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Measuring the Quality of Life: Empirical Evidence for Germany

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(The views expressed in this paper are those of the authors. They do not necessarily reflect the views of the German Federal Statistical Office.)

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Abstract

The Report by the Commission on the Measurement of Economic Performance and Social Progress by Stiglitz, Sen and Fitoussi has initiated a wide range of papers concerning the measurement of well-being. The central issue of these contributions is the search for indicators that could supplement the gross domestic product, i. e. to derive additional factors explaining well-being and quality of life. In this paper the focus is set on two issues: First of all, selected indicators proposed by the Stiglitz report are analysed with regard to the relevance for explaining the degree of individual quality of life (micro level). Secondly, it is examined, whether there is a change in relevance of indicators over time. These questions also include a discussion about relationship between selected indicators and their magnitude. The empirical results presented in this paper are based on yearly longitudinal data of private households in Germany. Currently, the data set covers about 23,000 individuals living in more than 12,000 private households. The data set provides information on various indicators for the quality of life mentioned by the Stiglitz report, like for instance people's objective life-circumstances, moral concepts and individual assessments. Concluding remarks concern the link of the quality of life both at the micro level and the macro level. Challenges of integrating results at the micro level into an analysis of quality of life at the aggregate level are discussed as well.

Keywords: Gross domestic product, Stiglitz-Sen-Fitoussi-Report, quality of life, Socio-economic panel (SOEP), Germany

JEL classification: C2, D6, I31

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1 Introduction

The "Report by the Commission on the Measurement of Economic Performance and Social Progress" by Stiglitz, Sen and Fitoussi has initiated a wide range of papers concerning the measurement of well-being.[1] The central issue of these contributions is the search for indicators that could supplement the gross domestic product, i. e. to derive additional factors explaining well-being and quality of life.

Progress in economics often can be regarded as circular. Paradigms, ideas and methods arise, vanish and arise again, reflecting the change in the problems of society and economy. It seems that this statement can also be applied to the statistical measurement of well-being.

Indeed, criticism on the gross domestic product and discussions about alternative measures of well-being are not new. For instance, in the 1990s the United Nations created the "human development index (HDI)" that combined the GDP with measures of health and educational achievement. In 1992 the UN Summit in Rio de Janeiro brought the notion of Sustainable Development into the policy debate ("Agenda 21"). In the 1970s Nordhaus and Tobin (1973) attempted to develop a measure of economic welfare (MEW), based on GDP, but correcting GDP for its most evident limitations.[2] And in the year 1972 the "Club of Rome" raised considerable attention with the report "The Limits to Growth".

Already at that time when the concepts of the national accounts were founded, the psychologist and humanistic philosopher Erich Fromm criticised the modern society with its focus set on material wealth: "We consume, as we produce, without any concrete relatedness to the objects with which we deal; we live in a world of things, and our only connection with them is that we know how to manipulate or to consume them. (Fromm, E., 1959, p. 134). And in the 1960 he came to the *credo* "… that love is the main key to open the doors to the 'growth' of man. Love and union with someone or something outside of oneself, union that allows one to put oneself into relationship with others, to feel one with others, without limiting the sense of integrity and independence." (Fromm, E., 1994)

Expressing it in his words from the mid of the last century Fromm has just dealt with the topic of this paper: it is the search for components or variables that determine the "growth of man", or in modern words: the quality of life of human beings.

Hereunto, the paper is organised as follows: Following this introduction section 2 deals in general with the framework of measuring the quality of life. In section 3 the data to be used for the econometric estimates later in this paper are explained. Section 4 discusses the basic set of variables and the (possible) methods for the estimates. In section 5 the empirical results are presented and the paper ends with some concluding remarks in section 6.

[1] In the following this report is called by its authors "Stiglitz-Sen-Fitoussi-Report".
[2] Commission on the Measurement of Economic Performance and Social Progress (2008), p. 1.

2 Measuring the quality of life: Background

2.1 The Stiglitz-Sen-Fitoussi-Commission and the initiative "GDP and beyond"

"A discussion on adequate well-being indicators is anything but new. An important academic debate on social and well-being indicators has been going on since the early 70s. The novelty of the current debate is that the discussion has fully reached and has been forcefully appropriated by the political sphere for the first time." (García Díez, S., 2012, p. 2)

For this new debate two reports are very influential. First of all, it is the "Report of the Commission on the Measurement of Economic Performance and Social Progress" (or "Stiglitz-Sen-Fitoussi-Report"). And on the other side, with the focus set on Europe it is the "Communication from the Commission to the Council and the European Parliament. GDP and beyond. Measuring progress in a changing world" by the European Commission.[1]

These reports discuss the informational value and the shortcomings of the gross domestic product (GDP). They both stress the usefulness of the GDP as an approved indicator. But they propose to supplement the GDP by other indicators concerning economic, social and ecological topics.

As one of the reasons for supplementing the GDP by other indicators the Stiglitz-Sen-Fitoussi-Commission considers the concept of the quality of life. To measure the quality of life it is not sufficient to measure the availability of goods and services. It is rather necessary to go beyond the concept of material standard of living and to investigate the determinants of the quality of life.

For this purpose the objective features that shape the quality of life have to be identified. According to the Stiglitz-Sen-Fitoussi-Commission seven features indicate the dimensions of the quality of live in addition to the economic conditions:

- Health,
- Education,
- Personal activities,
- Political voice and governance,
- Social connections,
- Environmental conditions
- Personal and economic insecurity.

It is common practice to measure these features in different ways. For instance, health can be measured by the life expectancy at birth, the absence of diseases or healthy live years. Therefore, it is the prior task to identify indicators that predominantly determine these features and the quality of life.

A second and possibly more important question is how to determine factors influencing quality of life. Can experts' proposals be accepted or should they be substantiated by empirical evidence? Do such factors change across countries and/or over time?

[1] For an overview see Braakmann, A. (2010).

2.2 Approaches to measure the quality of life

Apart from the traditional GDP approach there are four approaches to measure well-being and quality of life respectively.[1]

- Corrected GDP and extended national accounts,
- Composite indexes,
- Subjective approaches and
- Dashboards or sets of indicators.

One of the early attempts to calculate a corrected GDP was done by Nordhaus, W./Tobin, J. (1972). They derive a Measure of Economic Welfare (MEW) by subtracting from total private consumption a number of components that do not contribute positively to welfare (such as commuting or legal services) and by adding monetary estimates of activities that contribute positively to welfare (such as leisure or work at home). Then they convert the MEW in a "sustainable measure of economic welfare" (SMEW) that takes into account changes in total wealth.

The so-called "composite indicators approach" consists in aggregating several elementary indexes to encompass a broad spectrum of dimensions affecting what the indicator wants to measure (human development, well-being, environmental sustainability, etc.). Unlike the "corrected GDP" indicators, this approach does not provide a unified way of measuring heterogeneous dimensions of well-being. The distinctive features of these indicators relate to the domains covered, the normalisation methodology used, and the weights used for aggregation.

The most well-known composite indicator is the Human Development Index (HDI) proposed by the United Nation Development Programme (UNDP) in 1990. The HDI consists of a weighted average of GDP, life expectancy and education measures (adult literacy rate and school entry rates).

A third group of approaches consists of measures of subjective well-being. Subjective approaches are based on the idea that individuals themselves are the best judges of their quality of life. So, it is the best way to ask them directly about their well-being, which in practice can be done by using different methods.

Meanwhile, there are several surveys that include questions about well-being. For instance, EU-SILC, the European "Statistics on income, social inclusion and living conditions", which started in 2003 and is conducted in the member states of the European Union, in Switzerland, Norway, Island, Turkey, Croatia, Serbia and Macedonia, includes questions about poverty, social exclusion, education and health.[2]

The fourth approach to measure quality of life is to apply dashboards or sets of indicators. Sets of indicators have a long tradition. In the 1970s the OECD initiated an ambitious statistical program on social indicators. In the mids of the 1980s their influence decreased, but they have come back to life in the 1990s, represented by the "Sustainable Development Indicators of the United Nations.

[1] For a synopsis of these approaches see Commission on the Measurement of Economic Performance and Social Progress (2008). The survey is also the basis for this section.
[2] See Eurostat (2010).

Sets of indicators "typically refer to descriptive measures of *average* conditions of people living in different countries, with indicators covering a large number of domains. Recent initiatives on indicator sets share some specific characteristics that differentiate them from earlier developments. First, these initiatives have often a strong environmental focus, within the broader agenda of sustainable development. Second, these developments are often more participatory, developed at the local level by groups that use indicators as part of a strategy aimed to mobilize action on specific issues. Third, these indicator sets are often specifically tailored to the needs of policy makers." (Commission on the Measurement of Economic Performance and social Progress …, 2008, p. 8)

2.3 Selection of indicators

As there are several very different approaches to measure the quality of life this leads to the question which approach should be preferred. It is not straightforward to find an answer. Every approach has it pros and cons.

But an answer can be found on a very pragmatic level: Currently, the political discussion is focussing on sets of indicators. Not only the Stiglitz-Sen-Fitoussi-Report, but also the Commission of the European Communities (2009) or the German Council of Economic Experts and Conseil d'Analyse Economique (2010) discuss or propose respectively dashboards or set of indicators.[1]

To contribute to this discussion it would be very useful to investigate the question which indicators predominantly determine the quality of life. One approach for Germany was proposed by Kassenboehmer and Schmidt (2011): They analyse data at the macro level from the German Federal Statistical Office combined with micro level data from the German SOEP (1991–2008) on the personal work situation and subjective feelings concerning several aspects of life. Employing the indicators suggested by the Stiglitz-Sen-Fitoussi-Report, they come to the result that much of the variation in many well-being measures can be captured well by the hard economic indicators as used in the literature, especially by GDP and the unemployment rate. But they also see that these correlations are far from perfect, thus giving considerable hope that there is room for a broader statistical reporting.

Following and discussing the approach of Kassenboehmer and Schmidt (2011) in the next section it is tried to find indicators that predominantly determine the quality of life.

3 Data: German Socio-Economic Panel (SOEP)

The first step to search for indicators that determine the satisfaction with life is to find an appropriate data base. For instance, results from EU-SILC could be used. The advantage of this survey is that it covers many European countries.[2] On the other side, it is the aim of this study to begin with the results of Kassenboehmer and Schmidt (2011). As they use data from the German Socio-Economic Pane (SOEP), it is self-evident also to use these data.

[1] The Conseil d'Analyse Economique ist the French counterpart to the German Council of Economic Experts.
[2] Frick, J and K. Krell (2011) compare EU-SILC and the SOEP concerning income analysis for Germany.

Table 1: Subsamples of the SOEP 2008[1]

Sample	Start-Year	House-holds	Persons	Description
A West-German residents	1984	4,154	5,619	Head is either German or other nationality than those in Sample B
B Foreigners	1984			Head is either Turkish, Italian, Spanish, Greek or from the former Yugoslavia
C East-Germans	1990	1,592	2,889	Head was a citizen of the GDR (expansion of survey territory)
D Immigrants	1994 / 1995	328	602	At least one household member has moved to Germany after 1989 (expansion of survey population)
E Refreshment	1998	602	1,071	Random sample covering all existing sub-samples (total population)
F Innovation	2000	3,513	6,724	Random sample covering all existing sub-samples (total population)
G High Income	2002	787	1,574	Monthly net household income is more than 4.500 Euro (7.500 DM)
H Refreshment	2006	1,082	1,904	Random sample covering all existing sub-samples (total population)
I Incentive / Re-freshment	2009	-	-	Random sample covering all existing sub-samples (total population)

The SOEP is a longitudinal panel dataset of the population in Germany that started in 1984.[2] It is a household based study which reinterviews adult household members annually.

Altogether, the panel consists of nine subsamples: The survey began in 1984 with two subsamples: West German residents (subsample "A") and the subsample "B" of households with a head from a foreign country. After the German reunification they were supplemented by the subsample "C" with East German residents. In the following years these were supplemented by the subsamples "D" to "H" to consider the role of immigrants in Germany or to refresh the samples. The last subsample "I" was introduced in 2009. The subsamples are described in Table 1. In 2008, there were about 12,000 households, and more than 20,000 adult persons inquired.

The topics surveyed by the SOEP include questions concerning[3]

- Demography and housing,
- Personality traits und basic attitudes,
- Social capital and leisure time,
- Education,
- Labour market and employment

[1] The figures for households and persons concern to the number of successful interviews.in 2008. See Kroh, M. (2011), p. 5 – 10.
[2] For a description of the SOEP see Haisken-DeNew, J. P. and J. Frick (2005), Wagner, Gert G., Joachim R. Frick and Jürgen Schupp (2007) and http://en.wikipedia.org/wiki/Socio-Economic_Panel.
[3] See Gert G.Wagner, Jan Goebel, Peter Krause, Rainer Pischner and Ingo Sieber (2008), p. 305.

- Income, wealth and social security
- Health,
- Subjective indicators on social inclusion/exclusion (worries, satisfaction with life).

SOEP data are integrated into the Cross National Equivalent File (CNEF) which contains panel data from Australia, Canada, Germany, Great Britain and the United States. The data distribution of the SOEP for researchers outside of Germany is supplied with the CNEF by a group at Cornell University.

Table 2: Variables of the estimated models[1]

Variable	Description	Unit/Code/Remarks
SATLIFE	Satisfaction with life at today	0-low to 10-high
SATHEALTH	Satisfaction with health	
SATWORK	Satisfaction with work	
WORRYECON	Worried about economic development	1 Very concerned
WORRYECSIT	Worried about finances	2 Somewhat concerned
WORRYENV	Worried about environment	3 Not concerned
WORRYJOB	Worried about job security	
WORRYPEACE	Worried about peace	
LABNET	Current net labour income	Euro ; generated variable
OVERTIME	Hours of overtime last month	Hours
UNEMPLYD	Registered unemployed	1 yes ; 2 no
EDUCATION	Amount of education or training in years	Number of years
YEARBIRTH	Year of birth	Year
MARITALSTATUS	Marital status in survey year	Nominal
NATION	Nationality	Nominal ; generated var.

4 Method

4.1 The basic set of indicators

As it is an intention of this paper to discuss the results of Kassenboehmer and Schmidt (2011) the selection of indicators used for the estimated models is widely determined by their approach. All in all they have twelve variables for their investigation on the micro-level. These are shown in Table 2 on page 9.[2]

[1] See Goebel, J. (2012a) and Goebel, J. (2012b).

[2] Kassenboehmer and Schmidt (2011) have also an approach based on macro-data with partly different variables. For instance, they use GDP instead of (monthly) labour income, unemployment rate instead of the dummy for unemployment. But this approach on the macro-level is not investigated here.

The variable SATLIFE represents general satisfaction with life. It is measured on a scale from 0 ("low") to 10 ("high). On the same scale the variables SATHEALTH ("Satisfaction with health") and SATWORK ("Satisfaction with work") are measured. These variables represent so-called areas of satisfaction.

Five indicators describe special worries, ranging from individual worry about own finances and job security to rather general worries about environment and peace. These indicators are measured on a scale from 1 ("very concerned") to 3 ("not concerned").

The indicator LABNET represents the current net labour income. It is a so-called generated variable.[1] This variable is measured in Euro. The further variables used by Kassenboehmer and Schmidt (2011) are OVERTIME, UNEMPLYD and EDUCATION.

The variable YEARBIRTH is no part of the investigation of Kassenboehmer and Schmidt (2011). In this study the meaning of this variable is twofold. First of all, it is used to include only adults into the dataset. Secondly, YEARBIRTH serves as a control variable for some models to be estimated later. The other control variables are MARITALSTATUS and NATION. MARITALSTATUS is a variable empirically measured and NATION is a generated variable.

4.2 Estimation technique

There are several methodological approaches to investigate the question what kind of indicators determines the quality of live.

Kassenboehmer and Schmidt (2011) carry out their analysis using principal component factor analysis. It is the aim of the factor analysis to reduce the number of variables to a set of hypothetic variables, the so-called *factors*. Especially, in their paper the observed variables income, unemployment etc. is supposed to be presented by a smaller number of variables. Then, applying statistical measures it would be possible to select observed variables that are appropriate to represent the *dimensions* of wealth.

Factor analysis serves as a tool to reduce dimensions (of the data). It is a linear model between factors and variables.

Because of the high number of unknown parameters the general model of factor analysis is not without ambiguity and problems of identification concerning the problem of communalities, the problem of rotation or the number of variables to be extracted. These problems are an integral part of the factor analysis and they only can be solved by introducing very restrictive assumptions.

For this reason, the factors found by the factor analysis should not be interpreted as determining variables, but rather as variables that condense the information contained in the data. To find causalities between variables it would be useful to apply other methods.

First of all, it is possible to use the classical multiple linear regression model. The advantage of the multiple regression model can be described as follows: "The linear regression model is the single most

[1] Generated variables are no part of the SOEP-survey. They supplement the survey data to facilitate the analysis.

useful tool in the econometrician kit. Although to an increasing degree in contemporary research it is often only the departure point for the full analysis, it remains the device used to begin all empirical research. And, it is the lens through which relationships among variables are usually viewed." (Greene, W., 2012, p. 52) The linear regression model can be estimated with the pooled data from 1991 to 2009 or with data for single years.

One of the assumptions of the linear regression model are normal distributed residuals and homoscedasticity of the residuals. This implies that the variables of the model, especially the dependent variable, are also normally distributed and of a quantitative nature. But almost all variables described above do not hold this assumption. They are the result of an ordered choice measured on different scales. "The numerical values are only a ranking, not a quantitative measure. Thus a "1" is greater than a "0" in a qualitative sense, but not by one unit, and the difference between a "2" and a "1" is not the same as that between a "1" and a "0"." (Greene, W., 2012, p. 722). To consider the shortcomings of the linear regression model it would be useful to apply logit or probit models.

On the other hand, SATLIFE, the variable to be predicted, is measured on a scale from "0" to "10", which implies a binomial distribution for the sample. The discrete binomial distribution converges to the normal distribution for big samples. So, the assumptions of the linear regression model may be fulfilled asymptotically and the linear regression model could lead to useful results.

Hajek, A. (2011), p. 21 – 22 argues that the question if the satisfaction with life should be measured on an ordered scale or on an continuous scale has no clear answer. Psychologist and sociologist would treat satisfaction with life as continuous using OLS-regressions (Kahneman, Diener and Schwarz, 1999) whereas economists would apply ordered response models based on the assumption of an ordinal variable (for instance, Ferrer-i-Carbonell and Fritjers, 2004). Furthermore, Ferrer-i-Carbonell and Fritjers (2004) and Blanchflower (2009) would argue, that it does not matter if satisfaction with life is treated as ordinal or continuous.

In this paper the analysis predominantly uses OLS regressions. First of all, a detailed analysis is done for 2008. Then, the results of 2008 are compared with the results for the years 1991 and 2000. Hereafter, the regression is carried out with the pooled data from 1991 to 2009.

5 Empirical results

5.1 Descriptive Analysis of the indicators

Table 3 shows some descriptive information about the indicators used for the estimates of the models for 2008. The variable YEARBIRTH is here transformed to age. The only purpose of this transformation is to obtain a clear interpretation of the calculated parameters. For the regressions YEARBIRTH itself is applied.

Table 3: Descriptive statistics. Data for 2008

Variable	N	Arithmetic mean	Standard deviation	Mini-mum	Maxi-mum
SATLIFE	19512	6.98	1.75	0	10
SATHEALTH	19524	6.56	2.17	0	10
SATWORK	11598	6.90	2.10	0	10
WORRYECON	19475	1.89	0.61	1	3
WORRYECSIT	19472	2.10	0.70	1	3
WORRYENV	19482	1.86	0.63	1	3
WORRYJOB	11244	2.36	0.71	1	3
WORRYPEACE	19480	1.84	0.68	1	3
LABNET	19553	906.04	1245.75	0	20999
OVERTIME	4982	18.63	16.93	1	99
UNEMPLYD	19553	1.94	0.24	1	2
EDUCATION	18304	12.21	2.70	7	18
YEARBIRTH (Age)	19553	49.90	17.59	18	99
	Value			N	%
MARITALSTATUS	Married, live together			11741	59.65
	Married, live separated			337	1.71
	Single			4711	23.93
	Divorced			1534	7.79
	Widowed			1361	6.91
	Total			19684	100.0
NATION	Germany			18778	94.15
	Turkey			359	1.80
	Italy			192	0.96
	Greece			97	0.49
	Ex-Yugoslavia			71	0.36
	Croatia			61	0.31
	Austria			40	0.20
	Others			374	1.73
	Total			19945	100.00

MARITALSTATUS and NATION are nominal variables. Therefore, only absolute and relative frequencies are calculated. Both variables are shown here divided by subcategories. All subcategories for MARITALSTATUS are listed, but for NATION only the most frequently categories. For the purpose of regression estimates both variables are transformed

Table 4: Correlation coefficients of the variables (Bravais-Pearson)

	SATLIFE	SATHEALTH	SATWORK	WORRYECON	WORRYECSIT	WORRYENV	WORRYJOB	WORRYPEACE	LABNET	OVERTIME	UNEMPLYD	EDUCATION	YEARBIRTH
SATLIFE	1.000	0.513	0.475	0.149	0.377	0.006	0.248	0.028	0.029	0.006	0.175	0.023	0.068
SATHEALTH	0.513	1.000	0.385	0.121	0.184	0.066	0.131	0.089	0.010	0.001	0.047	0.016	0.321
SATWORK	0.475	0.385	1.000	0.132	0.281	0.029	0.245	0.043	0.011	-0.016	0.202	0.007	0.047
WORRYECON	0.149	0.121	0.132	1.000	0.395	0.259	0.257	0.292	0.004	-0.021	0.052	-0.007	0.076
WORRYECSIT	0.377	0.184	0.281	0.395	1.000	0.122	0.495	0.167	0.038	0.049	0.210	0.049	-0.157
WORRYENV	0.006	0.066	0.029	0.259	0.122	1.000	0.077	0.538	0.003	0.030	-0.011	0.001	0.059
WORRYJOB	0.248	0.131	0.245	0.257	0.495	0.077	1.000	0.156	0.039	0.024	0.096	0.025	-0.101
WORRYPEACE	0.028	0.089	0.043	0.292	0.167	0.538	0.156	1.000	0.007	0.048	0.012	0.004	0.116
LABNET	0.029	0.010	0.011	0.004	0.038	0.003	0.039	0.007	1.000	0.018	0.025	0.362	-0.006
OVERTIME	0.006	0.001	-0.016	-0.021	0.049	0.030	0.024	0.048	0.018	1.000	0.018	0.013	-0.034
UNEMPLYD	0.175	0.047	0.202	0.052	0.210	-0.011	0.096	0.012	0.025	0.018	1.000	0.009	-0.092
EDUCATION	0.023	0.016	0.007	-0.007	0.049	0.001	0.025	0.004	0.362	0.013	0.009	1.000	-0.014
YEARBIRTH	0.068	0.321	0.047	0.076	-0.157	0.059	-0.101	0.116	-0.006	-0.034	-0.092	-0.014	1.000

to dummy variables with “Married, live together” = 1/”Otherwise” = 0 and “Germany” = 1/”Otherwise” = 0.

5.2 Correlation of indicators

In Table 4 on page 13 the correlation between the variables for 2008 is shown. All variables are treated as numeric. Therefore the correlation coefficient of Bravais-Pearson was pairwise calculated. The calculation of the correlation coefficient of Spearman that would be more appropriate for ordered data led to similar results.

Altogether, the correlations between the variables are not very strong. None of the values exceeds 0.6 and only a few are higher than 0.4. For the purpose of regression analysis this result has its advantage. Poor correlation between the variables can mean that the variables are appropriate to explain the behaviour (or deviation) of the dependent variable.

Only some of the variables show a correlation that should be expected. There is a pairwise correlation between SATLIFE, SATHEALTH, SATWORK and WORRYECSIT and also a correlation between EDUCATION and LABNET.

On the other side, the lack of correlation between some variables is fare from intuition. For instance, it should be clear that there is a strong relationship between the year of birth and income or between income and the hours of overtime. But both parameters are near zero.

5.3 Cross-sectional evidence

The investigation of cross-sectional evidence starts with all variables used by Kassenboehmer and Schmidt (2011). But including the variable UNEMPLYD makes it necessary to group the regression equations. If the status of UNEMPLYD is “YES”, it can be expected that the influence of the variables LABNET, WORRYJOB or OVERTIME would not be the same as with the status “No”. It can also be expected, that the significant variables of the grouped models will differ. Therefore, the estimates are grouped by UNEMPLYD is “No” and “Yes”.

The results of the grouped regressions are shown in Table 5. Model 1 includes all variables of Kassenboehmer and Schmidt (2011) grouped by UNEMPLYD. First of all, the groups have a lot in common. As shown by the F-value the models for both groups are significant. Satisfaction with health and work, the (absence of) worry about the own economic situation have a significant influence on the satisfaction with life. OVERTIME has no influence for the employed. For the group of the unemployed it cannot be interpreted. WORRYECON, OVERTIME and EDUCATION have no significant influence on the satisfaction of life of both groups. WORRYENV is also significant, but it has the wrong sign.

For the group of the employed worry about peace has also the wrong sign, whereas this variable is not significant for the unemployed. According to a P-value of 6.6% LABNET has a significant influence on the satisfaction with life. The fact that the estimate is near zero depends on the different scales of the model variables. Whereas most variables are measured on a scale from 0 to 10 or 1 to 3, LABNET is measured in EUR with a range up to 18.000.

Table 5: Estimation results for grouped regression 2008

	Model 1: Full model		Model 2: Fore-ward selection		Model 3: Back-ward selection		Model 4: Free-hand-selection	
Variable	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
	Regression on SATLIFE ; UNEMPLYD = No							
Intercept	2.64001	<.0001	2.65333	<.0001	2.72648	<.0001	2.94303	<.0001
SATHEALTH	0.29126	<.0001	0.29134	<.0001	0.27198	<.0001	0.28642	<.0001
SATWORK	0.21321	<.0001	0.21319	<.0001	0.21489	<.0001	0.25164	<.0001
WORRYECON	0.01761	0.6093					0.22814	<.0001
WORRYECSIT	0.52187	<.0001	0.52657	<.0001	0.53957	<.0001		
WORRYENV	-0.06887	0.0456	-0.06706	0.0508	-0.10010	<.0001		
WORRYJOB	0.08964	0.0029	0.09062	0.0025	0.08974	<.0001		
WORRYPEACE	-0.06613	0.0419	-0.06336	0.0486	-0.07026	0.0013		
LABNET	0.00003	0.0663	0.00003	0.0727			0.00002	0.0139
OVERTIME	-0.00556	0.2987	-0.00551	0.3029				
EDUCATION	-0.00957	0.1895	-0.00960	0.1881				
F-Value (model)	315.51	<.0001	350.62	<.0001	1073.58	<.0001	1388.35	<.0001
Observations	4910		4911		10547		11208	
	Regression on SATLIFE ; UNEMPLYD = Yes							
Intercept	2.59977	0.0218	2.63750	<.0001	2.21105	<.0001	2.28061	<.0001
SATHEALTH	0.34598	<.0001	0.35772	<.0001	0.31621	<.0001	0.32601	<.0001
SATWORK	0.22331	0.0020			0.18074	<.0001	0.20210	<.0001
WORRYECON	-0.04529	0.8951					0.29144	0.0535
WORRYECSIT	0.74208	0.0251	0.89789	<.0001	0.75539	<.0001		
WORRYENV	-0.69327	0.0738	-0.00207	0.9884	-0.17914	0.2272		
WORRYJOB	-0.02660	0.9027						
WORRYPEACE	0.31985	0.3743	0.13520	0.0951				
LABNET	-0.00006	0.7851					0.00012	0.0739
OVERTIME	-0.03399	0.5104	-0.02130	0.3202				
EDUCATION	-0.00114	0.9883						
F-Value (model)	6.04	<.0001	45.05	<.0001	48.78	<.0001	42.46	<.0001
Observations	86		562		341		340	

Model 2 and model 3 are the result of automated model selection: forward selection and backward selection based on all variables of model 1.[1] Now, the model specifications differ from the kind of selection and the kind of group. For the group of the employed forward selection generated de facto the same specification as for model 1. WORRYECON which was not significant in model 1, is dropped by forward selection and again the variables OVERTIME and EDUCATION have no significant influence. WORRYPEACE has again the wrong sign.

In the case of the unemployed the variables SATWORK, WORRYECON, WORRYJOB, LABNET and EDUCATION are dropped. WORRYENV is still included but not significant. For the group of the employed backward selection dropped the variables WORRYECON, LABNET, OVERTIME and EDUCATION. For the group of the unemployed additionally, WORRYJOB and WORRYPEACE were excluded.

Model 4 is the result of freehand selection. For both groups the same set of indicators was selected: SATHEALTH, SATWORK, WORRYECON and LABNET.

Altogether, the results of the four models do not lead to a unique selection of variables. In all cases satisfaction with health and for the group of the employed satisfaction with work and the labour net income seem to be important for satisfaction with life. But there are also some problems of interpretation. For instance, the variable WORRYENV has the wrong sign in some cases and the variable LABNET is partly significant for the group of the unemployed.

5.4 Longitudinal results

To investigate the question, if the results are stable over time, the estimates were repeated with data for 1991, 2000 and for the pooled data from 1991 to 2009.

Additionally, several control variables were added now: Age, marital status and nationality. Even, if these variables may have an influence on the quality of life they were not included before, because it was the intention to investigate the impact of the variables of Kassenboehmer and Schmidt (2011) exclusively. Now, in the following step it is not only the intention to investigate the longitudinal aspect of the estimates but also to try to improve the model specifications.

With regards to the variables SATHEALTH, SATWORK, WORRYECON and LABNET the results for the models 5 to 8 are equal. They all have a significant influence on satisfaction with live, regardless of the year considered or the pooling of data. The influence of the variable EDUCATION seems not to be clear. For the years 1991 and 2000 there is a significant influence. But for 2008 there cannot be found any influence. And for the pooled data the influence is rather poor. Also for the variables YEARBIRTH, MARITALSTATUS and NATION the influence is not clear for all models.

To clarify this issue, especially the changes in the course of time, the regression estimates were supplement by some fixed effects models. But the results were not unambitious and are not reported here.

[1] The criterion to select or drop variables was the p-value of the F-statistics of the model. As a third automated method Stepwise selection was applied. Stepwise selection is not reported in Table 5, because it led to the same results as the Backward selection.For a discussion of the problem of model selection see for instance Greene, W. (2012), p. 178 – 181.

Table 6: Estimation results for 1991, 2000, 2008 and 1991 to 2009

	Model 5: 1991		Model 6: 2000		Model 7: 2008		Model 8: 1991 – 2009 (pooled data)	
	Regression on SATLIFE							
Variable	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Intercept	6.23270	<.0001	10.89664	<.0001	1.51379	0.0880	2.67417	<.0001
SATHEALTH	0.22444	<.0001	0.26671	<.0001	0.27681	<.0001	0.27703	<.0001
SATWORK	0.25600	<.0001	0.27773	<.0001	0.22275	<.0001	0.24214	<.0001
WORRYECON	0.39874	<.0001	0.22987	<.0001	0.22901	<.0001	0.25193	<.0001
LABNET	0.00034	<.0001	0.00026	<.0001	0.00008	<.0001	0.00007	<.0001
YEARBIRTH	-0.00312	0.0429	-0.00830	<.0001	0.00064	0.1527	0.00009	<.0001
EDUCATION	-0.05984	<.0001	-0.04507	<.0001	0.00145	0.7771	0.00225	0.0813
MARITALSTATUS	0.02483	0.5460	-0.00701	0.8576	0.28120	<.0001	0.21573	<.0001
NATION	-0.06102	0.2329	-0.07227	0.1375	0.14089	0.0008	-0.06077	<.0001
F-Value (model)	478.44	<.0001	485.63	<.0001	748.81	<.0001	11442.9	<.0001
Observations	8256		7784		13101		192876	

5.5 Evaluation of the results

The models presented in this paper have identified four variables from a restricted set of variables that predominantly determine the satisfaction with life:

- Satisfaction with health,
- Satisfaction with work,
- (Absence of) worries about the economy,
- Labour net income.

With minor exceptions these variables show a significant influence on the satisfaction with life. The results hold for grouped regression, in the course of time and for the pooled data from 1991 to 2009. The exceptions concern to the variable WORRYECON (worry about the economic development). In the full model (Model 1) this variable is not significant. And in the models with automated selection of variables WORRYECON does not belong to the selected variables. On the other side, in this cases the variable WORRYECSIT that reflects worries about the own financial situation plays a significant role for satisfaction with life. As there is a correlation between these variables, this leads to the conclusion that the assessment of the economic situation, either the economic development or the own economic situation, plays a significant role for the satisfaction with life, beside satisfaction with health, satisfaction with work and the labour net income.

6 Conclusion

In this paper it was investigated which factors determine the satisfaction with life. Based upon the results of Kassenboehmer and Schmidt (2011) a set of indicators was used to construct single equation regression models. The estimated models identified soft factors like satisfaction with health or satisfaction with work as well as the hard factor of (net labour) income as factors that predominantly determine the satisfaction with life.

Even if the results were unambitious according to the selected variables it seems necessary to broaden the investigation. The longitudinal results show some differences in the course of time. Therefore, it would be useful to supplement the regression models by appropriate panel data models.

To compare the results achieved with the results of Kassenboehmer and Schmidt (2011) the investigated set of indicators was restricted to the indicators used by them. Indicators that reflect social relationships where not examined. Therefore it would be very useful to broaden the analysis and to include variables like “Satisfaction with friends and acquaintances” or “spare time activities” into the models.

The data from the SOEP refer to Germany only. The results achieved are not valid for other countries. Therefore, it would be useful to repeat the estimates with other data. Cause of its international coverage, the data from EU-SILC seem to be very useful here.

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