Quantitative Analysis of Well-being with economic Applications
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Chapter 9

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9.1 Approach

This thesis has presented economic research on subjective measures of welfare and well-being. The number of studies making use of answers to subjective questions as a proxy to measure welfare and well-being has substantially increased over the last few years, and such studies have been applied especially to topics in health, welfare, and labor economics. In traditional applied welfare studies, such as the study of poverty and inequality, individuals are compared on the basis of income and other objective measures, such as whether the individual is employed or healthy. This thesis has instead compared individuals on the basis of their self-reported well-being. Moreover, it has shown the meaningfulness and applicability of subjective measures.

In order for individual self-reported welfare and well-being to be meaningful, interpersonal comparability of the answers needs to be assumed. The responses to well-being questions can be interpreted as ordinal or cardinal. At an ordinal level, interpersonal comparability means, for example, that an individual answering "8" on a "0" to "10" well-being scale is happier than someone answering "4". At a cardinal level, it means that the first individual is twice as happy than the second. Most empirical analyses in this thesis have assumed ordinality and have avoided, whenever possible, the stronger assumption of cardinality. Nevertheless, some empirical analyses were meaningless or technically impossible to perform if cardinality was not assumed. Since assumptions made differed among chapters various econometric techniques were employed. When ordinality is assumed, the answers to subjective well-being questions correspond to an ordered categorical variable, which allowed the use of an Ordered Probit model. When cardinality was assumed, GLS or OLS regression was performed.

The empirical analyses are based on three panel data sets: for Germany (GSOEP); for the UK (BHPS); and for Russia (RUSSET). These data sets are all micro-panels: they contain information on individuals and households across time. With the exception of Chapter 6, all empirical studies took advantage of the panel structure of the data by using several waves.
From an econometric perspective, this means that the regression analysis has to account for time as well as individual effects.

Time effects refer to those unobservable variables that change over time but are constant across individuals, such as the political and economic situation of a country. Such time effects have been included through yearly dummy variables: namely, as fixed time effects.

Individual effects are unobservable characteristics that stay constant across time but differ among individuals. Examples are intelligence and optimistic attitude. Individual effects can take the form of fixed effects, i.e. through the inclusion of a dummy variable for each individual, or as random effects, i.e. through the inclusion of a random disturbance with mean 0 and unknown standard deviation. An important characteristic of these unobservable individual effects is that they are bound to be correlated with some of the explanatory variables. For example, one would expect intelligence to be correlated with income. This correlation can only be addressed with fixed effects, and not with random effects. Therefore, fixed effects are, in principle, more suitable to address individual unobservables in an econometric analysis of well-being. Nevertheless, Ordered (Probit or Logit) models with individual fixed effects are either computationally infeasible or not consistent for samples with a small number of years.

If one does not wish to assume cardinality, the choice spectrum is therefore reduced to Ordered Probit with random effects and bi-Logit with fixed effects. Next to Ordinary Least Squares (OLS) or General Least Squares (GLS), these are the most common in the literature. With individual random effects, the individual unobservable characteristics are not allowed to correlate with the explanatory variables, which implies a serious limitation for well-being analysis. The individual fixed effects bi-Logit model has been estimated by reducing answers to subjective questions to just two categories: namely, ‘satisfied’ or ‘unsatisfied’. For example, if the original answers are integers between 0 and 10, these can be reduced to 0 for values below 6, and 1 otherwise. This leads to much loss of information.

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30 The use of random effects in an Ordered Logit model does not permit much flexibility and thus has often been considered as inadequate.

31 The inclusion of fixed effects in a biprobit model is already computationally difficult and not consistent for samples with a small number of years.

32 For a detailed discussion on this issue, see, e.g., Chamberlain (1980, 1984); Maddala (1987); Hsiao (1992).
Moreover, with fixed effects, all individuals who do not change category across time are lost, unless the threshold is individually defined (Ferrer-i-Carbonell and Frijters, 2002). In addition, the explanatory variables that do not change across time, such as gender and often education, can not be included in the regression if individual fixed effects are used.

Given the previous considerations, the approach adopted in this thesis is Ordered Probit with individual random effects. In order to allow for correlation between the individual unobservable effects and the explanatory variables, a specification is used that was first proposed by Mundlak in 1978. This specification decomposes the individual random effect into two terms: a pure error term, which is not correlated with the observable explanatory variables; and a term that is correlated with a subset of the explanatory variables. This has two advantages: all individuals and all explanatory variables can be maintained. This in turn allows for maximum quality of economic estimates.

From an economic perspective, the use of panel data makes it possible to distinguish between a level or average effect and a transitory or shock effect. These two effects are studied by including both the yearly value and the mean over the whole period of analysis for some of the explanatory variables. The level effect identifies the influence of the permanent individual or household characteristics on individual well-being. For example, the household average income over the years is interpreted as the ‘permanent income’, a concept introduced by Friedman (1957). The shock effect defines how individuals are affected by changes in their usual circumstances, e.g., income fluctuations. The introduction of some of the explanatory variables at their average over time is mathematically equivalent to the Mundlak transformation discussed above.

Most of the empirical studies presented in this thesis separate respondents into various sub-samples: the Germans are divided into former Easterners and Westerners, and between workers and non-workers; and the British are divided into workers and non-workers. In this way, the various groups are allowed to have fundamentally different preferences. For example, the influence of income on well-being turned out to be very different for Easterners than for Westerners, which makes sense, given the widespread belief that income is more relevant for individual’s well-being, the poorer they are.
9.2 Findings

This section summarizes and presents the main conclusions that can be drawn from the empirical studies presented in Chapters 2 through 8.

Chapter 2 surveyed the literature on subjective welfare and well-being, discussed its main assumptions, and provided arguments in favor of the use of such measures as a proxy for individual welfare and well-being. There are four main reasons to consider the measurement of welfare and well-being as relevant to economics and the behavioral sciences. First, it can be used to examine the structure of individuals' well-being, which helps to understand individuals' preferences and to predict their behavior. Second, it makes it possible to evaluate the effect on individual well-being of socioeconomic policies and macroeconomic circumstances, such as unemployment and inflation. Third, it contributes to an assessment of distribution and poverty issues. Fourth, it can help describe and analyze the tradeoffs that individuals make between the various factors of well-being, such as income, health, leisure, environment, and children.

Chapter 3 introduced a fairly complex model of the structure of individual well-being. Well-being or General Satisfaction (GS) was explained by individual satisfaction with six distinct domains of life, while Domain Satisfactions (DS) were explained by objective variables. This model was subsequently rewritten as a reduced form in which individual GS depends directly on objective variables. Among other things, the model can be used to calculate the tradeoff between health and income or, in other terms, the economic value of health.

The full extended model of individual well-being was compared with the reduced form model. The comparison showed that both specifications lead to very similar results. The structural model, however, is preferred, as it allows for a better understanding of individual preferences. For example, for West-Workers, the income effect on GS is mainly caused by the relevance of income for financial satisfaction, and to a lesser extent for job and housing satisfaction. Income is hardly relevant for their health and leisure satisfaction. These insights can not be obtained by only using the reduced model. Another example that illustrates the importance of developing a structural model concerns the relationship between gender and well-being. The structural model clearly showed that while for some DS, males were more satisfied, for other domains the opposite was true. The net effect of gender on well-being is
therefore mixed. This can explain why other, more aggregate, studies have not been able to find a consistent relationship between gender and well-being.

Chapter 4 presented an empirical analysis of the impact of income and ‘comparison income’ on individual well-being. This is relevant for two reasons. First, it contributes to the small empirical literature on the influence of interdependency of preferences on individual well-being and happiness. The study done here is one of the few that uses micro-data and a subjective measure of well-being. Second, it diverges from other studies, in that it tests four different hypotheses on the relationship between income and individual well-being. These are: (i) only an individual’s own income is important for individual well-being; (ii) individual well-being depends on the average income of the reference group; (iii) it depends on the difference between an individual’s own income and the average income of the reference group; and (iv) income comparisons are mainly ‘upwards’.

A number of conclusions can be drawn from the analysis. First, the income effect on individual well-being is relatively important. Second, the impact of income on individual well-being is larger for poorer individuals, i.e. individuals from the East Germany subsample. Third, simultaneous and similar increases in own income and in the average income of the reference group do not lead to a change in individual well-being. Fourth, individuals are happier, the larger their income is in comparison with the average income of their reference group. Fifth, for both Westerners and the total German sample, the comparison effect is asymmetric and mostly ‘up-wards’. This means that the well-being of poorer individuals is negatively influenced by the fact that their income is lower than the average of their reference group, while richer individuals do not get happier from having an income above the average of their reference group. This implies that, if a Social Welfare Function is defined as additive, the realization of a more equitable income distribution would lead to higher level of social welfare.

Chapter 5 studied individual preferences concerning health. Concretely, it considered the determinants of individual health satisfaction, such as income, age, and illness. Health Satisfation (HS) is operationalized by means of a self-reported measure. The main innovation is that the effect of an illness on health was allowed to differ with the age of the respondent. For this purpose, the model includes interaction terms between illnesses and age. The analysis showed that there are indeed strong age effects for some illnesses. The impact of
‘chest and breathing problems’ on HS increases with age. Nevertheless, for most other illnesses: namely, ‘difficulty in hearing’, ‘heart and blood problems’, ‘problems with the stomach, liver, and kidneys’, ‘diabetes’, and ‘anxiety, depression or bad nerves’, the impact on HS decreases with age. Thus, even if the illness may become objectively more severe with age, the individual can subjectively perceive it differently. There are a number of possible explanations for this: individuals adapt to an illness; old individuals expect and accept a worse performance of bodily functions; and older individuals tend to suffer from multiple disorders, causing a single one to become relatively less influential on happiness. Decomposing the influence of illnesses on HS generates results that can be useful for policy making.

Chapter 6 presented different concepts of, and measurement techniques for, poverty. Two main concepts of poverty were distinguished: namely, welfare poverty and well-being poverty. The latter is a new concept, which is broad in the sense that it includes not only the economic situation of the individuals but also tries to capture their satisfaction with life as a whole.

Three sorts of measurement techniques were examined: relative objective measures, absolute objective measures; and, subjective measures. The official measure in Russian governmental statistics is an absolute objective measure. It classifies an individual as ‘poor’ when he/she lives in a household with an income below a certain predefined minimum. The subjective measures were discussed for both welfare and well-being poverty. To operationalize welfare poverty, the Leyden Poverty Line (LPL) and the Subjective Financial Satisfaction Poverty Line (SFSPL) were used. The poverty ratios found when using these two measures were compared with the ones obtained when applying the officially-defined absolute objective measure. To operationalize well-being poverty, the Subjective Well-Being Poverty Line (SWB) was applied. It was found that, in the Russian Federation during 1997 and 1998, welfare poverty was much larger than well-being poverty. An encouraging result is the strong consistency found between the two subjective welfare poverty measures, in particular that the poverty ratios for the LPL and for the SFSPL were very similar.

Subjective measures are based on individual perception regarding one’s situation. Absolute objective measures of poverty, which are the most widely accepted, depend on what the researcher considers to be the minimum income, below which an individual can be regarded as poor. Defining this minimum income is a difficult and ambiguous task when assessing welfare poverty. This problem is magnified for assessing well-being poverty. In the latter
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Case, one first has to decide which are the relevant variables that define well-being, such as income, health, and education level, and subsequently determine the minimum level of possession of such 'goods' that define poverty.

*Chapter 7* contributes to the literature on inequality by introducing a subjective concept of inequality that can be compared to available objective measures. It introduces a new concept of inequality, which is referred to as Financial Satisfaction Inequality (FS). It is based on the variance of individual self-reported Financial Satisfaction (FS), so that it accounts for individuals perception of their own circumstances. Thus, it is considered a subjective measure of inequality. It can be argued that it includes objective income inequality as a special case: namely, when FS only depends on income.

Interestingly, traditional measures include subjectivism as well: namely, by letting a researcher decide on a family equivalence scale or on a specification of a welfare function.

The analysis showed that only a relatively small part of FS can be attributed to observed factors, such as income, education, or age. The two observable variables that contributed the most to it were average family income over all the years (permanent income) and, for non-workers, also age. In other words, objective income inequality is an important factor of financial inequality, besides psychological feelings of inequality.

*Chapter 8* presented a method to value health changes in monetary terms. Using the individual well-being model presented in Chapter 3, trade-offs between Health Satisfaction (HS) and income were derived. These trade-offs translate into a monetary value of health, defined as the increase in income necessary to maintain an individual at the original level of well-being after a change in HS. Specific illnesses were related to changes in HS. This allowed for the assessment of income compensation measures for specific illnesses.

This method was applied using German and British data. The results for both data sets were not identical but similar in magnitude. For example, working individuals who live in former West Germany suffer a decline in well-being equivalent to a reduction in income of 17.6% to 20% if they have 'problems in hearing'. For British workers, this percentage equals 27%.

The results of all empirical analyses presented in this thesis suggest that the assumption of interpersonal comparability of satisfactions cannot be rejected. Moreover, answers to subjective questions seem to be a good proxy measure of individual well-being. This indicates
that self-reported well-being has the potential to become a useful instrument for the evaluation and design of socioeconomic policy. However, rather than replacing objective measures by subjective ones, the latter can play a complementary role.