

# Beyond GDP and new indicators of well-being: is it possible to sum up objective and subjective data in the perspective of constructing new indicators?

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## Abstract

Measuring and monitoring well-being of societies require a complex and comprehensive framework and integrated approaches at conceptual and methodological levels. This perspective is urged not only by academic researchers but also by other important organizations and institutions. In the context of this complexity, the integration of objective and subjective information represents one of the crucial challenges. In order to manage the complexity, a correct methodological approach is required, including a solid conceptual framework (conceptual definitions) and a “composite” process (analytical tools and strategies), carried out through subsequent/consecutive steps (MULTI-STAGE) and different/alternative analytical approaches (MULTI-TECHNIQUE) (Maggino & Ruviglioni, 2008). The *Multi-Stage Multi-Technique* (MSMT) approach shows how the integration can be accomplished by taking into account the level of data production (micro and macro) and the different analytical solutions, among which the construction of composite indicators does not always represent the best and correct one. The paper’s goal is to describe a procedure able to yield results, not only statistically valid and consistent with reference to the defined conceptual framework, but also easy to read and interpret at policy level.

## Keywords:

Subjective and Objective Indicators – Integration of Indicators – Indicators Construction

## Introduction

The debate over the measurement of well-being (WB) and the inclusion of a wider and improved range of economic, social and environmental indicators is boosting since the last few years. The need to go beyond GDP when evaluating WB, progress and development was born together with GDP itself, but it has recently, starting with the creation by OECD’s World Forums and the Global Project for Measuring the Progress of Societies (2004), the process stepped through the EP’s Conference Beyond GDP (2007), the institution of the Stiglitz-Sen-Fitoussi Commission (2009) and the publication of the “Beyond GDP” Communication by the EC just to mention the most influential experiences. Taken for granted the need to go beyond GDP, one of the step forward which researchers and policy makers have to face is the analysis, management and communication of the complexity deriving from the multidimensionality of WB.

In the context of this complexity, the integration of objective and subjective information represents one of the crucial challenges.

In order to manage the complexity, a correct methodological approach is required, including (1) a solid conceptual framework (conceptual definitions) (2) and a “composite” process, including different analytical tools and strategies. The *Multi-Stage Multi-Technique* (MSMT) approach shows how the integration can be accomplished by taking into account the level of data production (micro and macro) and the different analytical solutions. In this paper we

1. identify the feasible conceptual framework, by first clarifying the distinction between objective and subjective data.
2. introduce the *Multi-Stage Multi-Technique* (MSMT) approach, carried out through subsequent/consecutive steps (MULTI-STAGE) and different/alternative analytical approaches (MULTI-TECHNIQUE) (Maggino & Ruviglioni, 2008).

3. show an application allowing the MSMT approach to be tested in its capacity of identify the best solution of integration. Subjective data are provided by the European Social Survey project and objective data are provided by the Joint Research Centre – JRC – European Commission.

## 1. Integrating objective and subjective dimensions: defining the conceptual framework

### 1.1 Let's make clear

#### 1.1.1 What is “subjective”?

Before showing the measuring process step-by-step, it is helpful trying to clarify here the meaning of “**subjective**” adjective, as well as its opposite “**objective**”, consistently with different concepts:

- A. What we are going to observe/measure? In this case the adjectives refer to the kind of information which has been defined in the ambit of a conceptual framework and subsequently objectively measured and analyzed. In order to make the distinction between **objective** and **subjective** characteristics more clear from the operative point of view, we can refer to the source – called *unit* – on which the characteristic of interest is measured. The units can be represented by individuals, institutions, social groups, services, administrative areas, geographical areas, nations, and so on. Consequently, we can distinguished between:

- *objective information*, collected by observing reality
- *subjective information*, collected only from individuals.

As we will see, defining what we are going to measure represents the first step of the measuring process.

- B. How the characteristics are modeled? In this case, we are referring to the conceptual framework defined in order to observe and to interpret the reality. The conceptual framework is always yielded by a “**subjective**” hypothesis and view of the world made by the researcher. Concerning this, as Michalos (1992) noticed, the models defined to observe a reality are only apparently neutral. Actually, the conceptual model is represent only a “small window” through which it is possible to see only some facets of the reality (*reductionism*); in this sense, the view is politically and socially distorted and can condition knowledge, evaluations, choices, actions, and policies. In this sense, subjectivity expresses the unavoidable working hypothesis helping in understanding the reality. The researcher, through the dialogue with the working hypothesis, can change the perspective in a continuously evolving knowledge path.
- C. Measuring and analysis methodology. The methodologies adopted to study the characteristics defined in the ambit of the conceptual framework have to be **objective**. In other words, the methodological objectivity concerns the capacity of a procedure to measure without alteration due to external factors and to be free from effects due to the observer; this notion spreads from the procedure of measurement to the data analysis to the interpretation of the results.

Sometimes, the distinction between objective and subjective is considered equivalent to the distinction between quantitative and qualitative. Of course, this is not correct. In our perspective, we can summarize the two dyads as follows:

- “objective – subjective” refers to what we are going to observe (→ what are we observing?)
- “quantitative – qualitative” refers to the methodological approach applied in order to observe the previous dimensions (→ in which way the observation is carried on?)

### 1.2 Let's define

#### 1.2.1 What are the “objective” and “subjective” components of well-being?

The necessity to study and comprehend facts through the observations of different components with reference to two different perspectives of observation, traditionally classified in terms of objective and subjective components is felt in many research fields concerning social phenomena – from economics to education).

The identification of the two aspects – objective and subjective – represents in itself a reduction of the reality. Even if the reduction is needed for measuring reasons, it should not degenerate into a contraposition between two different “realities.” The reality will be inevitably distorted by contemplating just one of the two aspects.

### 1.2.1.1 Objective components

In synthetic terms, objective components refer to the conditions in which each individual lives (health, working conditions, environmental situations, and so on). They can find different definition according to two major perspectives:

- micro-level, referring and taking into account the individual level (demographic and socio-economic characteristics, life style, observable knowledge and skills, observable behaviours).<sup>1</sup> With reference to quality of life, the objective components at micro level refer mainly to *individual living conditions*, material resources, standards of living, working conditions and status, state of health, individual status, social relationships, freedom to choose one's lifestyle. Objective indicators allow each aspect of living conditions to be evaluated. Their specificity is in the possibility to define and recognize external objective references. In other words, they are *verifiable*.
- macro-level, concerning and taking into account economic, demographic, geographical, administrative or social level. It is difficult to make an inventory of all possible objective characteristics definable and observable at macro level because they are different depending on the observed and studied field. Examples can be represented by aspects concerning environmental conditions, observable social, economic and health contexts (economic production, literacy rates, life expectancy, natural and urban environmental indices, political indices, and so on).

### 1.2.1.2 Subjective components

Traditionally “subjective characteristics” can be distinguished in three content areas (Nunnally, 1978):

- **abilities**, that concern the capacity in performing different tasks (*performance*, that is evaluated with reference to specified criteria);
- **personality traits**, that can be defined as the psychological characteristics that determine the organizational principles and that reflects the way through which an individual reacts to the environment;
- **sentiments**, generic terms referring to:
  - interests, concerning the preferences for particular activities;
  - values, concerning preferences for “life goals” and “ways of life”; actually, the term “value” refers to a wide range of contents, from intellectual aspects of life to more abstracts values regarding goals of self-attainment;
  - attitudes, concerning feelings about particular objects; traditionally, attitudes are defined as composed by three components: (i) cognitive (beliefs, evaluations, opinions); (ii) affective, (feelings, emotions, perceptions, including satisfaction and WB, and emotional states (i.e., happiness); (iii) behavioural (actual actions), including intentions.

With reference to WB, subjective components refer to and concern opinions, evaluations, feelings, perceptions, attitudes, desires, values, and motivations related to each individual life as a whole or in different specific contexts. Contrarily to the objective characteristics, no explicit standard is defined and no external reference can be defined in observing the subjective component.

It can be assessed by individuals' or groups' responses to questions about happiness, life satisfaction, utility, or benefit. Subjective indicators aim at measuring and quantifying individual components involving different elements – as conscience, cognition, emotion, attitude, and opinion – that are related to contingent and mutable situations.

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<sup>1</sup> One of the notions that can help in differentiating generic individual information from subjective information is that the latter can be observed only by/from the subject his/herself, in other words does not admit *proxy* person.

### 1.2.1.3 Objective and subjective components of well-being

With reference to social WB, the two components can be articulated more minutely. Schultz (2000) proposes to classify the components along a continuum ranging from “more objective” to “more subjective.” This effort allows four groups of variables to be quite clearly identified: (A) Social Structure, (B) Resources and Behaviour, defined in terms of living conditions (C) Evaluation of Living Conditions, and (D) Subjective Well-Being. By expanding the model elaborated by Schultz, the variables classification can be illustrated as follows:

Components →	STRUCTURE OF SOCIETY	SOCIAL STRUCTURE	STANDARD OF LIVING AND SOCIAL RELATIONSHIPS AND NETWORK (behavioural assessment)	EVALUATIONS OF LIVING CONDITIONS (cognitive assessment)	WELL-BEING (affective assessment)
	Social, political, institutional, economical setting	Socio- demographic characteristics	Resources and behaviour “objectively” reported/observed (concrete actions)	Beliefs and judgments	Subjective perceptions (feelings, emotions, self- descriptions, emotional states) ↓ Hopes – Fears Moods – Anomie Anxiety – Mental health
	Human rights Equality Schooling & education Health system Income distribution Longevity	Age Sex Occupation Income Household composition Marital status	Living conditions ↓ Housing Health Education Work conditions Personal environment	Importance of life domains and preferences for “life goals” and “ways of life” Perceived need fulfilment	Well-being ↓ Satisfaction concerning life domains Happiness
Description of →	<i>Country’s health and wealth</i>	<i>Social stratification (e.g. occupational prestige)</i>	<i>Characteristics of society (social/economic/political system)</i>	<i>Quality of society (social/economic/pol itical system)</i>	<i>Subjective dispositions</i>

### 1.2.2 What is their relationship?

Several conceptual frameworks can be identified trying to define the relationship between the two components, objective and subjective. Below, some patterns are introduced.

- Objective and subjective dimensions interpreted in terms of descriptive and evaluative dimensions. As previously stated, objective characteristics can be seen in terms of resources and conditions that individuals can use in order to improve their lives and to pursue their life projects. In this sense, the objective approach makes the social indicators model and Sen’s capability model very similar. Consequently, the terms “objective” and “subjective” should be respectively replaced, according to Erikson (1993), with the terms “descriptive” and “evaluative.”
- Objective living conditions explain subjective WB. According to “basic needs” approach, subjective appreciation of life depends on the objective living conditions. In other words, objective living conditions is important for the happiness and satisfaction of the individuals. Seen in macro perspective, an improvement in quality of life can occur as a result of social and economic development. It should be taken into account that people’s satisfaction with life in socio-economically disadvantage societies is not necessarily lower than those in advantages communities. In other words, the approach based upon absolute objective standards cannot explain the variances in subjective perceptions. It should be taken account that while objective information can reveal significant discrepancies among places, subjective perceptions and satisfactions differences among individuals can show different variations.
- Subjective WB explained by comparisons. According to “comparison” approach, subjective WB is not directly related to objective components or individual living conditions but is based upon the comparison between individual conditions and a series of (actual or ideal) standards (Easterlin, 1974). The comparison can be made at different levels:
  - social level, when comparisons are made between different social entities (social groups, populations, countries, etc.)
  - lifetime level, when comparison are made at individual level and related to individual experiences
 The smaller the perceived gap between individuals’ aspirations and their reality, the higher their subjective WB.

- Multiple discrepancies approach. The previous approach found successive modifications especially thanks to Michalos (1985), who formulates the *Multiple Discrepancies Theory* (MDT). In particular, Michalos introduces the concept of gap (*discrepancy*) between expectations and aspirations (*achievement gap*). According to this theory, subjective WB represents (is function of) the perceived gap between what one has and wants, and relevant others have, the best one has had in the past, expected to have, expected to deserve, and expected with reference to needs. The gap is observed with reference to different domains (health, finances, family, job, friendships, housing, recreation, religion, transportation, and so on). In this context, happiness is considered a individual trait not dependent on living conditions.
  - Disposition approach. According to this approach (Kozma et al., 1990), subjective WB does not depend on living conditions but depends on stable individual characteristics (personality traits). For this reason, subjective WB is not produced by the combination of perceptions in different ambits. In other words, the relationships between subjective WB as a whole and satisfaction in different ambits is definable not in causal terms but in inferential terms (subjective WB helps in obtaining success in different ambits, c.f. Lyubomirsky et al., 2005). Consequently, the approach pays a special attention on individual traits. Different versions of this approach were defined (*Costa-McCrae* in 1980, *Abbey-Andrews* in 1985). According to the *Kozma-Stones* approach (1990), subjective WB is composed by two components, one expressed in terms of “reactive state”, - acting in short periods (moods) – and the other expressed in terms of trait (disposition). Living conditions act on the reactive state, while the trait can attenuate the effects of that impact. Happiness is considered an additive combination of the two components (and the error). The importance of this approach is mainly in having encouraged interest in personality components of WB and for having contributed to explanation of WB in both conceptual and measurement terms.
  - Causal approaches: bottom-up approach, top-down approach, and up-down approach. The causal explanation of WB is at the core of several studies, which found different solutions. They were synthesized as follow by Diener (1984):
    - **bottom-up** approach (inductive – Simple Reactivity Model): subjective WB is explained as a “reactive state” to the environment. The sum of the reactive measures for the defined ambits allows subjective WB to be quantified.
    - **top-down** approach (deductive – Propensity Model): subjective WB is explained by the presence of individual stable traits, like happiness (individual disposition), which determine satisfaction in single ambits.

Actually, both approaches are not able to explain completely the relationships between the observed variables. This means that causal effects can emerge in both directions. The subsequent debate<sup>2</sup> did not allow us to identify which of the two approaches is the best explanatory description of WB, and produced the proposal of bi-directional approach (**up-down**). The proposal, which found many supporters, provides for the assessment of causal effects in both directions at the same time. This approach takes into account two explanatory components, a long-period component (top-down effect), represented by the personal disposition, and a short-period component (bottom-up effect), represented by satisfaction related to circumstances.
  - Needs, opportunities and subjective well-being. A possible model of relationships between objective and subjective components of WB is that that includes the concepts of (i) human needs, (ii) subjective WB, and (iii) opportunities, defined in terms of four capital approach (natural capital, produced capital, human capital and social capital) and involving the role of policy, in terms of both input and output. In this perspective, societal WB is the extent to which objective human needs are fulfilled in relation to personal or group perceptions of subjective WB. In other words, quality of life can be seen as an interaction of human needs and the subjective perception of their fulfilment, as mediated by the opportunities available to meet the needs. (Costanza et al., 2007)
- Policy and culture help to allocate the four types of capital as a means for providing the opportunities. According to this approach, overall quality of life is a function of
- (a) the degree to which each identified human need is met (*fulfilment*)
  - (b) the *importance* (“weight”) of the need to the respondent or to the group in terms of its relative contribution to their subjective WB.

<sup>2</sup> This issue was debated between Veenhoven and Stones on Social Indicators Research in the nineties.

- **Social epidemiology.** A different approach looks at integration between objective and subjective indicators by using the logic and the perspective of *social epidemiology*, which can be defined as the systematic and comprehensive study of health, WB, social conditions or problems, and their determinants.<sup>3</sup> Traditionally, social epidemiology is defined as the combination of epidemiology (the study of the distribution and determinants of disease and injury in human populations) with the social and behavioural sciences in order to investigate social determinants of population distributions of health, disease, and WB, rather than treating such determinants as mere background to biomedical phenomena (Krieger, 2002).

The principal concern of social epidemiology is the study of how society and different forms of social organization influence individuals' and populations' WB. Social epidemiology goes beyond the analysis of individual risk factors to include the study of the social context in which the well-being/ill-being phenomenon occurs (in Epidemiological Bulletin, 2002).

Even if social epidemiology is strictly related to the definition and identification of "social problems", (e.g. obesity, infectious diseases, violence, child abuse, drug use, and so on), in our viewpoint this approach turns out to be interesting also in the positive perspective of promoting quality of life (by involving not only the concept of "risk" but also the concept of "resource") since it considers both micro (personal behaviour) and macro trends in the social structure (distribution of wealth, social resources, and so on).

This perspective can help in explaining the path between exposure to social characteristics of the environment (with special attention to inequalities) and its effects on WB by involving concepts and techniques that require the use of multidisciplinary approaches in order to analyse complex social problems.

## 2. Integration of objective and subjective information: analytical tools and strategies

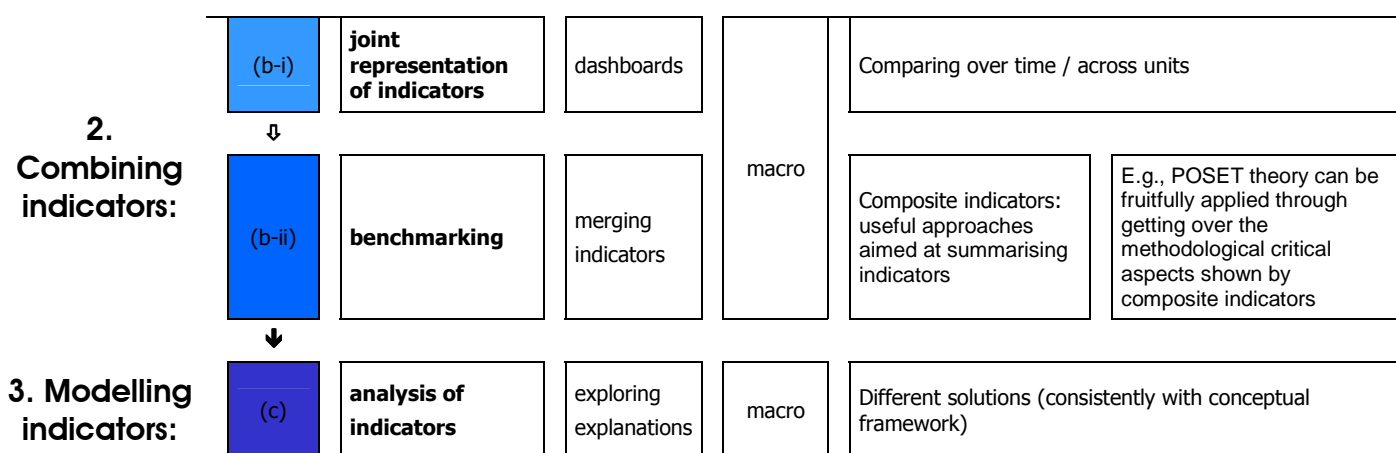
Data collected consistently with the conceptual framework produce a compound structure. In order to reconstruct a meaningful and interpretable picture and to integrate objective and subjective information, data need to be managed pursuing different technical goals: (1) reducing data complexity, (2) combining indicators, and (3) modelling indicators.

The different analytical and technical strategies to be adopted in this respect constitute a "composite" **process**, carried out through subsequent/consecutive steps (Multi-Stage – MS) and different/alternative analytical approaches (Multi-Technique – MT).

The following table summarizes the *Multi-Stage Multi-Technique* (MSMT) approach.

Goals	Stages	Aims	by	Level of analysis	Analytical issues	
					<b>Traditional approach</b>	<b>Alternative approach</b>
1. Reducing data structure:	(a-i)	reconstructing conceptual variables	aggregating basic indicators	micro	From basic indicators to synthetic indicators through different logics (reflective & formative)	New methodologies allowing discrete ordinal data to be dealt with (e.g., Partially Ordered SET Theory (POSET theory)).
	(a-ii)	defining macro-units	aggregating single cases		From micro units to macro units, by following different criteria (homogeneity, functionality).	

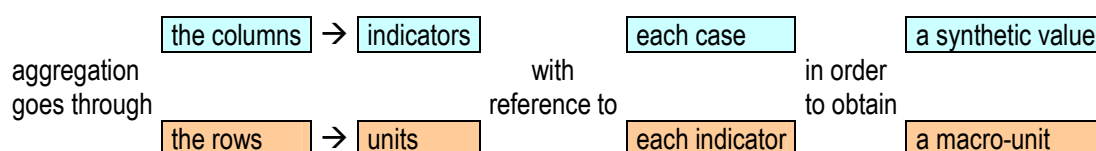
<sup>3</sup> In this context, we do not refer to the alternative definition of social epidemiology as "the branch of epidemiology that studies the social distribution and social determinants of states of health" (Epidemiological Bulletin, 2002).



## 2.1 Reducing data structure

When data are collected through indicators developed according to a conceptual framework dealing with a multidimensional construct and evaluating multiple aspects to be observed at different levels (individual, community, national, and global), the obtained data structure turns out to be very complex and needs to be reduced in some way. In particular, the information collected at micro level needs to be aggregated to a proper scale (spatial or temporal), in order to accomplish a correct analysis and obtain a composite picture (e.g. national).

Reducing data structure proceeds through the following logic:



Obtaining synthetic indicators: the purpose of this stage is to condense and synthesize the dimension by referring to the *multiple measures*, by defining and adopting particular assumptions (Maggino, 2009).

Obtaining macro-units: this stage aims at condensing values observed at micro/lower levels (usually, individual) to higher levels in order to produce new meaningful units, identified according to different kind of scales. Generally, the macro units refer to pre-existent / pre-defined partitions, such as identified *groups* (social, generation, etc.), *areas* (geographical, administrative, etc.), *time periods* (years, decades, etc.) (Maggino, 2009).

Reducing data structure does not lead to the integration of objective and subjective data.

## 2.2 Combining indicators

The previous procedures allowed the complexity of data to be reduced, even though data still constitute a complex system in which integration is not carried out yet. In order to pursue the integration of subjective and objective data, indicators could be combined. This goal can be accomplished through two approaches.

### A. Joint representation of indicators

In this perspective, dashboards can represent useful tools allowing indicators' values to be simultaneously represented, compared and interpreted (i) through an analogical perspective, (ii) by setting them on a standardized scale, and (iii) by representing them on a colour scale (e.g., a green-to-red colour scale). Through their graphical display, dashboards allow

- highly complex systems of indicators can be represented,
- comprehensive monitoring and evaluation of programmes, performances or policies,
- easy communications through a catchy and simple graphical representation,
- indicators to weighted in terms of importance and performance result,
- single cases can be compared.



While, dashboards do not allow complex analysis concerning relationships between indicators and comparisons of performance over time (trends) or across units (inter-cases comparisons), they provide a first approximate and rough idea of integration.

### **B. Merging indicators**

In some occasion, the indicators can be merged in order to define new comprehensive measures. Composite indicators can represent useful approaches in this perspective. A composite indicator synthesizes a number of values expressed by the indicators that compound it (Booyesen, 2002; Nardo et al., 2005a; Sharpe & Salzman, 2004) and re-establishing the unity of the concept described in the hierarchical design.

Composite indicators could represent one of the possible technical approaches in order to pursue the integration of objective and subjective dimensions. This proposal can appear attractive at a first glance but does not reveal to be easy and creates conceptual, interpretative and analytical problems when the aggregation involves measures very different, conceptually and metrically, as objective and subjective indicators are. For example, we can consider the standardization issue: in order to create composite indicators, data need to be reduced to a common reference-metric. That is particularly significant when data are measured with reference to different methodologies; for example, individual data do not always meet the requirement of metric measurement (like some objective individual information, for example, family typology); the problem is how to face the issue without adopting sophisticated approaches. In our opinion, this approach could be carefully considered as one of the possible solutions for integration.

## **2.3 Modelling indicators**

Dealing with a comprehensive conceptual framework requires exploring possible explanations of the relationships among the indicators, which conceptually model and hierarchically design the variables. In this perspective, a proper analytical approach should be identified according to the defined conceptual framework. The feasibility of the different statistical approaches needs to be considered by taking into account their specific assumptions. The goal is to identify a procedure able to yield results, not only statistically valid and consistent with reference to the defined conceptual framework, but also easy to be read and interpreted at policy level.

### **Structural models approach**

With reference to the causal explanatory perspective, we can refer to *Structural Equation Modelling* (SEM), which, as known, represents a statistical technique for testing and estimating causal relationships using a combination of statistical data and qualitative causal assumptions.

SEM is considered a confirmatory rather than exploratory approach. It usually starts with a hypothesis, represented as a model, operationalises the constructs of interest with a measurement instrument, and tests the model.

### **Multi-level approach**

*Multi-level analysis* refers to statistical methodologies, first developed in the social sciences, which analyse outcomes simultaneously in relation to determinants measured at different levels (for example, individual, workplace, neighbourhood, nation, or geographical region existing within or across geopolitical boundaries) (Goldstein, 1999; Hox, 1995; Krieger, 2002).

This approach can be applied in the perspective of integrating objective and subjective indicators by assuming that people living in the same territory (e.g. city or region) share the same macro-level living conditions (objective quality of life) that contributes together with the micro-level living conditions (objective quality of life) to the subjective WB. If the conceptual model is clearly specifiable and acceptable with reference to which variables are to be included in the study and at which level, these analyses can potentially assess whether individuals' WB is influenced by not only "individual" or "household" characteristics but also "population" or "area" characteristics (Krieger, 2002). In fact, this approach assumes that structural characteristics of territories come before individual living conditions and that both precede subjective WB. The goal is to describe the relationships between subjective WB ("outcome" variable), territorial characteristics (macro-level living conditions: socio-economic conditions, demographic trend, and so on) and individual objective characteristics (micro-level living conditions: sex, religion, family composition, level of education, and so on).

Even if the multilevel approach presents logic and analytic solutions acceptable from the statistical point of view, this method should be considered carefully in the context of quality of life. For instance, when the



territorial characteristics do not affect individuals in the same manner and with the same degree (territorial heterogeneity), some authors (Rampichini & Schifini, 1998) suggest introducing a new level in the hierarchy, represented by individuals within each territory. For example, different clusters of individuals could be identified sharing same living conditions at micro-level. This could lead to results in which similar clusters are in different territories.

### **Life-course perspective**

*Life-course perspective* refers to a conceptual model that considers WB status at any given individual state (age, sex, marital status) not only reflecting contemporary conditions but also embodying prior living circumstances. This means that we could try to study people's developmental trajectories (environmental and social) over time, by considering also the historical period in which they live, in reference to their society's social, economic, political, and ecological context. This approach assumes that some components can exist which can determine an effect, at a sensitive or "critical" period of individual life, lasting, or having a lifelong significance. The interest could be oriented to analysing which of these processes are reversible and which could be the role of objective micro or macro level characteristics in this.

This perspective deserves particular attention and consideration. Its limit is mainly represented by the difficulty to obtain detailed and consistent individual longitudinal data and by the complexity of managing, analysing, and modelling this kind of data. According to its characteristics, this approach turns out to be useful in order to study phenomena circumscribable through a clinical logic.

### **Bayesian networks approach**

A Bayesian network is a graphical model representing a certain reality described by variables. The goal is to explore the relationships among the variables of interest through probabilities.

A Bayesian net represents a model, reflecting the states of some part of a world that is being modelled and describing how those states are related by probabilities. All the possible states of the model represent all the possible worlds. The direction of the link arrows roughly corresponds to "causality". That is the nodes higher up in the diagram tend to influence those below rather than, or, at least, more so than the other way around. Further, since a Bayes net only relates nodes that are probabilistically related by some sort of causal dependency, an enormous saving of computation can result. There is no need to store all possible configurations of states. All that is needed to store and work with is all possible combinations of states between sets of related parent and child nodes (families of nodes).

### **Explorative approach**

Traditional explorative approaches, such as clustering and mapping approaches, multidimensional analysis, correspondences analysis (Aldenderfer & Blashfield, 1984; Bailey, 1994; Corter, 1996; Hair, 1998; Lis & Sambin, 1977), should be added to the approaches presented above.

They are all practicable but in view of their application, their capability to meet assumptions and to fit the needs of the conceptual framework need to be explored.

## **3. An example**

The particular application illustrated here is aimed at illustrating and exemplifying the *multi-technique multi-stage* characterization (goals no. 1 and 3) of the proposed approach by using subjective and objective data provided by the European Social Survey project)<sup>4</sup> and the Joint Research Centre (JRC – European Commission), respectively.

### **1. REDUCING THE COMPLEXITY OF DATA STRUCTURE**

#### *(i) First stage: construction of synthetic indicators at individual level*

The goal of this stage is to create synthetic subjective indicators through the aggregation of elementary indicators. The aggregation procedure should be consistent to the adopted model of measurement (reflective or formative approach (Maggino, 2009; Nardo et al., 2005a and 2005b).

From the European Social Survey data, some variables have been identified:

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<sup>4</sup> For any further information on European Social Survey project, please refer to <http://www.europeansocialsurvey.org/> where data and documentation can be found.

From the European Social Survey data, some variables have been identified:

European Social Survey – wave 1 (2002)					
Area	Variable	Items	Item number	Scaling technique	Model of measurement
Politics	Trust in	country's parliament	B7	0 (no trust at all) – 10 (complete trust)	reflective
		the legal system	B8		
		the police	B9		
		politicians	B10		
		the European Parliament	B11		
		the United Nations	B12		
	Self-placement	placement on left-right scale	B28	0 (left) – 10 (right)	
Subjective aspects	Happiness	how happy are you	C1	0 (extremely unhappy) – 10 (extremely happy)	
		how satisfied with life as a whole	B29	0 (extremely dissatisfied) – 10 (extremely satisfied)	
	Values: important in life	family	E13	0 (extremely unimportant) – 10 (extremely important)	formative
		friends	E14		
		leisure time	E15		
		politics	E16		
		work	E17		
		religion	E18		
		voluntary organizations	E19		
Immigration and asylum issues	Acceptance of immigration: allow	many/few immigrants of same race/ethnic group as majority	D4	1. allow many 2. allow some 3. allow a few 4. allow none to come and live here	reflective
		many/few immigrants of different race/ethnic group from majority	D5		
		many/few immigrants from richer countries in Europe	D6		
		many/few immigrants from poorer countries in Europe	D7		
		many/few immigrants from richer countries outside Europe	D8		
		many/few immigrants from poorer countries outside Europe	D9		
Socio-demographic profile	Income	feeling about household's income nowadays	F31	1. living comfortably 2. coping 3. difficult 4. very difficult on present income	

Items referring to each variable were submitted to analysis in order to verify the dimensionality. Afterwards, in case of:

- *uni-dimensional latent variable*, the items aggregation was performed through a simple additive technique,
- *multi-dimensional latent variable*: the items aggregation was performed through principal component analysis that allowed us to obtain scores showing normal-standardized distributions.

*Reflective approach: aggregation accomplished by testing multi-dimensional hypothesis*

<i>Reflective approach: aggregation accomplished by testing multi-dimensional hypothesis</i>						
Variable	Items	Item number	Item loading	Factor/dimension	Variance explained (%)	Aggregated score
Trust in	the legal system	B8	0.5	national security	31	TRUST_NS
	the police	B9	1.0			
	the European Parliament	B11	0.8	international institutions	33	TRUST_II
	the United Nations	B12	0.5			
	country's parliament	B7	0.7	national politics	36	TRUST_NP
	politicians	B10	0.7			
How satisfied with	present state of economy in country	B30	0.5	satisfaction for national foundations	41	SAT_NF
	the national government	B31	0.7			

	the way democracy works in country	B32	0.5			
	state of education in country nowadays	B33	0.5	satisfaction for		
	state of health services in country nowadays	B34	0.5	national social services	31	SAT_NSS

*Reflective approach: aggregation accomplished by testing unidimensional hypothesis*

Reflective approach: aggregation accomplished by testing unidimensional hypothesis	Items	Item number	Unidimensional model	Aggregated score
Variable				
Acceptance of immigration: allow	many/few immigrants of same race/ethnic group as majority	D4	aggregation through additive technique	IMMIGR
	many/few immigrants of different race/ethnic group from majority	D5		
	many/few immigrants from richer countries in Europe	D6		
	many/few immigrants from poorer countries in Europe	D7		
	many/few immigrants from richer countries outside Europe	D8		
	many/few immigrants from poorer countries outside Europe	D9		

*Formative approach: aggregation accomplished through Principal Component Analysis*

Variable	Items	Item number	Item loading	Component	Variance explained (%)	Aggregated score
Values: important in life	family	E13	0.6	Private life dimension	23	IMP_PL
	friends	E14	0.8			
	leisure time	E15	0.7			
	politics	E16	0.8	Active life dimension	18	IMP_AL
	voluntary organizations	E19	0.6			
	family	E13	0.5	Caring dimension	18	IMP_C
	religion	E18	0.9			
	voluntary organizations	E19	0.5			
	work	E17	1.0	Work dimension	15	IMP_W

Ten synthetic indicators were computed and then submitted to a successive level of aggregation, according to the formative approach, in order to obtain a small group of meaningful and interpretable synthetic indicators. This aggregation was obtained through Principal Component Analysis and Hierarchical Cluster Analysis (linkage method: Ward; distance technique: Pearson). The outcomes obtained by the two methods turned out to be identical and show the same four dimensions, each one composed by indicators referring to trust, importance and satisfaction characteristics. A particular result has to be noticed: “importance for private life” indicator obtained significant loadings in two components in Principal Component Analysis.

Synthetic indicators		Item loading	Obtained component	Variance explained (%)	Aggregated score
National politics	TRUST_NP	0.8	Public & political life	18	COMPOSITE1
Active life dimension	IMP_AL	0.6			
Satisfaction for national foundations	SAT_NF	0.8			
national security	TRUST_NS	0.8	Welfare dimension	15	COMPOSITE2
Private life dimension	IMP_PL	0.4			
Satisfaction for national social services	SAT_NSS	0.7			
Caring dimension	IMP_C	0.4	Personal life principles	12	COMPOSITE3
International institutions	TRUST_II	0.6			
Private life dimension	IMP_PL	0.4			
Work dimension	IMP_W	0.6			

Composite scores were calculated by means of Principal Component Analysis according to the observed results. At this stage the aggregation process concerned also objective indicators (construction of composite indicators through formative criterion).

*(ii) Second stage: definition of macro-units*

At this stage, a partitioning analysis were conducted (*K means method*) in order to explore the existence of homogenous groups of individuals. In the following table and figures, the results are presented.

INDICATOR			min.	mean	max.	SD
CLUSTER 1 (n=7369)	B29	life satisfaction	-3.10	-0.58	1.31	0.97
	C1	happiness	-3.74	-0.37	1.34	0.93
	F31	Feeling about household's income nowadays	-1.14	1.10	2.46	0.85
	B28	self-placement on left-right scale	-2.30	-0.34	2.24	0.98
	IMMIGR	Non-acceptance of immigration	-1.96	-0.47	2.17	0.79

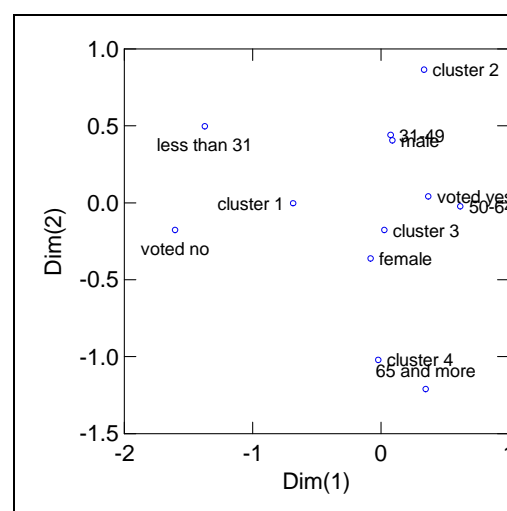
	COMPOSITE1	Public & political life	-3.19	-0.29	3.13	0.95
	COMPOSITE2	Welfare dimension	-3.88	-0.22	3.83	0.98
	COMPOSITE3	Personal life principles	-4.86	0.27	3.44	0.97
CLUSTER 2 (n=14855)	B29	life satisfaction	-3.10	0.54	1.31	0.54
	C1	happiness	-3.74	0.48	1.34	0.59
	F31	Feeling about household's income nowadays	-1.14	-0.61	2.46	0.63
	B28	self-placement on left-right scale	-2.30	0.26	2.24	0.92
	IMMIGR	Non-acceptance of immigration	-1.96	-0.64	2.17	0.76
	COMPOSITE1	Public & political life	-2.50	0.60	4.08	0.76
	COMPOSITE2	Welfare dimension	-4.32	0.12	2.90	0.86
	COMPOSITE3	Personal life principles	-5.03	0.10	3.15	0.91
CLUSTER 3 (n=9703)	B29	life satisfaction	-3.10	0.53	1.31	0.60
	C1	happiness	-3.23	0.54	1.34	0.58
	F31	Feeling about household's income nowadays	-1.14	-0.40	2.46	0.68
	B28	self-placement on left-right scale	-2.30	-0.46	2.24	0.90
	IMMIGR	Non-acceptance of immigration	-1.96	0.48	2.17	0.78
	COMPOSITE1	Public & political life	-3.85	-0.49	2.36	0.90
	COMPOSITE2	Welfare dimension	-3.83	0.48	3.85	0.94
	COMPOSITE3	Personal life principles	-5.71	-0.24	3.07	0.97
CLUSTER 4 (n=10418)	B29	life satisfaction	-3.10	-0.86	1.31	1.00
	C1	happiness	-3.74	-0.93	1.34	1.04
	F31	Feeling about household's income nowadays	-1.14	0.47	2.46	0.89
	B28	self-placement on left-right scale	-2.30	0.30	2.24	0.99
	IMMIGR	Non-acceptance of immigration	-1.96	0.81	2.17	0.79
	COMPOSITE1	Public & political life	-3.47	-0.26	3.61	0.99
	COMPOSITE2	Welfare dimension	-4.34	-0.54	3.29	0.99
	COMPOSITE3	Personal life principles	-5.59	-0.11	3.22	1.11

The obtained clusters have shown quite differentiated profiles. In the following table a possible synthetic description of each cluster is described. Cluster 1 and cluster 4 seem to be the group with problematical profiles. Cluster 1 and cluster 4 seem to be the groups with problematical profiles. In particular, cluster 4 seems to be composed by individual with low level of WB and trust and importance in society dimensions, high level of non-acceptance of immigration and low, and a clear self-placement on left-right political scale.

		CLUSTER 1	CLUSTER 2	CLUSTER 3	CLUSTER 4
B29	life satisfaction	Medium-low	Medium-high	Medium-high	low
C1	happiness	Medium-low	Medium-high	High	low
F31	Feeling about household's income nowadays	many difficulties	Very comfortable	comfortable	Some difficulties
B28	self-placement on left-right scale	Centre-left	Centre-right	Left	Right
IMMIGR	Non-acceptance of immigration	Medium-low	Low	Medium-high	High
COMPOSITE1	Public & political life	Medium-low	High	Low	Medium-low
COMPOSITE2	Welfare dimension	Medium-low	Medium-high	High	Low
COMPOSITE3	Personal life principles	High	Medium-high	Low	Medium-low

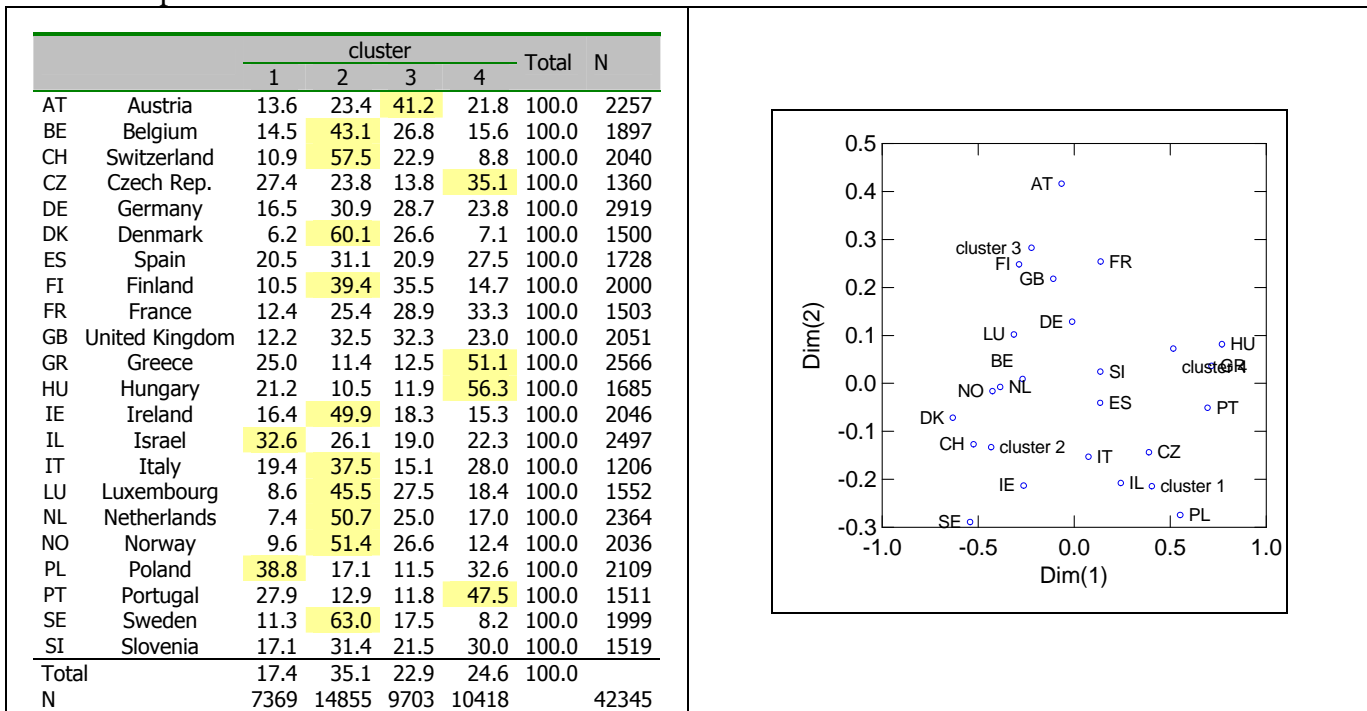
The conceptual framework should point out the individual objective characteristics to be integrated with the subjective ones (synthesized in clusters definition) at micro level. This level of integration is aimed at exploring and understanding subjective responses in terms of individual characteristics.

In this application we have chosen gender, age, and individual position with reference to vote in last political election. These indicators were submitted to correspondence analysis together with the cluster indicator. The analysis, performed on more than 38 thousands respondents with almost 30% of total inertia explained, produced a configuration (see figure) in which the more frequent profiles can be identified. For example, cluster 1 is more frequent among young individuals who did not vote, while cluster 4 is more frequent among elderly persons.



The clusters obtained through the previous stage were considered aggregations of subjective information (homogeneity criterion). In the following table the incidence of each cluster for each country can be observed.

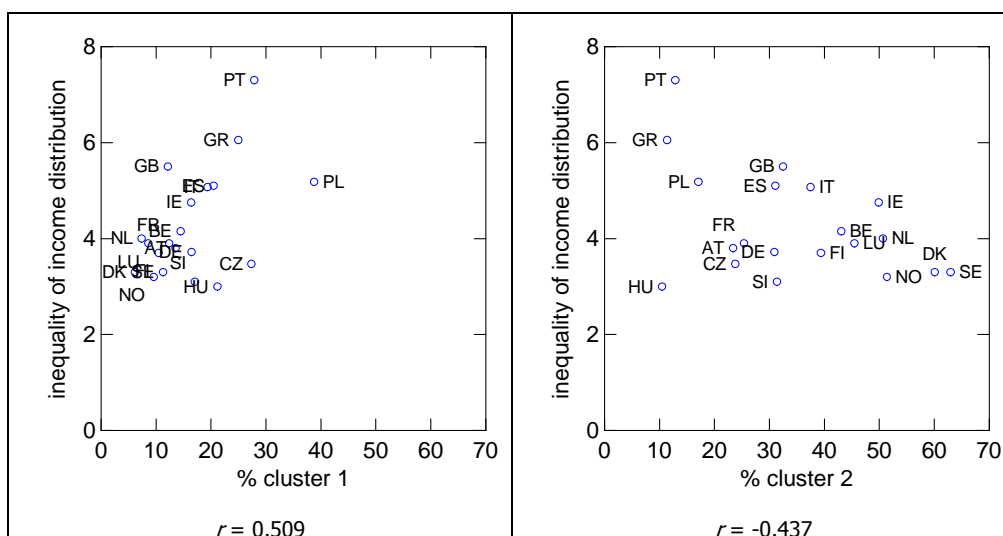
After that, correspondence analysis was performed by considering different indicators and applying a particular causal model (cluster=country). In the following figure the four clusters turn out to be more frequent with reference to different country. For example, cluster 1 is more frequent in Poland, Israel, and Czech samples.

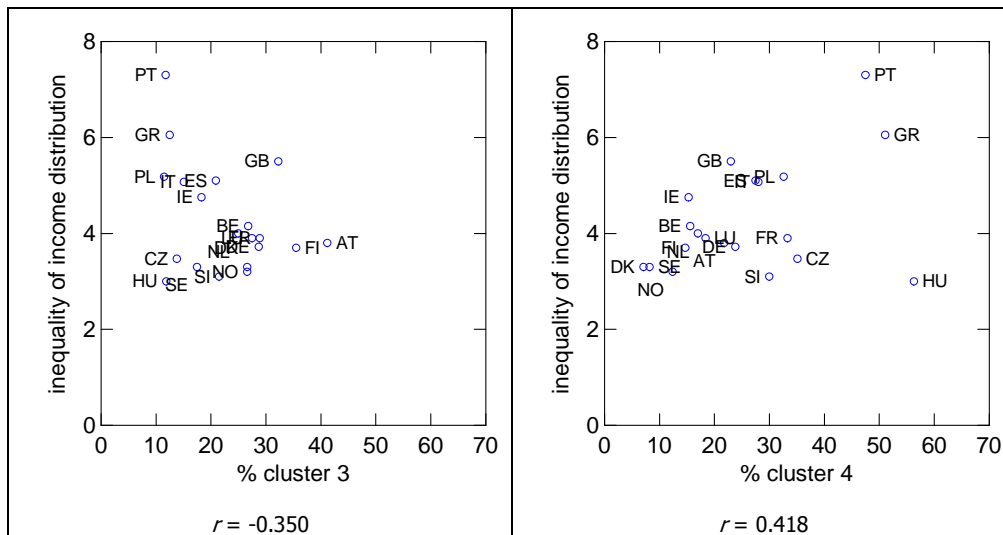


### 3. MODELLING INDICATORS

At this stage the information of the incidence of each cluster for each country was used and related to objective indicators measured at macro level. In the following figures (in which  $x$  scales show the same range in order to preserve comparability between scatterplots) the national incidences are related to *inequality of income distribution* of each country.

The results show a clear relationship between clusters incidences and the objective indicator measured at country level especially with reference to cluster 1, which represents the more problematic among the four observed clusters.





## 4. Final remarks

The main goal of this work is to identify and systematize the correct process allowing the integration of objective and subjective information to be accomplished by illustrating the composite approach through which the integration is made possible.

The approach is carried out through subsequent stages. In each stage different analytical solutions can be found. What emerges clearly from our work is that:

- integration can be accomplished only at a late moment of the process (*modelling indicators*)
- the soundness of the selected integration approach and of its results relies on the identified and adopted conceptual framework, which assumes the correct perspective according to the pursued integration objectives.

The illustrated application, which was made possible by the contribution of the Econometrics and Applied Statistics Unit (EAS) at the Joint Research Centre of the European Commission, has the restricted goal to illustrate and exemplify the *multi-technique multi-stage* characterization of the proposed approach. MSMT approach provides useful solutions for the different objectives, consistently with the different goals (monitoring, reporting, accounting, and so on) underlying the integration need.

The MSMT approach needs to be explored further on, in order to provide additional results, especially in a longitudinal perspective.

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