Revisiting the neoclassical theory of labour supply – Disutility of labour, working hours, and happiness

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Abstract

In empirical analyses, employment status has a substantial influence on individual well-being. People without work are consistently less happy, even after controlling for income. This result seems to contradict the standard theory assumption of labour disutility. In this paper, we analyze the impact of working time on happiness. The results show distinct positive utility effects caused by employment and working time. Happiness correlates positively with hours worked. However, there is an inverse U-shaped correlation – excessive hours reverse the relationship. Additionally, the results show the importance of exogenously given deviations of working time from the individually preferred labour supply. These discrepancies reduce well-being and counterbalance the positive effects of work.

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1. Introduction

The standard neoclassical theory of individual labour supply considers income and leisure as the source of individual utility. Work is seen as a bad necessary to create income for consumption. The derived assumptions of the economic theory suppose a utility-decreasing influence of work at the margin. The theory is based on the consumption-leisure trade-off with a limited amount of time that the individual can allocate to work and leisure, with the individual choosing the optimal labour supply that maximizes utility. Since working hours entail a reduction in leisure time, the individual utility loss caused by labour time is implicitly presumed.

The empirical findings of the fast-growing field of happiness economics show, however, that unemployment generates a sharp utility loss that is not caused by the loss of income. Life satisfaction decreases even if the individual is compensated entirely for the associated income reduction. This additional effect, which is substantial, is generally labelled as the non-pecuniary or psychological costs of unemployment.[1] Employment, on the other hand, leads to a rise in individual happiness. This result seems to contradict the economic assumptions of the disutility of work.

However, we have to distinguish between two different aspects here. The neoclassical theory assumes a disutility effect at the margin since an additional working hour causes disutility. But it does not say anything about the total utility effect of work as a whole. So it could be that the entire welfare effect of work is positive whereas at the margin the individual experiences disutility of work. Empirical happiness studies, in contrast, estimate only the total life satisfaction effect of labour. These results indicate that the aggregate effect of work is positive. But it is ambiguous how labour time influences happiness at the margin. Hence, the seeming contradiction may not, in fact, be a contradiction at all.

The present article pursues two aims. First, I analyze the utility effect of working time on life satisfaction at the margin to test the theory assumptions. If unemployment causes negative welfare effects even after we control for income, the utility of the first working hour should be positive because, in the state of unemployment, leisure time is maximal and working hours are zero. Consequently, the first working hour would increase the individual utility level. This apparently curious result arises because the loss of working hours is associated with non-pecuniary costs. On the other hand, this positive utility effect may only be the case for shorter working hours and could turn to disutility for longer working time. To shed more light on

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[1] Studies presenting the negative impact of unemployment come, for example, from Clark and Oswald (1994), Winkelmann and Winkelmann (1998), Frey and Stutzer (2000), Di Tella et al. (2001) and Clark (2003).

these utility effects of work, the direct influence of the wage and working time on individual happiness will be examined using the happiness approach. The econometric analysis allows us to examine the trade-off between wages and working hours at a constant utility level. By using compensating variation, the optimal wage that compensates the individual for an additional working hour can thus be determined.

Second, real working time is often not identical to the preferred individual labour supply time. Employees cannot choose the working time that maximises their utility but are rather restricted to specific contracts and compulsory working hours. Our data provide a possibility to analyze the association between life satisfaction and the mismatch between the time the individual works and the time the individual would like to work. Using the deviation from the preferred individual labour supply, we are able to analyze the influence of underemployment (employees would prefer longer working hours) and overemployment (employees would prefer shorter working hours) on individual life satisfaction. This is particularly interesting because the deviation is exogenously given and not a result of an individual decision and, hence, should have a stronger influence on life satisfaction.

I will proceed as follows. In the next section, I provide a short review concerning the effects of employment status on life satisfaction. In Section 3 the theoretical idea is described in a short model. Section 4 represents the data and provides useful descriptive statistics and Section 5 describes the underlying methodology and hypotheses. The empirical results are presented in Section 6 and the last part discusses the results and concludes.

2. Life Satisfaction and Work

The study of the influence of work on individual well-being has a long history in the scientific world, especially in psychology. Numerous psychologists are engaged in researching the impact of job loss on individual life satisfaction (e.g. Fryer und Payne, 1986; Feather, 1990; Argyle, 2001; Lukas et al., 2004). Economists rejected the use of subjective well-being data until the mid 1990s by reason of scepticism concerning the validity and reliability of the subjective data. This view changed following the seminal paper by Clark and Oswald (1994)[2] and subsequent discussions in The Economic Journal, which constituted the starting point for this dynamically growing research field.[3]

Following Clark and Oswald (1994), who examined the impact of unemployment on mental well-being, a strand of further articles regarding this topic has emerged. Gerlach and

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[2] To be accurate, Easterlin (1974) had already used the approach in his well-known paper over thirty years ago but could not break the scepticism of economists at that time.
[3] See Clark et al. (2008) for the number of recently published articles.

Stephan (1996) analyze the effects of unemployment in Germany and find high non-pecuniary costs following the loss of the job. Winkelmann and Winkelmann (1998) show that the non-pecuniary costs of unemployment are considerably higher than the happiness loss caused by the income deprivation. Blanchflower and Oswald (2004) confirm the strong welfare loss also for the US and Great Britain. Further studies come from Korpi (1997) for Sweden, Woittiez and Theeuwes (1998) for the Netherlands as well as from Frey and Stutzer (2000, 2002), Clark (2003, 2006) and Di Tella et al. (2001, 2003).

To sum up, each of the studies confirms the adverse impact of unemployment on well-being with the main effect not being the accompanying decrease in income but the psychological costs caused by unemployment. Social isolation and stigmatization, loss of self esteem and appreciation, depression and future insecurity are detrimental to individual life satisfaction. The result has become standard and has been confirmed across different countries and data sets. The implication of the result is simple - an individual is better off in employment than unemployment, even if he has to sacrifice leisure time without earning more money.

The main question of this article, the relationship between hours of work and general well-being, is virtually unexplored in the economics literature. Empirical studies come in a large part from the psychological sciences and focuses on aspects of psychological well-being such as distress, burnout or fatigue. In particular, the effects of long work hours on different outcome variables are considered, e.g. health, work/family conflicts and the quality of relationships.[4] The results are ambiguous, with some studies finding a detrimental effect of long working hours and other studies not confirming this correlation.[5]

Economists have focused primarily on the relationship between working hours and a subgroup of satisfaction, namely job satisfaction. Clark and Oswald (1996) and Clark (1997) found a negative, but rather weak, correlation of working hours and job satisfaction. Praag et al. (2003) analyzed the influence of various well-being domains, including job satisfaction, but found ambiguous results.

Apart from the studies concerning job satisfaction, the influence of working time on individual well-being has so far been neglected by economists. One reason could be that the empirical findings employing working hours as an explanatory variable are quite inconsistent. That may have lead to less attention to this topic than would have been the case if the results were more distinct, like the correlation between unemployment and life satisfaction, for example. Just recently two papers that consider working time as one of the relevant variables

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[4] See Staines and Pleck (1983), Gutek, Searle and Klepa (1991), van der Hulst (2003) and Caruso (2006).
[5] An interesting review of the related literature is given by Barnett (1998).

for life satisfaction have been published. Pouwels et al. (2008) analyze the influence of income on life satisfaction under the assumption that more income has not only a positive influence on happiness but also a negative side: it is mostly generated by more working hours. Hence, neglecting working hours in the analysis would lead to an underestimation of the positive effect of income. They come to the result that longer working hours reduce happiness significantly. Due to the negative effect of labour time the influence of income is usually underestimated by 12% for women and 25% for men. However, the study has some critical characteristics that may affect the results. The authors use a subsample of only one wave, containing 2,700 observations, of the German Socio Economic Panel (GSOEP) from the year 1999. Due to the restriction of one year a fixed effect regression was not practicable. Additionally, the authors assume a log-linear relationship between working hours and happiness, which is a disputable assumption. This implies that the disutility of an additional working hour is large if the number of hours already worked is small, but that the negative impact of an additional hour of work diminishes as the number of working hours increases.

The second study, by Booth and van Ours (2008), uses eight waves of the British Household Panel Survey to analyze the effect of part-time work and partnered well-being. Although not the main focus of the study, they analyze the influence of working hours on life satisfaction. Considering the panel estimation results, they do not find significant effects of working hours on life satisfaction for men and for women but the tendency is rather positive. Well-being of both men and women benefits from full-time work compared to working part-time. Additionally, they are able to show a negative correlation between working hours and the satisfaction with hours worked and job satisfaction for women.

One shortcoming of all the cited studies (except for the study by Booth and van Ours) is that they did not consider individual specific fixed-effects, which influence individual satisfaction to a large degree. Lykken and Tellegen (1996) find evidence that up to 80% of the well-being variation is influenced by individual genes and personal traits. Ferrer-i-Carbonell and Frijters (2004) have recently shown that time invariant individual specific effects are very important in explaining happiness. To account for the recent findings, I will base all estimations on fixed-effects models using the extensive panel dataset of the GSOEP, which offers an excellent opportunity to combine highly qualitative data with fixed-effects models.

Indeed the fact that this area has received little attention from economists is surprising when one considers that this question, whether life satisfaction increases with working hours, is of primary importance for economics. If lack of work causes individual utility losses, work should instead increase utility, contrary to the disutility assumption.

3. Neoclassical Theory and Non-pecuniary Utility of Work

The aim of this paper is an empirical study of the assumption of the utility of work and the choice of the optimal labour supply. The starting point is the decision of the individual whether to offer his or her manpower. The positive choice is justified with the desire for more income to increase consumption possibilities. Following firstly the neoclassical theory, I consider F as leisure time, L as working time, C as consumption and the utility function $U(C, L)$ with $U_C > 0$ and $U_L < 0$ as well as $U_{CC} < 0$ and $U_{LL} > 0$. The individual faces a trade-off between the positive utility of consumption and the negative impact of work. Under consideration of $-U_L = U_F$, the individual maximizes his utility so that the marginal rate of substitution equals the real wage rate with $-U_L / U_C = w / p$. Figure 1 represents the utility-maximizing labour supply as a function of consumption and leisure time. As is well known, the indifference curve I_1 (dotted) is decreasing and the optimum is reached where it is tangent to the budget line.

The curve changes to a U-shaped form if we now assume that employment generates non-monetary benefits in addition to earned income. Intangible benefits can comprise several types, starting from self-realization, self-affirmation, being in a social environment and part of society to the point of status seeking.
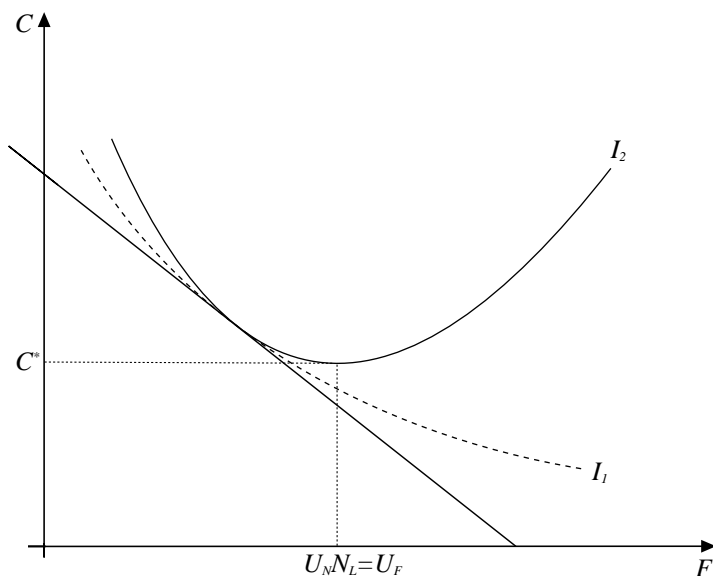

Figure 1: Individual Consumption-Leisure Decision

To account for the non-pecuniary benefits of work I modify the standard assumptions and consider the following model:

$$U = U(C, F, N),$$
(1)

where U is a utility function dependent on consumption C, leisure time F and non-pecuniary benefits of work N. The individual is restricted by the time limitation T and can split the available time in leisure and working time so that it follows that $F = T - L$. Consumption and the non-pecuniary benefits are influenced by working time L. The utility function can be rewritten as:

$$U(C, L) = U(C, T - L, N(L))$$
(2)

with

$$U_C > 0 \qquad \text{and} \qquad U_{CC} < 0$$

$$U_F > 0 \qquad \text{and} \qquad U_{FF} < 0.$$

Additional to the positive effects of consumption and leisure time, I further assume positive marginal utility of working time that decreases with increasing working hours:

$$U_N > 0 \qquad \text{and} \qquad U_{NN} < 0$$

Accordingly, the individual faces a new trade-off and maximization calculus between leisure time and non-pecuniary benefits of work. We can derive the net marginal utility of work with:

$$U_L = U_N N_L - U_F.$$
(3)

Hence, labour time causes two different effects: first, increasing utility due to intangible benefits of work shown by the first term on the right-hand side, and, second, decreasing utility due to a reduction in leisure time. There is an unique level of working time L^* for every constant consumption level C where the marginal disutility of labour equals the marginal utility of labour so that

$$U_L = 0 = U_N N_L - U_F.$$
(4)

A rise in the individual working time from L^* leads to:

$$\left. \begin{array}{l} \dfrac{\partial U}{\partial L} > 0 \\[2mm] \dfrac{\partial U}{\partial L} \leq 0 \end{array} \right\} \quad \text{if} \quad \begin{array}{l} U_N U_L > U_F \\[2mm] U_N U_L \leq U_F \end{array}.$$

The integration of the non-pecuniary benefits changes the indifference curve as shown in Figure 1. The indifference curve decreases in *F* as long as labour is a source of disutility but turns upwards behind the level L* and more leisure time has to be compensated by more consumption. At a given wage and, hence, consumption level the individual can increase utility by working more. The advantage of the following empirical analysis is the possibility of controlling for the wage rate and, therefore, of determining the optimal labour-leisure decision of the individual in dependence on different wage levels.

Figure 2 demonstrates the intangible utility of work. Following the standard assumption of labour disutility, the dotted line in the figure represents the marginal disutility curve of labour. Marginal disutility increases with the amount of working time L. The negative effects translate into negative aggregate individual utility of work, which sums up to the area between the dotted line and the abscissa. Supposing positive marginal utility for working hours, we obtain a form as shown by the continuous line. Marginal utility is positive but decreasing in working time. Aggregate utility rises until the point the marginal utility of leisure exceeds the marginal utility of labour. A zero, or even positive, aggregate utility of work implies that an individual would offer his labour for every positive wage rate (even for a negative wage rate in the case that the utility is positive). This seemingly surprising result is not as astonishing at second glance.
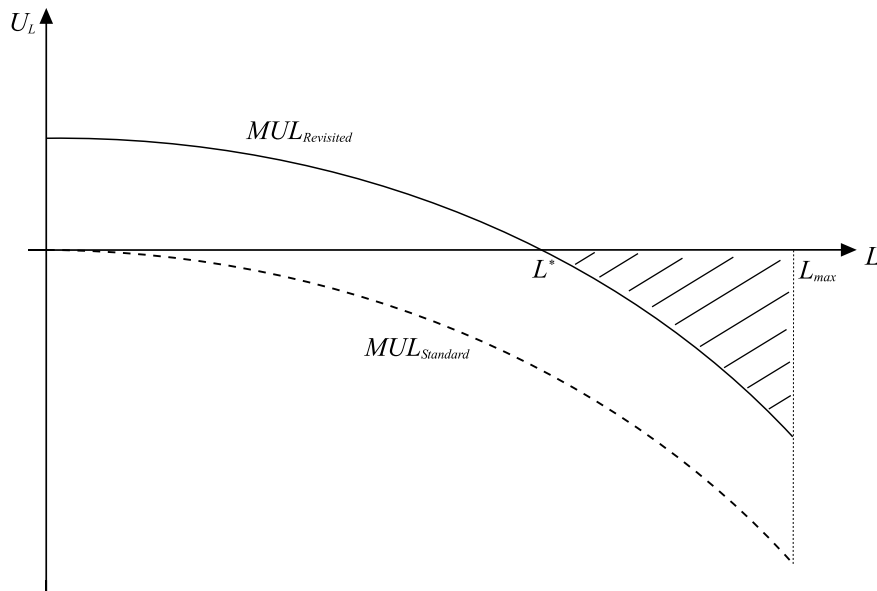

Figure 2: Non-Pecuniary Utility of Work

People are often engaged in voluntary services where they supply work for which they do not receive remuneration. For instance, an unemployed person, a retired person or a homemaker who is engaged in voluntary services would offer his or her labour until U_L is zero, which is at L^*. The numbers reveal the importance of this kind of service. More than one third of the German population or, in absolute terms, 23.4 million people were engaged in voluntary services in 2004.[6] The figures for the US and the UK are even higher. About 50 percent of the population in both countries are engaged in voluntary work, making this the highest relative participation rate among the developed countries.[7] Evidently this kind of job generates positive non-pecuniary effects. In some cases, people engaged in voluntary services even pay money to carry on this job, e.g. for travel expenses, workwear, etc.

Another indication that work indeed generates non-monetary benefits can be found in observing the results of a recently introduced labour market reform in Germany. Following a law from 2004, individuals that are unemployed longer than one year have to accept a public job offer where they must work in a public job creation scheme. If they reject the offer, their unemployment assistance will be cut. These public job schemes are called one-euro jobs because they do not get a wage but receive a representation allowance of one euro an hour. Besides the requirement to do this job, unemployed individuals can apply for the one-euro jobs themselves. That means they apply for the job and have to work about 120 hours a month to get the representation allowance of only 120 euro during this time. In fact, they are working nearly for free.[8] Surprisingly, the labour supply for the one-euro jobs is much higher than the public demand for this kind of work. The government cannot offer enough job opportunities to satisfy every unemployed person who would like to participate and people queue in front of the employment office to obtain one of the public jobs.

Both illustrations are not proof for the benefits of work. However, they give an indication that there are positive utility effects and that working without remuneration is not as unusual as it seems at first glance. To shed more light on the strength of the effects, I turn to the analysis of the correlation between working time and well-being in the following section.

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[6] Gensicke, Thomas, Picot, Sibylle and Geiss, Sabine (2006): Freiwilliges Engagement in Deutschland 1999-2004, VS-Verlag.

[7] See Anheier and Salamon (1999).

[8] Besides this, they do not even substantially improve their chances for a new regular job because the public jobs are mostly unrelated to the work the unemployed person had done before and different to the job the unemployed person is applying for in the regular labour market (IAB-Kurzbericht 2008).

4. Data and Descriptive Statistics

The empirical analysis is based on the German Socio-Economic Panel (GSOEP).[9] I use the data set including 23 waves for the period from 1984 to 2006. I consider all working age individuals between ages 18 and 60 that are active in the labour force. This yields an unbalanced panel with more than 160,000 person-year observations.[10] The great advantage of the GSOEP lies in its high quality data concerning employment status and its panel structure, which allows us to follow the same individual over several years. The subjective well-being data are generated from answers to a question in the GSOEP that asks respondents: "How satisfied are you with your life, all things considered?" The answer to this question takes discrete values from 0 (completely dissatisfied) to 10 (completely satisfied).

I start with the descriptive statistics of the data. Table 1 shows the distribution of life satisfaction levels broken down by employment status and gender for the period considered. The average level of life satisfaction for employed men (women) in Germany lies in the upper half of the scale at 7.07 (7.05). Only about 7 percent in both groups report a life satisfaction value in the lower half of the scale (strictly less than 5), whereas slightly over 80 percent locate themselves in the upper half (6 and above). In contrast to these high life satisfaction scores are the distinct lower values of the unemployed.

Life Satisfaction	Employed		Unemployed	
	Men	Women	Men	Women
0 – completely dissatisfied	0.3	0.3	2.7	1.8
1	0.2	0.3	1.9	1.5
2	0.9	0.9	5.0	3.8
3	2.2	2.2	9.0	6.8
4	3.2	3.4	9.2	8.3
5	10.9	12.3	23.0	23.1
6	11.5	11.1	14.8	14.6
7	24.1	22.9	15.9	16.8
8	31.3	30.5	12.9	16.1
9	10.8	11.1	3.5	4.8
10 - completely satisfied	4.6	5.0	2.1	2.4
Total	100.0	100.0	100.0	100.0
Average Life Satisfaction	7.07	7.05	5.47	5.80
Observations	82,512	66,375	7,756	8,574

Source: GSOEP, own calculations.

Table 1: Distribution of life satisfaction in Germany (1984-2006)

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[9] The data used in this publication were made available by the German Socio-Economic Panel Study (GSOEP) at the German Institute for Economic Research (DIW), Berlin.

[10] The data used in this paper was extracted using the Add-On-package PanelWhiz for Stata. PanelWhiz (http:\\www.panelwhiz.eu) was written by John P. Haisken-DeNew (john@panelwhiz.eu). See Haisken-DeNew and Hahn (2006) for details. The PanelWhiz generated do file to retrieve the data used here is available from me upon request. Any data or computational errors in this paper are my own.

The status of unemployment leads to a sharp drop in life satisfaction for men and women. Whereas the life satisfaction levels were nearly equal for the employed, this picture changes after losing the job - men suffer more than women. The first statistic confirms the expectation that work increases individual utility.

Table 2 shows the distribution of working hours a day of the German population for men and women. The mean working time differs markedly by gender. With a mean time of 6.73 hours, women work significantly less than men, who work 8.83 hours. Whereas the labour hour distribution for women tends to shorter working hours, the peak working time of 8 hours is equal for both groups.

The focus of our analysis is the dependence of life satisfaction on the working time of the individuals. To get a first impression of the correlation, Figures 3 and 4 represent the well-being of men and women against individual working hours a day. If working time generates disutility, we would expect a declining chart with incremental labour time. However, increasing working time also leads to higher income and expands the consumption possibilities, which would operate against the disutility influence.

Working Hours a Day	Men (Percentage)	Women (Percentage)
1	0.5	2.5
2	1.3	6.3
3	0.4	3.9
4	0.7	10.6
5	0.5	7.1
6	1.2	8.1
7	6.0	7.8
8	42.3	34.6
9	18.0	9.8
10	15.0	5.7
11	4.0	1.1
12	6.0	1.5
13	1.3	0.3
14	1.9	0.5
15	0.4	0.1
16	0.5	0.1
Mean	8,83	6,73

Source: GSOEP, own calculations.
Note: A working week comprehends five working days.

Table 2: Distribution of working hours a day of the employed in Germany (1984-2006)

To avoid income impact, I cluster the individuals in different income brackets and observe only individuals in the same income intervals.[11] The continuous line in Figure 3 shows the effect of working hours on life satisfaction for all employed men and the different dashed lines consider different monthly net wage intervals (in euro).[12] The first noteworthy result is the positive utility influence with respect to income. Life satisfaction increases with the monthly net wage for constant working hours. This relation is fairly stable: only the high income earners are worse off if labour time is less than six hours. Remarkably, individuals that work only very few hours a day have a mean life satisfaction of about 6.8 points. If we now compare the unemployed, who are not working at all, we detect a strong rise in well-being of about one point even for the low income earners. This is evidence that the non-pecuniary utility of labour is partly caused by being a part of the employed group independent of the working hours. It seems that employment status alone can explain to some extent the well-being differences between employed and unemployed found in several studies. Apparently, it is the knowledge and security of having a job, belonging to society, or status that makes people happy whereas unemployment causes a stigma.

The second interesting insight is the inverse U-shaped form of the well-being curves. Indeed, life satisfaction increases with working hours until it reaches a maximum that is between seven and nine working hours a day, depending on the income group. Rising working hours increase well-being instead of causing a negative utility effect. However, after the maximum is reached, the correlation becomes negative, in line with the standard economic assumption. It seems working hours cause positive marginal utility for men at the beginning and turn into disutility after they have reached their peak.
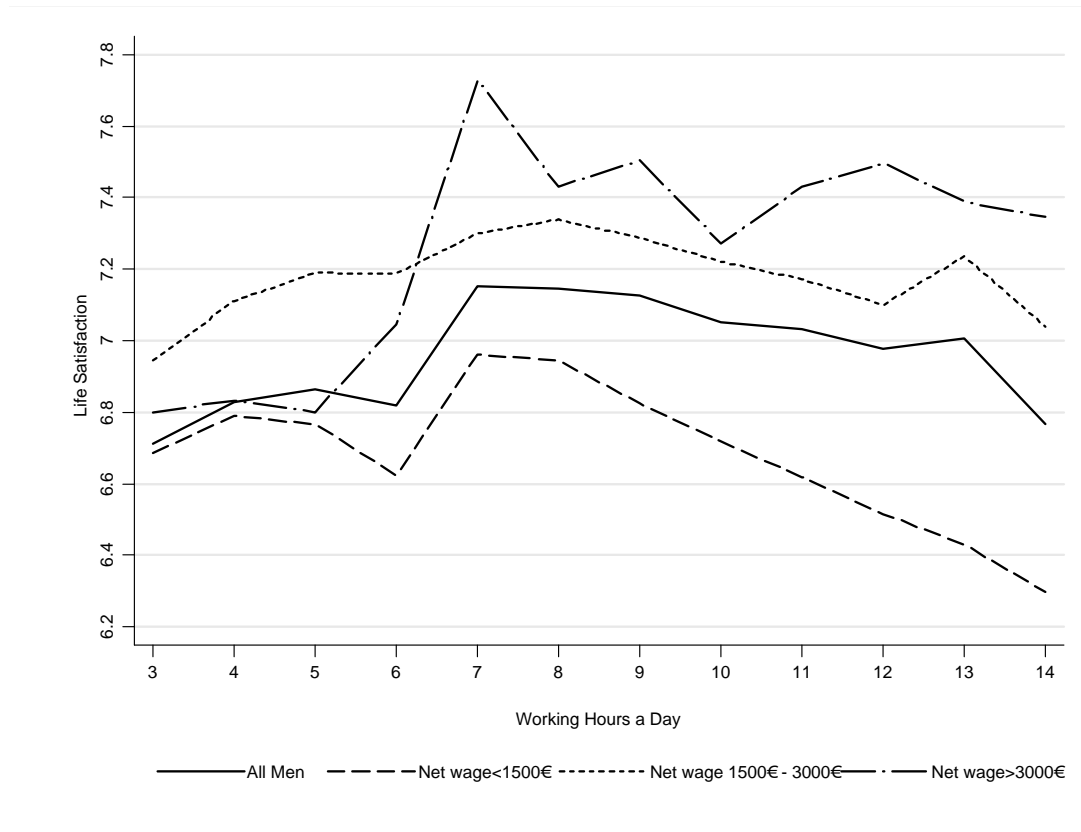
The influence of working hours on life satisfaction for women is presented in Figure 4. The positive effect of income on well-being levels is still valid but is diminished. Several reasons are conceivable. Working income generated by women plays a lesser role in the total household income because, in most households, the man still earns the bigger share of the total income. Furthermore, the income brackets are smaller for women in as much as the differences are only 750 euro instead of the 1500 euro for men.[13] A look at the correlation between working hours and life satisfaction provides another insight. Life satisfaction for women is maximized at low hours and is decreasing steadily.

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[11] The income intervals differ for men and women. Due to a lower mean income of women we choose smaller income intervals for women.

[12] Working hours are restricted to three and fourteen hours a day because there were too few observations outside of this range.

[13] Different income brackets for men and women are necessary because the income distribution for women and men differ significantly.
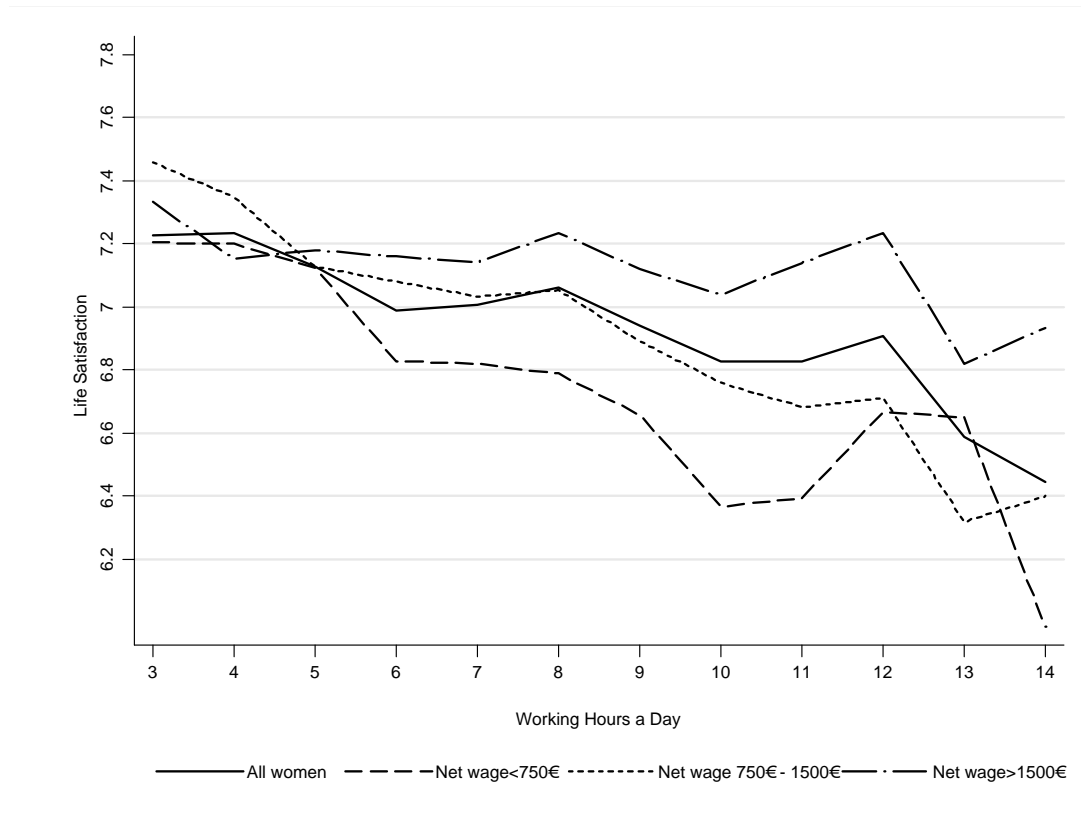
Source: GSOEP, own calculations.

Figure 3: Life Satisfaction and working hours a day of the employed men in Germany.

Instead of an inverse U-shaped curve, we see a falling chart. Indeed, the disutility of work seems to be confirmed for women although life satisfaction is partly constant with increasing working time, i.e. for women in the high income intervals well-being is nearly constant until working hours exceed a value of about twelve.

Three main findings of the descriptive statistics are noteworthy. First, a higher net wage influences life satisfaction positively for men and women. Second, there are positive non-pecuniary benefits of employment for both groups in comparison with the status unemployed. Employed individuals have much higher well-being levels than the unemployed even if they only work very few hours. The stigma of unemployment seems to be strong. Third, working hours correlate positively with life satisfaction for men until a maximum is reached. After the peak there is a negative relationship between working hours and life satisfaction. For women, though, we find a constant, or slightly negative, relationship for the first working hours that becomes more negative, the more hours are worked.

Source: GSOEP, own calculations.

Figure 4: Life Satisfaction and working hours a day of the employed women in Germany.

5. Hypotheses and Econometric Framework

The descriptive statistics in the preceding section give only an overview. To obtain a detailed analysis, we have to control for several other factors that potentially influence well-being by using multiple regression methods. The starting point is the individual decision to supply labour at all. A rational individual who decides to supply labour should have a higher life satisfaction level than when in the state of involuntary unemployment.[14] Therefore, employment should influence happiness positively whereas unemployment should be correlated negatively with happiness. To test for the first hypothesis I use the following regression:

$$LS_{it} = \beta_1 Y_{it} + \beta_2 UE_{it} + \sum_m \gamma_m X_{m,it} + v_i + \mu_t + \varepsilon_{it}. \tag{5}$$

The true individual life satisfaction is unknown, but instead the self-reported level, which is a discrete ordered variable, is observable. LS_{it} is the well-being level of individual i at time t. Y_{it} is the individual income in euro adjusted by the consumer price index und UE_{it} is a dummy

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[14] An individual is called unemployed if he is registered as unemployed, i.e. is looking for a job or is willing to work. All other individuals who are not working voluntarily are assigned to the out-of-labour-force group.

variable taking the value of 1 if the individual is unemployed and 0 otherwise. The vector X_{it} includes m socio-economic and demographic characteristics such as family status, sex, age, education, etc. v_i is an individual fixed effect that controls for individual specific characteristics, μ_t denotes a year fixed effect that captures shocks affecting all individuals in each year and ε_{it} is a random error term. I expect a positive β_1 coefficient to indicate effects of income increasing life satisfaction and a negative β_2 coefficient to indicate influences of unemployment decreasing happiness. Since we control for income, a negative unemployment coefficient indicates the strength of the non-pecuniary costs of unemployment.

The second, and main, hypothesis to be tested is whether working time leads to individual disutility or not. Therefore, I consider all working individuals with positive working hours in a second estimation. Outliers at the highest end of the working time distribution are not included by removing all individuals with more than sixteen working hours a day for plausibility reasons. To determine the effects of working time on well-being, I use the equation:

$$LS_{it} = \alpha + \beta_1 W_{it} + \beta_2 \overline{Y}_{it} + \beta_3 L_{it} + \beta_4 L_{it}^2 + \sum_m \gamma_m X_{m,it} + v_i + \mu_t + \varepsilon_{it}, \tag{6}$$

where W_{it} is the net wage of individual i at time t. Because the net wage is not the only income source, I also integrate the variable Y_{it} that denotes the entire net household income of individual i less the own net wage. I also include a household size variable in the estimation to control for different effects of the income for varying household sizes. Since we consider both income variables, it is possible to separate the effect of the own wage from the effect of the remaining household income, which is exogenous and not related to the individual work condition. We account for working time with the variable L_{it}, which denotes individual working hours a day. Since a non-linear influence of working hours is expected, I also include the square of working hours L^2_{it}. The estimation specification allows us to test whether various working hours have a direct impact on well-being and in what direction the impact operates. Following the standard theory of labour supply, we would expect:

working time is utility decreasing: raising working hours decrease well-being if we control for the net wage and the household income: $\beta_3 < 0$;

increasing marginal disutility: marginal disutility rises with increasing working hours: $\beta_4 < 0$.

The competing hypotheses are:

working time is utility increasing: working hours correlate positively with well-being even after controlling for the net wage and other well-being influencing variables: $\beta_3 > 0$;

excessive work is utility decreasing: the influence of working hours on life satisfaction is hill-shaped; hence extreme working hours lead to a decline in well-being: $\beta_4 < 0$.

Using the second estimation, we are able to determine the direct effect of working time on well-being after controlling for other variables. Therefore, we obtain the influence of the wage rate and working hours on life satisfaction. Holding the wage rate constant enables the utility effects of increasing working time to be analyzed independently of the earned wage. This direct effect denotes the non-pecuniary utility of work. Additionally, we can determine the trade-off between working time and wage rate. Using compensating variation, it is possible to calculate the hypothetical increase in the wage necessary to equal the utility loss following longer working hours. The question that can be answered is: "How much more do I have to pay the individual to keep him on the same utility level if he has to work one hour longer?". Hence, we determine the wage compensation for a change in labour time necessary to hold the utility level constant in order that the individual remains on the same indifference curve.

Now one could argue that working time is endogenous and individuals choose their optimal working time according to their individual optimization. If so, it would be not surprising that people who work longer are as satisfied as individuals who choose to work less. The first argument against this view is that working time is, in most cases, exogenously predetermined by the employer due to mandatory contracts and regulations.[15] The employee can often only choose to take the job or not (here he has the opportunity to influence his working hours in line with his preferences). This weakens the argument, but is not completely conclusive. However, we have data available that show the optimal labour supply if the individual could freely choose his own working time. The GSOEP acquires information on the desired working time for every individual. This information can be seen as the workers' true preferences concerning their hours of labour supply. The desired working time equates with the individual's own decision to offer labour if the individual could freely decide and, hence, corresponds to the real individual labour supply. Using these data, I test a third hypotheses:

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[15] We will see below that about 75 percent of the working population would prefer different working hours to those they in fact have. Hence, labour time is mostly exogenously given.

namely, whether the non-pecuniary benefits of work still hold if we consider exogenously determined working time that the individual cannot influence himself. The appropriate estimation equation is:

$$LS_{it} = \alpha + \beta_1 W_{it} + \beta_2 \overline{Y}_{it} + \beta_3 L_{it} + \beta_4 L_{it}^2 + \beta_5 LWO_{it} + \beta_6 LWU_{it} + \sum_m \gamma_m X_{m,it} + \nu_i + \mu_t + \varepsilon_{it} . \quad (7)$$

Although the denotation of the variables is the same as before, I integrate two new generated variables, capturing the deviation of the real working hours from the individual desired working hours. The variable LWO_{it} is generated by

LWO_{it} = Real working hours a day - Desired working hours a day

for all individuals with higher real working hours than desired working hours. This variable, therefore, captures overemployment. The variable LWU_{it} is generated by:

LWU_{it} = Desired working hours a day - Real working hours a day

and takes into account all individuals with desired working hours exceeding real working hours, thus capturing underemployment. If the desired working time equals the real working time, both variables obtain the value zero. By calculation, both variables are always positive and higher values imply larger deviations from the individual's labour supply choice. Overall I have 132,130 individual observations with about 58 percent of individuals preferring to work less, and 17 percent preferring to work more, than they actually do. Only 25 percent of the employed can choose their labour time freely. This shows that working time is exogenously determined rather than endogenously. Including both variables in the regression allows us to control for the effect of endogenously chosen labour hours (LWU and LWO are equal to zero) and labour hours exogenously determined by the employer due to employment contracts or wage agreement provisions. Because we are using a fixed effects model, we are able to estimate the within-individual effects over time. Thus we can estimate how well-being is influenced if the individual freely chooses to work more or less or if working time is determined by the employer.

6. Empirical Results

In the following section, the results of the three estimations are represented. I start with the first regression, analyzing if employment, as compared to unemployment, is positively related to life satisfaction. I estimated the regression using ordinary least squares with fixed effects to get a better perception of how strong the influences are and to obtain a better interpretation of the coefficient. Moreover, as Ferrer-i-Carbonell and Frijters (2004) show, the OLS fixed effects model provides essentially the same results as logit or probit models. Nevertheless, to

take the ordinary nature of the endogenous variable into account and to control for the OLS results, I also estimate a conditional logit model with fixed effects recently developed by Ferrer-i-Carbonell and Frijters (2004). I chose this estimator because the fixed effect logit estimator developed by Chamberlain (1980) transforms the categorical life satisfaction scale into a binary variable by imposing one and the same cut-off level on all individuals. This method has the disadvantage of losing all observations of individuals who always report life satisfaction levels above or below this cut-off. The fixed effect logit estimator of Ferrer-i-Carbonell and Frijters (2004) avoids this shortcoming by imposing individual-specific cut-offs.

Table 3 represents the outcomes of the first specification broken down by gender.[16] The unemployment coefficient has the strongest negative impact of all variables in the OLS estimation as well as in the logit estimation with men suffering more from unemployment than women. Even if income were constant, so that the person could enjoy more leisure without reducing consumption, the person would nevertheless suffer from lower well-being. "Work" not only serves to earn a living, but also has additional, non-pecuniary benefits. This means, at the same time, that individuals gain positive utility if they supply labour.[17] The estimated coefficient for the net wage is positive and highly significant: a higher net wage increases life satisfaction for both sexes. Interestingly, the impact is much stronger than the influence of the remaining household income. That is surprising because one would expect that a higher net wage would be accompanied by strenuous and hard work, which would diminish the positive income effect. The remaining household income is mostly exogenously given and independent of one's own efforts. Hence we would expect it to lead to a stronger well-being effect. That is not the case. It seems that there are some status effects so that individuals with a higher net wage also experience a higher status that increases life satisfaction.

As a first result we can sum up that individuals experience a utility increase (under constant income) due to a positive labour supply. To get a more detailed analysis, I now turn to the estimation results regarding different working hours.

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[16] I refrain from presenting the coefficients of the control variables but concentrate on the main outcomes. The results are comparable with previous studies (see Frey and Stutzer (2002), Blanchflower and Oswald (2004), or Frijters et al. (2004)).

[17] This is even true in the case they would not earn more income at all than in the unemployed status.

	Men		Women	
	OLS	Conditional Logit	OLS	Conditional Logit
	(1)	(2)	(3)	(4)
Employment status (reference: full-time employed)				
unemployed	-0.749***	-0.757***	-0.480***	-0.501***
	(0.026)	(0.045)	(0.030)	(0.048)
public job creation	-0.328***	-0.368***	-0.151**	-0.181*
	(0.066)	(0.109)	(0.064)	(0.103)
part-time	-0.210***	-0.246***	-0.083***	-0.071**
	(0.038)	(0.064)	(0.021)	(0.034)
self-employed	-0.136***	-0.202***	-0.102***	-0.038
	(0.032)	(0.053)	(0.037)	(0.060)
out of labour force	-0.197***	-0.163***	-0.018	0.076*
	(0.030)	(0.052)	(0.027)	(0.044)
Income				
net wage/1000	0.190***	0.293***	0.218***	0.313***
	(0.011)	(0.020)	(0.019)	(0.032)
remaining household	0.068***	0.117***	0.070***	0.103***
income	(0.007)	(0.014)	(0.006)	(0.011)
Family status (reference: single)				
living with a partner	0.204***	0.269***	0.248***	0.357***
	(0.025)	(0.042)	(0.028)	(0.045)
married	0.245***	0.381***	0.292***	0.377***
	(0.032)	(0.054)	(0.034)	(0.055)
divorced	-0.391***	-0.458***	-0.164***	-0.128*
	(0.044)	(0.076)	(0.044)	(0.070)
widowed	-0.334***	-0.318*	-0.470***	-0.388***
	(0.110)	(0.185)	(0.070)	(0.115)
Other variables				
household size	-0.054***	-0.100***	-0.102***	-0.061***
	(0.010)	(0.018)	(0.017)	(0.010)
age	-0.098***	-0.103***	-0.066***	-0.046***
	(0.006)	(0.011)	(0.006)	(0.010)
age^2	0.001***	0.001***	0.000***	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
number of children	0.056***	0.059***	0.054***	0.062***
	(0.012)	(0.020)	(0.012)	(0.019)
house ownership	-0.007	0.039	0.055***	0.135***
	(0.019)	(0.032)	(0.020)	(0.032)
relative in need of care	-0.337***	-0.337***	-0.340***	-0.378***
	(0.043)	(0.072)	(0.041)	(0.067)
years of education	-0.026***	-0.031***	0.013*	0.022**
	(0.007)	(0.011)	(0.007)	(0.011)
R^2 / log likelihood	0.06	-36,997	0.04	-39,223
observations	83,732	78,685	87,396	82,420

*Note: OLS Fixed Effect and Conditional Fixed Effect Logit estimations with individual fixed effects and time fixed effects. Standard deviations in parentheses. * denotes significance at the 10-percent level, ** at the 5-percent level and *** at the 1-percent level.*

Table 3: Regression results for life satisfaction

Table 4 summarizes the results of the second specification, which includes individual working hours a day. To avoid any bias, I only consider all working individuals in a fixed labour condition with strictly positive working time. Working hours have a highly significant, positive influence on life satisfaction for men in both specifications ($\beta_3 > 0$). A look at the coefficients of the OLS estimation shows that one working hour would increase life

satisfaction by 0.078 points. However, this influence is non-monotonic. In fact, it has a well defined hill-shaped form because the square of working hours has the expected negative sign ($\beta_4 < 0$), which countervails the positive influence. More working hours increase well-being up to a specific level and decrease life satisfaction afterwards. The point where the optimal life satisfaction level in relation to working hours is reached is 7.7 hours a day for men using both the OLS result and the conditional logit result. Longer working hours decrease well-being.

	Men		Women	
	OLS	Conditional Logit	OLS	Conditional Logit
	(5)	(6)	(7)	(8)
Working time a day				
working hours	0.078***	0.104***	0.018	0.018
	(0.013)	(0.023)	(0.013)	(0.022)
working hours^2	-0.005***	-0.007***	-0.002**	-0.003
	(0.001)	(0.001)	(0.001)	(0.002)
Income				
net wage/1000	0.193***	0.329***	0.257***	0.395***
	(0.011)	(0.023)	(0.023)	(0.042)
remaining household income	0.056***	0.115***	0.068***	0.110***
	(0.008)	(0.016)	(0.008)	(0.015)
Family status (reference: single)				
living with a partner	0.178***	0.275***	0.281***	0.412***
	(0.028)	(0.052)	(0.034)	(0.059)
married	0.252***	0.407***	0.237***	0.325***
	(0.035)	(0.063)	(0.041)	(0.072)
divorced	-0.456***	-0.563***	-0.102*	-0.110
	(0.048)	(0.090)	(0.052)	(0.091)
widowed	-0.211	-0.369	-0.457***	-0.329**
	(0.128)	(0.236)	(0.087)	(0.152)
Other variables				
household size	-0.063***	-0.121***	-0.071***	-0.116***
	(0.011)	(0.021)	(0.013)	(0.023)
age	-0.069***	-0.080***	-0.065***	-0.058***
	(0.007)	(0.013)	(0.008)	(0.014)
age^2	0.000**	0.001***	0.000**	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
number of children	0.031**	0.035	0.033**	0.046*
	(0.013)	(0.024)	(0.015)	(0.026)
house ownership	0.021	0.079**	0.045*	0.137***
	(0.020)	(0.036)	(0.024)	(0.042)
relative in need of care	-0.190***	-0.286***	-0.043	-0.144
	(0.050)	(0.089)	(0.061)	(0.104)
years of education	-0.006	0.002	0.014	0.044**
	(0.009)	(0.017)	(0.011)	(0.020)
R^2 / log likelihood	0.03	-28,507	0.03	-22,402
observations	66,976	61,515	54,243	48,910

Note: OLS Fixed Effect and Conditional Fixed Effect Logit estimations with individual fixed effects and time fixed effects. Standard deviations in parentheses. * denotes significance at the 10-percent level, ** at the 5-percent level and *** at the 1-percent level.

Table 4: Regression results for life satisfaction including working time

The picture is quite different for women. Working hours still have a positive influence and working hours squared a negative impact but both are not significant. The optimal working time for women is 4.2 hours (3.6 hours).[18] It should be recalled that, due to our control variables, these results are independent of income. Consider two identical men with the same income. The person that works 7.7 hours is happier than the person working less than 7.7 hours. This result does not confirm the general assumption of labour disutility (at least until the inflection point), but on the assumption of an average working man, or woman, working 8.83, or 6.73, hours a day, respectively, we indeed find marginal disutility of work. Therefore, the results support the neoclassical assumptions of marginal labour disutility. But, at the same time, work and working time do indeed generate, in total, positive non-pecuniary benefits for men and, in a weaker form, for women.

Again, there are strong gender differences if we consider the employment status and working time. One reason for the shorter optimal labour time for women could lie in the household work that women do in addition to their employment. Women have significantly shorter working hours, but if we view the time spent in the household or on family care as labour time, there is no significant difference in aggregate working hours between men and women. Another explanation for the differences could be a social norm effect. Men might be more satisfied with longer working hours because the social norm is to work full-time. Women, in contrast, do not have this distinct social custom and it is more socially acceptable to work shorter working hours.

Using the results in Table 4, one can now calculate the necessary net wage compensation for one working hour to keep the individual as equally satisfied as before. The results depend on the mean working time due to the non-monotonic influence of working hours. The net wage compensation K is calculated with:

$$K = \frac{\beta_3 + 2\beta_4 L}{\beta_1} \cdot 1000 \ . \tag{8}$$

The numerator captures the marginal well-being effect of working time and the denominator, the marginal effect of a wage increase.[19] The results in Table 5 show the net well-being effect of an increase in working hours for men.[20] As can be seen, the optimal

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[18] Interestingly, the OLS and the condition logit estimation yield the same relative results for men and nearly equal results for women. This confirms the result of Ferrer-i-Carbonell and Frijters (2004).

[19] Due to the use of the variable net wage/1000 in the regression, it is necessary to multiply the effects by 1000.

[20] Only the calculations for men are presented due to the insignificant estimation coefficients for women. The well-being effects turn negative for women after about four hours. If we consider the medium working time for women, which is about seven hours a day, an increase of one hour leads to a change of well-being of -0.012.

working time is between seven and eight hours, as mentioned above. The following examples will help to clarify the interpretation.

If the working time of a man rises from 3 to 4 hours a day, well-being increases by 0.0375 points. In the hypothetical case of a man increasing his working time from one hour to eight hours, the well-being change is the sum of the net effects, i.e. 0.192 points. However, a man who is already working 12 hours a day would experience a well-being decrease of 0.0427 if he had to work one hour more a day. He would need a net wage compensation of about 11 euro per hour. This corresponds to a wage premium of about 34 percent in comparison to the average hourly net wage of 8.28 euro for men working 12 hours a day in the sample.

Men		
Working Hours a Day	Net Well-Being Effect	Net Wage Compensation in euro
1	0.0676	-17.5
2	0.0576	-14.9
3	0.0475	-12.3
4	0.0375	-9.7
5	0.0275	-7.1
6	0.0174	-4.5
7	0.0074	-1.9
8	-0.0026	0.7
9	-0.0127	3.3
10	-0.0227	5.9
11	-0.0327	8.5
12	-0.0427	11.1
13	-0.0528	13.7
14	-0.0628	16.3
15	-0.0728	18.9
16	-0.0829	21.4

Note: Net wage compensation is the net wage necessary to compensate the individual for one more working hour to keep him as equally satisfied as before the increase.

Table 5: Well-being effects of working hours and net wage compensation (OLS results)

Aggregate utility of work

Using the estimation results, the total utility effect of work can be examined. Figure 5 shows the aggregated non-pecuniary utility effects of work. The total impact is positive for men up to a working time of about 14 hours a day. A man who is working 14 hours a day is still better off than a man who is not working at all. The findings for women are quite different. The aggregated utility of work is substantial less than for men and turns negative at about 7.5 hours. The results indicate that an average man (mean working time: 8.83 hours) as well as woman (mean working time: 6.73 hours) gains positive total utility from work whereas the marginal utility is negative.
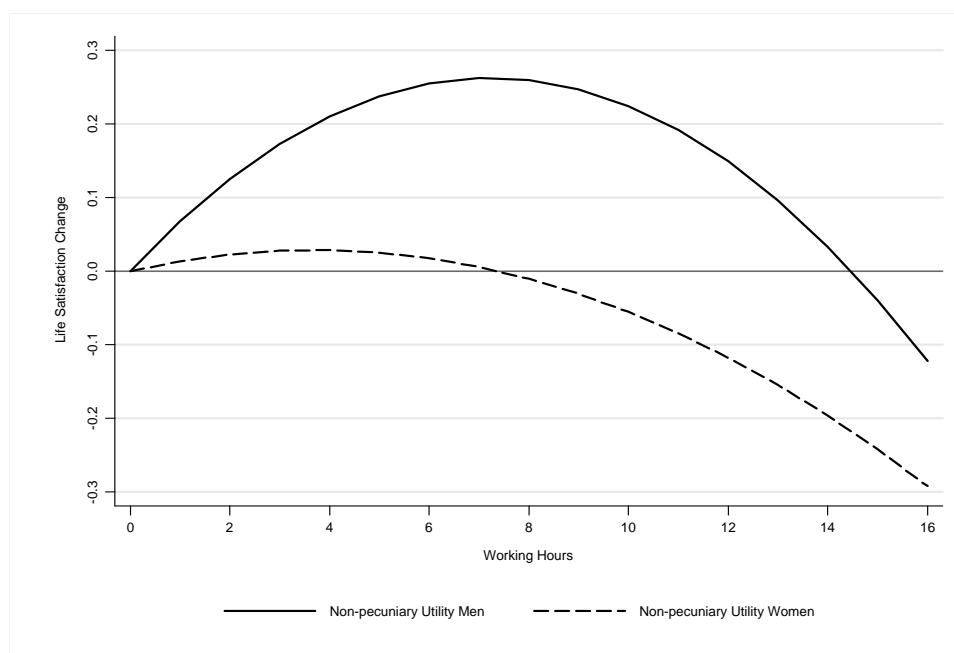
Figure 5: Non-Pecuniary Utility of Work: Life Satisfaction Change and Working Hours

Exogenous vs. Endogenous Working Time

So far we have not distinguished whether working time is exogenous or endogenous. It could be argued that employees can at least partly determine their labour supply. If working time is endogenously determined, individuals can choose their optimal labour hours according their preferences. Consequently, a positive correlation between chosen working hours and life satisfaction is driven by the rational decision to offer the preferred hours of work. The true individual labour supply is, however, not observable. Nevertheless the GSOEP questionnaire provides a solution because it asks respondents for the time they would like to work if they could freely choose. The answers can be seen as the workers' true preferences concerning their hours of labour supply. Thus we are able to detect mismatches between real working time and true preferred labour supply. To control for the mismatches, I now consider the third estimation including variables for overemployment and underemployment.

Table 6 represents the results of the extended estimation. Most of the conclusions of the former regressions still hold. Working hours are again significantly positive for men, but the size of the effect is reduced in comparison to the preceding estimation. This is caused by the explicit consideration of the exogenous changes in the working time. If people freely chose their working hours, the positive effect should diminish because individuals would now optimize according to their preferences.

	Men		Women	
	OLS	Conditional Logit	OLS	Conditional Logit
	(1)	(2)	(3)	(4)
Working time a day and deviation from preferred working time				
working hours	0.052***	0.064**	0.026*	0.029
	(0.016)	(0.030)	(0.014)	(0.025)
working hours^2	-0.003***	-0.004**	-0.001	-0.001
	(0.001)	(0.002)	(0.001)	(0.002)
overemployment	-0.025***	-0.035***	-0.033***	-0.052***
	(0.005)	(0.010)	(0.007)	(0.011)
underemployment	-0.015**	-0.022*	0.004	0.005
	(0.007)	(0.012)	(0.003)	(0.006)
Income				
net wage/1000	0.189***	0.316***	0.231***	0.341***
	(0.012)	(0.024)	(0.024)	(0.044)
remaining household income	0.050***	0.107***	0.069***	0.105***
	(0.008)	(0.017)	(0.008)	(0.016)
Family status (reference: single)				
living with a partner	0.169***	0.263***	0.281***	0.420***
	(0.030)	(0.054)	(0.036)	(0.062)
married	0.238***	0.392***	0.242***	0.361***
	(0.036)	(0.066)	(0.043)	(0.075)
divorced	-0.466***	-0.559***	-0.102*	-0.081
	(0.050)	(0.094)	(0.054)	(0.095)
widowed	-0.215	-0.411	-0.473***	-0.332**
	(0.135)	(0.252)	(0.091)	(0.161)
Other variables				
household size	-0.061***	-0.114***	-0.064***	-0.106***
	(0.012)	(0.022)	(0.014)	(0.024)
age	-0.070***	-0.074***	-0.059***	-0.049***
	(0.007)	(0.014)	(0.008)	(0.015)
age^2	0.000**	0.001***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
number of children	0.029**	0.035	0.031**	0.043
	(0.013)	(0.025)	(0.016)	(0.027)
years of education	0.029	0.082**	0.040	0.134***
	(0.021)	(0.038)	(0.025)	(0.044)
house ownership	-0.189***	-0.285***	-0.072	-0.193*
	(0.052)	(0.094)	(0.064)	(0.109)
relative in need of care	-0.006	0.005	0.018	0.046**
	(0.009)	(0.017)	(0.012)	(0.021)
R^2 / log likelihood	0.04	-25,597	0.03	-20,069
observations	61,738	56,119	49,998	44,635

*Note: OLS Fixed Effect and Conditional Fixed Effect Logit estimations with individual fixed effects and time fixed effects. Standard deviations in parentheses. * denotes significance at the 10-percent level, ** at the 5-percent level and *** at the 1-percent level.*

Table 6: Regression results for life satisfaction including working hours and preferences

The square of working hours is negative and significant. Hence, well-being is influenced positively by an increase in the first working hours and negatively if the rise occurs while the labour time is already high. We turn now to the variables that indicate the deviation from the individually preferred labour time. Both overemployment and underemployment have the expected negative sign. Deviations from the preferred working time decrease well-being significantly. Interestingly, the negative effect is stronger if employees work too long. One

hour more than the preferred working time leads to a fall in life satisfaction of 0.025 points for men whereas the well-being decrease due to underemployment is only 0.015 points. As the results show overemployment is a likewise unfavourable condition for women and has a highly significant influence. A deviation from the preferred working time leads to a strong decline in individual well-being but only if they work too much. Underemployment on the other hand does not have a significant impact on life satisfaction of women.

7. Conclusion

Standard economic theory assumes disutility effects caused by work at the margin whereas the economic happiness literature points to positive non-pecuniary effects of employment. This article investigates the relationship between working hours and individual well-being. The findings obtained from our empirical analysis suggest a more differentiated view. Increasing working hours lead to a rise in individual life satisfaction even if income is held constant. This finding is an indicator that work is a positive source of utility and suggests that employment and working time increase happiness. The change in status from unemployed to employed alone leads to a substantial enhancement of well-being even if the time spent at work represents only very few hours. Furthermore, men benefit from increasing labour hours due to non-monetary utility. The optimal labour supply for maximizing well-being is around seven hours a day. Increasing working time further leads to a reduction in happiness. As is the case with men, women benefit from the non-pecuniary utility of work but reach the optimal labour time after only about four hours a day, with decreasing impact afterwards. Since the happiness maximizing labour time is lower than the average real working time for both sexes, the neoclassical assumption of marginal labour disutility is supported. At the margin, labour does indeed cause disutility for the majority of the employed but the total utility of work is, as the happiness literature suggests, positive rather than negative. These results bring the theory assumptions in line with the empirical findings of the well-being research and find support for both. Moreover, they show that the assumptions of the neoclassical theory are compatible with the empirical happiness results.

The analysis of exogenous changes of working time that lead to over- or underemployment shows a similar picture. Working hours still generate positive utility effects but exogenous deviations from the preferred labour time lead to a strong decrease in well-being. In particular, working more than preferred appears to have a substantial diminishing influence.

Not only is work a necessity to generate income for consumption but it also generates positive non-monetary utility effects. This is a reassuring finding for the ongoing debate in

happiness economics and the question whether we should focus more on leisure time than on work. As long as individuals do not work excessive hours, labour even increases well-being, whereas too much leisure time affects life satisfaction negatively. The economic policy implications are obvious. The main interest should lie in reducing unemployment. Here policy could improve the well-being via two channels – an increase in income for consumption and a rise in the non-pecuniary utility of work. Mandatory restrictions regarding working hours, in contrast, decrease individual welfare because, if determined by outsiders, they do not in most of the cases correspond to the individually preferred labour time. If this is the case, people experience a drop in well-being due to over- or underemployment. It is not restrictions, but more flexible working time that can increase happiness and workers welfare. Particular companies could benefit from flexible working hours and a good working environment. Because the non-pecuniary utility can be seen as a substitute to wages, companies can attract employees even with lower wages than their competitors but have to pay for this wage discount with more flexible working hours and an improvement in their working conditions.

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