Chapter 2
Towards an Urban Quality of Life Index.
Basic Theory and Econometric Methods

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1. Introduction

The objective of this volume is to draw attention to the impact of urban provisions on the quality of life. The ultimate goal is to develop operational indexes by which the impact of urban provisions can be measured and consequently the urban provisions of various cities can be compared in terms of what they contribute to the citizen's quality of life. Then one may try to differentiate different urban provisions with respect to the impact of their contribution and get more grip on what type of urban policy will be the most favorable for the citizen's quality of life. But what is quality of life? There are many definitions proposed by philosophers, psychologists and other scholars (see e.g. Nussbaum and Sen 1993) . Many of these philosophical studies try to differentiate between terms as quality of life, happiness or satisfaction. Indeed the terms may correspond to slightly different concepts as language and the human mind is able to make many gradations. However, in practice of measurement such differentiations are and have to be ignored and it does not seem that in empirical practice it is possible to make such differentiations. In accordance with the empirical literature we shall use the three concepts as standing for the same metaphysical concept and we shall use the three terms indiscriminately.

Indeed, such definitions are only operational if they are accompanied by a recipe of how to measure quality of life in practice. Therefore, it is not only important to agree on more or less philosophical definitions but also to agree on *methods,* by which quality of life can be measured. This is actually the stumbling block, which has blocked the practical study of happiness and of what are the determinants of happiness for a long time. Human happiness depends on a number of factors like the relation with one's partner, one's health, one's family, one's job, one's income, and on the quality of the urban environment as reflected in the degree of safety on the street, the level of crime, the quality of sanitation and public traffic, the supply of education, etc. Finally, it depends on the availability of private commodities and services which are part of the private consumption bundle. Economists until recently focused on the last group of variables and excluded the more esoteric factors, which could not be bought on the market, from their scope of attention as belonging to the subject matter of other behavioral sciences. However, it cannot be denied that exactly those other factors that cannot be bought on the market have a tremendous effect on the quality of one's life situation.

Here the role of the quality of the living environment and especially the level and availability of public services is of primary importance, for public authorities are in the situation that they can determine (within limits) the availability and level of those services. But as those services are mainly financed out of the tax revenues or by direct retributions by consumers (e.g. toll roads), the decisions of the public authorities will affect the level of private consumption by citizens. So to speak, the choice is then between better public traffic at a low price or even for free and the citizens having private cars themselves. Similarly public authorities face the choice *within* the public budget between spending the public money on more police on the streets or on street lights or on free education for school children.

With respect to decisions on the level of taxes and on how the public budget will be spent, there is theoretically one decision maker: the parliament or at least some authorities who take more or less into account the preferences of the citizens. However, we have to be aware that it is very hard for the decision makers to get a good idea of the citizens' preferences. Citizens are not homogeneous and some are more successful in getting their opinions heard than others. Decision makers are faced with an enormous lack of information on what makes people happy.

This volume tries to make a first attempt in constructing some data sets and presenting some analysis of those data sets with respect to the urban quality dimension of human happiness. As this subject is more or less *terra incognita,* the International Development Bank as principal commissioned the studies in this volume to some national research groups. IDB described the main research objectives and indicated some tools of analysis, which preferably should have to be utilized,. However, IDB avoided a too sharp delineation of what should be the content of each national study in order to let 'hundred flowers flourish' and also to exploit the national data sources that differ per country most efficiently.

This chapter will try to give a methodological framework. The two methodologies proposed by IDB are the method of 'hedonic equations' and the method of 'happiness economics'.

In Section 2 we will consider the method of hedonic equations. In Section 3 we will consider the recently developed methodology of happiness economics. In Section 4 we dwell on the question of how indifference curves have to be estimated. Section 5 is devoted to discuss the methods of ´cardinalization´. In Section 6 we consider 'layered 'models , where overall satisfaction with life is seen as built up from the satisfaction with various domains of life. In Section 7 we inquire whether the results found and the methods developed may be helpful in constructing an Urban quality of Life – index. Such a UQoL- index might serve as a benchmark to compare urban policies between different cities. As that benchmark partly depends on urban policy variables, it may also serve a tool to enhance urban policy making. Section 8 concludes.

2. Hedonic equations

In this volume we find applications of happiness economics and of the hedonic equation technique. The idea of hedonic equations is developed by Roback (1982), Rosen (1979), Blomquist et al. (1988) . It is especially developed to evaluate the impact of external effects like climate, congestion and urban provisions. The idea is intuitively very simple. Let us assume we have two identical houses except for one thing. One is located in a safe quarter of the town and the other in an unsafe quarter. The rent of the safe house is $1000 per month and the rent of the second house is lower, say $500. Then it seems plausible that the difference in rent has to be assigned to the difference in safety, and that the value of safety per month may be evaluated by the rent difference of $500. Then the conclusion would be that the house owner of the unsafe house would be willing to pay an additional local safety tax of $500 to finance police surveyance in his part of the town as well. This idea may be generalized to a great extent. Assume that the rent per month of a specific house n at a specific location is r_n ,then it stands to reason that the rent will vary with the characteristics of the house like how many rooms it has, whether it is an apartment, or an independent house, the infrastructure of the living environment, and environmental characteristics like the air quality, in short a vector $x = (x_1,...,x_k)$. Then it follows that we may postulate and estimate relationships $r = r(x_1,...,x_k)$. For instance, if we have a number of housing data where we have the rent r_n per individual house n , and the number of minutes of an hour x_{1n} before the police arrives after an emergency, and x_{2n}, which stands for the walking distance (in minutes) to the nearest metro station, we may estimate ,after suitable transformations of the variables a linear relation for the logarithm of the rent

$$\ln(r_n) \approx \alpha_1 x_{1n} + ... + \alpha_k x_{kn} + \alpha_0 ,$$

where x_1, x_2 stand for a measure of safety and a measure of supply of public transportation, respectively. For instance, we may find an estimated relationship[1]

$$\ln(r) = -0.02x_1 - 0.01x_2 + ... + \alpha_k x_k + \alpha_0$$

Then this statistically found relation implies that every minute less arrival time would increase the rent by 2% and similarly every minute less to the metro station would increase the rent by 1 %[2]. Then it seems attractive to interpret the coefficients α_1, α_2 as the subjective *shadow- prices* in terms of money of x_1, x_2 In a similar way we can also ask how much less safety someone would find acceptable for having the metro station nearer by. We find that two minutes more walking to the metro would be compensated by one quarter less in arrival time. In this way we are able to compare the effects of widely different factors in terms of a common denominator, viz. the amount of rent to be paid. We call the ratio α_1 / α_2 the subjective trade-off ratio between both characteristics.

This method is in this volume used by all research groups and their results are surprising and interesting. This is caused by the fact that all groups were able to find a treasure of information in the urban administrations where data are found like the size of the plot, the distance to schools, the cleanliness of the roads, etc. This information per individual house has been enriched by the information drawn from individual questionnaires filled out by the inhabitants of those houses.

However, there is a basic problem with this method, which makes it less attractive in fact than it looks like. The problem has to do with the underlying assumption of neo –

[1] We find negative signs, because more minutes and larger distance are less appreciated.
[2] We get percentages, because we look at the *logarithm* of the rent.

classical economics that each person not only looks for the best position he can reach, but is also able to reach it. The assumption implies that every observed respondent is in the best position he can attain.

In the language of elementary economics we may clarify it as follows. Let us assume that the individual's position in the housing context is completely described by a number of housing characteristics $(x_1,...,x_k)$ and the remaining net income $(y-r)$ that can be spent on other commodities than housing. Then there will be a whole set of combinations $((y-r),x_1,...,x_k)$ that the individual perceives as equally good, or in technical jargon, combinations between which he or she is *indifferent.* Such a set is called an indifference set. It may be pictured as a surface in a multi –dimensional space and such a surface is called an indifference surface (see fig. 1. for a two- dimensional example). Actually, one position is better than another; there are different levels of satisfaction. To each satisfaction level corresponds its own specific indifference set. Similarly, there is a whole set of possibilities which may be realized for the same rent level *r.* The neo- classical assumption is now that consumers are buying efficiently, that is they cannot improve their situation and reach a better indifference curve, given that their paid rent remains the same. In that case the subjective substitution rates between various housing dimensions will equal the objective substitution rates on the housing market. However, this outcome is conditioned by the assumption that the consumer is in his optimum. This assumption, although one of the basic assumptions of neo- classical economics, is rather dubious, for does it hold in practice? Especially, for housing the choices have been made in most cases many years ago and there is reason to assume that individuals would not make the same choice now again if they were faced by it and had to start from scratch, but that now they would stay at their place because the monetary and psychic transaction costs of moving out to a new place are so considerable. Frequently the market (e.g. for social housing) is also rationed in such a way that it is impossible in practice to find another house. And if the equilibrium assumption does not hold, then the objective market substitution rates will not equal the subjective substitution rates.

A second problem is that it is implicitly assumed that the choice of a house is the only consumer choice that is partly affected by external factors like safety, distance to job and education facilities, sanitation, etc. But in fact the choice of a car and the decision to buy a car or not is also partly determined by such external factors. For instance, buying a car or not depends also on the quality of public traffic, the accessibility by car , i.e. the quality of the roads, the distance to schools and hospitals, etc. And similarly, we might think of many other commodities. It is not obvious that the trade–off ratios between urban variables when buying a car would be the same as when renting a house. If the trade–off ratios between urban variables are unequal, it is unclear which trade-off ratios have to be preferred.

Thus having sharp estimates of the rent equation $r = r(x_1, ..., x_k)$ is still interesting as such, because it describes the market possibilities on the housing market, but it does not necessarily give an adequate description of the subjective trade ratios, e.g. between safety and distance to the metro.

The attraction of the new 'happiness economics approach' is that it is not based on the assumption that the individual is at any time observed in his optimum in a perfect market.

In the next section we will look more in detail into that second approach.

3. Happiness economics[3]

It seems that modern happiness economics may furnish a solution to the unsatisfactory situation sketched above. The approach of happiness economics, starting with Clark and Oswald (1994) and in a slightly different way already with Easterlin (1974), Van Praag (1971) and the so-called Leyden School, is diametrically different from the approach of mainstream neo –classical economics. Recent surveys are found in Frey and Stutzer(2002), Van Praag and Ferrer -i-Carbonell (2004,2007), Graham (2007). The happiness economics approach starts straightforwardly in an empirical way by *questioning* individuals how happy they feel. In older questionnaires, we see response categories, which are described using verbal response categories like ‘bad’, ‘sufficient’ and ‘good’. This demonstrates that the well-known opinion agencies, which carry out these surveys, are confident that this way of putting satisfaction questions is understandable for respondents and is similarly interpreted by respondents. Respondents speak a common language and assign roughly the same emotional interpretation to verbal or numerical qualifiers. Their responses are comparable.

[3] This section borrows and elaborates on themes initiated in Chapters 2-4 of Van Praag and Ferrer -i-Carbonell (2004).

The standard question, which is now posed in similar wordings all over the world, is

"Please answer by using the following scale in which 0 means totally unhappy, and 10 means totally happy:
How happy are you at present with your life as a whole"
0_____1_____2_____3_____4_____5_____6_____7_____8_____9_____10

Here the respondent is asked to give a numerical evaluation. Similar questions are nowadays posed as a matter of routine with respect to *domains* of life like the household's financial situation, one's job, one's health, and so on. We quote a table with simple descriptive statistics for Germany (2004), derived from the German Socio- Economic Panel (GSOEP).

Table 2.1 Satisfaction, German SOEP, 2004

Variable	Obs	Mean	Std. Dev.	Min	Max
Satisfaction with Life	21964	6.801	1.825	0	10
Health Satisfaction	21940	6.610	2.242	0	10
Job Satisfaction	12964	6.874	2.211	0	10
Financial Satisfaction	21522	6.220	2.305	0	10
House Satisfaction	21858	7.852	1.857	0	10
Leisure Satisfaction	21873	6.981	2.183	0	10

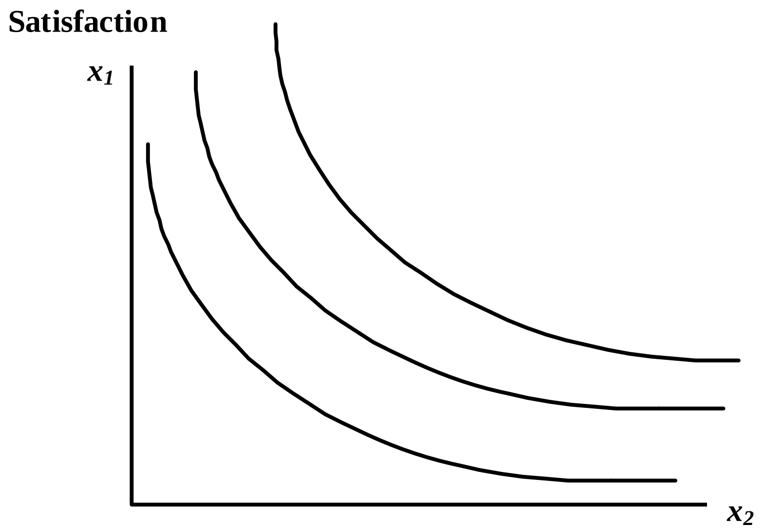
From this table it emerges that the great majority of participants in the survey are responding on satisfaction questions and that responses are found in all response categories from 0 to 10.

Let us consider the life satisfaction question and let us assume that life evaluation depends on income, age, being married, number of working hours, health situation, family size, travel distance to work, type of work, in short a vector of x of variables $x_1,...,x_k$. We call them *aspects* or *dimensions* of the life situation. Some of these aspects or dimensions, like the number of working hours or travel time to work, may be influenced by the respondents, others like *age* cannot be changed by the individual.

Let us assume now that we have different persons *A, B, C,*… being in objectively different situations $x^{(A)}, x^{(B)}, x^{(C)},...$ and that those persons express to be equally satisfied with their situation, where we identify 'equally satisfied' with the observation that they gave the same response to the satisfaction question. What does that mean?

To get a better idea we represent the persons as points in the x –space.

Figure 2.1. *A satisfaction indifference curve.*



It is obvious that this curve is by its construction a *satisfaction indifference curve* on the *x* –space. In practice the number of response categories is finite, say 0,1,2,….,10. It follows that we do not have a dense net of indifference curves but only 11 'indifference bands', corresponding to the 11 response categories. They may be interpreted as approximate indifference curves. The surprising fact is that just from questioning individuals, we are able to construct indifference curves, without assuming anything on optimizing behavior or functional specifications. Actually, the identifying power of the neo –classical marginal conditions is not needed.

Before continuing first let us clarify a terminological question. The term ´indifference curve' is traditionally derived from the analysis of consumer behavior, where the individual ranks commodity bundles in the commodity space according to preference. Here we use the term indifference curve in a wider context, where the space of alternatives consists of different *life situations.* A *life situation* is described by a vector *x* of characteristics, which are assumed to be relevant like age, income, housing situation, street safety, etc. In a similar way we may describe specific aspects of *domains* of life like one's job, one's health, one's financial situation, etc. The level of consumption, which is available to an individual and may be described by a bundle of commodities and services at his or her disposal, may also be seen as a description of a life domain and hence there seems to exist no impediment to apply the same type of questioning instrument to construct empirical indifference curves referring to commodity bundles in commodity space.

Let us assume that the geometrically distinguished indifference curves may be described by equations like $f(x_1, x_2, ..., x_k) = C$ (constant) , where the value of C indicates the *level* of the indifference curve, that is, if we compare two situations $x^{(1)}, x^{(2)}$ where $C_1 < C_2$ then $x^{(2)}$ is preferred to $x^{(1)}$. Now we may again define the *subjective trade –off ratio* between two dimensions x_1, x_2 at a specific point x of an indifference curve by changing slightly the two dimensions in such a way that we stay on the same indifference curve.

That is, we solve for given Δx_1 the equation $f(x_1 + \Delta x_1, x_2 + \Delta x_2, ..., x_k) = f(x_1, x_2, ..., x_k)$ for Δx_2. If the function f (.) is differentiable, this yields as limiting value the slope coefficient of the indifference curve at x , which is $\lim_{\Delta x_1 \to 0} \left(\Delta x_2 / \Delta x_1 \right) = - f_1 / f_2$, also known under the name of substitution rate or *trade – off ratio*, where f_i stands for the partial derivative with respect to x_i. Geometrically it is the slope of the indifference curve in the point *x*.

If the indifference surface is linear in *x* for a specific level *C*, say, then the equation of the curve looks like

$$\alpha_1 x_1 + \alpha_2 x_2 + ... + \alpha_k x_k = C$$

and then the trade off ratio is constant all along the indifference curve (hyper-plane) and it is just equal to $-\alpha_1 / \alpha_2$. If all indifference curves are parallel linear hyper-planes, there is *one* common trade –off ratio $-\alpha_1 / \alpha_2$.

We see that this trade –off ratio is estimated as the slope ratio of the observed indifference curve. Returning to the familiar context of consumer behavior we may ask whether the Second Law of Gossen holds, that is that the subjective substitution ratio equals the ratio of market prices, i.e., $f_1 / f_2 = p_1 / p_2$. We have to distinguish several cases.

If the x' s can be bought at the market, it is possible that Gossens' Law holds, but it is not necessary. If not so, it implies that the individual is not an efficient buyer on the market and that he could have reached the same satisfaction level at lower money cost. Or in other words, in theory it is possible to test whether the consumer is in market equilibrium or not by means of empirically observing indifference curves [4]. This empirical test has not been done yet, as far as we know.

The second possibility is that the situational aspects x cannot be bought on the market. Examples are the individual's *age* or in many cases his or her *health.* The third possibility is that one of the two x' s can be bought on the market at a market price and the other not. The good to be purchased may be leisure hours or cash dollars, as one of the relevant aspects of life is our income y, a stock of dollars per time period. The other good may be *health.* In that case the trade-off ratio between the aspect income and health is the *shadow –price* of having more *income* at the expense of having less health. Clearly, that shadow – price may be negative, e.g., if we sell our labor hours. It does not necessarily mean that health improvements can be bought on the market.

We conclude that it is possible to estimate indifference curves without taking recourse to the neo- classical axiom of economics that individuals behave as if they are optimizing their situation. In the 'happiness economics'- or 'satisfaction'- approach such a fundamental assumption on optimizing behavior is not made and it is also not needed to get identifiable estimates.

Indeed, may we assume that individuals, observed in a dynamic reality, are living in an optimal situation? Most serious decisions by the individual are long-term decisions with long-lasting consequences, e.g., with respect to education, job choice, housing, the number of children, and even the choice of one's partner in life. It is by no means certain that individuals at any arbitrary moment after decisions have been made, sometimes a long time ago, are still feeling that they have reached the highest possible indifference curve. It is much more probable that at present they would choose for another situation, if they were not hampered by rather enormous transition costs. (see also Bruni and Sugden (2007)). Hence, our feeling is that individuals in reality are rarely in an optimum situation, and that consequently the marginal equations will not hold as a rule. This is actually the situation to which the happiness economics approach pertains. There the indifference curves can be and are directly estimated without making use of identifying

[4] See also Van Praag and Baarsma (2005) for an elaboration on this point.

optimality conditions. It is not assumed that every respondent is by definition in an optimal situation.

4. Estimation of indifference curves[5]

In the literature there is no agreement on how the indifference curves should be estimated. In the practical econometrics there is a variable *y* to be explained , in this case the responses on the satisfaction question that assume values 0,1,…,10, and explanatory variables *x.* Then one stipulates an approximate relation

$$y_n = \alpha_1 x_{1n} + ... + \alpha_k x_{kn} + \varepsilon_n$$

where ε_n stands for the residual error, that is the difference between y and the structural estimate ($\alpha_1 x_{1n} + ... + \alpha_k x_{kn}$). The best estimates of the unknown parameters α are then those values that minimize the sum of squared residuals[6]

$$\sum_{n=1}^{N} [y_n - (\alpha_1 x_{1n} + ... + \alpha_k x_{kn})]^2$$

where N stands for the number of observations.

This simple OLS –version is often used by happiness economists.
However, in the older versions of satisfaction questions numerical response categories are avoided and the responses are cast in verbal qualifications like "not satisfactory", "somewhat unsatisfactory", "satisfactory", "very satisfactory". Here the dependent variable *y* is a *verbal* qualification. Evidently, we can translate the four verbal qualifications into numbers 1,2,3,4 and define the *y* in this way, but it is obvious that this translation trick introduces some arbitrariness. This is sometimes done, but others stick to the Probit – or Logit- versions, while the OLS –mode would, in the eyes of some be an arbitrary cardinalization. We refer for examples of the application of various methods to DiTella, MacCulloch and Oswald (2001), Oswald and Powdthavee (2007), Blanchflower and Oswald (2004), DiTella, Haisken–DeNew, MacCullogh (2007), Helliwell (2007) , Easterlin and Zimmermann (2006).

[5] The more technical paragraphs may be skipped by the reader at first reading.
[6] We abstain from looking at more sophisticated optimum criteria in this section.

However, the fact is that both the Probit and Logit- versions boil down to *arbitrary cardinalizations* as well. As we know the Probit model assumes a latent model

$$u_n = \alpha_1 x_{1n} + \ldots + \alpha_k x_{kn} + \varepsilon_n$$

where it is assumed that the response categories correspond with a partition of the real axis into *J* intervals $(-\infty, \mu_1], (\mu_1, \mu_2], \ldots, (\mu_{j-1}, \mu_j], \ldots, (\mu_{J-1}, \infty)$ such that u_n belongs to the j_n^{th} interval, where j_n stands for the response category of respondent n and where ε is assumed to be *N*(0,1)- distributed. The chance on observing a response in interval j by respondent *n* is then

$$P_n(j) = N(\mu_j - (\alpha_1 x_{1n} + \ldots + \alpha_k x_{kn} - \alpha_0)) - N(\mu_{j-1} - (\alpha_1 x_{1n} + \ldots + \alpha_k x_{kn} - \alpha_0))$$

The Probit estimates are then found by maximizing the sample probability, that is the product of the chances $\prod_{n=1}^{N} P_n(j)$ on observing the specific sample with respect to α and μ. The latent cardinalization is caused by the choice of the distribution of ε . A similar story holds for the Logit, where the normal distribution function *N*(.) is replaced by the logistic distribution function $\Lambda(.)$ Again here u may be interpreted as a (ordinal) utility level and the equation $u_n = \alpha_1 x_{1n} + \ldots + \alpha_k x_{kn}$ as describing an indifference surface corresponding to a specific satisfaction level u_n.

Superficially, it looks though we have a severe problem as it is not clear which specification to choose for the estimation method. However, in practice there is not much of a problem, as all these methods yield about the same gradient vectors α except for a multiplication factor. Indeed Amemiya (1981) conjectured a long time ago that Probit and Logit- methods yielded the same estimates apart from a multiplicative factor (see also Ferrer -i-Carbonell and Frijters (2004)).

Most econometricians are not aware of this, as the numerical estimates mostly look rather different. However, let $\hat{\alpha}^{(1)}, \hat{\alpha}^{(2)}$ be two estimators of the gradient vector corresponding to two cardinalizations. Then we may easily compare their ratios by 'normalizing'[7] both vectors, that is, by dividing them by their respective norms $|\hat{\alpha}| = \sqrt{\sum_{i=1}^{k} \hat{\alpha}^2{}_{i}}$.

We present a practical example which we borrow from Van Praag, Ferrer -i-Carbonell, 2008a).We try to explain job satisfaction on a German panel data set, derived from the German Socio- Economic Panel Survey (GSOEP) over the period 1999-2004. We estimate the model $u = \beta' x + \beta_0 + \varepsilon$ with individual random effects. We do this by means of OLS, Probit, a new CM –specification and two additional cardinalization methods (COLS, POLS[8]), which we introduced in Van Praag, Ferrer -i-Carbonell (2004) and which are also used in this volume. We apply this multitude of methods to stress the fact that nearly all reasonable cardinalization methods will yield approximately the same estimates (apart from statistical fluctuations), when we take account of a proportionality factor γ.

We use the Mundlak (1978) panel –specification, that is, we specify the model as

$$\begin{aligned} u_{nt} &= \beta' \overline{x}_n + \gamma' (x_{nt} - \overline{x}_n) + \beta_0 + \varepsilon_{nt} \\ \varepsilon_{nt} &= \varepsilon_{n.} + \eta_{nt} \end{aligned}$$

where $\overline{x}_n$ is the average over the observations for individual n over the total period 1997-2004. It follows that we may distinguish between 'level effects ' β and 'shock effects ' γ. The second line describes the usual random effect specification where the error term is decomposed into two mutually independent random errors, where $\varepsilon_{n.}$ is individually determined and η_{nt} is the usual white noise.

The estimation results are presented in Table 2a and in a normalized form in Table 2b.

Table 2.2a Job satisfaction, Five methods, German SOEP 1999-2004, *Coefficients not normalized*

[7] This normalization device may be replaced by many others.

[8] The POLS- method has been independently developed and applied by Stevenson and Wolfers (2008).

	POLS		***OLS***		***CA***		***CM***		***OP***	
	Coeff.	***t-val***	***Coeff.***	***t-val***	***Coeff.***	***t-val***	***Coeff.***	***t-val***	***Coeff.***	***t-val***
Constant	6.972	8.34	20.043	11.32	6.291	9.23	5.502	9.00		
Ln(age)	-4.182	-8.95	-8.198	-8.29	-3.290	-8.64	-2.945	-8.62	-6.497	-8.91
Ln2(age)	0.561	8.62	1.093	7.93	0.442	8.33	0.395	8.31	0.872	8.59
Individual is a male	-0.062	-3.75	-0.119	-3.42	-0.049	-3.63	-0.043	-3.60	-0.098	-3.84
Ln(household income–labour inc.)	0.000	0.01	0.001	0.24	0.000	0.21	0.000	0.19	0.000	0.05
Ln(years of education)	0.019	1.40	0.056	1.92	0.011	0.94	0.011	1.08	0.028	1.27
Having a partner	0.037	2.45	0.086	2.69	0.032	2.62	0.028	2.57	0.057	2.41
Ln(labor income per hour)	0.133	7.22	0.315	7.99	0.107	7.13	0.098	7.31	0.210	7.27
Individual is self-employed	-0.063	-3.37	-0.140	-3.53	-0.051	-3.36	-0.046	-3.40	-0.099	-3.41
Ln(nbr. contractual working hrs)	-0.091	-0.67	0.028	0.10	-0.078	-0.71	-0.062	-0.63	-0.115	-0.54
Ln(nbr. contractual working hrs)**2**	0.026	1.15	0.019	0.40	0.022	1.18	0.018	1.10	0.036	1.02
Ln(nbr. extra hours)	-0.007	-2.03	-0.016	-2.15	-0.006	-2.10	-0.005	-2.13	-0.012	-2.21
Temporary contract (vs.perm)	-0.028	-1.55	-0.060	-1.55	-0.026	-1.74	-0.023	-1.73	-0.042	-1.49
Ln(years of tenure)	-0.177	-11.47	-0.338	-10.24	-0.140	-11.11	-0.125	-11.03	-0.275	-11.28
Ln(years of tenure)2	0.031	6.39	0.057	5.55	0.024	6.12	0.021	6.04	0.048	6.37
Average(ln(hous.inc.- lab. inc.)	0.019	4.15	0.041	4.26	0.014	3.92	0.013	3.98	0.028	4.04
Average(ln(working income/hour))	0.054	2.80	0.107	2.63	0.039	2.46	0.034	2.43	0.085	2.84
Number of observations	39886		39886		39886		39886		39886	
Number of individuals	13053		13053		13053		13053			
R-Squared: Within	0.018		0.020		0.020		0.021			
Between	0.013		0.012		0.011		0.011			
Overall	0.013		0.014		0.013		0.013			
Log.Likelihood full model									-74051	
	0.664		1.384		0.539		0.484			
$\sigma^2_\eta/(\sigma^2_{\varepsilon n}+\sigma^2_\eta)$	0.501		0.485		0.496		0.497		0.511	

The regression also includes dummy variables indicating the year in which the interview took place.

Table 2.2b. Job satisfaction, Five methods. German SOEP 1999-2004
Coefficients normalized

	POLS		*OLS*		*CA*		*CM*		*OP*	
	Coeff.	***Sd.D***	***Coeff.***	***Sd.D***	***Coeff.***	***Sd.D***	***Coeff.***	***Sd.D***	***Coeff.***	***Sd.D***
Ln(age)	-0.989	0.111	-0.989	0.119	-0.989	0.114	-0.989	0.115	-0.989	0.111
Ln2(age)	0.133	0.015	0.132	0.017	0.133	0.016	0.133	0.016	0.133	0.015
Individual is a male	-0.015	0.004	-0.014	0.004	-0.015	0.004	-0.015	0.004	-0.015	0.004
Ln(household inc.–labour inc.)	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001
Ln(years of education)	0.005	0.003	0.007	0.004	0.003	0.003	0.004	0.003	0.004	0.003
Having a partner	0.009	0.004	0.010	0.004	0.010	0.004	0.010	0.004	0.009	0.004
Ln(labor income per hour)	0.031	0.004	0.038	0.005	0.032	0.005	0.033	0.005	0.032	0.004
Individual is self-employed	-0.015	0.004	-0.017	0.005	-0.015	0.005	-0.016	0.005	-0.015	0.004
Ln(nbr. contractual working hrs)	-0.021	0.032	0.003	0.034	-0.024	0.033	-0.021	0.033	-0.017	0.032
Ln(nbr.contr. working hrs)**2**	0.006	0.005	0.002	0.006	0.006	0.005	0.006	0.006	0.005	0.005
Ln(nbr. extra hours)	-0.002	0.001	-0.002	0.001	-0.002	0.001	-0.002	0.001	-0.002	0.001
Temporary contract (vs.perm)	-0.007	0.004	-0.007	0.005	-0.008	0.004	-0.008	0.004	-0.006	0.004
Ln(years of tenure)	-0.042	0.004	-0.041	0.004	-0.042	0.004	-0.042	0.004	-0.042	0.004
Ln(years of tenure)2	0.007	0.001	0.007	0.001	0.007	0.001	0.007	0.001	0.007	0.001
Average(ln(hous.inc.- lab. inc.)	0.004	0.001	0.005	0.001	0.004	0.001	0.004	0.001	0.004	0.001
Average(ln(workg. Inc./hour))	0.013	0.005	0.013	0.005	0.012	0.005	0.011	0.005	0.013	0.005

In Table 2.2a we present the *t-values* alongside and we see that these values are also remarkably similar, suggesting that the reliability of the estimates is rather independent of the specific estimation mode used. In Table 2.2b we present the standard deviations of the normalized estimates and we see that they are also very similar, irrespective of the method used. And what is even more important, the estimates themselves do not appear to be statistically different.

It follows that the trade –off ratios estimated by means of either one of the five methods are virtually the same. The same holds for the *t* –ratios. The individual effect accounts for about 48% of the variance in all five methods. That the *t- ratios are about the same is no accident either.* In some cases we have included the averages over the period to catch the level effects. For instance, the level effect of household income is found by adding the coefficient of *Ln(household income)* and the coefficient of *Average(ln(houseincome))* , yielding for the OLS-estimates the level effect 0.067 (= 0.010 + 0.057).

In sum, we see that independently of the cardinalization method used we will find approximately the same estimate of the gradient of the indifference hyper – planes apart from a method –specific proportionality factor and approximately the same subjective trade – off ratios. The reliability of those estimates, in terms of their corresponding *t-values,* will be about the same as well. In plain language, there are many methods which give the same results.

What findings can we distill from this equation? From this equation it is seen that job satisfaction is determined by the wage rate and by the number of hours worked. On the other hand age, and years of tenure seem to play a major role. We find the well-known U- shape in age with a minimum at the age 41. Satisfaction is also log –quadratic in hours worked with a minimum at about 11 hours per week. Tenure follows also a U-shape with a minimum at about 12 years.

Obviously we give this as just one example of a job satisfaction equation. Many other specification choices, i.e., which variables to include and which ones to exclude, are conceivable. Hence we have to be careful to give a too absolute interpretation to one specification. Actually, the choice of the specification is for a part based on intuition and plausibility, and not on hard science. However, if intuitively plausible and statistically significant effects remain to be found in repeating investigations, it seems wise to give that specification more credit than others as an explanation of the satisfaction response.

We notice, that the above estimates deal with *job* satisfaction only. It may be expected that *financial satisfaction* will be affected by a wage reduction as well. Hence, for a comprehensive evaluation of the effect of a wage reduction on satisfaction with ' life as a whole ' we can not base ourselves on one domain satisfaction only. Notably we have to discover how changes in *all relevant* domains (e.g., job and financial) affect satisfaction with life as a whole, either by finding a relation between domain satisfactions and satisfaction with life as a whole or by means of a reduced form approach where we assess the direct effects of income and work hours on satisfaction with life as a whole. It is the latter way that is mostly chosen in the following chapter.

In a similar way we can assess the effect of urban amenities, for which ample information has been collected in this volume. The typical domain satisfaction we are interested in is then *satisfaction with urban environment.* Variables may be such as 'public street lighting', 'vandalism in the neighborhood', etc. The problem with this type of estimated equations is that researchers are frequently including too many correlated explanatory variables (mostly dummy variables) with the consequence that many effects get statistically non – significant estimates. However, in the following chapters we will see many meaningful estimates of various aspects of the urban environment. As such these results are up to now one of the first large- scale and meaningful investigations on urban environment in the literature.

5. Is there one valid cardinalization?

Until now we have carefully kept to estimating indifference curves. We saw we can say something about the trade- off - ratios or more generally about the shape and the situation of the indifference curves, irrespective of which cardinalization is applied (see also Stevenson and Wolfers 2008, appendix).

However, for policy problems we frequently need information of a cardinal nature. Consider the familiar taxation problem. The principle of progressive taxation is based on the idea that comparisons of utility and of marginal utility are possible. More precisely, assume that the individual *A*'s happiness U_A depends on net income *y* and other variables *x* according to the relation $U_A = U_A(y, x)$ and similarly for *B*. Let us assume we tax *A* and *B* by Δ_A, Δ_B ,respectively. Then the effect is that happiness levels change into $U_A + \Delta U_A \approx U_A(y_A + \Delta y_A, x_A)$, and $U_B + \Delta U_B$ respectively. There are several meaningful criteria to judge tax measures. However, the primordial question is how to compare *A* 's and *B*' s happiness and changes in happiness see e.g. Plug, Van Praag, Hartog (1999).

If we stick to interpersonal non-comparability of happiness all these exercises, however intuitively attractive, are baseless and consequently fruitless. But even if we assume that individuals who react by the *same* answer to a happiness question feel *equally* happy, it is still unclear whether individuals have the same *U- function.* This can be checked if we have a sample where many individuals are in the same objective situation *x*. Do people in the same situation *x* give the same evaluation U(*x*) responding to a satisfaction question, that is all evaluate them by 'good' or by 'bad' or by '6' on a numerical scale? The experiences thus far are encouraging, as most differences in answers can be apparently ascribed to random factors.

Normative statements where happiness levels are compared between individuals are only possible if we are willing to accept some strong assumptions.

First, we have to assume that the wording of questions is emotionally translated by respondents in the same way and that they evaluate the same situation (approximately) similarly This can and has been checked with roughly positive results (see Van Praag, 1991).

The second point is that we have to agree on one cardinalization and henceforth on one cardinal utility function for all individuals of which we will compare utility. This does not exclude that utility functions are of the type $U = U(x; z)$, that is, they are 'individualized' with individual characteristics *z*.

Actually, cardinalization is a matter of routine in daily life. It may be that we cardinalize temperature measurements in terms of Celsius or Fahrenheit degrees, or that we evaluate the quality of restaurants in terms of a numerical scale from 0 to 10, or grade school exams. In the beginning such a translation into numbers is rather tentative and a bit arbitrary, but when an individual has become habited to it and calibrates it with judgments of others, he knows precisely what each rating number means.

Therefore the cardinalization, which is implicit in the individual's response on the happiness question, where situations are rated on a numerical scale from 0 to 10 or 1 to 7, may be considered as meaningful and does mean about the same to similar individuals. This cardinalization most probably also implies that the distance on the happiness ladder from 4 to 5 is the same as that from 7 to 8. Equal jumps on the ladder stand for equal jumps in happiness (see also Van Praag (1991).

If we think of a functional specification $U = U(x)$, then it lies at hand to choose a probability distribution function, since such a function assumes values between 0 and 1, while the domain of the function is mostly unlimited. We notice that this choice has nothing to do with a probabilistic content of the phenomenon under consideration, but only with the analytical suitability of this specification. Here a normal distribution function of the type $N(\alpha_{inc} \ln(inc) + \alpha_1 x_1 + \alpha_2 x_2 + ... + \alpha_k x_k + \beta' z + \alpha_0; 0, \sigma)$ seems a nice choice. As income gets mostly a pivotal role in this kind of analysis and nearly always the log is taken without further contemplation we include ln(*inc*) separately. This gives rise to the Cardinal Median (CM) – transformation, which we will describe now in more detail.

If we have only discrete response categories, the respondent is forced to discretize his evaluation. For instance, if we have a discrete scale with classes 0,1,…,10 and somebody evaluates his satisfaction by 6.75 on a continuous scale, he will most probably round off to 7. Actually, this will hold for everybody who evaluates his satisfaction within the interval (6.5,7.5). Lacking more exact estimates we assume for such a person that his evaluation equals 7, that is the median value in the interval. The problem is a bit more difficult if somebody responds by 0 or by 10, and these responses are found in practice. Then we assume the median values are 0.25 and 9.75, respectively.

If we assume this, we may apply the transformation $U \longrightarrow u$ with $N(u) = U$ where *N*(.) stands for the standard normal distribution function. The 0.6 – quantile $u_{0.6}$ is then defined by the familiar transformation $N(u_{0.6}) = 0.6$. We may assign to each response j_n a transformed response u_{j_n} [9] with $N(u_{j_n}) = j_n / 10$, taking into account the corrections for the extreme intervals. Then there will hold approximately the linear model

$$\frac{\alpha_y \ln(y) + \alpha_1 x_1 + \alpha_2 x_2 + ... + \alpha_k x_k + \alpha_0}{\sigma} = u_{R_n}$$

which can be estimated[10]. Notice that it describes a net of linear indifference curves. The COLS –specification is fairly similar. We assign to an answer R_n the variable $u_n = E(X \left| u_{R_n/10-0.05} < X \leq u_{R_n/10+0.05} \right.)$, where X is normally distributed with obvious changes for the extremes. The POLS- transformation is somewhat different as it departs from the response sample shares, which we denote by $p_{1,}..., p_J$. Let R_n be in the first response category with a sample share p_1 and corresponding quantile u_{p_1} . Then we define $u_{R_n} = E(X \left| -\infty < X \leq u_{p_1} \right.)$,etc.

If we have accepted a specific cardinalization , then and only then it makes sense to consider *average* happiness in a society (see e.g. Easterlin 1974, Van Praag, Ferrer-i-Carbonell (2008a)), or the inequality of the distribution of happiness in a population.

6. Life as a whole and its partition into domains, the two –and multi – layer model

[9] We denote u_{j_n} from now on as u_n for short.

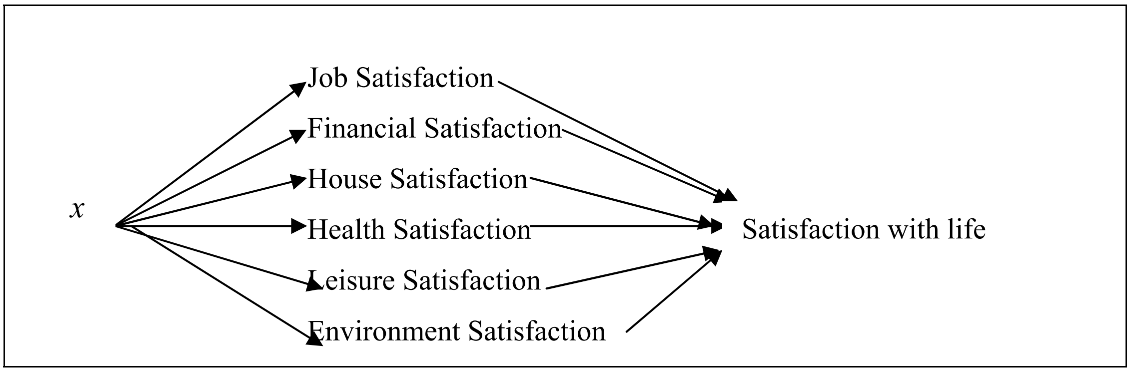
[10] This CM –model is a slightly changed variant of a method we used in Van Praag, Ferrer-i-Carbonell (2004, 2008a). That earlier method we called the Cardinal OLS- method (COLS) .

We saw already that we can consider satisfaction with life as a whole , but that it is also possible by the same tools to observe and analyze satisfaction with respect to specific aspects or *domains* of life. A specific example was given before, where we looked at *job* satisfaction. We shall now consider how the satisfaction with domains may be linked to satisfaction with life as a whole. This yields the so –called two layer satisfaction model. It was proposed, estimated and applied in Van Praag, Frijters, Ferrer - i- Carbonell (2003) , Ferrer - i- Carbonell, Van Praag (2002) , Van Praag,Baarsma (2005), and elaborated upon in Van Praag, Ferrer - i- Carbonell (2004,2008).

Like for *job* satisfaction we may ask in a similar way for the satisfaction with *health, financial situation, social relations, marriage, the government, housing situation,* the satisfaction with *one's neighborhood* or the satisfaction with the supply *of urban amenities.* The last domain is the main focus point of the present volume.

These questions refer to specific *domains* or aspects of life and we speak of domain satisfactions. It is clear that individuals may not be equally satisfied with all domains of life. For instance, one's financial situation may be very satisfactory while at the same time his health situation is perceived as bad. We posit that satisfaction with life as a whole, say *LS,* may be seen as an aggregate measure, as a kind of weighted average of domain satisfactions, where the most important domain gets most weight. The satisfaction with life depends on how satisfied we are with the various aspects of life $DS_1 ,...,DS_k$. An example of such a model is pictured in figure 2.2. We call it a two- layer model. The underlying idea is that first the domain satisfactions are formed and then their weighted aggregate is satisfaction with life as a whole. The domain satisfactions are components of satisfaction with 'life as a whole '.

Figure 2.2: The two layer model



Doing this we may analyze the following equation

$$LS = \mathrm{LS}(DS_1,...,DS_k)$$

For instance, we might think of a linear aggregate:

$$LS = \alpha_1 DS_1 + \ ... + \alpha_k DS_k + \varepsilon_{GS}\,.$$

where the DS 's are operationalized by the CM – or COLS –method and *not by* their "calculated" values according to their explanatory equations.

The advantage of this intuitively plausible decomposition is that many variables that have no significant direct impact on LS do have a significant impact on one or more domains. For instance, income has a rather limited impact on satisfaction with life as a whole, but a rather considerable impact on some of its components like financial satisfaction, health satisfaction and some on job satisfaction. The total effect on life as a whole is then an addition of the *three effects* via the three domain effects. Or in other words, the estimated *direct* income effect on LS is mostly found to be small, while domains as financial satisfaction are significant components in LS.

Similarly, the presence of electric lights in the streets is not a significant explanatory variable in life satisfaction, but it is important as an explanatory variable for satisfaction with urban amenities, while the latter is a sizeable component of satisfaction with life as a whole.

It is obvious that as a rule we should not try to include objective variables x, which have been used to explain one or more domain satisfactions, a second time as explanatory variable for LS as a whole, because this causes difficulties with identification.

It is also evident that we may distinguish more domains than those considered here and that we may consider more layers than the two suggested here. For instance, in Van Praag and Ferre-i-Carbonell (2004) for a British data set we further decompose job satisfaction according to satisfaction with pay, with security, with work itself, with worked hours. The only requirement for such multi-layer decompositions is clearly whether such further differentiations make intuitively and empirically sense.

In Table 2.3 an example is presented of an explanation of satisfaction with life as a whole by means of six domains. The data set is again the German Household Panel (GSOEP).[11]

[11] As both the DS and LS are probably affected by the same unobservable psychological factors (e.g. optimism, pessimism) we include a variable z_n which is the loading on the first principal component of the (8x8)- domain error covariance matrix. Notice that the covariance matrix is found here as an average over five years. However, the same method can be obviously applied on a cross – section data set.

Table 2.3. Satisfaction with life decomposed. (CM). GSOEP 1999-2004-West workers

	Coeff.	*Std. Dev.*	*Level effects*
Constant	0.112	7.25	
Job Satisfaction	0.087	19.96	
Financial Satisfaction	0.112	22.85	
Health Satisfaction	0.133	28.35	
House Satisfaction	0.059	13.49	
Leisure Satisfaction	0.072	16.87	
Average (Job Satisfaction)	0.063	7.07	0.160
Average (Financial Satisfaction)	0.100	11.96	0.212
Average (Health Satisfaction)	0.086	9.74	
Average (House Satisfaction)	0.029	3.40	
Average (Leisure Satisfaction)	0.059	6.82	0.131
First principal component [3]	-0.014	-1.06	
Number of observations	38595		
Number of individuals	12849		
$\sigma^2_\eta/(\sigma^2_{\varepsilon n}+\sigma^2_\eta)$	0.360		
R-Squared			
within	0.152		
between	0.474		
overall	0.412		

The regression also includes dummy variables indicating the year in which the interview took place.

Again, we will not dwell for long on these results. Similar results have been studied to a great detail in Van Praag and Ferrer -i-Carbonell (2004,2007). We notice here only that the domains 'social life', 'marriage', and 'health ' score the highest and in that order. Job satisfaction plays a more modest role together with financial satisfaction.

Two points should here be observed explicitly. First, we may track the influence of objective factors “through the layers". For instance, income has several effects. First, more income is seen to increase one's satisfaction with his or her financial situation. But more income is frequently linked with less leisure time, and so satisfaction with leisure may be negatively affected. So income affects life satisfaction through more than one domain channel.

Second, by these cardinalizations of the domain satisfactions and life satisfaction the computations are significantly simplified as we can use OLS and related techniques. In Van Praag, Ferrer-i-Carbonell (2007, Ch.4) we give an example where the same model is estimated by means of Ordered Probit and by the corresponding OLS- variant for a large panel data set. While Ordered Probit required a computation time of about 1.5 hour the OLS-variant did things in about one minute. The results were virtually the same except for a proportionality factor. It is obvious that the absolute computation time is not that important, as computers become faster and faster. However, the fact that one way to the goal was about 90 times as fast as the other cannot be ignored.

7. Towards An index of Urban Quality of Life

The final question in the present context is of course whether it is possible to derive a quality of life index on the basis of the methods sketched before. As a matter of fact there are now various indexes advocated in the literature and in international policy circles which are called 'Quality of life' – indexes and which have the pretension to be a tool for international comparison of living conditions. Some are based on life expectancy, some on price levels, some on income adequacy, crime level, rent levels, etc. It emerges that at first we have to make clear what aspects or domains we have in mind when making comparisons.

It stands to reason that in the context of this volume we are primarily interested in those aspects of quality of life which can be influenced by local and/or national authorities and which have to do with *urban amenities in the broad sense*. That is including, for instance, health facilities, road system, housing supply and housing cost, education, recreational facilities, crime level, public traffic, accessibility of local government, corruption, local taxes. Hence, what we have in mind here, is an urban quality of life (UQoL) index. The aim of such an index is explicitly not to compare international cities on their cost levels for "ex-pats" of multi- nationals or for setting up local branches of the company.

There are two ways to approach this project. The first one is what we may call the objective 'approach'. This is already sketched above. It is based on objective data which are considered context- relevant. Obviously, which urban characteristics $X_{1,}...,X_k$ are considered to be relevant to describe urban quality is of primary importance. Mainly the choice is made on the basis of data availability and the feelings of policy makers and statisticians on what will be important and representative for urban quality as a whole. There is an inherent element of paternalism. The second critical point is how the collected information on the characteristics $X_{1,}...,X_k$ is aggregated into one or more indexes. Mostly this is done by defining an index as a weighted sum $Y = w_1 X_1 + ... + w_k X_k$, where the weights (adding up to one) stand for the relative importance assigned to the different characteristics. Here there may be set question signs. First, how are the weights assigned? Second, is the choice of linear aggregation appropriate or should we choose for a non-linear function? In sum, the definition of these 'objective' indices is not so objective as it looks like at first sight, because their definition and consequently their interpretation depends on a number of choices by policy makers and statisticians. It follows that it is unclear whether such indexes really reflect the urban quality, as it is perceived by the urban citizens. This does not imply that objective indices cannot convey very interesting information on urban quality. It is also true that an established index which is in use for some time tends to get significance in public and individual opinion, e.g. the Human Development Index of the United Nations Development Program, UNDP.

The second road to define an urban quality index is to ask citizens themselves how they evaluate urban quality on a numerical (0 to 10) or verbal ('very bad' to 'excellent') scale. The following chapters in this book report on the results of such surveys among citizens of some big- cities in Latin – America. Then it appears attractive to take the average of 'satisfaction with urban amenities' as an index of the urban quality in a specific city, say Buenos Aires or Lima. Moreover, as the following chapters convincingly demonstrate it is possible to 'explain ' the individual evaluations, that is, we find objectively measurable factors like the supply of safety, education, public traffic, etc. which appear to determine to some extent the individual's satisfaction with urban quality. These variables are potential tools for policy makers to enhance the quality of urban amenities. In the following studies it is also estimated which factors are important and which are less important, or in other words, the relative weights of different variables are empirically estimated from the data set by the analysis of individual opinions. This is in contrast to the objective approach sketched above where the relevant variables and their weights are exogenously defined.

However, there are a number of pitfalls in this approach as well that we have to recognize. The first point is that individual satisfaction with urban amenities does not *only* depend on the supply of urban amenities but also on *individual* factors like income, age, family composition, education level, type of employment, health of the individual respondent, etc., or even on a reference point how friends and family members are living. So the same objective situation may be differently perceived and evaluated by different citizens. Let us denote satisfaction with urban amenities as depending on two sets of variables:,urban amenities *A* and individual characteristics *Z;* then the urban satisfaction or urban quality of life, say $S_{U,}$ will be a function $S_U = S_U(A,Z)$. If we assign cardinal significance to the satisfaction response categories, it follows quite naturally that average urban quality as perceived by the population is approximated by its sample average $\overline{S}_U = \frac{1}{N}\sum_{n=1}^{N} S_U(A,Z_n)$. However, it is seen that this average depends on urban amenities *and* on (the distribution of) population characteristics. So it cannot be an index of the quality of urban amenities without any correction.

This is not just a pedantic remark. Consider the case where we try to compare the urban quality of Buenos Aires with that of Lima. The distribution of Z_{Lima} is likely to differ from that of $Z_{B.A.}$. Hence, the quality of Lima may be evaluated by the inhabitants of Lima by

$$\overline{S}^{Lima}_{Lima\;\;U} = \frac{1}{N_{Lima}} \sum_{n \in Lima} S_U(A_{Lima}, Z_n)$$

or by the inhabitants of Buenos Aires by

$$\overline{S}^{Lima}_{B.A.} = \frac{1}{N_{B.A.}} \sum_{n \in B.A.} S_U(A_{Lima}, Z_n)$$

It follows that the quality of urban amenities in Lima may (and probably will) be evaluated differently by the inhabitants of Lima than by the inhabitants of Buenos Aires. In short, we meet here similar problems as when constructing price indices in traditional consumer theory where individuals have different consumption baskets.

A solution seems to be to appoint a standard type *Z* and to evaluate both cities from the standpoint of that standard type. It seems attractive to define that standard as the average inhabitant of the joint population of Lima and Buenos Aires. But similarly, we can define urban QoL – indices for social subgroups like the poor and the rich, the well – educated and the less educated, families with more than three children and families with less, single parent families and other families, families living downtown and families living in the suburbs, etc. Kapteyn et al (2007) suggested another way out by means of using vignettes. The idea translated to this context would be to describe urban environment by means of a shorthand description, a so–called vignette (see also Van Beek et al. 1997), and to ask both inhabitants of Buenos Aires and of Lima to evaluate them in terms of satisfaction. If respondents of both places would evaluate the vignettes in the same way the satisfaction index can be used for both countries together. If there is a systematic difference in how the two groups evaluate the same vignettes, we have a tool for a systematic translation of the norms of Buenos Aires inhabitants into those of Lima and inversely.

Things become more easy if we can assume that

$$S_U = S_U(A, Z) = S_{urb}(A).S_{pop}(Z)$$

Obviously, the approximate validity of such a relationship has to be established on the basis of empirical analysis. Actually this is the case of *homothetic* price indices in consumer theory. In this case we may interpret the factor $S_{urb}(A)$ as a UQoL- index which is independent of *Z.* It seems that this is the ideal index we should like to construct (see also Van Praag,1988).

Summing up, what would be the result? The result would be a population- independent UQoL- index $S_{urb}(A)$, by which the UQoL of different cities could be compared. Moreover, from the underlying satisfaction equations we can identify which variables may be the most powerful and/or the cheapest (in terms of local and national budgets) government instruments to enhance urban quality. It follows then that the UQoL- index can then be used as a benchmark instrument to evaluate the efficacy of government urban policy. Thus far, we have assumed that there is one homogeneous urban supply , available to each citizen in a specific city. However, it is clear that the same technique may be used to create group –specific indices, like for the poor and the rich, etc.

The index, outlined above, may be seen as representing an average level of urban satisfaction, comparable over cities. In a similar way it is possible to construct an *urban* *inequality* index (see Van Praag,Ferrer -i-Carbonell, 2007, Ch. 14), measuring the inequality of urban supply over quarters of the town or the inequality between cities. In order that such an index is realized we sketch a research program ,which may follow up the project on which there will be reported in this volume.

Sketch of a research program.

At first we should come to an *identification of the variables* that are likely to characterize the supply of urban amenities, that is, which drive the urban quality of life. It may be that we feel the need to differentiate the concept of urban quality into various domains of urban quality, like safety, rent price level, quality of housing, public traffic, sanitation, education, culture, parks, etc. A thorough comparison of the six pilot projects, described in this volume, may give a first hunch on what are the urban key characteristics. By comparing the different sets of variables in the six countries involved, we may also find out which variables are not everywhere collected and/or available, and which should be collected all over the relevant region. Furthermore the definitions of common variables should be streamlined in such a way that there is no ambiguity in the definition between countries.

Then we should gather the national data sets to be used into one collective data set in order that hedonic rent and satisfaction equations can be estimated cross- nationally.

On the basis of the estimated relationships we estimate then the distributions of urban satisfaction, both with respect to urban QoL as a whole and with respect to various separate dimensions of urban satisfaction. In a similar way we can estimate the rent equations, which can be used to evaluate the housing supply and the housing market and to compare them between cities.

On the basis of the estimated relationships we try to split up urban QoL into a population and an urban QoL-component. This is possible both with respect ot satisfaction and to rent. The latter component is the UQoL- index which should be come a tool for urban policy.

8. Conclusion

It is now time to summarize the main message of this chapter. We started by recognizing that there is a need to give local and national authorities tools by means of which they can evaluate the quality of urban provisions. This can be done by studying the differences in rents and in house prices, where the idea is that rent and price differences may be explained by differences in the urban environment in which the houses are situated. Then the different urban characteristics can be assigned shadow prices and one can find out which factors have a strong impact on quality and which factors a weak impact. A stronger tool is to ask citizens straightforwardly how satisfied they are with various aspects of their life, especially, with their urban environment in the wide sense, comprising all or almost all public provisions. The studies hereafter reveal how many very detailed individual data are available for at least Latin American capitals. The satisfaction method is one of the major tools of the happiness economics - approach.

In the pages above we have attempted to familiarize the reader with the modern happiness economics literature. First, we clarified on which points the established mainstream economics cannot offer an answer on urgent policy questions. Then we showed that happiness economics offers an instrument to fill in that gap. Moreover, the approach of happiness economics makes it possible to liberate ourselves of accepting the neo – classical assumption that individuals are always, by definition, in an optimal situation. As is also recognized in other social sciences like sociology and psychology, we may safely assume that this will be seldom the case in a dynamic situation, where people are unable to adapt continuously to continuously changing circumstances. Except from getting rid of the equilibrium assumption on behavior, the method of satisfaction measurement is operationally much easier, the data collection frequently less costly and hence there are larger data sets available. This in turn yields a greater reliability to the results.

This does not imply that happiness economics could have the pretension to replace the body of neo- classical economics. It has to be seen as complementary to neo – classical theory and practice, because it provides a new additional instrument for empirical research.

That instrument is of course a simple low- cost method. It can serve for the calculations of trade – offs. In this book it is applied on the collection of knowledge in order to evaluate the trade- offs between various urban dimensions like 'garbage collection', water supply, public street lighting, etc. Moreover, if we can measure the trade- off between individual family income and the level of public services, we can also estimate whether it is more profitable to tax income away and to spend the tax revenue on more public services, or that in fact the individual family is a more efficient spender of his own income. The same holds for the evaluation of environmental policies (e.g. Van Praag, Baarsma, 2005). Hence, especially for the formation and evaluation of public policy it seems that happiness economics is the instrument which was lacking up to now.

The six pilot projects which are described in following chapters indicate that it is certainly possible to come to a unified approach for Latin America. The methodology seems to be applicable elsewhere in the world as well.

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