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Essays on Multidimensional Well-Being

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1 Introduction

The definition of poverty has long been subject to debate. Traditionally, poverty has been assessed by means of monetary measures, namely income or expenditures. The underlying assumption of this approach was that these variables were able to capture the most relevant aspects of human development. However, in the last few years, several studies have shown the incapacity of monetary measures to capture the multiple dimensions of development, leaving the role of income and wealth as part of a broader concept of individual well-being.

Multidimensional approaches of poverty have been developed following the work of Nobel Prize laureate, Amartya Sen. The essence of his contribution consists in translating a person's ability to participate in society and to live a decent life into a number of key "functionings" (to be nourished, healthy, educated, etc...). In this framework, poverty is conceptualized as the lack of various capabilities to achieve these functionings.

The last decade has witnessed an increasing availability of both qualitative and quantitative data on poverty and standards of living, in particular the use of subjective variables, as satisfaction with life or subjective health status etc..., has increased. As a result, a related body of literature has emerged, in which quantitative and qualitative approaches to poverty measurement are evaluated and compared.

The first two chapters of this dissertation build on this literature, combining subjective perception of well-being with multidimensional poverty measurement. The last chapter focuses on a specific issue in the measurement of multidimensional poverty, namely the choice of the weights given to the different dimensions required to build a deprivation index.

In the European context there have been many discussions on 'social exclusion' and a growing body of research that has examined poverty in terms of lack of access to a number of goods or services, rather than lack of income per se. This has led to social monitoring based on summaries of a collection of indicators other than simple income indicators. *Chapter 2* aims at investigating empirically the relationship between an individual's well-being, as measured by the indices of deprivation and social exclusion which follow that approach, and self-declared satisfaction with life. Results on European countries show that life satisfaction decreases with deprivation and exclusion after controlling for individual's income, relative income and other influential factors in a multivariate setting.

In *chapter 3* we study the relationship between individual's objectively measured multidimensional poverty and its subjective perception. In particular the present contribution investigates individual's multidimensional subjective and objective

well-being in three domains (income, education and health) using a unique data covering subjective measures of poverty specifically added for the purpose of this research to a survey recently conducted in rural Peru. Considering an unidimensional approach to poverty our analysis demonstrates that although subjective and objective poverty measures are correlated, they do not identify uniquely the same set of individuals. These results show that the subjective assessment of income poverty, quality of education or health reflects their objective measure and also a comparison with their level in the reference group they belong to. Moving to a multidimensional approach, our results suggest that multidimensional measures have a higher and more significant effect on the general assessment of the economic situation than any unidimensional one (objective and subjective).

Finally, while the first two chapters make extensive use of multidimensional approaches to poverty measurement, one has to be aware that the implementation of such approaches poses a number of conceptual and empirical questions; the choice of the weights given to the different dimensions is among the most crucial. Whereas a consistent part of the literature has usually given an equal weight to each of these dimensions these weights might differ among dimensions, and more importantly, among various social groups. *Chapter 4* builds on this literature by characterizing a deprivation index that weighs different dimensions according to their perceived importance by members of various reference groups. This method is applied to European data. In the empirical section, we show that preferences over dimensions are indeed differentiated by social group. This distinction has an effect on the value of the deprivation index for each country and each social group, affecting their ranking as compared to the standard equal weighting approach.

2 Deprivation, Social Exclusion and Subjective Well-Being[1]

2.1 Introduction

The relationship between an individual's well-being and satisfaction with own life has been the focus of many studies in the past decade both within and across countries, during a single time period and over time. Many interesting findings and insights about self-reported satisfaction with life and its determinants have been discussed by the subjective well-being studies. Using income as a proxy for economic well-being it has been highlighted that: 1) within each country at a given point in time, richer people are more satisfied with their lives; 2) within each country over time, an increase in average income does not increase substantially satisfaction with life; 3) across-countries, on average, individuals living in richer countries are more satisfied with their lives.[2] These studies showed that income matters but also other factors are important in explaining differences in well-being, since well-being of a person is intrinsically multidimensional.

A move towards multidimensionality has been witnessed at the same time also in the more traditional income distribution literature. Sen (1992) argued that the proper space for social evaluation is that of functionings. Not only material resources, such as money, food or housing, matter but also social attributes, such as access to education and healthcare or meaningful relations with friends and relatives.

In this context, deprivation and poverty are not simply measured by a lack of monetary resources but by a more comprehensive concept involving the entire quality of life of an individual. The capability set of a person provides information on the set of functionings that a person could achieve. Deprivation and poverty can then be defined as a condition in which a person is deprived of the essentials for reaching a minimum standard of well-being and life. The social exclusion approach also regards poverty and deprivation as a multidimensional issue. Social exclusion can be broadly interpreted as the inability of an individual to participate in the basic political, economic and social activities of the society in which she lives due to persistence in the state of deprivation. Social exclusion is, with poverty, the key concept in the political debate in Europe. In the Treaty of Amsterdam, signed in 1997, the European Union included the reduction of social exclusion among its

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[1]Joint work with C. D'Ambrosio, forthcoming as "Deprivation, Social Exclusion and Subjective Well-Being" in *Social Indicator Research*.

[2]For empirical evidence on these facts see, among others, for 1)Blanchflower and Oswald (2004), Easterlin (1995); for 2) Blanchflower and Oswald (2004), Easterlin (1995); for 3)Frey and Stutzer (2002).

objectives. The design of policies aimed at combating social exclusion is at the heart of the 'Lisbon strategy' agreed upon during the European Council of March 2000. 2010 has been designated by the European Commission to be the European year for combating poverty and social exclusion. Promoting social inclusion is one of the five key areas of the 'Europe 2020 strategy' as agreed upon during the European Council of March 2010. The fight against poverty and social exclusion is one of the seven flagship initiatives to catalyze progress on Europe 2020.

Among the differences between these two branches of economics–happiness and income distribution–are the type of variables subject of study. In the income distribution literature, the approach followed by the great majority of researchers is ex-ante and normative, where well-being of an individual is measured looking at 'objective' functionings a person achieves chosen according to what is believed to be relevant for deprivation and poverty in the society under analysis.[3] On the contrary, the happiness literature relies on 'subjective' variables due to an ex-post and positive approach. But there is a clear overlap among them as the object of analysis—the individual's well-being—coincide. It comes natural to ask the following question: Are the deprived and excluded less satisfied with their lives, as we would expect? Is there a relationship, and if so of which type, between self-declared satisfaction with life and an individual's well-being as measured by the indices of deprivation and social exclusion proposed in the income distribution literature? The aim of this chapter is to shed light on this issue.[4]

The remainder of the chapter is organized as follows. The measures of deprivation and social exclusion applied in this chapter are presented in Section 2. The data and methods are described in Section 3 and 4 respectively, followed by the empirical results contained in Section 5. Section 6 concludes.

2.2 Some deprivation and social exclusion indices

At the basis of all subjective well-being studies are interdependent preferences of individuals, that is, preferences that depend directly on the situation of others. Individuals do not live in isolation and their subjective well-being depends also on their relative standing in the society. As a consequence the analysis considers the income of the individual together with alternative formulations of her relative position in the income distribution such as her rank, relative income, overall mean income, and sum of the income gaps with respect to richer and poorer individuals.

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[3]The more well-known exception is that of the 'Leyden School' developed by Van Praag (1968) and Kapteyn (1977).

[4]D'Ambrosio and Frick (2007) explored the relationship between self-reported satisfaction with income and relative deprivation as measured by the sum of the gaps between the individual's income and the incomes of all the richer individuals.

In the income distribution literature, relative standing plays its most significant role in the measurement of deprivation and social exclusion. The definition of relative deprivation adopted is the following: "We can roughly say that [a person] is relatively deprived of X when (i) he does not have X, (ii) he sees some other person or persons, which may include himself at some previous or expected time, as having X, (iii) he wants X, and (iv) he sees it as feasible that he should have X" (Runciman, 1966, p.10). Runciman further adds: "The magnitude of a relative deprivation is the extent of the difference between the desired situation and that of the person desiring it".

Following Yitzhaki (1979), income is the object of relative deprivation, as income should be considered an index of the individual's ability to consume commodities. In this seminal contribution, Yitzhaki suggests to measure individual deprivation as the sum of the gaps between an individual's income and the incomes of all individuals richer than her, while the absolute Gini turns out to be an appropriate index of aggregate deprivation.

More recently Bossert et al. (2007) (henceforth BDP) propose a more comprehensive measure of deprivation considering different aspects of the quality of life of an individual. This index assumes that, for each individual, there exists a measure of functioning failure which indicates the degree to which functionings that are considered relevant in the society under analysis are not available to the agent. Formally, let N denotes the set of all positive integers and R (R_+) is the set of all (all non-negative) real numbers. The distinct levels of functioning failures are collected in a vector $q = (q_1, ..., q_K)$ where $K \in N$. Let π_j indicate the population share composed of individuals suffering the same level of functioning failures, q_j. A distribution is $(\pi, q) \equiv (\pi_1, ..., \pi_K; q_1, ..., q_K)$, $q_i \neq q_j$ for all $i, j \in \{1, ..., K\}$. Let Ω be the space of all distributions. $\overline{q}$ indicates the illfare ranked permutation of the vector q, that is $\overline{q}_1 \leq \overline{q}_2 \leq ... \leq \overline{q}_K$.

The members of the class of individual deprivation measures, $D_i : \Omega \to R_+$, characterized by BDP (2007) are such that the degree of deprivation for a distribution (π, q) is obtained as the product of two terms with the following interpretation. The first factor is a multiple of the ratio of the number of agents who have fewer functioning failures than i and the population size. This number is interpreted as an inverse indicator of agent i's capacity to identify with other members of society–the lack of identification. The second factor is the average of the differences between q_i and the functioning failures of all agents having fewer functionings failure than i. This part captures the aggregate alienation experienced by i with respect to those who are better off. In particular the index is defined by:

$$D_i(\pi, q) = \left(\sum_{k=1}^{i-1} \pi_k \right) \sum_{j=1}^{i-1} (\overline{q}_i - \overline{q}_j) \pi_j, \tag{2.1}$$

for all $(\pi, q) \in \Omega$. BDP index of individual deprivation incorporates elements of indices proposed earlier in the literature. Yitzhaki's measure focuses uniquely on the second factor of BDP. Thus, taking into consideration the lack of identification in addition to aggregate alienation is what distinguishes the BDP approach from earlier contributions. BDP believe that individuals worse off or as well off as the agent under analysis play some role in determining her level of deprivation. Hence they combine alienation with (lack of) identification, thus capturing both effects. The difference between this measures and the earlier ones is that, in addition to the aggregate alienation experienced by the agent with respect to those who have fewer functioning failures, BDP index also depend on the capacity of an individual to identify with other members of society and the lack of it increases deprivation.

While the concept of deprivation is usually treated as a static concept, social exclusion has important dynamic aspects: an individual can become socially excluded if her condition of deprivation is persistent or worsens over time. Therefore, the measurement of social exclusion requires the inclusion of time as an important variable. A person on a trajectory exhibiting persistence in deprivation has "little prospects for the future" (Atkinson, 1998, p.14) and is not able to participate fully in the society she lives in. The BDP distinction between deprivation and social exclusion is captured by this temporal aspect. An individual experiences a higher degree of social exclusion in situations where deprivation is present in consecutive periods as compared to equal levels of deprivation interrupted by periods without deprivation. Thus, BDP view social exclusion as chronic relative deprivation in terms of functionings.

Starting from the individual index of deprivation as given by equation (2.1), BDP account for persistence by giving a higher weight to consecutive periods in a state of deprivation than to isolated ones. A t-period functioning-failure profile involving individual i is a $(t \times K)$ matrix $q = (q^1, \ldots, q^t)$, similarly we indicate by $\pi = (\pi^1, \ldots, \pi^t)$ the $(t \times K)$ matrix with the t-period population shares vectors. For all $t \in N$ and for all q, let $T_i(q)$ be the set of periods $\tau \in \{1, \ldots, t\}$ such that individual i suffers positive deprivation. For any $t \in N$ and for any profile q such that $T_i(q) \neq \emptyset$, let $T_i^1(q)$ be the set of consecutive periods beginning with the first period $\tau \in \{1, \ldots, t\}$ such that individual i suffers positive deprivation and ending with the last period $\tau \in \{1, \ldots, t\}$ such that individual i suffers positive deprivation and i is not deprived in the following period if such a period exists; if not, the last period to be included in $T_i^1(q)$ is t. If $T_i(q) \cap [\{1, \ldots, t\} \setminus T_i^1(q)] \neq \emptyset$, the set $T_i^2(q)$ is obtained from $\{1, \ldots, t\} \setminus T_i^1(q)$ in the same way $T_i^1(q)$ is obtained from $\{1, \ldots, t\}$. Because t is finite, this construction can be repeated until we obtain a partition $\{T_i^1(q), \ldots, T_i^{\ell(\mathbf{q})}(q)\}$ of $T_i(q)$, where $\ell_i(q) \in N$ is the number of

sets of consecutive periods τ such that individual i suffers positive deprivation.

An individual measure of social exclusion for individual i is a mapping $E_i \colon (\Omega)^t \to R_+$ that assigns i's level of social exclusion to each profile of intertemporal functioning failures defined as follows:

$$E_i(\pi, q) = 0 \quad \text{if } T_i(q) = \emptyset$$

and

$$E_i(\pi, \mathbf{q}) = \sum_{k=1}^{\ell_i(\mathbf{q})} |T_i^k(\mathbf{q})| \sum_{\tau \in T_i^k(\mathbf{q})} \left(\sum_{k=1}^{i-1} \pi_k^\tau\right) \sum_{j=1}^{i-1} (\bar{q}_i^\tau - \bar{q}_j^\tau)\pi_j^\tau \quad \text{if } \mathcal{T}_i(\mathbf{q}) \neq \emptyset.$$

This index is given by the sum of individual deprivation measures weighed by the number of them for consecutive periods spent in deprivation. As an example if there are ten periods such that the individual is deprived in periods 1, 2, 5, 6, 7 and 9, we have $\ell(q) = 3$, $T_i^1(q) = \{1, 2\}$, $T_i^2(q) = \{5, 6, 7\}$, $T_i^3(q) = \{9\}$ and the value of $E_i(\pi, q)$ is $2[D_i(\pi^1, q^1) + D_i(\pi^2, q^2)] + 3[D_i(\pi^5, q^5) + D_i(\pi^6, q^6) + D_i(\pi^7, q^7)] + D_i(\pi^9, q^9)$.

To investigate empirically the relationship between self-declared satisfaction with life and an individual's well-being we also use a simpler measure of individual deprivation given by the sum of functioning failures, following the 'counting' approach (Atkinson (2003), henceforth SUMC), that is for each individual $D_i^c(q) = \bar{q}_i$. We calculate individual social exclusion with this second approach as well, that is:

$$E_i^c(q) = 0 \quad \text{if } T_i(q) = \emptyset$$

and

$$E_i^c(\mathbf{q}) = \sum_{k=1}^{\ell_i(\mathbf{q})} |T_i^k(\mathbf{q})| \sum_{\tau \in T_i^k(\mathbf{q})} \bar{q}_i^\tau \quad \text{if } \mathcal{T}_i(\mathbf{q}) \neq \emptyset.$$

2.3 The data

The empirical analysis is performed using longitudinal data from the European Community Household Panel.

The ECHP is a standardized multi-purpose annual longitudinal survey providing comparable micro-data about living conditions in the European Union over the period 1994–2001. Of the 15 EU member states, we have excluded Austria, Finland, Luxembourg and Sweden since the data for these countries were not available

for all the waves. For similar reasons, we also dropped Germany and the United Kingdom. In particular, the ECHP samples of these countries were substituted by national surveys, SOEP and BHPS respectively, that did not collect information on all the variables considered in our application.

The unit of our analysis is the individual and since we are interested in analyzing the persistence of deprivation, our estimation sample is restricted to all respondents, 49,273 individuals, who provided an interview in all the waves for all the variables.[5] Descriptive statistics of the sample are contained in Table 2.1.

Table 2.1: Descriptive statistics

ECHP				
Variable	**Mean**	**Std.Dev.**	**Min**	**Max**
satmainactivity	4.06	1.35	1	6
satfinance	3.47	1.36	1	6
sathousing	4.46	1.21	1	6
satleisure	4.09	1.34	1	6
satlife(PCA)	0.0	1.34	-5.24	4.13
satlife(FA)	0.0	0.79	-3.87	2.47
income/10000	0.91	1.02	0.00	53.07
mean income	0.92	0.60	0.00	2.20
SUMC	2.04	1.86	0	12
BDP	0.66	1.04	0	9.25
SUMC_SE	111.92	109.34	0	704
BDP_SE	29.71	42.85	0	388.63
female	0.53	0.50	0	1
edu1	0.14	0.34	0	1
edu2	0.24	0.43	0	1
edu3	0.60	0.49	0	1
unemp	0.06	0.23	0	1
married	0.68	0.47	0	1
divorced	0.04	0.19	0	1
widowed	0.08	0.27	0	1
age	48.41	16.82	16	92
kids	0.65	0.48	0	1

Note: Own calculation based on all waves of ECHP data .

In the ECHP, a respondent's quality of life is measured along various dimensions such as financial difficulties, basic needs and consumption, housing conditions, durables, social contacts and participation.

In choosing the non-monetary indicators to be considered for measuring social ex-

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[5]The impact of panel attrition on the estimates has been shown in Watson (2003) and Behr et al. (2005) to be only moderate in the ECHP. Differences in response rates are mainly due to household mobility in the sample period and only minimally to other characteristics of the households that could affect our variables of interest.

clusion and deprivation within the ECHP, we followed some suggestions of Eurostat and analyzed the well-being of EU societies focusing on the following nonmonetary deprivation variables, belonging to these five domains:

1. *Financial difficulties:*

    (a) living in households that have great difficulties in making ends meet;

    (b) living in households that are in arreas with (re)payment of housing and/or utility bills;

2. *Basic necessities*:

    (a) living in households that cannot afford meat, fish or chicken every second day;

    (b) living in households that cannot afford to buy new clothes;

    (c) living in households that cannot afford a week's holiday away from home;

3. *Housing conditions:*

    (a) living in an accommodation without a bath or shower;

    (b) living in a dwelling with damp walls, floors, foundations, etc.;

    (c) living in households which have a shortage of space;

4. *Durables:*

    (a) not having access to a car due to a lack of financial resources in the household;

    (b) not having access to a telephone due to a lack of financial resources in the household;

    (c) not having access to a color TV due to a lack of financial resources in the household;

5. *Social contact:*

    (a) meeting friends or relatives less often than once a month.

In order to control for differences in household size and economies of scales, disposable annual income is transformed into equivalent income by applying the modified OECD equivalence scale which assigns a weight of 1.0 to the head of household, 0.5 to each additional adult and 0.3 to each child.

Subjective well-being is usually measured in survey data by a question capturing respondents' satisfaction with their life. Unfortunately, the ECHP survey does not include a general measure of life satisfaction which is our variable of interest. However, four different questions on satisfaction with work or main activity, financial situation, housing situation and amount of leisure time are available. A respondent's satisfaction with each of these domains is measured by a decreasing six-point scale labeled not at all satisfied, largely unsatisfied, mildly unsatisfied, mildly satisfied, largely satisfied, fully satisfied. High differences exist among countries in reporting very low (and very high) satisfaction levels. For example the prevalence of not at all satisfied with the main activity ranges from 0.78% in the Netherlands up to 10% in Italy. Apart from genuine differences in satisfaction levels across countries, reporting biases may be due to regional differences in cultural norms and expectations.

Taken individually, these (observed) indicators only partially reflect the theoretical phenomenon of (the unobserved) satisfaction with life. Thus, they are likely to only provide an incomplete picture of its complexity. For this reason, we use all four questions on satisfaction to construct a composite index of satisfaction with life considering the latter as an aggregate of all the domain satisfactions.[6] This new variable has been constructed, for each country separately, with techniques commonly used to derive composite indices such as Principal Component Analysis (PCA) and Factor Analysis (FA) methods. These methods were developed for continuous data and most of the theoretical results, including the implicitly used consistency of the estimates of the factors loadings, were derived under the normality assumption.[7] Given that our variables are ordinal, we assume that the data arise from cut off points of the underlying continuous normal variable.

FA assumes that the observed variables are different manifestation of one or more underlying unobservable variables called factors. FA finds a small number of common factors that reconstruct the original variables so that these can be seen as a linear combination of an underlying and unique factor, that accounts for common variance in the data. We based our choice of a one-factor model on the eigenvalues. For all the countries the first factor loads positively all the four variables. The variable Satisfaction with life is thus given by the scores of the first common factor and it is normalized to have standard deviation 1 and mean 0.

PCA is essentially a data reduction technique that is used when variables are highly correlated. The basic idea behind this method is to determine orthogonal linear combinations of a set of observed indicators chosen in such a way to account for most of the variance. The component scores are thus linear combinations of the observed variables weighed by theirs eigenvectors. There is a substantial literature

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[6]See van Praag and Ferrer-i-Carbonell (2004, Chapter 4) for a discussion of what they called the 'aggregating' approach.

[7]See on this issue Bartholomew (1980) and Kolenikov and Angeles (2004, 2009).

on the use of ordinal data in multivariate methods. Pearson and Pearson (1922) and Olsson (1979) introduced the concepts of polychoric correlation as the maximum likelihood estimates of the underlying correlation between the unobserved normally distributed continuous variables from their discretized versions. Thus we use polychoric principal component analysis to calculate the new variable. The first principal component identified accounts for most of the variance in the data, in our case it ranges from 47% for France to 62% for Ireland. The variable Satisfaction with life is given with this specification by the scores of the first principal component and it is again normalized to have standard deviation 1 and mean 0.

The correlations between various aspect of satisfaction and the constructed Satisfaction with life variables are reported in Table 2.2. With PCA the estimated life satisfaction gives almost equal weight to the domain satisfactions, somewhat lower on leisure satisfaction. On the contrary, with FA life satisfaction is driven mostly by satisfaction with main activity and finance.

2.4   Empirical Methods

Our empirical analysis is performed in two steps. We first derive the deprivation and social exclusion indices using the ECHP data. To derive these indices, we construct a dummy variable for each functioning failure that gives the value 1 if the individual reports a lack of this functioning and 0 otherwise. We then employ as the individual functioning failure the sum of the above 12 dummies to calculate the individual deprivation indices following the method discussed in Section 2. In constructing these indices the comparison is performed at the country level, that is the individual relative level of deprivation and social exclusion is assessed when comparing to individuals sharing the same norms and expectations as living in the same country. We then use multivariate regression analysis to gain deeper insights of the relationship between deprivation, social exclusion and life satisfaction.

Consequently, we first estimate a reduced form model of life satisfaction (LS) expressed by:

$$LS_i^\tau = \alpha D_i^\tau + \theta y_i^\tau + \phi \overline{y}^\tau + \beta X_i^\tau + \eta_i + \epsilon_i^\tau \tag{2.2}$$

where D_i^τ is the measure of deprivation of individual i at time $\tau \in \{1, \ldots, 8\}$. We include individual income y_i^τ to capture its contribution to life satisfaction independent of deprivation. Following the subjective well-being literature, we also include the mean income ($\overline{y}^\tau$) of the country of residence of individual i at time τ to take into account the relative position of the individual in the income distribution. Consistently with previous works on this topic,[8] X_i^τ is a vector of socio-demographic variables including sex, age (age squared), marital status, education, household

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[8]See, among others, Van Praag et al. (2003).

Table 2.2: Correlation between satisfaction variables, multidimensional indices, income and subjective well-being

ECHP

	satmainactivity	satfinance	sathousing	satleisure	satlife(PCA)	satlife(FA)
satmainactivity	1					
satfinance	0.5580*	1				
sathousing	0.4313*	0.4663*	1			
satleisure	0.2858*	0.2508*	0.3345*	1		
satlife(PCA)	0.6983*	0.6816*	0.6687*	0.5173*	1	
satlife(FA)	0.7320*	0.7287*	0.6597*	0.4606*	0.9868*	1

	satlife(PCA)	satlife(FA)	Income	Mean Income	SUMC	BDP	BDP_SE	SUMC_SE
satlife(PCA)	1							
satlife(FA)	0.9868*	1						
Income	0.1663*	0.1879*	1					
Mean Income	-0.0108*	0.0070*	0.4930*	1				
SUMC	-0.3819*	-0.4087*	-0.3819*	-0.3663*	1			
BDP	-0.3795*	-0.4043*	-0.2566*	-0.1103*	0.8757*	1		
BDP_SE	-0.3839*	-0.4085*	-0.2579*	-0.1010*	0.7248*	0.7960*	1	
SUMC_SE	-0.3574*	-0.3831*	-0.4013*	-0.3854*	0.8269*	0.6867*	0.8368*	1

SOEP

	satmainactivity	satfinance	satleisure	sathousing	satlife	satlife(FA)	satlife(PCA)
satmainactivity	1						
satfinance	0.4564*	1					
satleisure	0.2634*	0.2839*	1				
sathousing	0.3060*	0.4060*	0.3245*	1			
satlife	0.4886*	0.5387*	0.3466*	0.3759*	1		
satlife(FA)	0.7192*	0.7762*	0.6257*	0.7185*	0.6197*	1	
satlife(PCA)	0.7222*	0.8100*	0.5827*	0.7102*	0.6245*	0.9979*	1

	satlife	satlife(PCA)	satlife(FA)	Income	Mean Income	SUMC	BDP	BDP_SE	SUMC_SE
satlife	1								
satlife(PCA)	0.6197*	1							
satlife(FA)	0.6245*	0.9979*	1						
Income	0.1198*	0.1868*	0.2014*	1					
Mean Income	-0.0765*	-0.0469*	-0.0489*	0.1236*	1				
SUMC	-0.2468*	-0.2822*	-0.2925*	-0.2273*	0.0863*	1			
BDP	-0.2230*	-0.2605*	-0.2698*	-0.2094*	0.0471*	0.9386*	1		
BDP_SE	-0.2373*	-0.2796*	-0.2890*	-0.2526*		0.7594*	0.7442*	1	
SUMC_SE	-0.2525*	-0.2904*	-0.3003*	-0.2633*		0.7627*	0.7092*	0.9519*	1

Note: * $p < 0.01$. Own calculation based on all waves of ECHP data and on waves 18, 20, 22, 24 of SOEP data

composition and unemployment. The individual-specific error, η_i, captures unobserved individual heterogeneity in life satisfaction and ϵ_i^τ is an independent error term. In our context, individual fixed effects allow for the existence of individual heterogeneity in preferences and fixed regional attributes.

Assuming that the individual fixed effects are uncorrelated with the dependent variables, equation (2.2) is consistently estimated as a linear random effects model. However, it is reasonable to assume that unobserved individual characteristics such as ability and motivation are likely to be correlated with deprivation as personality traits of individuals will very likely influence the experienced satisfactions. As a consequence, the random effects model coefficients on the explanatory variables will in part capture the effect of this individual effect. To control for this potential bias, we estimate equation (2.2) as a linear fixed-effects model.

To further explore the relationship between life satisfaction and deprivation over time, we consider a second reduced form model of life satisfaction expressed by:

$$LS_i^8 = \theta y_i^8 + \phi \overline{y}^8 + \gamma \widehat{y_i} + \alpha SE_i + \beta X_i^8 + \varepsilon_i \qquad (2.3)$$

where SE_i measures social exclusion experienced by individual i in all the years under consideration and $\widehat{y_i}$ is the individual 'permanent income' as measured by the individual mean income across all waves, and ε_i is an independent error term. We estimate equation (2.3) on the pooled sample of all individuals in the last wave of ECHP, wave 8.

In all the specifications we compute the 'cluster robust' standard errors at the individual level to make our inference fully robust to heteroskedasticity and serial dependence.

2.5 Results

The focus in this chapter is to document how deprivation and social exclusion affect life satisfaction. Simple correlations between subjective well-being and deprivation, reported in Table 2.2, suggest that this association is much stronger (0.4 on average among all the countries in our sample) than that between subjective well-being and own income (about 0.16 on average). The correlation between individual income and the deprivation variables is significantly negative but never exceeding -0.3 confirming the low overlap between income and multidimensional well-being.

To control if this association still holds in a multivariate setting we first estimate, as baseline model, equation (2.2) including only 'single-adult equivalent household income' and all the contributing factors mentioned in the previous section (Model 1). Our second specification also includes country specific average income to control for the relative income effect on satisfaction with life (Model 2). As a last step,

we introduce (in separate regressions), the simple sum of individual functioning failures, SUMC, and the BDP index of deprivation (Model 3).

Equation (2.3) is estimated for the last wave to capture the effects of the social exclusion indices (SUMC_SE and BDP_SE) on satisfaction with life (Model 4).

All models specifications are estimated on the pooled sample of 9 European countries with life satisfaction as the dependent variable. The latter has been previously constructed using PCA and FA. Our main results for both measures of subjective well-being are presented in Tables 2.3 and 2.4.

In the baseline model, the standard correlates yield results in line with many empirical findings in the literature and fairly robust to model specifications (column 1 in Tables 2.3 and 2.4). In particular, our results suggest that life satisfaction is significantly associated with income as well as marital status, education and labor market condition.

Not surprisingly disposable income still retains a significant explanatory power for satisfaction, but also the individual relative position matters, although the results on this variable do change in the different specifications.[9]

Consistent with findings of earlier work,[10] becoming unemployed seems to have one of the most important detrimental effects on life satisfaction. Reaching the highest level of education is mildly associated to a lower life satisfaction.[11] Getting married is also significantly associated with an increase in life satisfaction, while getting divorced is associated with a significant decrease. Quite surprisingly having kids is associated with a rather small but negative and significant effect on life satisfaction. The regression on each component[12] of the life satisfaction index suggests that our results are mostly driven by the impact of having a child on leisure and financial satisfaction.

The pooled OLS regression model shows that being a woman is not significantly and consistently associated with higher satisfaction.[13]

More important for our research question is the comparison between Models 2 and 3 where alternative measures of deprivation are considered. If the hypothesis that income and the multidimensional concepts of deprivation are not capturing

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[9]In the simple OLS regressions, both pooled and by country, the level of the country mean income is always significantly negatively correlated with life satisfaction, while the effect of a variation of it, as in the fixed effect estimations, varies by country and by the life satisfaction index used.

[10]See, among others, Clark (2003).

[11]In the ECHP data the levels of education are grouped as follows: (edu1) Less than second stage of secondary education. (ISCED 0-2); (edu2) Second stage of secondary level education. (ISCED 3); (edu3) Recognized third level education. (ISCED 5-7).

[12]See section 5.1.

[13]See column 5 and 6 in Tables 2.3 and 2.4.

the same phenomenon holds, we would expect that even after the introduction of a nonmonetary index of deprivation as control, both income and our index of deprivation remain significantly correlated with life satisfaction. This is in fact what we observe in columns 3 and 4, for the sum of individual functioning failures, SUMC, and the BDP index, respectively. These results also indicate that the association between subjective well-being and objective multidimensional deprivation is robust to changes in the way of measuring the latter.

Taken together, our results suggest that life satisfaction not only decreases with a decrease in equivalent income but also decreases with an increase in deprivation.

As far as social exclusion is concerned, the results of Model 4 show that persistence in the state of deprivation is significantly negatively associated with satisfaction, while the permanent income does not seem to have any association with subjective well-being (columns 5 and 6 in Tables 2.3 and 2.4). Moreover, even after including both current deprivation and social exclusion in the same regression,[14] we find that both relationships with satisfaction remain highly significant. This reinforces the idea of the importance of incorporating also the time dimension in measuring individual well-being.

2.5.1 Robustness checks

As a first robustness check, we replicate our analysis on the German Socio Economic Panel (SOEP) data. The use of the latter is appealing for two reasons. First it provides an additional data source to examine the association between life satisfaction and deprivation. Second, SOEP also includes a direct measure of life satisfaction in addition to the four satisfaction questions available in the ECHP, which can be used to perform some sensitivity checks for the use of the proxy measures of life satisfaction obtained with PCA and FA.

All these variables are measured on a 11-point scale, ranging from 0 ("completely dissatisfied") to 10 ("completely satisfied"). We report the correlations among the satisfaction domains within the SOEP variables in Table 2.2. The correlation between Satisfaction with life and its proxies is 0.62, which is the highest value observed for this variable in the Table.

Unfortunately the nonmonetary variables[15] which we used to calculate deprivation and social exclusion with ECHP are only available in the German data for a limited number of panel years in 2000, 2002, 2004 and 2006.

When life satisfaction is directly measured by a categorical ordinal variable, such

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[14]The results are available from the authors upon request.

[15]The variable regarding buying new clothes is not present in the data, so we used only 11 variables for Germany.

Table 2.3: Determinants of Life Satisfaction (ECHP)

VARIABLES	satlife(FA)	satlife(FA)	satlife(FA)	satlife(FA)	satlife(FA)	satlife(FA)
eq inc	0.0342***	0.0339***	0.0262***	0.0287***	0.0483*	0.0481*
	(0.005)	(0.005)	(0.004)	(0.004)	(0.023)	(0.025)
mean inc		0.0622**	0.0538**	0.0696***	-0.475***	-0.183***
		(0.026)	(0.025)	(0.026)	(0.034)	(0.043)
perm inc					0.0164	0.04
					(0.017)	(0.022)
SUMC			-0.106***			
			(0.001)			
BDP				-0.143***		
				(0.002)		
SUMC_SE					-0.00307***	
					(0.000)	
BDP_SE						-0.00629***
						(0.000)
female					-0.0282	-0.0271
					(0.020)	(0.020)
age	-0.00934***	-0.0124***	-0.0182***	-0.0131***	0.0173**	0.0144*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)
agesqr	0.200***	0.200***	0.195***	0.187***	-0.193*	-0.151
	(0.040)	(0.040)	(0.039)	(0.039)	(0.089)	(0.089)
edu2	-0.0103	-0.0103	-0.00543	-0.00902	-0.00796	-0.0195
	(0.007)	(0.007)	(0.007)	(0.007)	(0.021)	(0.025)
edu3	-0.0177**	-0.0155**	-0.00494	-0.0138*	-0.0872	-0.131*
	(0.008)	(0.008)	(0.007)	(0.007)	(0.050)	(0.058)
unemp	-0.387***	-0.387***	-0.367***	-0.371***	-0.410***	-0.401***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.071)	(0.068)
kids	-0.0409***	-0.0409***	-0.0326***	-0.0371***	-0.0405*	-0.0492*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.019)	(0.022)
married	0.0508***	0.0508***	0.0403***	0.0422***	0.0820***	0.0759***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
divorced	-0.0497***	-0.0498***	-0.0336**	-0.0344**	-0.0912***	-0.0776***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.023)	(0.022)
individual F.E.	yes	yes	yes	yes	no	no
country dummies	no	no	no	no	yes	yes
time dummies	yes	yes	yes	yes	no	no
Constant	-0.906***	-0.834***	-0.300**	-0.623***	1.548***	0.827***
	(0.132)	(0.134)	(0.130)	(0.131)	(0.228)	(0.231)
Observations	365306	365306	365306	365306	46349	46349
R-squared	0.022	0.022	0.061	0.05	0.213	0.199
Number of ctypid	49273	49273	49273	49273		

Note: Robust standard errors in parentheses.$***p < 0.01$, $**p < 0.05$, $*p < 0.1$.
Own calculation based on all waves of ECHP data.

Table 2.4: Determinants of Life Satisfaction (ECHP)

VARIABLES	satlife(PCA)	satlife(PCA)	satlife(PCA)	satlife(PCA)	satlife(PCA)	satlife(PCA)
eq inc	0.0553***	0.0550***	0.0426***	0.0467***	0.0740*	0.0736
	(0.008)	(0.008)	(0.006)	(0.007)	(0.037)	(0.040)
mean inc		0.059	0.0456	0.0707	-0.824***	-0.348***
		(0.045)	(0.043)	(0.044)	(0.054)	(0.071)
perm inc					0.0331	0.0727*
					(0.030)	(0.037)
SUMC			-0.170***			
			(0.002)			
BDP				-0.226***		
				(0.003)		
SUMC_SE					-0.00501***	
					(0.000)	
BDP_SE						-0.0102***
						(0.001)
female					-0.0406	-0.0388
					(0.034)	(0.034)
age	-0.00804	-0.0109*	-0.0202***	-0.0120**	0.0371**	0.0325**
	(0.005)	(0.006)	(0.005)	(0.006)	(0.012)	(0.013)
agesqr	0.170**	0.171**	0.162**	0.150**	-0.417**	-0.349*
	(0.068)	(0.068)	(0.066)	(0.066)	(0.151)	(0.152)
edu2	-0.0145	-0.0145	-0.00665	-0.0124	0.00521	-0.0136
	(0.012)	(0.012)	(0.012)	(0.012)	(0.033)	(0.040)
edu3	-0.0236*	-0.0216*	-0.00461	-0.0188	-0.113	-0.186*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.079)	(0.092)
unemp	-0.506***	-0.506***	-0.474***	-0.481***	-0.519***	-0.505***
	(0.012)	(0.012)	(0.011)	(0.011)	(0.126)	(0.121)
kids	-0.0763***	-0.0763***	-0.0629***	-0.0703***	-0.0906**	-0.105**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.035)	(0.038)
married	0.0649***	0.0650***	0.0482***	0.0513***	0.125***	0.116***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.018)	(0.019)
divorced	-0.0810***	-0.0811***	-0.0552**	-0.0567**	-0.136**	-0.115**
	(0.027)	(0.027)	(0.026)	(0.026)	(0.042)	(0.041)
individual F.E.	yes	yes	yes	yes	no	no
country dummies	no	no	no	no	yes	yes
time dummies	yes	yes	yes	yes	no	no
Constant	-0.802***	-0.735***	0.121	-0.399*	2.797***	1.616***
	(0.223)	(0.228)	(0.221)	(0.223)	(0.387)	(0.387)
Observations	365306	365306	365306	365306	46349	46349
R-squared	0.014	0.014	0.048	0.038	0.196	0.181
Number of ctypid	49273	49273	49273	49273		

Note: Robust standard errors in parentheses.$***p < 0.01$, $**p < 0.05$, $*p < 0.1$.
Own calculation based on all waves of ECHP data.

as in the SOEP, equation (2.2) lends itself to the estimation of an ordered random effects probit model or an ordered fixed effects probit model if the individual fixed effects are assumed to be correlated with our controls. Unfortunately, the estimation of the latter is known to yield inconsistent estimates (Maddala, 1983). To circumvent this issue, we assume that respondents' answers to the life satisfaction question can be interpreted in cardinal terms. Under this assumption, we estimate consistently equation (2.2) as a linear fixed effects regression model.[16]

The results presented in Tables 2.5, 2.6 and 2.7 show that our main findings hold for all the regression models. The main difference is the persistently negative and significant coefficient of mean income. Moreover the coefficient on life satisfaction and on the Life satisfaction index, created with Factor Analysis and Principal Component respectively, are not significantly different.

As further robustness checks, we perform the analysis on ECHP data separately by each of the satisfaction components of the Life satisfaction index. We also estimate all models specifications for each country separately. Deprivation affects significantly every satisfaction component of the index and these results continue to hold for each country considered.[17]

2.6   Conclusion

This chapter investigates the relationship between different objective measures of economic well-being, such as deprivation and social exclusion indices, and a subjective measure of individual well-being. Our results corroborate the findings of the happiness studies: individual income matters together with many other factors. We have proposed to include among them some indices of multidimensional well-being recently introduced in the income distribution literature. Our results also confirm that deprived and excluded individuals are less satisfied with their lives. This finding supports the decision of the EU to include the fight of social exclusion among its central objectives in order "to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion" (Presidency Conclusions, Lisbon European Council, March 2000). The European Commission has reaffirmed the importance of collective responsibility in combating exclusion by designating 2010 as the European Year for Combating Poverty and Social Exclusion. At the heart of the Lisbon Strategy is the idea that economic, employment and social goals are interdependent. "Europe needs constantly to reform and renew its welfare state, but at the heart is a partnership, not an antagonism, between economic and social policies." (Marlier, Atkinson, Cantillon and Nolan, 2007, p.8.)

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[16]See Ferrer-i Carbonell and Frijters (2004) for a detailed discussion on this issue.

[17]The Tables are not presented here but are available from the authors upon request.

Table 2.5: Determinants of Life Satisfaction (SOEP)

VARIABLES	satlife(FA)	satlife(FA)	satlife(FA)	satlife(FA)	satlife(FA)	satlife(FA)
eq inc	0.0618***	0.0639***	0.0591***	0.0601***	0.0728***	0.0712***
	(0.008)	(0.008)	(0.009)	(0.008)	(0.020)	(0.020)
mean inc		-0.529***	-0.428***	-0.479***		
		(0.143)	(0.139)	(0.142)		
perm inc					0.0388	0.0467*
					(0.025)	(0.025)
SUMC			-0.0594***			
			(0.006)			
BDP				-0.0834***		
				(0.008)		
SUMC_SE					-0.0117***	
					(0.001)	
BDP_SE						-0.0178***
						(0.001)
female					0.0623***	0.0614***
					(0.024)	(0.024)
age	-0.0116	0.0223*	0.0202	0.0216*	-0.0267***	-0.0272***
	(0.009)	(0.013)	(0.013)	(0.013)	(0.010)	(0.010)
agesqr	-1.11E-04	-0.000138	-0.00015	-0.000145	0.000224**	0.000227**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
yearedu	-0.000199	-0.0000267	-0.00397	-0.00367	-0.0013	-0.000819
	(0.012)	(0.012)	(0.015)	(0.012)	(0.004)	(0.004)
unemp	-0.523***	-0.520***	-0.501***	-0.498***	-0.684***	-0.684***
	(0.042)	(0.042)	(0.063)	(0.042)	(0.096)	(0.096)
kids	-0.125***	-0.124***	-0.121***	-0.120***	-0.172**	-0.174**
	(0.029)	(0.029)	(0.035)	(0.029)	(0.084)	(0.084)
married	0.139***	0.139***	0.135***	0.135***	0.141***	0.144***
	(0.034)	(0.034)	(0.037)	(0.033)	(0.034)	(0.034)
divorced	0.0408	0.0409	0.0613	0.0598	0.0643	0.0701
	(0.044)	(0.044)	(0.049)	(0.044)	(0.045)	(0.045)
Individual FE	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	no
East dummies	no	no	no	no	no	yes
Constant	0.0812	0.245	0.263	0.272	0.514**	0.449*
	(0.240)	(0.262)	(0.261)	(0.262)	(0.229)	(0.229)
Observations	15625	15867	15867	15867	3967	3967
R-squared	0.029	0.03	0.04	0.04	0.128	0.124
Number of persnr	3967	3967	3967	3967		

Note: Robust standard errors in parentheses.$***p < 0.01, **p < 0.05, *p < 0.1$.
Own calculation based on waves 18, 20, 22, 24 on SOEP data.

Table 2.6: Determinants of Life Satisfaction (SOEP)

VARIABLES	satlife(PCA)	satlife(PCA)	satlife(PCA)	satlife(PCA)	satlife(PCA)	satlife(PCA)
eq inc	0.104***	0.107***	0.0988***	0.101***	0.118***	0.115***
	(0.014)	(0.014)	(0.016)	(0.014)	(0.037)	(0.037)
mean inc		-0.874***	-0.701***	-0.787***		
		(0.258)	(0.252)	(0.257)		
perm inc					0.0633	0.0773*
					(0.046)	(0.046)
SUMC			-0.102***			
			(0.011)			
BDP				-0.143***		
				(0.014)		
SUMC_SE					-0.0208***	
					(0.001)	
BDP_SE						-0.0315***
						(0.002)
female					0.118***	0.117***
					(0.043)	(0.043)
age	-0.0235	0.0324	0.0289	0.0312	-0.0497***	-0.0506***
	(0.016)	(0.023)	(0.024)	(0.023)	(0.019)	(0.019)
agesqr	-1.48E-04	-0.000192	-0.000214	-0.000206	0.000435**	0.000439**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
yearedu	-0.00544	-0.00516	-0.0119	-0.0114	-0.00322	-0.00236
	(0.022)	(0.022)	(0.027)	(0.027)	(0.007)	(0.007)
unemp	-0.895***	-0.891***	-0.857***	-0.852***	-1.168***	-1.168***
	(0.077)	(0.077)	(0.112)	(0.076)	(0.174)	(0.174)
kids	-0.225***	-0.225***	-0.219***	-0.218***	-0.316**	-0.320**
	(0.052)	(0.052)	(0.063)	(0.052)	(0.152)	(0.152)
married	0.247***	0.247***	0.241***	0.240***	0.251***	0.256***
	(0.061)	(0.061)	(0.067)	(0.060)	(0.062)	(0.062)
divorced	0.0867	0.0869	0.122	0.119	0.125	0.136*
	(0.079)	(0.079)	(0.089)	(0.079)	(0.081)	(0.081)
Individual FE	yes	yes	yes	yes		no
Time dummies	yes	yes	yes	yes		no
East dummies	no	no	no	no		yes
Constant	0.948**	0.574	0.604	0.62	0.986**	0.870**
	(0.387)	(0.403)	(0.470)	(0.401)	(0.414)	(0.415)
Observations	15867	15867	15867	15867	3967	3967
R-squared	0.026	0.027	0.036	0.036	0.117	0.11
Number of persnr	3967	3967	3967	3967		

Note: Robust standard errors in parentheses.$*** p < 0.01$, $** p < 0.05$, $* p < 0.1$.
Own calculation based on waves 18, 20, 22, 24 on SOEP data.

Table 2.7: Determinants of Life Satisfaction (SOEP)

VARIABLES	lifesat	lifesat	lifesat	lifesat	lifesat	lifesat
eq inc	0.0995***	0.106***	0.0969***	0.0990***	0.160***	0.157***
	(0.018)	(0.018)	(0.021)	(0.018)	(0.044)	(0.044)
mean inc		-1.804***	-1.603***	-1.706***		
		(0.321)	(0.316)	(0.320)		
perm inc					-0.0275	-0.00902
					(0.054)	(0.054)
SUMC			-0.118***			
			(0.013)			
BDP				-0.163***		
				(0.018)		
SUMC_SE					-0.0244***	
					(0.002)	
BDP_SE						-0.0361***
						(0.003)
female					-0.0008	-0.00298
					(0.051)	(0.051)
age	-0.0515***	0.0640**	0.0598**	0.0626**	-0.105***	-0.106***
	(0.020)	(0.029)	(0.029)	(0.029)	(0.022)	(0.022)
agesqr	-6.19E-05	-0.000153	-0.000178	-0.000168	0.000911***	0.000914***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
yearedu	-0.0195	-0.0189	-0.0268	-0.0261	0.00403	0.00524
	(0.028)	(0.028)	(0.030)	(0.028)	(0.008)	(0.009)
unemp	-0.726***	-0.718***	-0.679***	-0.674***	-1.126***	-1.129***
	(0.095)	(0.095)	(0.149)	(0.095)	(0.206)	(0.207)
kids	0.0658	0.0669	0.0738	0.075	-0.199	-0.204
	(0.065)	(0.065)	(0.064)	(0.064)	(0.180)	(0.181)
married	0.301***	0.301***	0.294***	0.294***	0.234***	0.241***
	(0.076)	(0.075)	(0.090)	(0.075)	(0.073)	(0.073)
divorced	0.161	0.161	0.202*	0.198**	0.11	0.12
	(0.099)	(0.099)	(0.114)	(0.098)	(0.096)	(0.097)
Individual FE	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	no	no
East dummies	no	no	no	no	yes	yes
Constant	9.142***	8.370***	8.405***	8.423***	9.585***	9.432***
	(0.483)	(0.501)	(0.533)	(0.499)	(0.492)	(0.494)
Observations	15867	15867	15867	15867	3967	3967
R-squared	0.023	0.026	0.034	0.033	0.102	0.094
Number of persnr	3967	3967	3967	3967		

Note: Robust standard errors in parentheses. $***p < 0.01$, $**p < 0.05$, $*p < 0.1$.
Own calculation based on waves 18, 20, 22, 24 on SOEP data.

Individuals identified as deprived and socially excluded by some indices proposed in the literature are not satisfied with their lives. Europe cannot be better if its inhabitants show a low level of life satisfaction.

3 Objective and Subjective Poverty: evidence from rural Peru[18]

3.1 Introduction

A large and increasing number of contributions from the so-called "happiness literature" focuses on the determinants of subjective well-being and its link to economic well-being (mostly using income as a proxy). These contributions have convincingly established that individual well-being is a multidimensional concept that cannot be adequately measured by simple income based measures developed by early utilitarians.[19]

Likewise, dissatisfaction with the sole use of income to measure poverty has fueled an expanding multidimensional poverty literature[20] that defines poverty as a condition in which a person is deprived of the essentials for a minimum standard of well-being and life. In this context, individual well-being does not only refer to material resources, such as money, food or housing, but also to social resources, such as access to education and healthcare or any type of relational goods.

Unfortunately, thresholds used to *objectively* determine whether a person is deprived of the essentials to reach a socially acceptable standard of living is intrinsically normative and might not consistently overlap with the actual feeling of deprivation experienced by individuals.

To the best of our knowledge, the links between objective poverty and its subjective perception have not yet been fully explored. The purpose of this chapter is to fill this gap, relying on a unique data covering subjective measures of poverty specifically added for the purpose of this research to a longitudinal survey collected in rural Piura, a northern coastal region in Peru.

This chapter aim at extending previous works on this topic in two ways. On one hand, we explore the extent to which objective and subjective poverty profiles overlap relying on specific questions on perceived poverty. On the other hand, we investigate in more details the association between the individual's subjective assessment of his economic status and his objectively measured well-being, exploring this gap form both a unidimensional and a multidimensional point of view.

In our empirical exercise we consider the relationship between our objective measures and the subjective perception of it, focusing at first on the income dimension

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[18]Joint work with C. De Los Rios.

[19]For comprehensive survey on the relevance of happiness research, see Frey and Stutzer (2007).

[20]See the seminal work of Sen (1979).

and then on a general assessment of individual well-being. To do so, we compute a multidimensional measure of objective poverty considering three domains (income, education and health)[21] and also a multidimensional measure of subjective poverty, which follows the same approach.

To preview our results, the use of subjective, instead of objective, poverty measures identifies as poor a different set of individuals in our sample. This gap is confirmed in every dimension considered. Moreover, although the objective measures of education, health risk and income poverty are correlated with the individuals' subjective perception of it, they do not seem to completely overlap.

This chapter is organized as follows. The next section offers a brief review of some important contributions which shed light on the links between objective and subjective poverty. Section 3 introduces the survey and the variables used in this chapter. Section 4 discusses our methodology and the empirical results, followed by some concluding remarks in section 5.

3.2 Poverty and perceived poverty: a brief literature review

This chapter relates naturally to the economic literature on subjective well-being. In particular we focus on the gap between objective and subjective measurements of well-being, frequently observed in the literature.

In this regard, one of the first contribution analyzing the determinants of people's perceptions of their economic welfare is due to Ravallion and Lokshin (2002). They found, using Russian data, that while income is a significant predictor of subjective economic well-being, other factors, among which health, education and the relative income in the areas of residence, are also highly influential. Moreover their results suggest a positive, but weak, relationship between self-rated and objective well-being. Carletto and Zezza (2006), following the same strain of research, combine objective and subjective measures of welfare to elicit the poverty profiles in Albania. They explore possible determinants of the gaps between these measures, highlighting in particular the presence of economies of scale in household consumption.

More recently, on the link between objective material deprivation and subjective well-being in developed countries, Oswald and Wu (2010) provide evidence that across the United States of America, individuals' answers to subjective well-being questions have the same pattern of quality of life as estimated solely with objective data. Using European data, Bellani and D'Ambrosio (2010) show that self-declared

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[21]Commonly thought as important dimension to assess poverty in developing countries (see the Human Development Index among others).

satisfaction with life decreases with multidimensional deprivation and social exclusion after controlling for individual's income, relative income and other influential factors in a multivariate setting.

In developing countries context, Moller (2005), using South African data, finds a very strong and significant link between subjective assessment and objective living conditions, as expected, since those countries have greater poverty rates than developed ones. Nevertheless, those are not universal findings. Low income individuals in developing countries have not always been reported to experience higher levels of satisfaction as income increases and objective conditions improve. Banerjee et al. (2004) finds that the poor generally do not complain about their health or life in general, even though they do feel poor. Their levels of self-reported happiness and self-reported health levels are not as low as expected.

Focusing on emerging market and, in particular, on Peru, Graham and Pettinato (2002) and Graham (2009) provide empirical evidence of the importance of the relative rather than absolute income differences in assessing subjective well-being, in particular for those in the middle of the distribution. They mainly focus on relative income mobility, finding a consistent gap between the objective income patterns and the subjective assessment of it. Guillen-Royo (2008, 2009) empirically analyzes the relationship between consumption and individual's subjective well-being in seven poor Peruvian communities. Against a common assumption that relative consumption only matters for the rich, her papers provide evidence that all individuals are likely to be influenced by the level of consumption of the area where they live when evaluating their general economic situation. Furthermore, she claims that consumption affects subjective well-being not only increasing the possibility to satisfy basic needs, but also giving to the poor opportunities to meet other non material needs, like acquiring a particular status within their reference group or the mere pleasure of consuming.

In the direction of a wider-ranging concept of poverty are also the findings of Alatas et al. (2010), who, in a recent and interesting contribution on different ways of targeting the poor for redistribution policies, provides evidence of a different concept of poverty at the community, or household level, than that based solely on per-capita consumption.

Closer to the focus of this chapter, Kingdon and Knight (2006) analyze the extent of overlap between subjective well-being, income poverty and a broader concept of poverty incorporating the "basic needs" approach. They also examine the determinants of these measures and whether they affect them with the same intensity.

3.3 Description of the Data

3.3.1 The IEP Survey

Since 2003, the Institute of Peruvian Studies (IEP) follows a representative sample of 455 households from rural Piura, a northern coastal region in Peru that is largely an agricultural-based economy with strong connections to different markets of goods and services. The initial objective of IEP was to study the socio-economic situation of agricultural households after the 1998 economic crisis, using as a baseline a sample of households previously surveyed by the University of Wisconsin and CIPCA, its local partner in Piura, in 1997. In 2004, 2006 and 2007, IEP continued following the same group of households, supported by BASIS-CRSP (USAID), with the objective to strengthen the analysis of farmers' behavior and the role of financial and insurance markets.

In this chapter we use the last wave of this survey, conducted between November and December 2009, over the same group of farmers. This wave was supported by Global AgRisk with the objective to study changes in farmers' behavior and attitude towards risk, due to some innovations in insurance markets.

As shown in table 3.1, our sample is mainly composed of farm households, of on average four members, 70% of which is in age to work.[22] The average household head is a male around 60 years old with five years of schooling. The new generations have generally almost twice the education of their parents.

A large portion of farmers decide to self-ration their consumption of formal credit services, mainly because of high interest rates, high risk of losing collateral and high transaction costs. Therefore, a large proportion of the credit provided in the region comes from informal sources that fill the gap left by formal institutions.

Within this region, we can notice some heterogeneity in these characteristics. For example, Bajo Piura is the valley with on average the lowest per capita and absolute income and wealth. San Lorenzo is the richest one, with the highest average level of education and the lowest access to credit and incidence of any agricultural shocks. At the same time, San Lorenzo is also the valley which reports the worst health conditions. Chira is the most affected by economic shocks in the sample period, while Alto Piura is characterized by the lowest incidence of health problems, the lowest percentage of independent workers and the lowest educational level.

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[22]Between 14 and 65 years old.

Table 3.1: Average Characteristics of the Sample

Variables	Alto Piura	Bajo Piura	Chira	San Lorenzo	Total
INCOME(H)*	1379	789	1585	2380	1372
INCOME(pc)*	456	229	430	1005	409
INCOME(agro)	69%	63%	71%	81%	69%
WEALTH(land)	84810	26961	77661	144469	68376
WEALTH(total)	88575	30042	82665	158293	73082
HH sex (Male)	94%	93%	93%	92%	93%
HH age	63	58	62	63	61
HH married	70%	73%	70%	71%	71%
HH works as dependent	27%	36%	15%	13%	23%
HH works as independent	6%	13%	10%	13%	10%
HH edu	4.2	4.5	5.3	5.5	4.9
maximum edu in the H	8.7	8.6	10.4	8.3	9.5
Number of members	3.6	4.5	4.4	4.0	4.3
% Members under 5 y.o.	3%	4%	4%	2%	4%
% Members in age to work	70%	69%	68%	50%	68%
credit	53%	55%	55%	55%	51%
credit(formal)	44%	31%	31%	31%	40%
rationed	35%	42%	42%	42%	38%
shock	58%	60%	73%	38%	65%
Serious health problem	10%	12%	22%	29%	18%
N.obs	77	126	228	24	455

Note: *Nuevos Soles per month. In November 2009, 1 US$ equaled around 3 Nuevos Soles.
Source: Own calculations based on IEP Rural Piura Survey (2010)

3.3.2 Subjective Indicators

For the purpose of this research, we were able to add to the original survey a set of quantitative and qualitative questions on individuals' perception of the adequacy of income, education and health and on their general economic situation.

A variety of approaches have been proposed in the literature to assess individuals' subjective well-being. In one of the first attempt, Cantril (1965) measures subjective well-being by asking respondents to rank themselves on a ladder, in terms of happiness or satisfaction with life. This approach has been adapted to investigate subjective poverty. For example, Ravallion and Lokshin (2002) derive a subjective poverty measure from a question in which respondents were asked to position themselves on a poverty scale. Van Praag (1971) introduced the Income Evaluation Question (IEQ), asking to the respondents what income they consider 'very bad' ,'bad', 'not good', 'not bad', 'good', 'very good'. A similar method, known as the Minimum Income Question (MIQ), asks respondents to report the minimum level of income they consider necessary "to make ends meet". (Kapteyn, 1994; Pradhan and Ravallion, 2000)

In this survey we followed both approaches asking the individuals to reply to the

following questions:[23]

1. *What is the minimum monthly income your household require as needed to survive?(MIQ)*

2. *According to your socio-economic condition how do you consider your household?*
   1 Very Poor, 2 Poor, 3 More or less poor, 4 Not Poor

3. *How do you consider the quality of the education received?*
   1 Very bad, 2 Bad, 3 Mediocre, 4 Good, 5 Excellent

We use respondents' answers to the first question to construct our *subjective poverty line* variable. We then use this poverty line to calculate each respondent's *subjective income poverty* status defining as poor everyone whose income falls below his self-reported poverty line. We define *subjective poor* all the respondents answering "very poor or poor" to the second question.

The *subjective quality of education* is given by the answers to the third one. The question itself could relate to the household as a whole rather than the individual. This may raise some concerns about the interpretation of the results. We address these concerns in the next sections, here we define as poor in this dimension the individuals for which the quality of education is considered as mediocre, bad or very bad.

Respondents were also provided with a set of 22 potential risks that may lead to negative outcomes.[24]The respondents were then asked to choose those which are a greater source of concern in their lives, this step is open and respondents can select as many potential risks as they wish. Finally, respondents were asked to rank the potential risks they selected. The *subjective health risk* variable takes the value of 1 if the health risk is perceived as very important (ranked first, second or third) by the respondent, and takes the value of 0 otherwise.

Table 3.2 summarizes the answers to these questions for the entire sample and by valley. The average subjective per capita poverty line in this sample is given by around 232 soles a month, while the official one was fixed for 2009 at around 208 soles per month. San Lorenzo has the higher mean score on the subjective poverty question (which means a lower perception of poverty). Interestingly, Bajo Piura is

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[23] The original phrasing of these questions is the following: Cuanto estima Ud. el monto mnimo mensual que necesita su hogar para vivir? De acuerdo a su condicion economica Ud. considera que su hogar es: 1.Muy pobre 2.Pobre 3.Ms o menos pobre 4.No es pobre. Como considera la calidad de la educacion recibida? 1.Muy mala 2.Mala 3.Regular 4.Buena 5.Muy buena.

[24]These risks include both environmental and market risks linked to the agricultural activity and other individual and family related risks.

Table 3.2: Average Characteristics of the Sample (Subjective Measures)

Variables	Alto Piura	Bajo Piura	Chira	San Lorenzo	Total
Subjective Poverty	2.6	2.6	2.7	3.2	2.7
Health as an important risk	25%	22%	44%	25%	34%
Subjective Education	3.5	3.5	3.8	3.9	3.7
Subjective Poverty Line	883	806	1149	938	997
N.obs	77	126	228	24	455

Source: Own calculations based on IEP Rural Piura Survey (2010)

the only valley with an average subjective per capita poverty line lower than the official (only 179 soles per month).

Consistently with the objective measures presented above, the average perception of education does not significantly differ between valleys and it is on average close to good. While the percentage of perception of health as an important risk is in Chira almost twice the one in the other valleys.

3.3.3 Multidimensional Indicators

As mentioned in the introduction, the focus of this chapter relates also to the measurement of poverty, in particular to the recent and growing literature on multidimensional poverty.

Atkinson (2003) introduces the counting approach, that focuses on the number of dimensions in which each person is poor. This approach has been proved to be an appropriate procedure when dealing with ordinal and categorical variables, as in this chapter. The first counting poverty measure introduced in the literature is the *multidimensional headcount ratio*, which is simply the percentage of poor in the society. Among the recent contributions on the counting approach, Alkire and Foster (2007) propose an adjusted Foster Greer and Thorbecke (FGT) measure that accounts for multidimensionality, a special case of which is the *adjusted headcount ratio*, defined as the mean number of deprivation suffered by the poor.

In this multidimensional framework two aggregation methods over the dimensions have been proposed: the intersection and the union approach. Following the first approach, a person is said to be multidimensional poor only if he is deprived in all dimensions, while, following the letter, a person is said to be multidimensional poor if there is at least one dimension in which he is deprived.

Any attempt of measuring multidimensional poverty has at least to specify a cutoff to identify the poor in each dimension and an aggregation methods over those.

In this chapter the selection of cutoffs points is done accordingly to the most relevant national definitions for each dimension. In particular we define as poor with respect to income the individual with a monthly per capita income lower than the official poverty line, which for rural Piura was set by the Peruvian National Institute of Statistics (INEI) for 2009 at US$ 75 per individual. We set the cutoff with respect to education to less than 6 years of schooling (equivalent to primary education) and, with respect to the health dimension, to having had any member with a severe health problem in the last 4-5 years.

We refer as multidimensional poverty measure mainly to the multidimensional headcount and we show results using the union, the intersection and an intermediate aggregation approach.

3.4   Methods and Results

3.4.1   Objective and subjective poor

Perceptions of one's economic situation, as measured by being above or below the subjective income poverty line, are not always in line with what is officially measured.[25] In our sample, as shown in table 3.3, about 33% of households officially poor do not consider themselves as such, while 27% of the officially non-poor consider themselves as poor. Moreover, using the direct perception of poverty, we notice an even higher discrepancy between the incidence of poverty according to the official threshold and the one derived using the number of households who perceive themselves as poor.[26] In particular, 53% of households officially considered poor do not consider themselves as such, while 30% of households considered as non-poor feel they are. We also compare the difference between subjective income poverty and subjective poverty. Around 62% of households living with an income lower than the one they claim they "need to survive", do not consider themselves as poor, while 37% of households with incomes above the "minimum required to survive", still perceive themselves as poor.

Table 3.4 summarizes the joint distribution of the subjective ranking and the one based on household income. We assign household to income quantile such that the number of respondents in each category is equal to the number of respondents in the corresponding subjective poverty group. If there was a complete overlap between the two measures the off-diagonal elements should be zeros. In our case we can notice that the association between the two measures in not complete,

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[25]The poverty line is defined as the amount of money required to fulfill a minimum consumption bundle (includes food, health, education, amongst others).

[26]In this context we consider as poor all the respondents answering "very poor or poor" to this question: "According to your socio-economic condition, do you consider your household as [very poor, poor, more or less poor, not poor]".

Table 3.3: Objective and subjective poverty

| % of the sample | **Official Poverty Line** | | |
Subjective Poverty Line	Poor	Non-poor	Total
Poor	30%	15%	45%
Non-poor	15%	40%	55%
Total	45%	55%	100%
Subjective Overall Poverty	Poor	Non-poor	Total
Poor	21%	16%	37%
Non-poor	24%	39%	63%
Total	45%	55%	100%
	Subjective Poverty Line		
Subjective Overall Poverty	Poor	Non-poor	Total
Poor	17%	21%	37%
Non-poor	28%	35%	63%
Total	45%	55%	100%

Source: Own calculations based on IEP Rural Piura Survey (2010)

although significant, given that the value of the Cramer's V is greater than zero.

Table 3.4: Comparing subjective poverty and income ranks

| | **Subjective Rank** | | | | |
Income Quantile	Very Poor	Poor	More or less poor	Not Poor	Total
1	1	8	4	1	14
2	8	67	68	13	156
3	4	75	136	22	237
4	1	6	29	10	46
Total	14	156	237	46	453

Pearson chi2(9) = 29.3475 Pr = 0.001
Cramer's V = 0.1470

Source: Own calculations based on IEP Rural Piura Survey (2010)

As shown in table 3.5, the profiles of poverty resulting from objective and subjective definitions are quite similar on many dimensions, although there are differences which are worth mentioning. Considering household size, households composed of one, or two persons only, feel poorer than what the objective measure would define,

while the opposite is true for the largest households. A possible explanation for this difference is given by the effect of economies of scale that are not captured by the objective measure, calculated in per capita terms without using any equivalence scale. Focusing on age, the same reverse pattern can be observed for the eldest and the youngest group, which could also be explained by the fact that the objective measure does not take into account the different needs individuals of different age may have. Regarding education, respondents with the highest education seem to feel poorer with respect to income than their less educated counterpart, probably due to higher aspiration on the quality of life linked to a higher level of human capital acquired. Concluding, it is interesting to notice the very low incidence of subjective overall poverty in San Lorenzo, where objective measures identify 4.8 times more households as poor than the subjective poverty one.

Table 3.5: Comparing objective and subjective poverty profiles

		Objective Income Poor	Subjective Income Poor	Subjective Poor
Gender	Female	8.8	9.9	7.1
	Male	91.2	90.2	92.9
Education	None	21.0	16.3	18.2
	Primary	58.1	56.7	64.7
	Secondary	20.0	23.7	15.3
	Higher	1.0	3.5	1.8
Age	26-45	17.1	15.3	9.4
	46-59	31.2	27.6	27.7
	60+	51.7	57.1	62.9
HH size	1-2	12.7	25.1	22.9
	3-5	51.7	53.7	50.0
	6 or more	35.6	21.2	27.1
Location	Alto Piura	12.2	12.3	19.4
	Bajo Piura	43.4	32.0	37.7
	Chira	41.5	52.2	42.4
	San Lorenzo	2.9	3.5	0.6
Total		45.1	44.6	37.4

Source: Own calculations based on IEP Rural Piura Survey (2010)

These first descriptive results highlight that to deem oneself as poor is more complex than just declaring the minimum amount of income required to survive, suggesting the existence of other factors, different from income, that might affect the perception of poverty. Therefore, in this chapter we analyze also other two dimensions of poverty, namely education and health.

Table 3.6(a) shows the poverty headcount ratio for both objective and subjective measures. The upper part of the first (second) column shows the headcount for each objectively (subjectively) defined poverty dimension, while the lower part, shows the percentage of households which are considered as poor in one, two or three dimensions. The subjective multidimensional headcount index identifies for every cutoff on the number of dimensions a lower number of individuals as poor. The same result is found analyzing the adjusted headcount ratio, given by the

average among the poor of the number of deprivations suffered.[27]

Columns 3-4 explore whether both measures jointly identify the poor or the non-poor. Results show that there are differences in poverty identification between objective and subjective measures. Poverty identification on both health and income is positive correlated between both methods. The 62.5% and 66.3% of the health and income poor respectively (72.3% and 73.2% of the non-poor), are classified as poor (non-poor) also using subjective measures, while only the 26% of the individuals with an education lower than the acceptable one, are classified as poor in that dimension by the subjective measure. Moreover, both methods seem well correlated in identifying the number of poor in one dimension. However, the larger the number of dimensions considered, the larger the discrepancy, while the opposite pattern holds for the classification of the non-poor.

Results on multidimensional poverty and subjective poverty (SP), as presented in table 3.6(b), suggest a higher overlap between the latter and the subjective multidimensional measures. Both objective and subjective measures seem to predict better the poor according to SP the larger the number of dimension considered.

3.4.2 Determinants of Subjective Poverty Line, Education and Health

To gain a better understanding of these discrepancies between subjective and objective measures, we first explore each dimension separately.

Consistently with previous works in this literature, we estimate the determinants of individuals subjective poverty line as follows:

$$z_i = \alpha + \gamma_1 y_i + \gamma_2 \overline{y} + \beta_1 X_i + \beta_2 X_h + \eta_i \tag{3.1}$$

where y_i is the actual income, $\overline{y}$ is the mean income in the individual's reference group, X_i and X_h are vectors of controls at the individual and household level respectively and η_i is a zero mean error term. Our unit of observation is the individual, in particular we refer to the head of the household for whom the largest set of informations is available. The individuals' reference group is composed by the individuals living in the same valley. As controls we use individual socioeconomic characteristics, such as gender, age, marital status, years of schooling, job type, and household composition variables, as number of members, number of children, etc. We also add variables capturing the economic condition of the household as an asset index and other sources of household income.

As reported in table 3.7, subjective poverty line is significantly and positively in-

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[27]The results are not presented here but they are available from the authors upon request.

Table 3.6: Multidimensional Poverty Headcount (Objective & Subjective) and Subjective Poverty (SP)

(a)

Dimension	Poverty Headcount		Joint Classification of Poverty	
	Objective	Subjective	Poor	Non Poor
Health	18.7%	33.9%	60.0%	72.2%
Education	75.2%	26.8%	26.7%	72.6%
Income	45.1%	44.6%	66.3%	73.2%
Number of Dimensions				
k = 1	97.1%	83.7%	83.9%	23.1%
k = 2	76.3%	36.3%	41.2%	79.6%
k = 3	28.1%	10.3%	15.3%	91.7%

(b)

Number of Dimensions	Objective MD	SP	Poor	Non Poor
k = 1	97.1%		37.8%	76.9%
k = 2	76.3%	37.4%	41.2%	75.0%
k = 3	28.1%		53.1%	68.8%
Number of Dimensions	**Subjective MD**	**SP**	**Poor**	**Non Poor**
k = 1	83.7%		44.6%	100.0%
k = 2	37.3%	37.4%	76.4%	84.8%
k = 3	10.3%		100.0%	69.8%

Source: Own calculations based on IEP Rural Piura Survey (2010)

fluenced by both the household income and the average income in the reference group, although in this context the relative income effect does not result as significant. The higher the level of education, the higher the poverty line, which could be explained, together with the positive effect of income and wealth, by a change in the definition of the basic consumption bundle for richer and more educated people. Households that in the period under consideration had access to credit tend to have a lower subjective poverty line, probably given a less tightening budget constraint. It is interesting to notice that an increase in the percentage of income coming from agriculture, decreases the income defined as necessary to cover the basic needs. The more rural the area is, the lower the income needed to survive, mainly due to self-consumption, but also, in this particular region, due to a larger presence in these areas of national social programs concerning health and education. Another interesting result is that household head's characteristics as age, marital status, or sex, do not have any significant effect on the determination of the subjective poverty line.

To have a sense of the correlates of the subjective measures of education and

Table 3.7: Determinants of Subjective Poverty Line

Log (Subjective Poverty Line)	
Log (Household Income)	0.168***
	(0.0314)
Log (Average Valley Income)	0.168**
	(0.0821)
Male	-0.0226
	(0.114)
Married	-0.0542
	(0.0629)
Age of HH	0.00199
	(0.00256)
HH Education	0.0251***
	(0.00766)
Max. Educ. within household	0.0127
	(0.00822)
Number of members	0.0315**
	(0.0136)
% Members at working age (a)	-0.0560
	(0.111)
% Members below 5 yo	-0.00456
	(0.297)
Credit	-0.134***
	(0.0515)
Shock	0.0609
	(0.0501)
Asset Index(b)	0.161***
	(0.0537)
% dependent income	-0.00952
	(0.0931)
% agricultural income	-0.222***
	(0.0733)
Constant	4.015***
	(0.630)
Observations	450
R-sq	0.312

Source: Own calculations based on IEP Rural Piura Survey (2010)
Robust Standard errors in parentheses.*** $p < 0.01$, **$p < 0.05$, *$p < 0.1$
(a) Members between 14 and 65 years old.
(b) Index of household assets.

health, we estimate the following reduced form model:

$$y_i^s = \theta_1 y_i + \theta_2 \overline{y} + \beta_1 X_i + \beta_2 X_h + \eta_i \tag{3.2}$$

where y_i and y_i^s are the individual i objective and subjective perception of quality
of education/health risk, respectively and $\overline{y}$ is the mean of the objective measure
in the individual's reference group. We estimate equation (3.2) as an ordered

probit model for education, which is an ordinal variable ranging from 1 "very bad education" to 5 "very good education", while we use a discrete choice model for health, as the dependent variable takes the value one if the household head considers health as an important risk to cope with, and zero otherwise. Our results are reported in table 3.8 and table 3.9, respectively.[28]

Regarding education, table 3.8 presents results for two different specifications of quality of education. Given the phrasing of the question, this variable can be interpreted by the respondent either as the quality of his own education or as the general quality of education at the current time, referring more likely to the education of his children. Assuming the first interpretation, the first column shows the perceived quality of education of the household as a function of the years of schooling of the household head. We are aware that this is an objective measure of quantity of education that does not explicitly take into consideration the quality of it. Unfortunately in our survey we do not have data on more quality-related variables, such as pupils by teacher ratio or test scores, that we believe would be significant determinants of the subjective variable we collected. In the second specification, we consider the alternative interpretation of the question and we analyze the maximum level of perceived quality of education in the household as a function of the maximum years of schooling attained by any member in the household. It is interesting to notice that the perception of the quality of education (either measured as the household's head level or as the maximum attained level within the household) mainly depends on the reference group level of education, while the individual education level does not have significant effects on it. In particular, examining more in details the marginal effects, we find that an increase in the average years of schooling in the valley increase the probability of observing a higher score (good or very good) on the subjective perception of education, while decrease the one of getting lower scores. The same it's true for the maximum years of schooling in the household, although with a lower magnitude. Again, households characteristics seem to be insignificant in defining this probabilities.

Perceived risk of health problems is positively and significantly related to its objective counterpart measured as severe health problems. Similarly, it is positively and significantly correlated to the average level of health issues in the reference group. Interestingly the maximum level of education within the household plays an important role in determining health as a risk. The higher the level of education in the household, the lower the perception of health risk. Especially in a rural area, like the one analyzed in this chapter, being more educated may be linked to a better knowledge of how to remain healthy, on how to cope with some common diseases and it may also be correlated to a better understanding and interaction with medical doctors. Finally, the effect of access to credit decrease the perception

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[28]As robustness checks we run different specifications with different sets of controls, the original relationship between objective and subjective measures remains consistent.

Table 3.8: Determinants of Subjective Quality of Education

Subjective Education (1=Too Bad 5=Very good)	Years of Schooling of the household head						Maximum years of schooling within the household					
	Coeff.	Marg. Effects					Coeff.	Marg. Effects				
		1	2	3	4	5		1	2	3	4	5
Return to Schooling / Years of schooling	0.0175 (0.0192)	0.00	0.00	-0.01	0.00	0.00	0.0414** (0.0198)	0.00	0.00	-0.01	0.01	0.00
Average valley level	0.460*** (0.129)	0.00	-0.02	-0.14	0.12	0.04	0.163** (0.0711)	0.00	-0.01	-0.04	0.03	0.02
Male	0.187 (0.278)	0.00	-0.01	-0.06	0.05	0.02	0.117 (0.250)	0.00	0.00	-0.03	0.02	0.01
Age of HH	0.00501 (0.00657)	0.00	0.00	0.00	0.00	0.00	0.00137 (0.00560)	0.00	0.00	0.00	0.00	0.00
Married	-0.243 (0.167)	0.00	0.01	0.07	-0.06	-0.02	-0.0960 (0.154)	0.00	0.00	0.03	-0.02	-0.01
Number of members	0.0307 (0.0427)	0.00	0.00	-0.01	0.01	0.00	-0.00752 (0.0354)	0.00	0.00	0.00	0.00	0.00
% Members at working age	-0.309 (0.240)	0.00	0.01	0.09	-0.08	-0.03	-0.400 (0.254)	0.00	0.01	0.11	-0.08	-0.04
% Members below 5 yo	-0.192 (0.870)	0.00	0.01	0.06	-0.05	-0.02	-0.446 (0.877)	0.00	0.01	0.12	-0.09	-0.05
Credit	0.0421 (0.130)	0.00	0.00	-0.01	0.01	0.00	0.0562 (0.126)	0.00	0.00	-0.02	0.01	0.01
Shock	0.320** (0.134)	0.00	-0.01	-0.10	0.08	0.03	0.408*** (0.126)	0.00	-0.01	-0.11	0.09	0.04
Asset Index	0.211 (0.131)	0.00	-0.01	-0.06	0.05	0.02	0.265** (0.125)	0.00	-0.01	-0.07	0.06	0.03
% dependent income	0.282 (0.241)	0.00	-0.01	-0.08	0.07	0.02	0.0485 (0.233)	0.00	0.00	-0.01	0.01	0.00
% agricultural income	0.124 (0.207)	0.00	0.00	-0.04	0.03	0.01	0.217 (0.198)	0.00	-0.01	-0.06	0.05	0.02
/Cut 1	0.226						-0.505					
/Cut 2	0.964						0.209					
/Cut 3	2.725***						1.836**					
/Cut 4	4.987***						4.190***					
Observations	368						427					
pseudo R-sq	0.0547						0.0578					
Log pseudolikelihood	-308.116						-343.774					

Source: IEP Rural Piura Survey (2010)
Robust Standard errors in parentheses.*** $p < 0.01$, **$p < 0.05$, *$p < 0.1$

of health as a risk, while, on the opposite direction, the presence of any shock in the household in the last few years increases it.

Table 3.9: Determinants of Subjective Health Risk

Health as important risk	Coeff.	Marginal Effect
Had a serious health problem	0.463***	*0.15*
	(0.177)	
Average Health problems	1.976***	*0.63*
	(0.762)	
Distance to Health Facility	-0.210	*-0.07*
	(0.131)	
Male	0.334	*0.11*
	(0.301)	
Married	-0.284*	*-0.09*
	(0.162)	
Age of HH	0.00591	*0.00*
	(0.00739)	
HH Education	0.00816	*0.00*
	(0.0225)	
Max. Educ. within household	-0.0531**	*-0.02*
	(0.0224)	
Number of members	0.0530	*0.02*
	(0.0367)	
Members at working age	0.189	*0.06*
	(0.290)	
% Members below 5 yo	0.870	*0.28*
	(0.868)	
Credit	-0.243*	*-0.08*
	(0.144)	
Shock	0.663***	*0.21*
	(0.161)	
Asset Index	0.372**	*0.12*
	(0.147)	
% dependent income	0.228	*0.07*
	(0.285)	
% agricultural income	0.133	*0.04*
	(0.214)	
Constant	-1.628**	
	(0.759)	
Observations	443	
Pseudo R2	0.1348	
Correctly classified	71.56%	

Source: Own calculations based on IEP Rural Piura Survey (2010)
Robust Standard errors in parentheses.*** $p < 0.01$, **$p < 0.05$, *$p < 0.1$

3.4.3 Perception of Poverty, Subjective and Objective Multidimensional Poverty

Moving from a unidimensional to a multidimensional approach, we estimate a model that seeks to explain the gap between subjective and objective measures in terms of household and individual characteristics. We regress the *subjective poverty* on the per-capita objective(subjective) measure and on a vector of individual and household's variables we consider could explain this gap:

$$SP_i = \alpha P_i + \beta_1 X_i + \beta_2 X_h + \eta_i \tag{3.3}$$

where SP_i is the individual perception of his own economic situation, P_i is an objective (subjective) measure of income, education, health or multidimensional poverty, respectively.

We are aware that in the context of subjective variables we could consider that unobserved individual characteristics, which could capture personality, motivation etc., could be correlated with our objective measures, as well as influence the experienced perceptions. In this chapter we are not able to fully control for this unobserved heterogeneity.[29]

In table 3.10 we present the analysis of the possible determinants of the *subjective poverty* introducing (in separate regressions) six different indicators of the corresponding objective measure of poverty. As the dependent variable is categorical, we estimates these relations using an ordered probit regression model. A negative (positive) coefficient indicates that an increase in that explanatory variable converts to an increase (decrease) in the probability of feeling poorer. In line with the part of the literature on poverty perception in development countries which claims a strong and significant correspondence between subjective assessment and objective living conditions, the income dimension seems to be the only one with a strong impact on the individual perceived poverty. Moreover, considering a multidimensional definition of poverty, only being poor in all the dimensions has a significant negative impact on the individuals' subjective poverty. This result seems to go in favor of the so-called "intersection" approach in identifying who is multidimensional poor. It is worth noticing that the individual characteristics in this case have a significant impact on the subjective perception of poverty, while they are not significantly correlated with any of the dimensions considered separately, as shown above. More in details, the older the household head, the higher the probability of feeling poor, while being married and having at least one member of the household with a higher level of education, decrease this probability.

Concluding, to better assess the relationship between subjective poverty and subjective multidimensional measures of poverty, as shown in table 3.11, we estimate

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[29]See Ferrer-i Carbonell and Frijters (2004) for a detailed discussion on this issue.

equation (3.3) including all the contributing factors mentioned above and six different indicators of the corresponding subjective measure of poverty. We find that the standard correlates yield results in line with the literature and fairly robust to model specifications. More interestingly, having an income below your self declared poverty line is not significantly correlated with the probability of feeling poorer (column 1), while both subjective quality of education and health risk result as important in defining the individual subjective poverty status (column 2 and 3). The higher the number of dimensions in which the individual is considered poor, using a subjective multidimensional indicator, the higher the probability of self-defining his household as poor or very poor.

3.5   Concluding remarks

In the last decade a literature on the measurement and analysis of poverty, which try to understand the differences, links, and overlaps between quantitative and qualitative approaches has emerged, as the availability of both qualitative and quantitative data on poverty and standards of living has increased.

Considering an unidimensional approach to poverty our results suggest that to deem oneself as poor is indeed more complex than simply define a minimum amount of income needed to survive. Our analysis demonstrates that although subjective and objective poverty measures are correlated, they do not identify uniquely the same set of individuals. These results show that the subjective assessment of income poverty, quality of education or health reflects their objective measure and also a comparison with their level in the reference group they belong to.

Moving to a multidimensional approach, our results suggest that multidimensional measures have a higher and more significant effect on the general assessment of the economic situation than any unidimensional one (objective and subjective). Moreover, the subjective measure of poverty in the non-income dimensions are shown to be a better predictor for the overall perception of poverty than their objective counterpart.

Table 3.10: Determinants of Subjective Poverty (a)

Subjective Poverty (1=Very Poor 4=Not poor)	(1)	(2)	(3)	(4)	(5)	(6)
Objective Income Poor	-0.409***					
	(0.126)					
Objective Education Poor		0.143				
		(0.228)				
Objective Health Poor			0.221			
			(0.133)			
Objective. Multidim. Poor in k=1				-0.299		
				(0.257)		
Objective. Multidim. Poor in k=2					-0.265*	
					(0.146)	
Objective. Multidim. Poor in k=3						-0.373***
						(0.139)
Male	-0.448*	-0.360	-0.330	-0.356	-0.341	-0.377
	(0.248)	(0.239)	(0.240)	(0.239)	(0.242)	(0.243)
Age of HH	-0.0214***	-0.0179***	-0.0178***	-0.0176***	-0.0184***	-0.0201***
	(0.00631)	(0.00609)	(0.00611)	(0.00606)	(0.00615)	(0.00616)
HH Education	0.00532	0.0262	0.0124	0.0108	-0.00324	-0.00427
	(0.0200)	(0.0291)	(0.0198)	(0.0200)	(0.0224)	(0.0210)
Max. Educ. within household	0.0397**	0.0365**	0.0373**	0.0370**	0.0359*	0.0429**
	(0.0185)	(0.0185)	(0.0185)	(0.0185)	(0.0185)	(0.0185)
Married	0.383***	0.356**	0.374**	0.360**	0.361**	0.403***
	(0.145)	(0.144)	(0.146)	(0.144)	(0.145)	(0.148)
Number of members	-0.0624**	-0.0833***	-0.0899***	-0.0852***	-0.0807***	-0.0819***
	(0.0308)	(0.0302)	(0.0305)	(0.0303)	(0.0303)	(0.0306)
% Members at working age	-0.730***	-0.696***	-0.652***	-0.700***	-0.677***	-0.665***
	(0.241)	(0.239)	(0.239)	(0.240)	(0.238)	(0.240)
% Members below 5 yo	0.297	0.271	0.298	0.303	0.263	0.353
	(0.684)	(0.689)	(0.685)	(0.692)	(0.690)	(0.682)
Asset Index	0.288**	0.400***	0.408***	0.404***	0.398***	0.325**
	(0.142)	(0.135)	(0.135)	(0.134)	(0.134)	(0.138)
Credit	-0.0201	-0.0230	-0.0131	-0.0233	-0.00542	-0.0288
	(0.118)	(0.117)	(0.116)	(0.117)	(0.117)	(0.118)
Shock	-0.247**	-0.242**	-0.295**	-0.249**	-0.280**	-0.256**
	(0.117)	(0.117)	(0.124)	(0.119)	(0.118)	(0.118)
% dependent income	-0.123	-0.172	-0.146	-0.160	-0.139	-0.161
	(0.223)	(0.219)	(0.219)	(0.220)	(0.222)	(0.219)
% agricultural income	0.0279	0.0387	0.0564	0.0649	0.0459	0.0376
	(0.177)	(0.178)	(0.177)	(0.178)	(0.176)	(0.175)
/Cut 1	-3.940***	-3.231***	-3.322***	-3.665***	-3.687***	-3.730***
/Cut 2	-2.241***	-1.564***	-1.650***	-1.997***	-2.014***	-2.039***
/Cut 3	-0.478	0.175	0.0922	-0.258	-0.270	-0.285
Observations	451	451	451	451	451	451
pseudo R-sq	0.0781	0.0667	0.0685	0.067	0.0693	0.0747
Log pseudolikelihood	-435.154	-440.548	-439.669	-440.383	-439.297	-436.739

Source: Own calculations based on IEP Rural Piura Survey (2010)
Robust Standard errors in parentheses.*** $p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 3.11: Determinants of Subjective Poverty (b)

Subjective Poverty (1=Very Poor 4=Not poor)	(1)	(2)	(3)	(4)	(5)	(6)
Subjective Income Poor	-0.0495					
	(0.108)					
Subjective Education Poor		-0.485***				
		(0.134)				
Subjective Health Poor			-0.219*			
			(0.112)			
Subj. Multidim. Poor in k=1				-0.816***		
				(0.104)		
Subj. Multidim. Poor in k=2					-1.446***	
					(0.16)	
Subj. Multidim. Poor in k=3						-1.746***
						(0.164)
Male	-0.360	-0.385	-0.329	-0.377	-0.488*	-0.441
	(0.239)	(0.246)	(0.236)	(0.248)	(0.251)	(0.269)
Age of HH	-0.0179***	-0.0187***	-0.0172***	-0.0181***	-0.0184***	-0.0207***
	(0.00610)	(0.00605)	(0.00602)	(0.00621)	(0.00631)	(0.00616)
HH Education	0.0132	0.0121	0.0142	0.00953	0.00908	0.00594
	(0.0195)	(0.0192)	(0.0195)	(0.0202)	(0.0198)	(0.0193)
Max. Educ. within household	0.0371**	0.0324*	0.0339*	0.0424**	0.0344*	0.0343*
	(0.0186)	(0.0182)	(0.0187)	(0.0188)	(0.0177)	(0.0181)
Married	0.358**	0.372**	0.335**	0.360**	0.436***	0.513***
	(0.144)	(0.146)	(0.143)	(0.145)	(0.155)	(0.155)
Number of members	-0.0854***	-0.0840***	-0.0800***	-0.0995***	-0.0880***	-0.0936***
	(0.0302)	(0.0299)	(0.0301)	(0.0293)	(0.0301)	(0.0325)
% Members at working age	-0.695***	-0.628***	-0.688***	-0.608**	-0.637***	-0.537**
	(0.238)	(0.239)	(0.240)	(0.242)	(0.239)	(0.241)
% Members below 5 yo	0.285	0.490	0.338	0.342	0.482	0.704
	(0.689)	(0.681)	(0.697)	(0.682)	(0.727)	(0.681)
Asset Index	0.397***	0.372***	0.436***	0.340**	0.177	0.297**
	(0.135)	(0.135)	(0.135)	(0.136)	(0.141)	(0.136)
Credit	-0.0256	-0.0506	-0.0453	-0.00202	0.0974	-0.128
	(0.117)	(0.119)	(0.119)	(0.117)	(0.120)	(0.119)
Shock	-0.237**	-0.319***	-0.180	-0.380***	-0.492***	-0.331***
	(0.117)	(0.120)	(0.119)	(0.123)	(0.124)	(0.119)
% dependent income	-0.169	-0.199	-0.162	-0.134	-0.231	-0.382*
	(0.219)	(0.221)	(0.219)	(0.222)	(0.237)	(0.230)
% agricultural income	0.0424	-0.000782	0.0616	-0.0164	-0.00157	-0.0493
	(0.177)	(0.177)	(0.177)	(0.179)	(0.186)	(0.176)
/Cut 1	-3.940***	-3.758***	-3.339***	-4.335***	-4.813***	-4.343***
/Cut 2	-2.241***	-2.047***	-1.671***	-2.595***	-2.758***	-2.327***
/Cut 3	-0.478	-0.279	0.0785	-0.791	-0.729	-0.458
Observations	451	451	451	451	451	451
pseudo R-sq	0.0781	0.0667	0.0685	0.067	0.0693	0.0747
Log pseudolikelihood	-435.154	-440.548	-439.669	-440.383	-439.297	-436.73969

Source: Own calculations based on IEP Rural Piura Survey (2010)
Robust Standard errors in parentheses.*** $p < 0.01$, **$p < 0.05$, *$p < 0.1$

4 Multidimensional Indices of Deprivation: Should Reference Groups Matter?

4.1 Introduction

What is meant by 'poverty' has been the subject of intense debates. It may refer to a lack of income, a low level of consumption, bad housing or other physical living conditions, lower quality health care, education and other basic social services, and so on.

Multidimensional approaches have been used since the reconsideration of the concepts of poverty and inequality stimulated by the work of Nobel Prize winner, Amartya Sen. In his lectures on human values at Stanford University in 1979 he outlined for the first time his, so-called, 'capabilities approach'. In short, poverty is conceptualized as a lack of 'capabilities', where capabilities are defined as combinations of 'functionings' that are feasible for a person to achieve. Functionings are any kind of actions or states that a person may value doing or being, which are related to income and goods but describe what a person is able to do or be given these commodities (Sen, 1979).

Taking a multidimensional point of view requires new measures of poverty, and more generally, of the quality of life. These indices of well-being and deprivation have become increasingly popular, both in the theoretical and policy-oriented literature. There is currently a wide range of methods to construct multidimensional well-being indices, differing in the way they transform, aggregate and weigh the relevant dimensions.

From a social choice perspective, the focus has been defining measures of multidimensional welfare, inequality or poverty, emphasizing the measurability and comparability of the different dimensions, and desirable properties of obtained indices. The characterization of poverty indices has also benefited much from axiomatic approaches (Bourguignon and Chakravarty, 2003; Chakravarty et al., 2008).

When it comes to operationalizing the multidimensional approaches, one quickly runs into the crucial problem of how to describe individuals' multidimensional well-being by one single index, and, as pointed out by Anand and Sen (1997), any reduction of a multidimensional phenomenon into a single index must involve an exercise of specifying weights. Moreover "it is crucial that the judgements that are implicit in such weighting be made as clear and comprehensible as possible and thus open to public scrutiny"(Anand and Sen, 1997, p. 6).

In this chapter we follow the definition of relative deprivation first conceptualized

by **?**,[30] that critically involves comparing the individual's situation with the one of another person or group, the reference group, which Runciman calls 'the comparative reference group'.[31] Thus, an important choice in designing an indicator of individual's well-being is the identification of a relevant reference group.

Among the theoretical results of this literature, Bossert and D'Ambrosio (2006) provide an axiomatization of the relative deprivation index proposed by Yitzhaki (1979), considering, as comparison group, the subgroup of the reference group with respect to which an individual feels deprived in a given distribution. This group is usually composed of the set of agents in the reference group whose income is higher than that of the agent under consideration. In a more recent paper Bossert et al. (2007) characterizes a new measure embedding the concept of identification within individuals which have the same or a lower level of well-being.

In the empirical applications identifying a pertinent reference group is a well-known difficulty.[32] Using European data, Clark and Oswald (1996) and Ferrer-i Carbonell (2005) among others, find that well-being is partly driven by relative positions within the reference group, where reference groups are defined by demographic characteristics.

In many contributions a large number of indicators of functioning failure are still explicitly weighed equally, not allowing to consider that different functionings are not necessarily equally important for all individuals in measuring their well-being.

An attempt to explicitly integrate the idea of reference group in measuring relative deprivation is due to Silber and Verme (2009). They, as Clark and Oswald (1996) and Ferrer-i Carbonell (2005), assume that an individual, when assessing her situation, compares herself with individuals whose environment can be considered as being similar to hers. Thus, they propose to measure relative deprivation comparing the actual income of an individual to the one she could have expected on the basis of the levels of some observables characteristics. To the best of our knowledge, the first attempt to introduce individual preferences in weighting dimensions of a social exclusion index is due to Haisken-DeNew and Sinning (2010). They propose a scheme that weighs components of social exclusion by their subjective contribution to an overall measure of life satisfaction. They examine two groups who are typically thought of as being very different in many respects, namely migrant and non-migrant, living in Germany.

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[30] "We can roughly say that [a person] is relatively deprived of X when (i) he does not have X, (ii) he sees some other person or persons, which may include himself at some previous or expected time, as having X, (iii) he wants X, and (iv) he sees it as feasible that he should have X" (Runciman, 1966, p. 10)

[31] For **?** the groups are 'social classes'.

[32] Refer to Clark and Oswald (1996); Clark et al. (2007); Clark and Senik (2009) among others.

Should reference groups matter in measuring individual well-being? If so, how should a deprivation measure account for the different reference groups?

The purpose of this chapter is to extend previous works on this topic by explicitly integrating the idea of comparison within reference groups in the weighting of a multidimensional index of deprivation. We propose to rely on the perceived importance of the various dimensions of deprivation within each individuals' reference group to set these weights. In particular, the more the individual's peers care about a dimension the higher the weight attached to that dimension.

These group-specific weights represent a move toward considering individuals views about the notion of well-being, avoiding the usual critique of paternalism, while maintaining an interpersonal comparability of the indices which is not completely individual-specific.

The chapter is organized as follows. After a brief literature review in Section 2, the theoretical framework is presented in Section 3. In Section 4 is the empirical application and Section 5 concludes.

4.2   Literature Review

The contribution of this chapter builds on the multidimensional poverty (and/or deprivation) measurement literature and the sociological and economic literature on reference groups.

The recent literature on multidimensional indices of well-being has focused on the choice of relative weights for the different dimensions. Decancq and Lugo (2010) provide an extensive critical survey of eight methods to set weights: frequency based, statistical, most favorable, equal or arbitrary, expert opinion, price based, stated preference and hedonic. They distinguish three different classes of weights: data-driven, normative and hybrid.

Data-driven weights depend solely on the data distribution, in particular frequency based weighting sets them relative to the proportion of population suffering deprivation in that dimension.[33] Multivariate statistical weighting is mainly based on two different statistical techniques, a descriptive one (Principal Component analysis) and an explanatory one, known as latent variable models (Factor analysis).[34] The most favorable weighting method generates individual specific weights, endogenously determined to maximize the obtained well-being of the individual.[35]

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[33]For an application see Tsakloglou and Papadopoulos (2002) among others.

[34]See Krishnakumar and Nagar (2008) among others.

[35]See Cherchye et al. (2008) for an overview of composite indicators that set the weights based on this method and Ramos and Silber (2005) for a comparison of this approach to alternatives ones.

The second approach suggests to use normative based weights, which only depend on value judgments. Equal weighting is simple to implement but implicitly assumes that all indicators are equally important for everyone.[36] In the literature there are some methods to elicit the preferred trade-off between the different dimensions, like, for example, using survey data on experts' opinions about relative importance of the dimensions (Chowdhury and Squire, 2006), or budget allocation (Moldan and Billharz, 1997) or a hierarchy process (Nardo et al., 2005) or, the less popular price-based approach.[37]

A hybrid approach combines the previous two using both information on the actual distribution and the value judgments. For instance, instead of imposing a ranking of dimensions as stated by a set of experts, the so-called stated preference weights reflect the view of the society under analysis using, as proposed by Fusco et al. (2009), the direct answers of a representative group of individuals. Or, as in the last method surveyed in Decancq and Lugo (2010), using, as weights, the coefficients estimated in a subjective well-being equation (Shokkaert, 2007; Fleurbaey et al., 2009).

In the sociological and social psychology literature, reference group theory is based on the principle that people take the standards of significant others as basis for making self-appraisals, comparisons, and choices. The term reference group can refer to any and all groups that influence the attitudes and behavior of individuals.[38] Reference group theory distinguishes two types of phenomena: normative reference groups and comparative reference groups (Kelley, 1968).

A normative reference group is described as a group in which individuals are motivated to gain or maintain acceptance. To promote this acceptance, individuals hold their attitudes in conformity with what they perceive to be the consensus of opinion (norms) among the group members. In normative reference group theory, the group sets and enforces standards for individuals. Such standards are often referred to as group norms; thus we have the 'normative function' of reference groups.

A comparative reference group is instead used to describe a group which individuals use as a standard or point of reference in making evaluations or comparisons of themselves and of other individuals or groups.

As briefly reviewed, vast majority of contribution in psychology and sociology assumes the variability of preferences (and opinions, values, norms, etc.) and constructs models to explain this variation. One conclusion drawn by Runciman's study is that individuals tend to make comparisons with others like themselves.

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[36]Well-know example is the EU material deprivation indicator among others.

[37]See Fleurbaey and Gaulier (2007) for a survey of possible applications of this approach.

[38]Refer to Hyman and Singer (1968) for a discussion on this topic.

Wilkinson (2000) has made a similar point in proposing a theory of social comparison to explain consistent findings on the impact of inequality on health.

Though contemporary economists are aware that individuals may care about their relative position, accepted mainstream models state that individuals derive utility only from their own consumption, rather than a combination of own consumption and that of relevant others.

The first systematic use of the concept of comparison income is the relative income and consumption hypothesis of Duesenberry (1949). His basic idea is that "any particular consumer will be more influenced by the consumption of people with whom he has social contacts than by that of people with whom he has only casual contacts". (Duesenberry, 1949, p.48)

A theory of interdependent preferences of individuals, i.e. preferences that depend directly on the situation of others, has been also proposed by several authors in the game-theoretic field.[39] These studies usually do not specify what constitutes the appropriate reference group, which can be easily identified in the experimental games but not in more complex social environments.

Another well-known exception is a group of economists belonging to the so-called 'Leyden School',[40] who treat utility as a completely relative concept, i.e. an individual evaluates a bundle of consumption goods by comparing it to the consumption bundles of others, or perhaps to the bundles the individual has consumed in the past. The main theme of the theory of preference formation formalized by Kapteyn (1977) is this notion of relative utility. Kapteyn's basic idea is that an individual welfare function of income is a perceived income distribution. At each moment in time an individual is assumed to assign non-negative weights to any individual in the society. These weights, called reference weights, indicate the importance individuals attach to the income of other individuals.

In economics, to conclude, there is also a rapidly growing literature on social networks, both empirical and theoretical, that focus on how social networks influence economic behavior, as well as the formation of social networks (Vega-Redondo, 2006; Jackson, 2008). The strong tendency of individuals to associate with others with similar attributes, like age, race, gender, profession, religion or other dimensions, has been widely documented.[41] In this literature clustering, defined as the tendency of nodes to attach to other nodes that have similar characteristics, is called 'homophily'.

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[39]See Sobel (2005) for a review of these models.

[40]See Van Praag and Frijters (1999).

[41]See McPherson et al. (2001) for a comprehensive survey.

4.3 The Theoretical Framework

4.3.1 Individual Measure

Consider a society with a population of N individuals, each individual is endowed with a group identity (type) $k \in \{1, ..., K\}$. Each individual feels completely identified with the other individuals belonging to the same type. Let us consider the following example: if individual i forms a link (e.g. friendship) with individuals j and k because i identifies with j and k, there are consistent chances that j and k identify with each other. Therefore j and k are more likely to be linked as well, which results in i's social network to be homogeneous with regard to many sociodemographic, behavioral and interpersonal characteristics.

Identifying the appropriate reference group is a difficult task. Any individual, in principle, has her own reference group and this group may vary with the behavioral aspect concerned (e.g. business, religion etc.), although it has been argued in the literature that most people have a restricted range of groups with which they compare themselves. Moreover because of the relative homogeneity of the worlds in which people live, i.e. neighborhoods, work places, schools, individuals are more likely to meet people like themselves.

We thus assume complete 'homophily' by type. In our framework this implies that the population can be partitioned into K distinct groups and is homogeneous by type within each group.

The population of group k is denoted by N_k. Each individual at each point in time belongs to one group, hence total population N is given by the sum of those belonging to different groups, $N = \sum_{k=1}^{K} N_k$.

Assume that we have $H \in \mathbb{N}$ dimensions, or domains of well-being that are relevant, and moreover that individual achievements for these dimensions can be measured in an interpersonal comparable way. Each distribution vector $X^i = (x_1^i, ..., x_H^i)$ in $\mathbb{R}_+^H$ (H-dimensional nonnegative Euclidean space) represents a particular distribution of outcomes for the individual i in H dimensions. Any element of this vector (x_h^i) denotes the outcome of individual i in dimension $h = 1, ..., H$.

A multidimensional measure of deprivation for individual i who belongs to group $k \in \{1, ..., K\}$ is a function of a vector of several functionings associated with each individual $D_i^k = f(D^i, W^k)$, where $D^i = f(X^i) = (d_1^i, .., d_H^i)$ and $W^k = (w_1^k, ..., w_H^k)$ is the vector of nonnegative weights associated with the reference group k to which i belongs. Since W^k depends on the group distribution and not on the individual distribution, it has to be a more general function than the additively separable one.

Definition 1. *The index of deprivation D_i^k for individual $i \in N$ who belong to group k is defined as the weighted sum of her deprivation in each dimension:*[42]

$$D_i^k = \sum_{h=1}^{H} w_h^k d_h^i. \tag{4.1}$$

We now formulate some desirable properties of this deprivation measure D_i^k : $\mathbb{R}_+^H \longrightarrow \mathbb{R}_+$, which maps a non-negative vector of individual outcomes on the non-negative real line.

(1) **Focus (F)**: For any dimension h such that $d_h^i = 0$, an increase in x_h^i does not change D_i^k.

(2) **Normalization (NORM)**: If for every h, $d_h^i = 0$, D_i^k is zero.

(3) **Dimensions Monotonicity (DMON)**: For any dimension h, a decrease in d_h^i, ceteris paribus, does not increase D_i^k.

(4) **Continuity (C)**: D_i^k is continuous on $\mathbb{R}_+$.

(5) **Symmetry (SM)**: For any D^i in $\mathbb{R}_+^H$, $D_i^k\left(D^i, W^k\right) = D_i^k\left(\Pi D^i, \Pi W^k\right)$, where Π is any permutation matrix of order HXH.

(6) **Scale Invariance (SI)**: For any X^i and Z in $\mathbb{R}_+^H$ and all positive diagonal matrices Λ, $D_i^k\left(D^i, W^k\right) = D_i^k\left(\tilde{D}^i, W^k\right)$, where by $\tilde{D}^i = (\Lambda X^i)$.

To remain consistent with the literature, we want the measure not to increase if there is an improvement in the individual's outcome in a dimension in which she is already not deprived (Property 1), to be zero if the individual is not deprived in any dimension (Property 2), to not increase if the individual's outcome in one dimension improves (Property 3), to be insensitive to the order of aggregation over the dimensions (Property 5) or to any scale transformation, like a dimension specific standardization of the individual's outcomes (Property 6).[43]

In addition to these well-known properties, we introduce two axioms to capture the specific structure of the weights attached to each dimension.

Individual's well-being is linked to the relative position in her reference group. The greater the importance attached to a particular dimension or item in the group

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[42]The focus of this chapter is the structure of the weights, thus we decided not discuss here the choice of this particular form for the index.

[43]Although we are considering the aggregation over dimension for an individual measure of deprivation and not a general aggregate measure of poverty in a country or region, properties 1 to 6 are consistent with the standard set of axioms in multidimensional poverty measurement. See Bourguignon and Chakravarty (2003); Chakravarty et al. (2008) among other.

to which i belongs, the greater her sense of deprivation with respect to that item. Thus, the *group preferences* over these dimensions may be taken to indicate the weights placed on her functioning failures.

Axiom 1. Weights order (WO): *For any group k and dimension h, $w_h^k = \alpha l_h$, where for any $k \in \{1, .., K\}$, l_h is defined as the group k preference over dimension h and $\alpha > 0$.*

We define the weight relative to dimension h in group k such that the dimension perceived as more important in the reference group has higher weight, this axiom takes into account not only the ranking of the dimensions but also the intensity of the *group preferences* over each dimension.

Axiom 2. Weights Normalization (WN): $\sum_{h=1}^{H} w_h^k = 1$.

This normalization axiom allows us to compare deprivation values for people belonging to different reference groups, and thus, to meaningfully aggregate the individuals' deprivation levels into, for example, a country index.

Theorem 1. *An individual index of deprivation D_i^k as defined in (4.1) satisfies (WO, WN) if and only if for all d_h^i in $\mathbb{R}_+$ we have:*

$$D_i^k = \sum_{h=1}^{H} \frac{l_h}{\left(\sum_{h=1}^{H} l_h \right)} d_h^i. \tag{4.2}$$

Proof. The (if) part of the theorem is straightforward to verify by substitution. For the (only if), rewrite (4.1) such that it satisfies WO:

$$D_i^k = \sum_{h=1}^{H} (\alpha l_h) d_h^i. \tag{4.3}$$

The only value of α satisfying WO and WN is the following:

$$\alpha = \frac{1}{H \sum_{h=1}^{H} (l_h)}. \tag{4.4}$$

Thus, substituting (4.4) in (4.3) we get (4.2). $\qquad\square$

4.3.2 Aggregate Measure

An aggregate measure of deprivation is a function D of a vector of individual's deprivation, $D = f(D_i)$ where $D_i = (D_1^k, .., D_{N_k}^k)$ and $D : \mathbb{R}_+^N \longrightarrow \mathbb{R}_+$.

Definition 2. *The aggregate index of deprivation D is defined as the weighted sum of the deprivation in each group:*

$$D = \sum_{k=1}^{K} \frac{N_k}{N} \left(D_k \right) \tag{4.5}$$

where $D_k = \frac{1}{N_k} \sum_{i=1}^{N_k} D_i^k$ is a measure of group deprivation.

Given the assumption that $N = \sum_{k=1}^{K} N_k$, it can be seen as a special case of a more generic extended symmetric mean of order r, with r=1, of the *individual's deprivation*.[44]

Therefore, this measure satisfies the following properties in line with the standard set of axioms proposed in the literature: **Normalization, Monotonicity, Continuity, Subgroup Decomposability, Population Principle, Symmetry, One Dimensional Transfer Principle**, as formally proved in Bourguignon and Chakravarty (2003).[45]

4.4   Empirical application

In this empirical illustration we select the different dimensions of deprivation focusing on developed countries, although the general idea of weight construction could be applied to any multidimensional measure of deprivation.[46] In this section, in particular, we apply the measure described in section 3 to European data. To empirically calculate the weights reflecting 'group' preferences, we proxy the importance of each dimension within each group using direct answers of a representative group of individuals as proposed by Fusco et al. (2009). However, we compute a different scheme for each reference group: a country reference group (*country*), a socioeconomic reference group (*social*),[47] and a group that considers both country and socioeconomic variables (*country & social*).

Moreover, to asses the impact of the use of this weighting scheme, we calculate the individual and aggregate deprivation in each country and in each socioeconomic group using both equal weighting and the weights proposed in section 3. We combine information from two different databases, the European Union Statistics on Income and Living Conditions (EU-SILC) and the Eurobarometer.

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[44]$D = \sum_{k=1}^{K} \frac{N_k}{N} \left(\frac{1}{N_k} \sum_{i=1}^{N_k} D_i^k \right) = \frac{1}{N} \sum_{k=1}^{K} \sum_{i=1}^{N_k} D_i^k = \frac{1}{N} \sum_{i=1}^{N} D_i^k.$

[45]Formal definition of these axioms is in the Appendix.

[46] We are aware that there is no real possibility of getting a complete set of domains equally relevant in developed and developing countries.

[47]See table 4.1 for definition of the socioeconomic characteristics values.

4.4.1   Data

Our first source of data is the EU-SILC, which provides comparable, cross-sectional and longitudinal multidimensional data on income, poverty, social exclusion and living conditions in the European Union.

In our application we restrict the sample to 22 countries[48] and waves 2, 3, 4 and 5.[49] In choosing the non-monetary indicators to measure deprivation within the EU, we follow some suggestions of Whelan et al. (2008), Whelan et al. (2001) and Atkinson et al. (2002) and analyze the well-being of EU societies focusing on the nonmonetary variables belonging to these four domains:

1. *Financial difficulties*:

    (a) The household has been in arrears at any time in the last 12 months on mortgage or rent payments (`financial1`).

    (b) The household has been in arrears at any time in the last 12 months on utility bills (`financial2`).

    (c) The household has been in arrears at any time in the last 12 months on hire purchase installments or other loan payments (`financial3`).

2. *Basic necessities*:

    (a) The household cannot afford to pay for a one-week annual holiday away from home (`basic1`).

    (b) The household cannot afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day (`basic2`).

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[48]Austria (AT), Belgium (BE), Cyprus (CY), Czech republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Spain (ES), Finland (FI), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Luxembourg (LU), Latvia (LV), Poland (PL), Portugal (PT), Sweden (SE), Slovenia (SI), Slovak republic (SK), United Kingdom (UK).

[49]In the first wave only few countries participated in the survey.

Table 4.1: Definition of social characteristics values

	Age	percentage	Education	percentage	Economic Status	percentage
1	15 - 24	5.8	primary	16.6	wage-earner	52.6
2	25-34	15.9	lower secondary	16.4	self-employed	6.3
3	35-44	20.0	upper secondary	40.1	unemployed	2.7
4	45-54	19.3	post-secondary	27.0	student	0.7
5	55-64	15.8			retired	28.1
6	65+	23.3			inactive	9.5

Note: Note: Own calculation based on waves 2-5 of EU-SILC data.

(c) The household lacks the capacity to face unexpected required expenses (`basic3`).

3. *Housing conditions:*

   (a) The dwelling has a leaking roof, damp walls/doors/foundations (`house1`).

   (b) The household lacks the ability to keep the home adequately warm (`house2`).

   (c) The dwelling does not have a proper room with a bath or shower (`house3`).

   (d) The dwelling does not have an indoor flushing toilet for the sole use of household (`house4`).

   (e) The dwelling is too dark, meaning that there is not enough day-light coming through the windows (`house5`).

   (f) The dwelling has noise from neighbors or noise from the street (`house6`).

   (g) The household lives in an area with pollution, grime or other environmental problems caused by traffic or industry (`house7`).

   (h) The household lives in an area with crime, violence or vandalism (`house8`)

4. *Durables:*

   (a) not having access to a telephone (including mobile phone) due to a lack of financial resources in the household (`durab1`)

   (b) not having access to a color TV due to a lack of financial resources in the household (`durab2`)

   (c) not having access to a computer due to a lack of financial resources in the household (`durab3`)

   (d) not having access to a washing machine due to a lack of financial resources in the household (`durab4`)

   (e) not having access to a car due to a lack of financial resources in the household (`durab5`)

Our second source of data is the Eurobarometer, a survey commissioned by the European Commission to monitor the public opinion in the EU member countries. The sample is composed of individuals aged 15 and over living in the 27 EU Member States. We use the Special Eurobarometer 279 on poverty and social exclusion conducted in 2007 and the same 22 countries as for the EU-SILC.

The 2007 survey diverged from the Standard Eurobarometer measures and queried respondents on four particular topics,[50] amongst which were poverty and social exclusion. Within this topic respondents were asked to evaluate their quality of life and to determine society needs in attaining decent living conditions. This round was commissioned for the preparation of the 2009 thematic module on material deprivation of EU-SILC, it thus contains all the non-monetary variables described above and available in EU-SILC.[51]

After dropping the observations with inconsistent information we are left with a sample of 956,861 individuals.[52] Descriptive statistics for the variables used in our analysis are given in table 4.2.

4.4.2 Methods

In empirical practice individuals can be distinguished only with respect to a limited number of social characteristics. All individuals with the same vector of social characteristics belong to the same social type and we assume all individuals of the same social type belong to the same reference group. Van Praag et al. (1979) specify the reference weights[53] as functions of the similarity in social characteristics of individuals. They distinguished six characteristics: education, sector of employment, job-type, degree of urbanization, age and place of residence. The estimation of these reference weights yield interesting insight into the social process of whom individuals look at when evaluating their own income. In particular, individuals with more than a primary education only look at the incomes of others with the same or greater education level. However, those with a primary education only consider individuals with the same level of education. Moreover individuals appear not to refer to older individuals but mainly to individuals of (at most) the same age.[54] Woittiez and Kapteyn (1998) incorporate direct survey information on the reference group of each individual in a neoclassical labor supply model. They use data from the Socio-Economic panel (SEP) and utilize answers to questions about age and education level in one's reference group to construct the social reference group variables (indicators of the female participation rate and number of hours

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[50]The four topics are: (1) cultural values, (2) poverty and social exclusion, (3) developmental aid, and (4) residential mobility.

[51]The only discrepancy concerns the access to a telephone since the Eurobarometer distinguishes between landlines and mobile phones. In this chapter we decided to weigh according to the answer given to landlines as in Bossert et al. (2009)

[52]We merge different data source in a consistent way, thus we dropped the country and/or the groups that were not represented in both surveys. Moreover we decided to use the cross sectional data of the EU-SILC, hence in case the same individual is interviewed more than once we consider her as a different individual.

[53]See section 2 for the definition of reference weights.

[54]See Van Praag et al. (1979) for numerical values and for results on the other characteristics.

Table 4.2: Descriptive Statistics

Variables	N. Obs	Mean	Std.Dev	Min	Max
basic1	956861	0.36	0.48	0	1
basic2	956861	0.10	0.30	0	1
basic3	956861	0.31	0.46	0	1
financial1	956861	0.02	0.13	0	1
financial2	956861	0.05	0.22	0	1
financial3	956861	0.02	0.14	0	1
durab1	956861	0.01	0.10	0	1
durab2	956861	0.00	0.06	0	1
durab3	956861	0.09	0.28	0	1
durab4	956861	0.01	0.11	0	1
durab5	956861	0.08	0.28	0	1
house1	956861	0.18	0.38	0	1
house2	956861	0.09	0.29	0	1
house3	956861	0.03	0.16	0	1
house4	956861	0.03	0.16	0	1
house5	956861	0.07	0.26	0	1
house6	956861	0.20	0.40	0	1
house7	956861	0.16	0.37	0	1
house8	956861	0.13	0.33	0	1
index	956861	0.10	0.11	0	1
wcindex	956861	0.09	0.11	0	1
wgindex	956861	0.09	0.11	0	1
windex	956861	0.09	0.11	0	1
age	956861	4.00	1.56	1	6
edu	956861	2.79	1.04	1	4
econ	956861	2.69	2.02	1	6
group	956861	84.0	37.11	1	144

Note: Note: Own calculation based on waves 2-5 of EU-SILC data.

worked in the reference groups of each respondent). They also calculate the same indicators assuming that the people one meets are primarily the same age and education, and they find that the correlation between the indicators is around 0.6 for the hours worked and 0.4 for the participation rate.

Clark and Senik (2009) exploit direct survey information on the intensity and direction of income comparison in Wave 3 of the European Social Survey. They find that coworkers are the most frequently cited reference group, and that individuals tend to compare to those with whom they interact the most.

We thus define these groups assigning each individual to the group of individuals that share with her more than one socioeconomic characteristic. We assume that the people one meets are primarily same age and same educational level, as in several other studies,[55] and also same job-type and place of residence following the findings of Van Praag et al. (1979) for the Netherlands and more recently of

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[55]See Woittiez and Kapteyn (1998) and Tsakloglou and Papadopoulos (2002) among others.

Clark and Senik (2009) for Europe.

Our empirical analysis is thus performed in two steps. First, using Eurobarometer data, for each non-monetary variable we use the percentage of people in each group that consider this variable "absolutely necessary" for an acceptable standard of living in her country to calculate the *preference* (l_h^k) for every functioning.

Then, using EU-SILC data, we construct a dummy variable for each functioning failure that gives value 1 if the individual reports a lack of this functioning and 0 otherwise.[56] We employ as the individual measure of well-being the weighted sum of these dummies, as described in Section 3.

4.4.3   Results

Table 4.3 reports the average weights and ranking of functionings calculated for our three reference groups (*country group, social group and country & social group*). Consistent with prior expectations, we find that the aggregate mean weights of functionings are sensitive to the choice of the reference group.

When the country of residence is used as grouping criteria, we find that both *living in a place that has an indoor flush toilet and no leaking roof, damp walls, etc.*(`house1,4`) and *being able to pay utility bills on time* (`financial2`) are the most important items in defining what constitutes an acceptable standard of living as evidenced by their higher mean weights (0.07) and higher minimum value (0.06). In contrast, *not having access to a computer due to a lack of financial resources in the household* (`durab3`) is considered the least important item in almost all countries in our sample evidenced by a mean value of 0.027 (meaning that this item is on average the least important) and minimum and maximum values between 0.02 and 0.04 (meaning that this item is the least important in almost all countries in our sample). This finding corroborates results published in the Report on the Special Eurobarometer 279 (TNS, 2007) using the same survey data [57] as this study. The aggregate ranking reported in Table 3 masks, however, important cross-country differences which are worth mentioning. [58] For instance, while *having access to a car* appears to be a very important item in Cyprus, it is much less important in Denmark. While *being able to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day* is a very important item in both Portugal and Spain, it appears much less important in Cyprus or Hungary.

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[56]To deal with the loss of informations due to the presence of missing values for some of the variables of interest we follow Bossert et al. (2009) and consider the individual with missing values as the ones non reporting those failures.

[57]Our sample size is smaller due to our more restrictive sample selection criteria

[58]These results are not explicitly reported in this study but are available from the author upon request.

Table 4.3: Weights

	Country Group					Social Group					Country&Social Group				
	Mean	Std. Dev.	Max	Min	Rank	Mean	Std. Dev.	Max	Min	Rank	Mean	Std. Dev.	Max	Min	Rank
basic1	0.020	0.006	0.03	0.01	18	0.019	0.005	0.03	0.01	18	0.038	0.020	0.15	0.00	18
basic2	0.050	0.014	0.08	0.02	11	0.051	0.007	0.08	0.03	12	0.050	0.017	0.13	0.00	12
basic3	0.040	0.009	0.05	0.02	13	0.042	0.005	0.06	0.03	13	0.047	0.017	0.12	0.01	13
durab1	0.020	0.009	0.04	0.00	17	0.021	0.006	0.04	0.01	17	0.039	0.020	0.14	0.00	17
durab2	0.028	0.012	0.05	0.01	15	0.028	0.005	0.04	0.02	15	0.041	0.019	0.12	0.00	15
durab3	0.013	0.005	0.02	0.01	19	0.010	0.006	0.03	0.00	19	0.036	0.022	0.14	0.00	19
durab4	0.063	0.013	0.09	0.04	8	0.064	0.006	0.08	0.04	7	0.057	0.017	0.15	0.01	7
durab5	0.025	0.013	0.07	0.01	16	0.025	0.007	0.04	0.01	16	0.040	0.020	0.15	0.00	16
financial1	0.078	0.011	0.11	0.06	4	0.077	0.005	0.09	0.07	4	0.064	0.018	0.15	0.01	4
financial2	0.083	0.010	0.11	0.07	1	0.082	0.005	0.10	0.07	1	0.067	0.019	0.16	0.01	1
financial3	0.063	0.008	0.08	0.05	7	0.062	0.005	0.07	0.05	8	0.057	0.016	0.15	0.01	8
house1	0.082	0.013	0.10	0.06	2	0.080	0.007	0.11	0.07	3	0.067	0.020	0.15	0.01	3
house2	0.076	0.010	0.09	0.06	5	0.075	0.005	0.09	0.06	6	0.064	0.017	0.15	0.01	5
house3	0.075	0.010	0.09	0.06	6	0.075	0.004	0.08	0.06	5	0.063	0.017	0.14	0.01	6
house4	0.082	0.010	0.10	0.06	3	0.081	0.004	0.09	0.07	2	0.067	0.018	0.13	0.01	2
house5	0.050	0.008	0.06	0.04	12	0.052	0.005	0.07	0.04	11	0.051	0.016	0.13	0.01	11
house6	0.037	0.009	0.05	0.02	14	0.039	0.004	0.05	0.03	14	0.045	0.017	0.15	0.00	14
house7	0.055	0.006	0.06	0.04	10	0.055	0.005	0.07	0.04	10	0.052	0.015	0.12	0.01	10
house8	0.061	0.008	0.07	0.05	9	0.061	0.005	0.07	0.05	9	0.055	0.016	0.12	0.01	9

Note: Own calculation based on waves 2-5 of EU-SILC data and Eurobarometer 279.

The analysis presented in TNS (2007) and our own[59] considers age, education and occupation groups to assess the extent to which items considered in this study constitute an absolute necessity to reach an acceptable standard of living. Results from this exercise suggest the aggregate ranking of functionings does not appear to differ substantially when considering age, education and occupation separately as grouping variables.[60] However, once we consider the weights derived by defining social groups based on combinations of these factors, interesting results emerge. In particular, *not having access to a computer due to a lack of financial resources in the household* (`durab3`) now ranks as the most important item for at least one of the social groups considered as evidenced by the the minimum and maximum values related to this item reported in table 4.3.

A closer inspection of these results [61] reveals this item is in fact among the two most important, across the unemployed between 15 and 34 years of age with a primary level of education. In contrast, *living in a place that has an indoor flush toilet and no leaking roof, damp walls leaking roof, damp walls, etc.* and *being able to pay utility bills on time* are not considered that important among the oldest self-employed with a post-secondary degree and the youngest unemployed with an upper secondary degree.

As expected, calculating weights using both socioeconomic groups and the country of residence as reference group, significantly increases the variance of the weights and the distance between the minimum and maximum values (see the last columns of table 4.3). Any item is considered the most important necessity for at least one social group in one particular country.

To conclude on the analysis of the weights, it's worth noticing that the ranking of the same functionings based on the average outcome of the individuals in our EU-SILC sample, has a correlation of only 0.13 with the average ranking resulting from pooling the individuals preferences. This result suggests that using the proportion of the population having a relevant item to reflect the relative importance of that item for the overall population, as it has been previously done in the literature, may not capture the effective preferences over these items.

The first index (*index*) assumes equal weighting for all functionings.[62] The next three indices (*wcindex, wgindex* and *windex*) are derived using the weights as in (4.2), accounting for three reference groups (country of residence, socioeconomic groups and the combination of both).

The average ranking of the countries over the period considered varies due to changes in the applied weights. In particular, as shown in figure 4.1, Latvia and

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[59]Not presented here but available upon request.

[60]See Tables QB12 and QB13 in TNS (2007).

[61]Not presented here but available from the author upon request.

[62]In this case the weights are equal to $1/H = 1/19 \cong 0.05$.

Figure 4.1: Average Ranking of the Countries by weighting Scheme
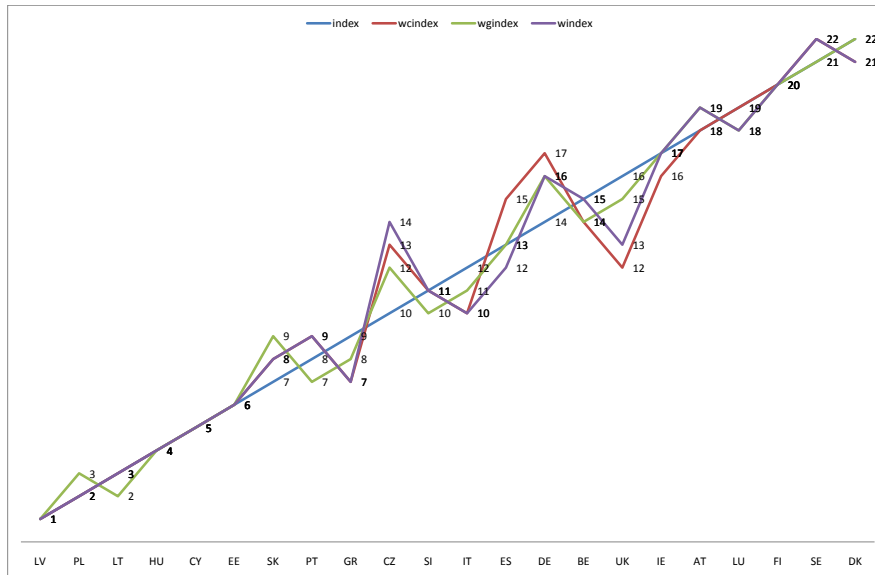
Note: Own calculation based on waves 2-5 of EU-SILC and Eurobarometer 279 data.

the Scandinavian countries are consistently the most and least deprived countries respectively, while 70% of the countries change at least one position for at least one specification of reference groups. The use of country specific weights or social weights affects more than 50% of the countries while country & social group specific weights changes the average rank of 65% of the countries.

Figure 4.2 reports the deprivation index given by the different weighting schemes aggregated separately by age, education or economic status. In general, consistent with aggregation by country, the use of *group preferences* in the weighting scheme change the absolute value of the aggregated deprivation index. However, the magnitude of this *reference group effect* is not consistent over the weighting schemes. The most deprived groups are given by economic status (the unemployed), education level (the least) and age (the youngest). Those with a post secondary level of education and the self employed are the least deprived groups in our sample. These results are consistent over the type of weights and over the reference group's definition used in the weights.

When considering aggregating over the narrowest groups on average *the youngest*

Figure 4.2: Average Deprivation Indices of the Social Groups by weighting
Scheme
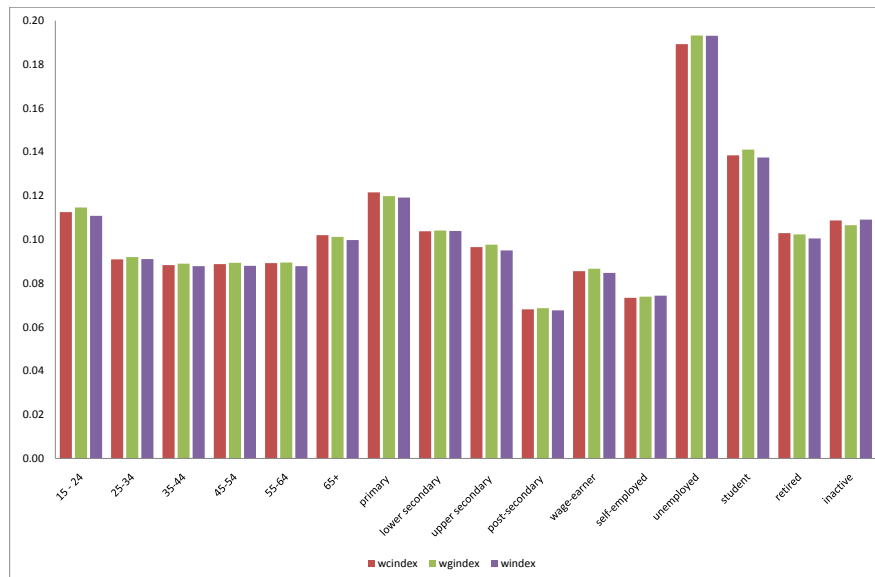
Note: Own calculation based on waves 2-5 of EU-SILC and Eurobarometer
279 data.

unemployed with a lower secondary level of education and *the unemployed aged between 45 and 54 with with an upper secondary level of education* result as the most deprived in our sample using equal weights or more generic reference groups (*country* or *social*). While, when we use a more specific notion of reference group, *the unemployed aged between 25 and 34 with the lower secondary level of education* and *the unemployed aged between 35 and 44 with with an upper secondary level of education* result as the most deprived. Moreover, it is worth noticing that the rank of the groups is sensitive to changes in the choice of reference group used in the weights. As shown in figure 4.3, the most noticeable changes are due to the use of *windex*, that account for *country & social reference group preferences*.

As last empirical illustration of the effect of the use of *reference groups weights* we analyze more in details the characteristics of the individuals who belong to the lowest decile of the deprivation distribution when using equal weights and do not when we take into account their *reference group preferences*. In particular we focus on three countries with a different average level of deprivation over the entire period (lowest, average and highest), namely Denmark, Italy and Latvia in

Figure 4.3: Average Ranking of Social Groups by weighting Scheme
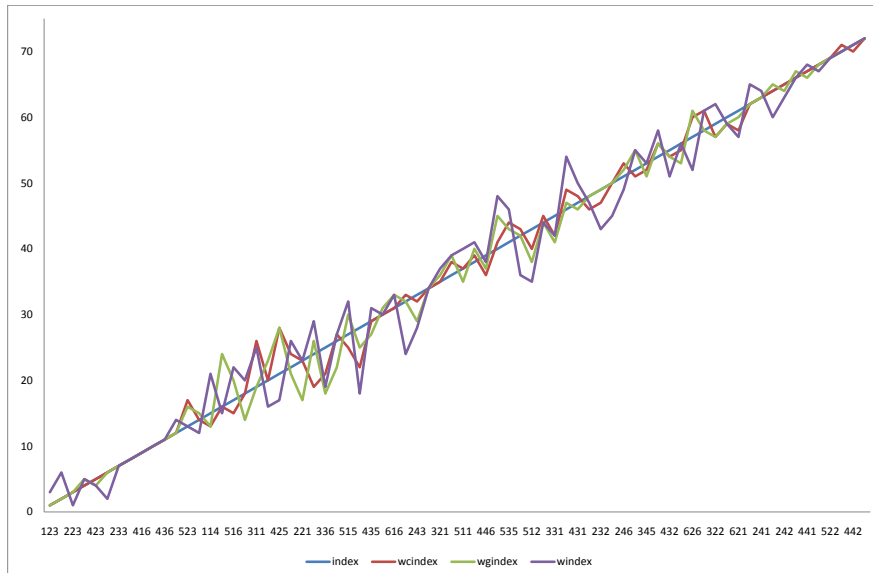
Note: The numbers on the X-axis represent the age, education and economic
status group values, e.g. 123: age=1, edu=2, econ=3. Own calculation based
on waves 2-5 of EU-SILC and Eurobarometer 279 data.

the year in which the Eurobarometer survey was conducted (2007).[63] In the least
deprived country, with respect to the entire Danish sample in the same year, this
group is composed of more upper secondary educated individuals, aged between
25 to 34 and less aged 55 to 64, while in Italy the 45% of these individuals has
the lowest level of education (only 33% in the population), they are younger and
relatively more inactive with respect to the general distribution. In Latvia this
differences are even more striking, in fact 40% of individuals belonging to the
lowest percentile when using equal weights and not when we use groups specific
weights has less than a secondary level of education (only 25% of the population
has this level), they are older (45% instead of 30% in the last age group) and we
observe a switch between wage-earner, that are almost 60% in our sample, and
retired, that in this group are the majority (54%).

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[63]We check the consistency of these results using also other survey years.

4.5 Conclusion

Individuals do not live in isolation and their well-being depends on the relative standing in society. For these reasons, the definition and consideration of reference groups matters in measuring individual well-being.

In this chapter we explicitly integrate the idea of comparison within a reference group in the weighting of a multidimensional index of deprivation. In the empirical application, we demonstrate this has an effect on the value of the deprivation for each country, each group and the ranking of each.

Eradicating poverty only through income redistribution policies may not be enough to eradicate the 'feeling' of poverty. Setting weights according to the perceived importance of various dimensions of deprivation within each individuals' reference group provides a better measure of the economic situation as perceived by the individual. Therefore, it provides a better starting point for targeting poverty reduction policies and could also give a better understanding of their effectiveness.

Appendix

Formal statement of the axioms for the aggregate measure

Definition 3. *An individual i, belonging to group k, is defined as deprived if $D_i^k \neq 0$.*

Axiom 3. *Normalization*: *If for every i, $D_i^k = 0$, D is zero, i.e. if there is no individual who is deprived the aggregate deprivation is zero.*

Axiom 4. *Monotonicity*: *For any i an increase in D_i^k increases D.*

Axiom 5. *Continuity*: *D is continuous on $\mathbb{R}_+$.*

Axiom 6. *Symmetry*: *For any D_i^k in $\mathbb{R}_+^N$, $D\binom{k}{i} = D(\Pi_i^k)$, where Π is any permutation matrix of order NXN, i.e. the order of aggregation of the individuals should not matter.*

Axiom 7. *Subgroup Decomposability*: *For any $D_k \in D_i$, $D = \sum_{k=1}^{K} \frac{N_k}{N} D_k$, where N_k is the population size corresponding to D_k , $N = \sum_{k=1}^{K} N_k$ and D_k is a measure of group deprivation.*

Axiom 8. *Population Principle*: *For any D_i in $\mathbb{R}_+^N$, $D(D_i) = D(D_i^n)$, where D_i^n is the n-fold replication of D_i*

Axiom 9. *One Dimensional Transfer Principle*: *for any $D_i \in \mathbb{R}_+^N$, if D_i' is obtained from D_i by a Pigou-Dalton progressive transfer of some attribute h from one deprived person to another, then $D(D_i')$ is not greater than $D(D_i)$.*

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