.063 (job satisfaction), insignificant (life satisfaction)
Green and Tsitsianis (2005)	Germany, SOEP 1985-2002, partly 1991-2002	job satisfaction (11-point scale)	dummy for underemployment, dummy for overemployment, linear fixed effects regression	<ul style="list-style-type: none"> • underemployment: West -0.16 / East -0.10 • overemployment: West -0.20 / East -0.00

Study	Data	Outcome(s)	Model and estimation	Results
Green and Tsitsianis (2005)	UK, BHPS 1992-2002	job satisfaction (7-point scale)	dummy for underemployment, dummy for overemployment, linear fixed effects regression	<ul style="list-style-type: none"> • underemployment: -0.15, • overemployment: -0.38
Grözinger et al. (2008)	Germany, SOEP 2004	job, life, and health satisfaction (11-point scale)	number of mismatch hours, cross section analysis, ordered probit	<ul style="list-style-type: none"> • mismatch hours: -0.01 to -0.18 (job, life and health satisfaction)
Hanglberger (2010)	Germany, SOEP 2005 – 2007, separated for part-time and full-time employees	job satisfaction (11-point scale)	hours of underemployment and hours of overemployment, linear fixed effects regression, control for working time variables regarding overtime, night work, etc.	<ul style="list-style-type: none"> • part-time and underemployment: -0.04 • part-time and overemployment: -0.03 • full-time: insignificant coefficients
Wilkins (2007)	Australia, HILDA 2001	job and life satisfaction (11-point scale)	dummy for underemployment, cross section analysis	<ul style="list-style-type: none"> • part-time and underemployment: life and job satisfaction (-0.4) • full-time and underemployment: life and job satisfaction (insign., exc. men's life satisfaction)
Wooden et al. (2009)	Australia, HILDA 2001 – 2005, 15 years and older, partly only employed persons	job and life satisfaction (11-point scale)	indicator variables that represent categories of actual hours of work by working hours mismatch type (underemployment, overemployment or match), linear fixed effects regression	<ul style="list-style-type: none"> • number of working hours unimportant for SWB • males and underemployment: -0.4 (job satisfaction, esp. part-time) • males and overemployment: -0.1 to -0.4 (job and life satisfaction) • females and underemployment: -0.3 (job satisfaction, part-time), +1.0 (job satisfaction, part-time) • females and overemployment: -0.1 to -0.6 (job and life satisfaction)
Wunder and Heineck (2013)	Germany, SOEP 1985 – 2011, couples (both employed, 30 – 60 years)	life satisfaction (11-point scale)	hours of underemployment and hours of overemployment, linear fixed effects regression, IV regression	<ul style="list-style-type: none"> • underemployment: -0.01 to -0.02 (females and males) • females and overemployment: -0.01, • males and overemployment: insign., • partner's underemployment: -0.01, • partner's overemployment: insign.

Table 2: Descriptive statistics: HILDA

Variable	Females		Males	
	Mean	Std. Dev.	Mean	Std. Dev.
Life satisfaction	7.88	1.29	7.82	1.31
Job satisfaction	7.70	1.70	7.54	1.68
Actual hours	32.80	13.50	43.56	12.27
Desired hours	31.00	11.33	40.97	10.91
Overemployed	0.27	0.45	0.30	0.46
Underemployed	0.15	0.36	0.12	0.33
Overemployment (in hours)	3.44	6.87	4.01	7.66
Underemployment (in hours)	1.64	4.76	1.41	4.64
Age	39.01	11.14	38.67	11.12
Log of wage	3.04	0.51	3.16	0.55
Log of household size	0.98	0.50	0.98	0.53
Log of yearly non-labor hh income	10.12	2.64	9.49	2.99
Number of dependent children	0.63	0.96	0.69	1.03
Married	0.50	0.50	0.53	0.50
Defacto	0.18	0.38	0.18	0.38
Separated	0.03	0.18	0.02	0.16
Divorced	0.08	0.26	0.04	0.19
Widowed	0.01	0.10	0.002	0.04
Single	0.20	0.40	0.22	0.42
Education: Postgraduate degree	0.05	0.21	0.05	0.22
Education: Graduate diploma	0.08	0.28	0.05	0.23
Education: Bachelor degree	0.21	0.40	0.16	0.37
Education: Diploma	0.11	0.31	0.09	0.29
Education: Certificate level III and IV	0.16	0.37	0.29	0.46
Education: Finished year 12	0.17	0.38	0.16	0.37
Education: Finished year 11 or less	0.22	0.42	0.19	0.39
Disabled	0.15	0.36	0.15	0.35
Born outside Australia	0.20	0.40	0.21	0.41
Occupation: Missing or other	0.00	0.00	0.00	0.00
Occupation: Managers	0.08	0.28	0.15	0.35
Occupation: Professionals	0.27	0.44	0.18	0.39
Occupation: Technicians	0.19	0.39	0.14	0.34
Occupation: Clerical support workers	0.21	0.41	0.08	0.27
Occupation: Service and sales workers	0.17	0.37	0.08	0.27
Occupation: Skilled agricultural workers	0.00	0.07	0.02	0.15
Occupation: Craft workers	0.01	0.08	0.16	0.37
Occupation: Operators and assemblers	0.01	0.12	0.11	0.31
Occupation: Elementary	0.06	0.24	0.08	0.27
Industry: Missing or other	0.01	0.12	0.01	0.12
Industry: Agriculture and mining	0.03	0.18	0.09	0.28
Industry: Manufacturing	0.03	0.16	0.09	0.29
Industry: Electricity and gas supply	0.01	0.09	0.04	0.18
Industry: Water supply/construction	0.02	0.14	0.12	0.33
Industry: Trade, Retail	0.19	0.40	0.18	0.38
Industry: Information/finance	0.08	0.27	0.12	0.33
Industry: Administration activities	0.18	0.39	0.20	0.40
Industry: Education	0.39	0.49	0.11	0.31
Industry: Arts, entertainment	0.05	0.22	0.04	0.20
Number of persons	7,768		8,047	
Number of person-year observations	34,424		37,099	

Source: HILDA v12, 2001-2012.

Table 3: Descriptive statistics: SOEP

Variable	Females		Males	
	Mean	Std. Dev.	Mean	Std. Dev.
Life satisfaction	7.13	1.62	7.13	1.57
Job satisfaction	7.05	1.98	7.03	1.96
Actual hours	32.85	12.91	44.28	9.74
Desired hours	30.48	10.10	39.5	7.66
Underemployed	0.21	0.41	0.12	0.32
Overemployed	0.51	0.50	0.61	0.49
Underemployment (in hours)	1.85	4.79	0.91	3.72
Overemployment (in hours)	4.21	6.33	5.69	7.41
Age	41.75	10.39	41.88	10.30
Log of wage	2.39	0.59	2.64	0.61
Log of household size	0.95	0.45	0.99	0.49
Log of monthly non-labor income	6.41	2.63	5.46	2.89
Number of children LE16	0.56	0.84	0.68	0.96
Married	0.61	0.49	0.64	0.48
Divorced	0.12	0.33	0.09	0.28
Widowed	0.02	0.14	0.004	0.06
Single	0.24	0.43	0.27	0.44
Education in years	12.68	2.64	12.69	2.77
Disabled	0.05	0.22	0.06	0.24
Foreign citizenship	0.06	0.23	0.07	0.25
East Germany	0.24	0.43	0.22	0.42
Occupation: Missing	0.03	0.17	0.03	0.17
Occupation: Managers	0.04	0.19	0.08	0.28
Occupation: Professionals	0.17	0.37	0.20	0.40
Occupation: Technicians	0.30	0.46	0.17	0.38
Occupation: Clerical support workers	0.17	0.37	0.07	0.25
Occupation: Service and sales workers	0.17	0.37	0.04	0.20
Occupation: Skilled agricultural workers	0.01	0.09	0.01	0.11
Occupation: Craft workers	0.03	0.17	0.23	0.42
Occupation: Operators and assemblers	0.02	0.15	0.10	0.31
Occupation: Elementary	0.07	0.26	0.05	0.23
Industry: Missing	0.04	0.21	0.04	0.19
Industry: Other	0.01	0.09	0.02	0.13
Industry: Agriculture and mining	0.02	0.15	0.03	0.17
Industry: Manufacturing	0.06	0.25	0.17	0.38
Industry: Electricity and gas supply	0.04	0.20	0.11	0.31
Industry: Water supply/construction	0.02	0.14	0.11	0.31
Industry: Trade, Retail	0.18	0.38	0.11	0.31
Industry: Information/finance	0.08	0.27	0.11	0.31
Industry: Administration activities	0.17	0.38	0.17	0.38
Industry: Education	0.31	0.46	0.09	0.29
Industry: Arts, entertainment	0.07	0.26	0.05	0.22
Number of persons	11,597		12,047	
Number of person-year observations	52,390		56,973	

Source: SOEP v29, 2001-2012.

Table 4: Distribution of actual hours per week (% of employed workforce)

	Actual hours of work				
	<20	20-35	36-43	44-51	>52
Australia					
Female	17.5	31.6	33.5	12.3	5.1
Male	3.9	9.5	41.0	27.9	17.8
Germany					
Female	16.5	32.0	34.6	13.3	3.6
Male	1.9	5.9	46.1	30.8	15.2

Source: HILDA v12, SOEP v29, 2001-2012.

Appendix

Supplementary material for

Working hours mismatch and well-being: comparative evidence from Australian and German panel data

Contents

Life satisfaction and working hours in the absence of mismatch	39
Estimation results: HILDA, females	40
Estimation results: HILDA, males	41
Estimation results: SOEP, females	42
Estimation results: SOEP, males	43
Job satisfaction as bivariate smooth function of desired hours and mismatch hours by subsample	44

Figure A1: Life satisfaction and working hours in the absence of mismatch

Fig. A1.1: Australian females

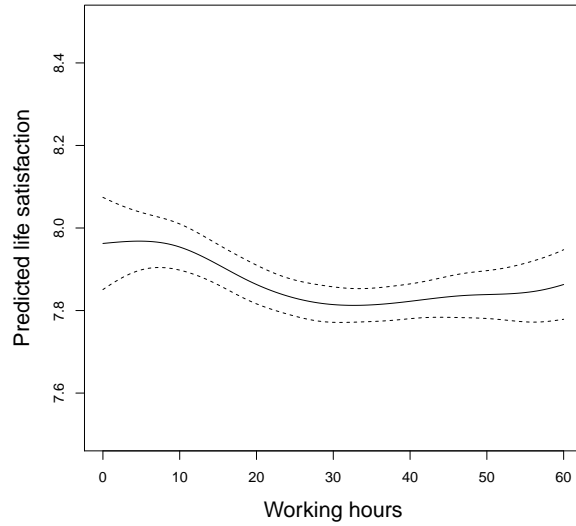


Fig. A1.2: Australian males

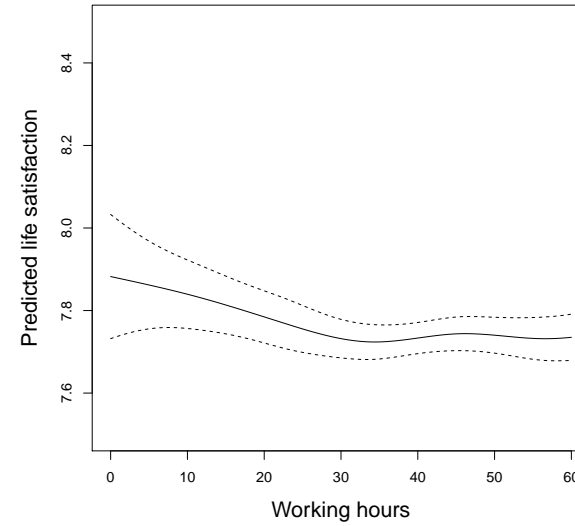


Fig. A1.3: German females

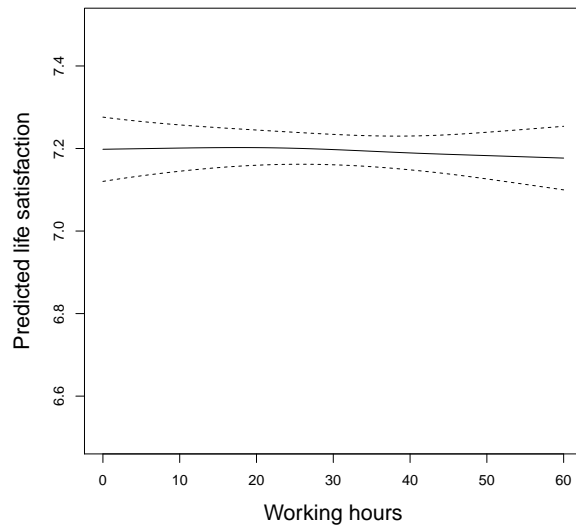
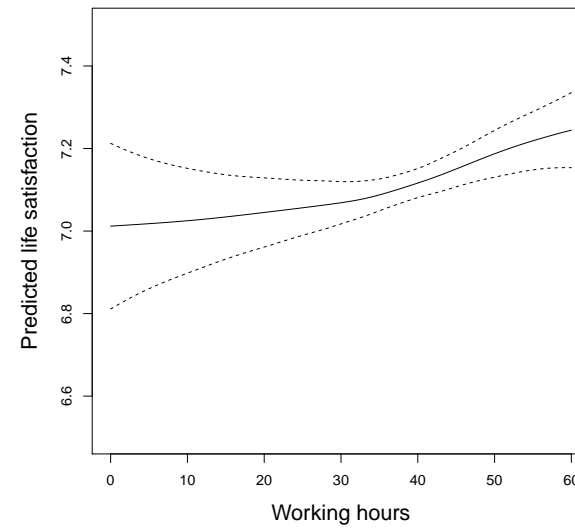


Fig. A1.4: German males



Note: The smooths show the level of life satisfaction as a function of working hours setting mismatch hours to zero (i.e. in the absence of mismatch).
Source: HILDA v12, SOEP v29, 2001-2012.

Table A1: Estimation results: HILDA, females

Variable	Life satisfaction		Job satisfaction	
	Coef.	S.E.	Coef.	S.E.
Constant	7.050***	0.154	6.730***	0.183
d: Log of wage	0.030†	0.017	0.149***	0.025
d: Log of household size	-0.067*	0.028	-0.034	0.041
d: Log of yearly non-labor hh income	0.006†	0.004	0.016**	0.005
d: Number of dependent children	-0.024†	0.013	0.017	0.019
d: Married	0.182***	0.039	-0.007	0.058
d: Defacto	0.235***	0.033	-0.046	0.049
d: Separated	-0.292***	0.054	0.090	0.081
d: Divorced	-0.041	0.055	-0.095	0.082
d: Widowed	-0.300*	0.124	0.216	0.185
d: Education: Graduate diploma	0.009	0.080	-0.022	0.120
d: Education: Bachelor degree	-0.104	0.071	-0.220*	0.106
d: Education: Diploma	-0.182†	0.098	-0.072	0.146
d: Education: Certificate level III and IV	-0.176†	0.091	-0.236†	0.135
d: Education: Finished year 12	-0.176*	0.084	-0.099	0.125
d: Education: Finished year 11 or less	-0.044	0.102	0.006	0.153
Disabled	-0.201***	0.019	-0.149***	0.026
Born outside Australia	-0.102**	0.031	-0.121***	0.036
m: Log of wage	0.131***	0.033	0.215***	0.040
m: Log of household size	-0.035	0.047	0.062	0.057
m: Log of yearly non-labor hh income	0.031***	0.009	0.011	0.010
m: Number of dependent children	-0.072***	0.020	0.023	0.024
m: Married	0.426***	0.044	0.218***	0.052
m: Defacto	0.252***	0.045	0.027	0.054
m: Separated	-0.340***	0.089	0.015	0.106
m: Divorced	-0.130*	0.065	0.073	0.076
m: Widowed	0.123	0.133	0.549***	0.155
m: Education: Graduate diploma	-0.041	0.080	-0.067	0.092
m: Education: Bachelor degree	0.017	0.070	0.107	0.081
m: Education: Diploma	0.073	0.076	0.159†	0.089
m: Education: Certificate level III and IV	0.076	0.075	0.334***	0.087
m: Education: Finished year 12	0.103	0.075	0.329***	0.087
m: Education: Finished year 11 or less	0.182*	0.075	0.525***	0.088
Occupation fixed effects (d/m)	included		included	
Industry fixed effects (d/m)	included		included	
Year fixed effects	included		included	
Significance of smooth terms				
$f(H_{1it}, M_{it})$ (p-value)	0.000***		0.000***	
$g(A_{it})$ (p-value)	0.000***		0.000***	
Test of difference between underemployment and overemployment (p-value)	0.000***		0.000***	

Note: d: denotes demeaned variable values centered around the individual-specific averages, m: denotes individual-specific averages of the respective variables. Significance levels: †<0.1, *<0.05, **<0.01, ***<0.001.

Source: HILDA v12, 2001-2012.

Table A2: Estimation results: HILDA, males

Variable	Life satisfaction		Job satisfaction	
	Coef.	S.E.	Coef.	S.E.
Constant	6.912***	0.148	6.697***	0.174
d: Log of wage	0.077***	0.017	0.201***	0.024
d: Log of household size	0.016	0.025	-0.006	0.036
d: Log of yearly non-labor hh income	0.001	0.003	-0.003	0.004
d: Number of dependent children	0.004	0.011	0.008	0.016
d: Married	0.314***	0.036	0.059	0.052
d: Defacto	0.278***	0.030	-0.028	0.044
d: Separated	-0.443***	0.053	0.007	0.078
d: Divorced	-0.060	0.057	0.040	0.083
d: Widowed	-0.250	0.222	0.153	0.326
d: Education: Graduate diploma	-0.060	0.088	-0.154	0.129
d: Education: Bachelor degree	-0.044	0.077	-0.148	0.113
d: Education: Diploma	-0.002	0.104	-0.139	0.152
d: Education: Certificate level III and IV	-0.077	0.099	-0.324*	0.145
d: Education: Finished year 12	-0.061	0.095	-0.083	0.139
d: Education: Finished year 11 or less	-0.065	0.113	-0.052	0.165
Disabled	-0.183***	0.018	-0.143***	0.025
Born outside Australia	-0.105***	0.031	-0.117***	0.036
m: Log of wage	0.123***	0.030	0.182***	0.035
m: Log of household size	0.071	0.047	0.108*	0.055
m: Log of yearly non-labor hh income	0.022**	0.008	0.006	0.009
m: Number of dependent children	-0.068***	0.021	-0.030	0.024
m: Married	0.510***	0.046	0.154**	0.054
m: Defacto	0.322***	0.045	0.062	0.053
m: Separated	-0.585***	0.109	0.091	0.128
m: Divorced	-0.033	0.082	0.229*	0.096
m: Widowed	0.650*	0.299	0.645†	0.350
m: Education: Graduate diploma	0.040	0.085	0.096	0.097
m: Education: Bachelor degree	0.018	0.070	0.036	0.080
m: Education: Diploma	0.062	0.077	0.159†	0.089
m: Education: Certificate level III and IV	0.165*	0.072	0.348***	0.083
m: Education: Finished year 12	0.165*	0.074	0.314***	0.086
m: Education: Finished year 11 or less	0.194**	0.075	0.396***	0.087
Occupation fixed effects (d/m)	included		included	
Industry fixed effects (d/m)	included		included	
Year fixed effects	included		included	
Significance of smooth terms				
$f(H_{1it}, M_{it})$ (p-value)	0.000***		0.000***	
$g(A_{it})$ (p-value)	0.000***		0.000***	
Test of difference between underemployment and overemployment (p-value)	0.000***		0.000***	

Note: d: denotes demeaned variable values centered around the individual-specific averages, m: denotes individual-specific averages of the respective variables. Significance levels: †<0.1, *<0.05, **<0.01, ***<0.001.

Source: HILDA v12, 2001-2012.

Table A3: Estimation results: SOEP, females

Variable	Life satisfaction		Job satisfaction	
	Coef.	S.E.	Coef.	S.E.
Constant	5.775***	0.115	6.497***	0.137
d: Log of wage	0.079***	0.019	0.198***	0.025
d: Log of household size	0.041	0.033	0.134**	0.044
d: Log of monthly non-labor income	0.016***	0.004	-0.004	0.005
d: Number of children LE16	-0.003	0.016	0.053*	0.021
d: Married	0.097*	0.042	0.119*	0.056
d: Divorced	0.151**	0.055	0.093	0.073
d: Widowed	-0.270*	0.116	0.298†	0.157
d: Education (in years)	0.026	0.017	-0.001	0.023
Disabled	-0.416***	0.038	-0.421***	0.049
Foreign citizenship	0.037	0.048	-0.120*	0.058
East Germany	-0.352***	0.029	-0.207***	0.035
m: Log of wage	0.325***	0.028	0.255***	0.033
m: Log of household size	-0.001	0.045	0.091†	0.054
m: Log of monthly non-labor income	0.033***	0.006	-0.007	0.008
m: Number of children LE16	-0.051*	0.022	0.064*	0.027
m: Married	0.318***	0.043	0.295***	0.052
m: Divorced	-0.113*	0.052	0.107†	0.062
m: Widowed	0.108	0.097	0.366**	0.115
m: Education (in years)	0.027***	0.007	-0.009	0.008
Occupation fixed effects (d/m)	included		included	
Industry fixed effects (d/m)	included		included	
Year fixed effects	included		included	
Significance of smooth terms				
$f(H_{1it}, M_{it})$ (p-value)	0.000***		0.000***	
$g(A_{it})$ (p-value)	0.000***		0.000***	
Test of difference between underemployment and overemployment (p-value)	0.000***		0.000***	

Note: d: denotes demeaned variable values centered around the individual-specific averages, m: denotes individual-specific averages of the respective variables. Significance levels: †<0.1, *<0.05, **<0.01, ***<0.001.

Source: SOEP v29, 2001-2012.

Table A4: Estimation results: SOEP, males

Variable	Life satisfaction		Job satisfaction	
	Coef.	S.E.	Coef.	S.E.
Constant	5.645***	0.117	6.136***	0.144
d: Log of wage	0.201***	0.019	0.338***	0.026
d: Log of household size	0.136***	0.028	0.059	0.038
d: Log of monthly non-labor income	0.007*	0.003	-0.002	0.004
d: Number of children LE16	0.007	0.013	-0.025	0.018
d: Married	0.043	0.036	-0.006	0.048
d: Divorced	-0.103*	0.050	-0.049	0.067
d: Widowed	-0.783***	0.178	-0.268	0.239
d: Education (in years)	-0.046**	0.016	-0.061**	0.022
Disabled	-0.419***	0.033	-0.283***	0.042
Foreign citizenship	-0.040	0.041	-0.176***	0.051
East Germany	-0.248***	0.028	-0.063†	0.035
m: Log of wage	0.500***	0.027	0.514***	0.033
m: Log of household size	-0.050	0.041	-0.025	0.051
m: Log of monthly non-labor income	0.032***	0.006	-0.006	0.007
m: Number of children LE16	-0.023	0.020	0.016	0.024
m: Married	0.224***	0.040	0.069	0.049
m: Divorced	-0.206***	0.053	0.003	0.065
m: Widowed	-0.151	0.186	0.168	0.228
m: Education (in years)	0.012†	0.006	-0.003	0.007
Occupation fixed effects (d/m)	included		included	
Industry fixed effects (d/m)	included		included	
Year fixed effects	included		included	
Significance of smooth terms				
$f(H_{it}, M_{it})$ (p-value)	0.000***		0.000***	
$g(A_{it})$ (p-value)	0.000***		0.000***	
Test of difference between underemployment and overemployment (p-value)	0.000***		0.000***	

Note: d: denotes demeaned variable values centered around the individual-specific averages, m: denotes individual-specific averages of the respective variables. Significance levels: †<0.1, *<0.05, **<0.01, ***<0.001.

Source: SOEP v29, 2001-2012.

Figure A2: Job satisfaction as bivariate smooth function of desired hours and mismatch hours by subsample

Fig. A2.1: Australian females

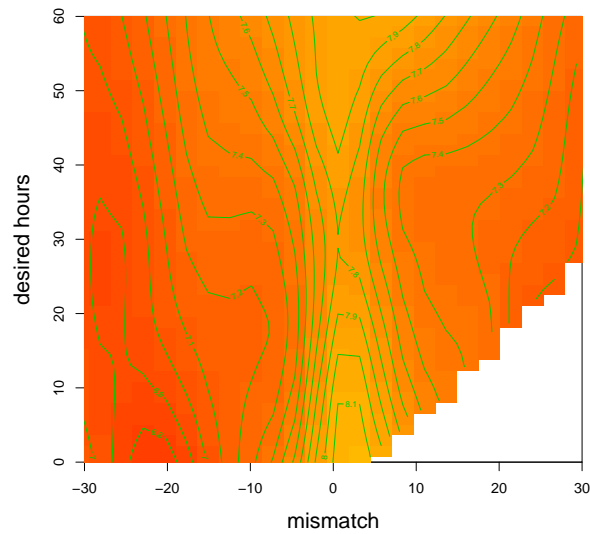


Fig. A2.2: Australian males

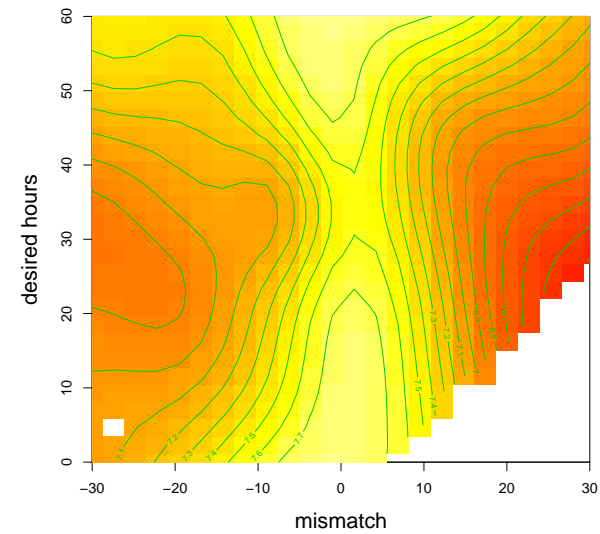


Fig. A2.3: German females

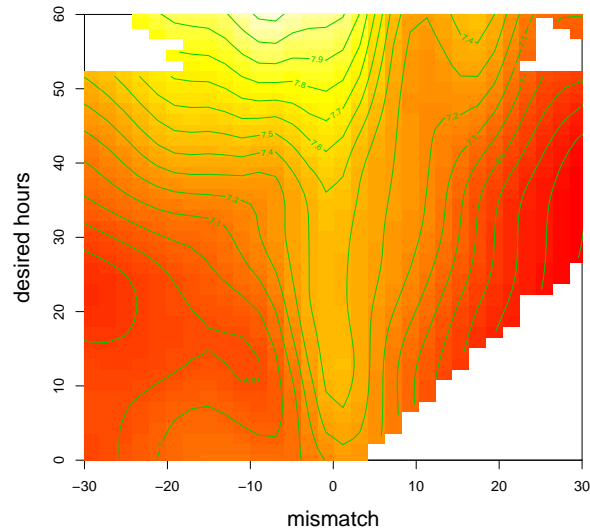
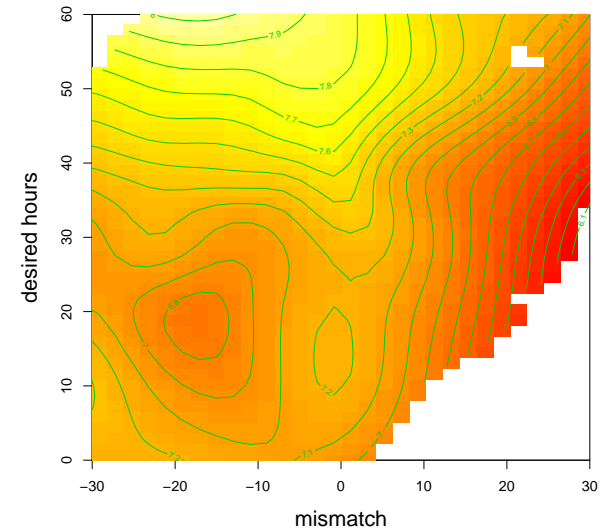


Fig. A2.4: German males



Note: Contour plots of bivariate smooth functions estimated on the basis of Equation 1. In the upper graph, the SWB levels are represented by a color gradient from yellow to red, with yellow indicating higher well-being and red indicating lower well-being. Negative mismatch hours ($M < 0$) indicate overemployment while positive mismatch hours ($M > 0$) indicate underemployment. Calculation for median values of covariates.

Source: HILDA v12, SOEP v29, 2001-2012.