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THEORETICAL AND QUANTITATIVE ISSUES ON ASSESSING WELL-BEING AND QUALITY OF LIFE

Questioni teoriche e quantitative sulla valutazione del benessere e della qualità della vita

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This PhD dissertation contains the results of a broad research carried out at the School of Social Sciences of the University of Genoa. Those contributions are related to the analysis of Well-being and Quality of Life and the indexes created to measure them, facing different issues and answering to diverse questions.

Usually, especially until a decade ago, per-capita income has been adopted as a unique measure to quantify well-being, although it can represents it only partially. As per-capita income measures the total value of final goods and services produced within the borders of a country in a year, it focuses only on the economic dimension of well-being. It ignores other determinants of well-being, so the evaluation of the multidimensional nature of well-being is limited to the monetary dimension.

The measurement of income, despite its incompleteness, still remains an indicator able to show the historical evolution of well-being between people and countries history. Actually, there are many forms of well-being, and before discussing the concrete policies to increase them, it is necessary to fully understand the many nuances of the concept. In order to do so, it is necessary to refer to both economic and social aspects, evaluating the interconnections between them. Only such an analysis allows to highlight an increasingly complex and detailed phenomenon.

Thus, to go beyond the mere income-related aspect of well-being, it is crucial to consider well-being as a multidimensional phenomenon involving all aspects of people's lives. This is the reason why, after the financial crisis, which hit industrialized economies in the final part of the 2000s, "Quality of Life'' and ''Well-being'', became very popular words and received the attention of policy makers and researchers. The first term is mainly used when one speaks at the level of individuals, whilst the second is more frequent when one speaks about communities, localities, and societies. Similarly, ''Well-being'' refers rather to actual experience, and ''Quality of Life'' to context and environments. However, in both cases, the terms are used with a broad range of meanings, and the ranges frequently overlap. However, this multidimensionality makes the assessment of Well-being and Quality of Life even more complex, because most of its dimensions are hard to identify and quantify and depend on subjective assessments.

The aim of this work is to investigate and to find possible theoretical backgrounds and methods able to give an extensive, but at the same time organised, description of those phenomena, as well as a precise assessment. The first part (Chapter 1) of the work presents the topic under scrutiny, summarizing the main concepts and findings about multidimensional Well-being and its quantification. It goes through different frameworks, as well as the examination of a number of international well-being indicators familiar to the public audience. The subsequent three chapters instead, focus on measurement issues. Chapter 2 shows the construction of a composite multidimensional Well-being index for the European Union. It

represents a comprehensive quantitative attempt to deal with the multidimensionality of the phenomenon. Chapter 3 is a step further, since, focusing on the European Union again, it tries to assess if the use of two different kind of aggregation methodologies, compensatory and non-compensatory, could create difficulties in quantify well-being. The final chapter, Chapter 4, deal with other two fundamental issues in the multidimensional well-being evaluation. Indeed, analysing data about Italian cities, the aim is to deal with the attribution of specific weights to dimensions and with intertemporal comparison.

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CHAPTER 1

Multidimensional Well-being: issues and attempts. A summary.

Abstract

Multidimensional Well-being is a complex concept and it is necessary to understand properly the meaning of dimension that contribute to its essence. In the same time, it is also necessary to understand what it means to unify all the dimensions in order to define the well-being phenomenon. This review tries to shed some light on what is the multidimensional well-being and on the statistic attempt to quantify it.

1. Introduction

Humankind's ideal of well-being changes in time and in space. It changes in time because what used to provide well-being in the past, even just several decades ago, is different to what provides well-being today. However, in a society influenced by mass phenomena, consumer goods and global trends it has become more complex to evaluate what guarantees well-being: it is no longer sufficient to satisfy fundamental needs and obtain a certain degree of personal satisfaction as, in the more advanced economies, our needs are shaped by the fast-changing economy and society.

The ideal of well-being also changes in space: certain communities aspire to satisfying their primary needs and are not influenced by consumeristic behaviour; others must take into consideration the complex relationship between well-being, needs and personal satisfaction. In general, in Western societies, there is a loss of direction as to what makes people happy.

It is not uncommon for the concepts of well-being and happiness to be thought of as the same thing. There is, however, a fundamental difference between the two: happiness is of an intimate and personal nature not directly linked to objective evaluations of the social and economic context; but it is on this context that we wish to focus. It is these objective characteristics, which define the conditions that people live in, and they are the means by which the State, or the market, should ensure that individuals can enjoy a level of well-being.

The assessment and measurement of the level of well-being in a society have been on the radar of researchers, economists, international organisations and institutions for many years. National and international studies to identify clear and universally applicable paradigms abound

in literature, contributions to which are not only provided by economists, but also by sociologists, ecologists and psychologists.

For decades, the commonly held opinion was that this kind of research was useful for third world economies, now known as developing economies, which did not have the levels of income and consumption that guaranteed a sufficient level of well-being. It was believed that the Western world with its long-established high standards of living and easy access to a wide range of services in all aspects of life (health, education, social security, etc.) had no need for this kind of research. This is the reason why researchers and economists have focused on strictly economic valuations, such as production, consumption, income per capita. Thus, the increase in well-being and social progress were strictly linked to the growth in GDP per capita.

However, the political and economic events of the seventies and eighties have called this paradigm into question, highlighting the increasing inequality, even in high-income countries, in the access to both resources and services. At the same time, there has been growing awareness of the consequences of overexploiting natural resources and the environmental damage caused by pollution. Consequently, sustainability issues have been raised alongside equity issues.

All this played a part in discrediting the usefulness of GDP per capita as a measure of well-being and provided the basis for a different approach to research, which would look beyond the mere monetary value and evaluate different aspects of the quality of life. Easterlin (1974) came to the conclusion that variations in people's income and wealth had very little bearing on their happiness throughout life.

His observations showed that when income increases, and consequently economic well-being, happiness only increases up to a certain point and then declines. This conclusion is known as the "Easterlin Paradox" or "Happiness-Income Paradox" and it demonstrates that the relationship between GDP per capita and well-being is possibly stronger in the first stages of development, when the main problem is satisfying primary needs[1].

Why then do we measure well-being? Why do we believe it is necessary to search for a measurement of well-being that goes beyond the mere economic-income related aspect? It is in fact impossible to measure the well-being of an individual in absolute terms as the complexities and multiple aspects that shape a human being cannot be caught in a single measurement; even though important efforts in this direction have been made.

These can have both intrinsic and extrinsic benefits: in the first case, we refer to the fact that, thanks to these measurements, it is possible to have reliable evidence of how well one lives in

[1] More recently, Easterlin has offered two explanations of the paradox. The first concerns relative income comparisons: happiness, or subjective wellbeing, is directly linked to personal income and inversely related to the income of others. Therefore, increasing everyone's income does not lead to greater happiness for everyone as, the positive effect on subjective wellbeing due to the increase in personal income is offset by the negative effect of the general increase in average income. The second explanation is that in the search for happiness, people get caught in an increasing expectations trap: by which the satisfaction from the purchase of new goods (for example a better car or a larger house) increases temporarily and then returns to the previous level as individuals adapt to the new situation and place their expectations higher. (Easterlin 1998; see also Giovannini et al., 2007; Cheli, 2013).

society and how much is available to develop human faculties and modify choices and behaviour; in the second case, we mean the benefit that these measurements provide to policy-makers in determining whether the choice of policies are suitably geared towards the improvement of well-being of citizens and in identifying where greater efforts should be made.

The following section provides a concise definition of well-being and lists the issues that arise from the measurement of well-being through GDP. It then examines and discusses the two different approaches to measurement: the capabilities of Amartya Sen and the indicators of Dasgupta. The third section provides a general description of the main measurements of well-being. Finally, the fourth section analyses the literature on multidimensional measurements of well-being. Indeed, our research falls into this category.

2. MULTIDIMENSIONAL WELL-BEING

2.1. THE WELL-BEING CONCEPT

There have been many definitions of well-being over the years. The utilitarian approach initially limited well-being to a purely hedonistic dimension and later on to a marginal utility concept. It subsequently became more common and necessary to consider well-being as a multidimensional concept. McGillivray (2007) identifies some of these concepts, such as Sen's capabilities approach, the basic human values approach (Grisez et al., 1987), the intermediate needs approach (Doyal e Gough, 1991; 1993), the universal psychological needs approach (Ramsay, 1992), the axiological categories approach (Max-Neef, 1993), the universal human values approach (Schwartz, 1994), the domains of subjective well-being approach (Cummins, 1996), the dimensions of well-being approach (Narayan et al., 2000), and the central human capabilities approach (Nussbaum, 2000).

The term well-being is used to refer to all those areas (i.e. dimensions) that are taken into consideration to evaluate the quality of life. Seligman (2002) adds a positive connotation to the definition, describing it as a favourable evaluation of an individual's life, including positive emotions, engagement, satisfaction and meaning. Well-being can also be defined in neutral terms, such as not being exposed to hunger, illness, unemployment or crime (Van de Ven et al., 1999).

2.2. GDP AS A MEASURE OF WELL-BEING

It is worth noting that in literature the concept of well-being is sometimes identified in terms of life quality, standard of living, human development, welfare, well-living, utility, satisfaction,

prosperity, needs fulfilment, development, empowerment, capability expansion and, more recently, happiness. Although some of these terms have different meanings, there are frequent overlaps between them. Some studies focus on one term only, others use terms that are considered to be synonymous (McGillivray, 2007).

The term "economic well-being" was first used during the Great Depression when the main concern was to quantify production levels and determine the link between these levels and public investment and unemployment with the aim of promoting the policies that were being implemented by President F.D. Roosevelt. This led to the development and proposal by Simon Kuznets to Congress in 1934 of the GDP indicator, defined as the value at current prices of the overall final goods and services produced in a year in a country.

Simon Kuznets himself warned Congress about the limitations of the indicator, as he believed that:

"(…) the welfare of a nation can scarcely be inferred from a measure of national income. If the GDP is up, why is America down? Distinctions must be kept in mind between quantity and quality of growth, between costs and return, and between the short and long run. Goals for more growth should specify more growth of what and for what." (S. Kuznets, Report to the US Congress, 1934)

However, following the Bretton Woods conference in 1944, GDP became the main tool for measuring the economy of a country, gaining ever greater importance in literature in the fifties and sixties. Up until the sixties, the economic growth of the Western world provided the basis for the strong link between economic growth and well-being, with GDP per capita becoming synonymous with an indicator of living standards. Following the oil shocks of the seventies this assumption is questioned as people become more aware of issues such as the scarcity of natural resources and environmental pollution. From then on, there is an increase in the number of studies on the effectiveness of GDP per capita as an indicator of well-being and on finding suitable alternatives or, at least, amendments to it. The results of these studies, however, have been so questionable that most economists today continue to favour GDP as an indicator, albeit with its limits and weaknesses.

2.3. THE LIMITATIONS OF GDP AS A MEASURE OF WELL-BEING

One of the main aims of macroeconomic policies over the last fifty years has been economic growth, measured as increases in Gross Domestic Product. National economic policies generally consist of an array of measures implemented to stimulate economic activity, from optimising the tax system in order to favour markets and trade, to investing in infrastructure and education. However, concerns over the long-term sustainability of economic growth have increased over the years, and given rise to three main focus areas: well-being (focusing on the

economy as a means rather than a purpose), welfare (distinguishing between growth that can have positive effects as opposed to that which produces negative effects) and sustainability (recognising the existence of physical limits to growth). These issues have led to the development of a shared vision that analyses GDP critically, especially when it is considered as the only point of reference to measure economic and social performance (Bleys, 2012)[2].

As GDP measures the total value of final goods and services produced within the borders of a country in a year, it focuses only on the economic dimension of well-being. It ignores other determinants of well-being, so the evaluation of the multidimensional nature of well-being is limited to the monetary dimension. The reason why the monetary value of economic services and living standards play such an important role in our society, is that the monetary value of goods and services can aggregate quantities of a different nature. Moreover, GDP considers all the final goods and services produced in an economy regardless of whether they are consumed by families, companies or by the public sector: assigning a value on the basis of their price seems to be an adequate way of expressing, in a single figure, the well-being of society in a certain moment in time. Furthermore, by keeping prices constant, it is possible to observe changes over time in the quantities of goods and services that constitute GDP. This seems a reasonable way to evaluate how living standards evolve in real terms. However, for certain goods and services there is no market price, and, even when there is, it can differ from the basic value given to these goods and services by society. Finally, although the reference to the concepts of "prices" and "quantities" is clear, defining and measuring their real variations is a very different matter (Stiglitz et al., 2010).

As well as the above-mentioned critical points, there are further issues recognised in literature, listed below (Brugnoli et al., 2009):

- GDP takes into consideration only monetary transactions, whilst "non-market" activities such as voluntary work, housework[3] and activities undertaken in one's leisure time[4] are not considered, even though their consumption contributes to economic well-being. The reasons why many of these activities are excluded from GDP calculations are well-summarised by the SNA[5] (SNA, 1993):

[2]Amongst the most important contributions made, mention is made of: Kuznets (1941), Hicks (1948), Samuelson (1961), Mishan (1967), Nordhaus e Tobin (1972), Hirsch (1976), Sen (1976), Scitovsky (1976), Daly (1977), Frank (1985; 2004), Hartwick (1990), Tinbergen e Hueting (1992), Arrow et al. (1995), Weitzman and Löfgren (1997), Dasgupta and Mäler (2000), Dasgupta (2001), and Kahneman et al. (2004). Whilst for an in-depth analysis of all the limitations of Gross Domestic Product, please see Van Den Bergh (2009).

[3]By the term productive domestic or household activity, Fouquet e Chadeau (1981) intended "any unpaid activity, carried out by a family member for the benefit of the family, and the subsequent creation of a good or service necessary to the everyday running of family life, for which an alternative exists within the current social norms". Families can be considered economic units that act like consumers and producers of goods and services, but the non-market production of services by families remains outside the SNA. The rationale behind this choice is mainly practical as the lack of market prices for these services makes it hard to estimate values, not only for output but also for income and associated expenses (Schreyer e Diewert, 2013).

[4]Defining the boundary between household productive activities and leisure activities can be a difficult task. Roy (2011) proposes to refer to the guidelines provided by Canada's national statistic agency to define the boundary for leisure time by bearing in mind whether the activity is pleasurable or not.

[5]The System of National Accounting (SNA), as it is defined by the document ratified by the European Commission, the IMF, the OECD, the UN and the World Bank, is the internationally agreed standard set of recommendations on how to compile measures of economic activity according to rigorous accounting conventions based on economic principles. The recommendations are

1. the use of services provided by family members for their own business is an independent activity which has limited repercussions on the rest of the economy;
2. as most family housework is not provided for a market, there are no market prices available to measure the value of those services;
3. in any case, the economic meaning of estimated values is different to that of monetary values. Furthermore, if the income related to housework were settled in currency, there would be a change in consumer habits.

- GDP is an aggregate measure that does not take into consideration distributional aspects: whilst there is detailed information available in relation to businesses, national accounting only provides aggregate economic data relating to families.
- All transactions are given a positive value, without distinguishing between economic activities that increase well-being and those that either keep it constant or even decrease it.
- GDP is a measure of flows so it does not take into account the effects it has on the existing stock (such as natural resources) or the negative environmental and social externalities associated with production activities.

Therefore, one element that must be considered when discussing well-being is the scarcity of resources that are used to produce goods and services, hence, the issue of sustainability becomes an inevitable part of the discussion. Sustainability poses the question of whether it is possible to keep the current level of well-being for future generations in the future, or whether it will decrease constantly over time (Stiglitz et al., 2009). An evaluation of the environmental impact of the socio-economic system[6] becomes essential as the existence of externalities indicates that the current market prices do not reflect total costs. This means the signalling effect of prices is no longer reliable and these cannot be used to calculate social well-being accurately[7]. Furthermore, the damage resulting from the pollution of air, water or natural areas is not included in the calculation of GDP, whilst the interventions required to remove the damage caused by pollution, increase GDP. Moreover, the depreciation of capital stock associated with environmental changes (water resources, forests and biodiversity) and the depletion of

expressed as a set of concepts, definitions, classifications and accounting rules. The accounting framework of the SNA provides the basis for completing economic data and presenting it in a format that can be used for economic analysis and policy decision making. The accounts summarise a great deal of information, organised under economic principles, relating to the working of an economy; they provide a detailed and complete assessment of the complex economic activities that occur within an economy and of the integration between different economic agents and groups of agents, both within and outside the market. However, this system has faced criticism, for example by Moulton (2004), Atkinson (2005) and Diewert (2005).

[6]Even sustainability can be considered a multidimensional concept that should include different dimensions: the economic dimension, the social dimension, the environmental dimension and the policy-institutional dimension. For discussions relating to this, please see Goodland (1995), Herremans and Reid (2002), Spangenberg (2004). For specific contributions to sustainability indicators, reference can be made to Fricker (1998), Levett (1998), Bell and Morse (2008). For a complete analysis, please see Böhringer and Jochemc (2007).

[7]For further details on sustainability and externalities, please see Van den Bergh (2010).

resources (fossil fuels and minerals) do not form part of GDP calculation. As a result, GDP indicates we are richer than we really are.[8] (Van Den Bergh, 2009).

2.4. TWO ALTERNATIVE CHOICES IN DETERMINING WELL-BEING

In order to extend the concept of well-being beyond the mere income-related dimension, there are different options available. Well-being is a multidimensional phenomenon that includes different aspects of people's lives, and, as well as being hard to identify and quantify, most of its dimensions are influenced by subjective evaluations. This implies that there is not a single universal definition of well-being, nor a unique method to measure it. Its multidimensional nature makes it harder to assess, from which a number of theoretical, methodological and empirical issues emerge.

Two approaches have been developed to deal with these issues[9]: the first is traced back to Amartya Sen and has its roots in the idea of well-being as the ability to choose. It defines a common standard of well-being based on a well-defined approach, which associates well-being with the ability to pursue aims that increase an overall, all-encompassing well-being. This is the so-called Capabilities or Functionings approach. The second approach, which could be defined as the "Indicators of economic and social well-being" approach is based on the ideas of Partha Dasgupta.

Although Sen's approach is closer to understanding those characteristics which escape quantitative measurement, this work will follow the approach taken by Dasgupta, creating a multidimensional indicator of well-being, which, as well as being easier to compute, plays a more functional role in economic research as it shares the aim of addressing the goals of the policy-makers

2.4.1. THE APPROACH OF AMARTYA SEN

The approach taken by Amartya Sen has provided a new concept and new prospects in the study of well-being and is considered a fundamental contribution in the field of poverty and well-being research. The conceptual framework that underlies it offers a multidimensional prospect of well-being which sheds light on the causes, effects and deeper levels of analysis, which are often ignored or not adequately discussed.

[8]It is worth noting that to interpret GDP per capita correctly, it is necessary to consider demographic development. Where there is negative growth in the population, the increase in GDP per capita may suggest an increase in well-being that is not justified. Soro (2008) discusses the case of the Liguria region in Italy, which between 1970 and 2004 registered a heavy decrease in population levels (equal to, in absolute terms, four times the negative growth rates of the regions of Molise and Basilicata, who also experienced demographic decline in this period). As the decrease in population had a positive effect on the GDP per capita of the region, this contributed to mask the stagnation of the economy.

[9]This dual aspect has also been observed by Grasso (2002a).

Supported by a wide range of literature (Sen 1980; 1982; 1985a; 1991; 1993; 1997; 2003; 2005), this theoretical framework is particularly useful in analysing life quality and the sustainability of development in advanced contexts, firstly because it describes individual well-being not merely as a static and materialistic condition, defined by the possession at a given time of a certain amount of material resources (be these income or goods available), but as a process where the means and resources available are a way of attaining well-being, which is not *per se* an adequate measure of overall well-being. Secondly, it does not simply extend the notion beyond mere monetary terms but it also draws attention to a number of personal and family-related factors, as well as to the variety of social, environmental, economic, institutional and cultural contexts which influence individual well-being (Chiappero Martinetti et al., 2007).

Sen's theory is grounded in criticism towards social choice (Sen, 1995; 1999a) and increasing utility (Sen, 1980; 1985b) theories. The utilitarian approach measures social states on the basis of utility achieved but the concept is controversial: according to Sen, the term is defined exclusively on a subjective assessment that disregards any information not pertaining to the rational behaviour of individuals. Sen specifically questions two assumptions which characterise the utilitarian approach: the existence of a direct and determined relation between the quantity of goods possessed and the total utility achievable, and the conceptual overlap between the notion of utility and the idea of well-being.

As regards the first assumption, utility, be it happiness or pleasure according to the classic interpretation, or satisfaction of wants as an expression of underlying individual choices, is not capable of adequately representing the living standards of an individual. The assumption that the relation between goods possessed and utility derived from them is more complex and not necessarily direct is a more plausible interpretation.

As concerns the second assumption, which considers individual utility as the key element underlying the evaluation of well-being, the criticism brought forward by Sen relates to the incompleteness of this relation. The personal utility we derive from our actions is only one of the aspects of a general condition of well-being that includes a range of interests, ideals, aspirations, motivations and moral sentiments that go beyond the mere pursuit of material well-being. Neglecting the great scope for evaluation, for explanatory details and for environmental factors that come into play in determining the well-being process implies excluding a large part of what adds value to life from this particular kind of computation and ignoring the complex network of causal factors that contribute to determine or limit this process (Chiappero Martinetti et al., 2007).

Moreover, utilitarian theories, such as Rawls theory on primary goods[10], are based on the principle of resource equality, whilst according to Sen (1980) the best redistributive results can

[10] A "Theory of justice" by John Rawls considers the way in which costs and benefits are distributed in society and how , on the basis of these, the fundamental structure of society is organised (public institutions, economic structure, social organisation). Rawls interprets the concept of justice in a distributive sense; for this reason Rawls identifies certain main "goods", the equal distribution

only be achieved by considering an equality in the capabilities of individuals, bearing in mind their individual freedom. Although Rawls' approach to "primary goods", the distribution of which is fundamental in creating a fairer social order, takes into consideration a wide and inclusive range of goods, including rights, liberties, opportunities, income and wealth, it considers the goods per se instead of focussing on the role these goods play for human beings. On the other hand, the utilitarian concept does address what goods do for human beings, but the criterion it uses does not focus on the capabilities of the individuals but on their mental response.

According to Sen, what is lacking is a notion of basic capabilities, that is the innate state of human beings that allows them to perform certain actions, be these basic ones, such as the ability to move, or more complex ones, such as the ability to satisfy one's nutritional need, to obtain adequate clothing or to take part in the social life of the community.

The key point is to avoid interpreting needs on the basis of their utility. Instead, the interpretation of needs and wants on the basis of basic capabilities, so-called basic capability equality, is the basis for the attainment of individual well-being. Hence, great importance is given to freedom, that is the possibility that each individual has to achieve what he wants to be or do and to pursue without constraints, from a range of capabilities available, the one that most gives substance and value to well-being[11].

It is essential to distinguish and define the concepts of functioning and capability. By the term functionings, we mean the states and the activities that are constitutive of a person's being. It can include quite common activities such as keeping in good health, eating well and having a good education and more complex ones such as undertaking a political campaign during elections or performing a classical ballet sequence (Sen, 1980). Functionings can be evaluated objectively but this does not imply that they can fall under one umbrella, unlike, for example, happiness; on the contrary, the number and diversity of options and outcomes available is well recognised. It is not possible to even link these with a quantitative dimension, as a relative weight cannot be attributed. The weights which are sometimes given to the different functionings are the result of a value judgement that reflects the relative importance that each functioning has in the context of the aims pursued (Alkire, 2008).

On the other hand, capabilities refer to the set of resources available to a person, together with the ability to use and employ them to obtain functionings. The latter are an achievement, whilst the former are an ability *to* achieve. In a certain way, functionings are more directly linked to living conditions, of which they form the different aspects; whilst capabilities are freedoms in

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of which forms the basis for a fair social order; these goods are called "primary goods" and represent those goods that a rational individual would want, as they are the right means to achieve and satisfy each individual aim. These goods consist of some fundamental liberties and opportunities, wealth, income and the social basis for self-respect (i.e. the social conditions that allow each individual to be aware of his worth). In the theory of justice of Rawls, primary goods represent the main social values, the unequal distribution of which has consequences on the social structure.

[11] Human rights are considered important as according to Sen (2005) they can be interpreted as the rights to enjoy certain civil liberties. The duties associated with these rights should also be taken into consideration in terms of what individuals can do to safeguard and extend these liberties. As capabilities are also deemed a kind of freedom, the two concepts are strictly linked.

a positive sense of the term: which opportunities are available in relation to the life which one can have[12] (Sen, 1991).

It follows that individual well-being is given by a set of functionings, including utility. The lifestyle to be achieved coincides with the functionings vector and the set of possible vectors for each individual coincides with the set of capabilities possessed. These represent the opportunities that an individual can take to fulfil a life plan and thus, improve well-being; the judgement on the life quality is an evaluation of these functionings and the capabilities required to achieve them (Sen, 1989).

Clark (2005) highlights the flexibility of the conceptual framework of Sen's approach, which has a considerable degree of internal pluralism that allows researchers to develop and apply it in different ways (Alkire, 2002). In fact, Sen does not identify a fixed or definitive list of capabilities and functionings, believing instead that the selection and weighting of capabilities depends on the individual value judgements (which are partly influenced by the nature and purpose of the evaluative exercise). However, while in some cases Sen provides examples of intrinsically valuable capabilities, such as being able to live long, escape avoidable morbidity, be well nourished, be able to read, write and communicate, take part in literary and scientific pursuits and so forth (Sen, 1984), on the other hand Sen refuses to endorse a unique list of functionings as objectively correct.

Considerations on the Capability Approach can be broadened to include what Sen calls agency, which recognises that individuals often have values and goals (such as preserving the environment, purchasing free trade products or opposing injustice, tyranny and oppression) that transcend and sometimes even conflict with personal well-being (Sen, 1985a; 1985b; 1992).

The Capability Approach has also been used to focus on inequality, social justice, living standards and rights, although Sen (1999b) recognises that it is not satisfactory for all evaluative purposes. The Capability Approach does not *per se* provide a complete theory of justice and development as it is essential to take into consideration other principles, such as personal freedom or economic growth. However, it does broaden the information base of evaluation by giving priority to individuals as ends in themselves (not merely a means to engage in economic activity). The Capability Approach also recognises the heterogeneity and diversity of human beings by drawing attention to the disparities between them (such as those based on gender, race, class or age) and by recognising that different people, cultures and societies may have different values and aspirations (Clark, 2005).

The greatest limitation of the theoretical framework designed by Sen is the difficulty in addressing its quantitative application. This issue is, in essence, the income conversion problem in the functionings (Granaglia, 1994). The first attempts at overcoming this were taken by Sen

[12]According to Sen (1991; 1985b) the degree of freedom should not be judged purely on the basis of the number of alternatives available, but also on the quality of those alternatives.

himself (Sen, 1985a), but numerous other studies have offered useful contributions down the "operationalizing" route, such as Brandolini and D'Alessio (1998), Chiappero Martinetti (2000; 2006), Balestrino and Sciclone (2001), Grasso (2002b), Kuklys (2005).

Therefore, the main issue relates to the lack of data available to analyse well-being within the functioning space. However, the criticism is not aimed at diminishing its efficacy as it certainly has empirical value but at highlighting the difficulties that lie in attributing quantitative measurements to the innermost and most controversial aspects of human nature.

2.4.2. THE DASGUPTA APPROACH

The alternative approach used to measure well-being in a multidimensional space was developed by Partha Dasgupta. With this approach, a quantitative measurement of well-being is considered essential as there is a need for aggregate data which can describe economic and social activities; these can outline the macroeconomic situation of a country and provide an estimate of the income measure of living standards that an economy is able to sustain. Indicators of quality of life standards are essential to compare levels of well-being in different places (for example in different countries) or between different groups of people at a certain moment in time (for example poor and rich, or men and women). Moreover, these indicators are necessary as tools to evaluate alternative economic policies (Dasgupta, 2000).

The theoretical framework developed by Dasgupta gives a wide picture of economic and social well-being. It captures the different dimensions and provides support in the evaluation of public policies. The measure of a life quality index, based on a number of indicators, facilitates the choice between different policy-making options as it renders the entire evaluation process capable of encapsulating conflicting interests. The relevant aspect of this process is its multidimensionality, as it is only by aggregating amounts that differ in significance, range and measurement that it is possible to draw nearer to the complex nature of well-being.

In this respect, the measures of quality can reflect the constituent elements of well-being, or, alternatively, they can estimate the access to the determinant elements of well-being. With reference to the constituent elements, we can include indicators of health, well-being, freedom of choice and in general of fundamental freedoms. Those indicators that refer to the availability of food, clothing, shelter, drinking water, legal assistance, educational establishments, and healthcare, resources dedicated to national security or income are, in general, examples of the determinant elements. The former are output measures, whilst the latter value and aggregate the required input. Changes to aggregate measures that refer either to constituent or determinant elements can be interpreted as changes to the quality of life in a society (Dasgupta et al., 1972; Dasgupta e Weale, 1992).

Although Dasgupta himself stated: «*I use the terms "well-being", "welfare", the "standard of living", and the quality of life" interchangeably*», it is important not to confuse well-being with happiness: a person can be happy even with very low standards of life quality. Moreover, there is considerable complexity in determining and measuring personal experience associated with a certain level of well-being as subjective judgements come into play. One way to overcome these could be to use indicators such as suicide and divorce rates, however this method could skew results, for example, the reasons behind a low divorce rate could be down to the high costs associated with divorce, especially for women, and not necessarily to the overall happiness in the marriage. An alternative could be to ask individuals if they consider themselves happy based on a specific scale (Dasgupta, 2000). Despite the fundamental role that happiness plays as a component of well-being, this aspect is frequently ignored in literature and superficially correlated purely to income levels. However, when income levels are reasonably high, happiness is less dependent on these, this could be referred to as "diminishing marginal returns for happiness on income". To corroborate this, Dasgupta refers to research carried out in different Western countries that shows how significant increases in income per capita do not translate to equivalent increases in levels of happiness (Easterlin, 1974; Scitovsky, 1976; Oswald, 1997). However, he adds that it is not as simple to come to a similar conclusion for societies that have low income levels.

In terms of theoretical perspective, the Senian approach appears to provide a more well-defined vision of well-being as the indicators given by Dasgupta are essentially quality of life measures that refer to a concept of well-being that is static and rooted in reality. It is lacking the dynamic aspect, intended as the ability to choose a life plan without constraints. In a nutshell, Sen's approach relates well-being to the qualities associated with a "good life", determined as the ability to achieve the desired functionings and capabilities. On the other hand, the approach taken by Dasgupta is more limited and describes well-being as a situation where individuals experience a certain level of well-being.

However, empirically, the difficulties in applying Sen's approach and the fact that it is more easily employed to support policy decisions as it offers a new perspective on the traditional utility-related visions, have led to a preference towards the use of indicators. The information gathered and inferred from the elaboration of data is intended to be the starting point for public policy considerations (Grasso, 2002a).

3. MEASURES OF WELL-BEING

There is now agreement on the fact that, although undeniable, the relation between individual and economic well-being is not as solid as previously thought; research such as that

undertaken by Sen depends on many factors. The attempts at identifying and quantifying these factors, developed over the years, form an integral part of the economics and statistics of well-being. However, they also play an important role in the initiatives taken by National and International Institutions that have as primary objective the definition of guidelines and recommendations for policy interventions. Having chosen the approach taken by Dasgupta in quantifying well-being by referring to indicators[13], it is important to bear in mind that the aggregating process can use different kinds of indicators and variables.

For this purpose Offer (2003) proposes to distinguish between different categories depending on the origin of the different measures: a first category is identified on the basis that access to certain goods and services is a premise to well-being and this access is measured by using "Social Indicators of Objective Variables". A second type of measure refers directly to the psychological state of individuals by means of results of studies on subjective well-being and research undertaken on emotional response; these measures are referred to as "Subjective Indicators of Well-being". The third category can be considered an extension of National Accounting that includes non-market goods and services, by excluding components that have a distorting effect; in this way measures of National Accounting are aggregated and arranged to achieve measures of well-being that do not merely consider the income dimension.

A second categorisation is offered by Goossens et al. (2007), which classifies measurements in three categories on the basis of the objectives pursued: "Indicators adjusting GDP": this category includes the traditional indicators that measure economic performance, adjusted for environmental and social factors expressed in monetary terms; "Indicators replacing GDP", i.e. indicators that attempt to assess well-being more directly than GDP, for example, by assessing satisfaction levels; "Indicators supplementing GDP": where additional environmental and social information is used to create satellite account systems and to complement GDP with environmental and social indicators.

A third classification scheme is put forward by Bleys (2012), and is built on the different approaches that are used to quantitatively capture the notions. The first measure refers to the concept of "Well-being": measurements of well-being aim to assess the overall living conditions of an individual and of a group of people. The second concept to refer to is "Economic well-being", which captures the contribution made to the economy by the general level of well-being that the citizens enjoy, hence why they are considered as measures of the economic dimension of well-being. Finally measures of "Sustainability" are identified, which investigate whether the current levels of well-being and economic well-being will be able to be maintained in the future.

In this chapter, the measures of well-being are discussed using the categorisation provided by Offer; by referring to their source, it is easier to determine the boundaries of each category,

[13] The term "Indicator" still causes confusion when used. In this work by "Indicator" we mean the statistical data that attempts to capture a more or less complex reality that one intends to study. This interpretation is in line with De Vries (2001), who stated that "an indicator is a single number, a ratio or another observed fact that serves to assess a situation or a development".

with less ambiguity. The discussion is deemed useful as it provides additional meaning to the use of aggregate variables in the proposed indicator.

3.1. SOCIAL INDICATORS OF OBJECTIVE VARIABLES

One of the first definitions of social indicators is provided by Biderman (1966), as "quantitative data that serve as indexes to socially important conditions of the society". A wider definition is given by Carlisle (1972), who defines a social indicator as "the operational definition, or part of the operational definition of any one of the concepts central to the generation of an information system descriptive of the social system". This definition is relevant as it highlights the process that turns abstract concepts into quantitative elements by means of proxies through an operationalizing process (Carley, 1981).

Noll (2002a) believes that, out of all the numerous definitions of social indicators, two of them are particularly significant: the first one comes from the Australian Bureau of Statistics, "Social indicators are measures of social well-being which provide a contemporary view of social conditions and monitor trends in a range of areas of social concern over time" (McEwin, 1995); the second is referred to by the United Nations: "Social indicators can be defined as statistics that usefully reflect important social conditions and that facilitate the process of assessing those conditions and their evolution. Social Indicators are used to identify social problems that require action, to develop priorities and goals for action and spending, and to assess the effectiveness of programmes and policies" (United Nations, 1994). Both definitions highlight the focus that social indicators place on the conditions that are of social interest and the function of monitoring these conditions over time. The definition provided by the United Nations is more ambitious as it takes into account the use of social indicators not only in the description and monitoring of trends, but also to identify issues, determine priorities, assess programmes and policies to be implemented.

For a social indicator to be considered valid and functional, it must reflect a particular social idea, be meaningful, be sensitive to capturing the underlying phenomenon, be readily available in a time series to be able to make intertemporal comparisons, be capable of being disaggregated, be easily understood and interpreted and be able to link up with other indicators, where possible (McEwin, 1995). Moreover, the measure must be relevant to the points in question and the concepts underlying the measures must be clear and agreed upon; the measure must refer to the presupposed concept clearly; the methods used to determine the measure must give unbiased and reliable results; furthermore, the notion and limitations of the measure must be comprehensible and well-defined (Innes, 1990). The concept of social indicator is wide reaching for the social and economic implications it has and that stem from the indications provided; social indicators are based on the economic and social circumstances of

society, where government programmes have little control and influence. A consequence of the development of indicators on living conditions is the attribution of responsibility as they give overall indications of economic and social welfare (Van Dooren e Aristigueta, 2005).

Since the publication of the first United Nations Human Development Report, the initiatives on the subject, both at a national and international level, have increased. This growing interest is the consequence of a combination of social factors and objectives: a first factor can be traced back to the negative consequences of economic activity on the environment (for example climate change), whilst a second factor is related to the end of the catching up period with reference to the European countries[14], where GDP growth was substantial; the following period, characterised by a lower and less regular economic growth was combined with a greater perception of economic insecurity, with a greater exposure to phenomena of unemployment, poverty and poor working conditions. The decades of rapid economic growth with many winners and few losers were left behind and this brought progressively to a new assessment of the objectives of human progress. These changes in objectives must be accompanied by a change in indicators (Afsa et al, 2008). These factors encouraged further direct research into identifying an adequate measure of well-being; however this research developed generally as an analysis of complex and efficient methodologies from a descriptive perspective but more ambiguously interpretable when considered as real measurements of overall well-being.

It is for this reason that, despite the wide consensus on the importance of social indicators and on the need to go beyond the unidimensional measures of development, the debate is still open on the most adequate method of measurement to be applied in order to understand the multidimensional nature of well-being. Two different methods can be used (Sharpe, 2004; Brandolini, 2008; Decancq and Lugo, 2008, Chiappero Martinetti and von Jacobi, 2012): on the one hand, the grouping of an ordered set of indicators, known as a dashboard, is considered an appropriate method of monitoring the development or socio-economic trends; on the other hand, aggregate indexes of poverty and well-being are frequently determined to encourage comparisons over time between countries, to simplify interpretation and communication and to support the decision-makers. Furthermore, they encourage a more prudent selection of the information to be included in the general index by limiting the excessive abundance of information that frequently characterises any dashboard.

[14]Formalised by Abramovitz (1988, 1994), the *catch up* theory states that the progressive reduction in relative gaps between the group of a-convergent countries and the United States and the convergence between levels of GDP per capita within that same group in the post war period are regulated by two sets of conditions. The first relates to the so-called growth "potential" (in productivity) of the individual countries; the second relates to the capacity that each country has to realise its own potential. This theory stems from previous studies on the "advantages of backwardness" (Gerschenkron, 1962), that draw attention to the role played by institutions in the process of technology transfer and in the opportunity for a country which is behind to imitate, at a low cost, innovations introduced in countries at the frontier of technological development (Fagerberg, 1994). For a review of the different growth, development theories and the international differences in the respective rates, reference should be made to Soro (1997-98).

3.2. COMPOSITE INDICATORS

Composite indicators are determined by means of aggregation of different elementary indexes in order to take account of a vast range of dimensions that have influence on what the indicator is attempting to measure. It is possible to identify two different approaches (Gadrey e Jany-Catrice, 2003; Brandolini, 2008): the first gives a monetary value systematically to the variables in order to aggregate and produce a concise indicator expressed in monetary units. The second builds a composite indicator based on the variables that form it, without attempting to turn the values of the components systematically into monetary units. In relation to the first approach, reference is made to the studies of Kuklys (2005) and Lelli (2005). The index that is developed with the second approach instead permits a concise analysis of the social conditions within a country; it also allows comparisons between countries, it is less challenging and easier to implement than the pricing procedures.

There has been increasing debate on the conceptual and methodological issues for and against this method of measurement as a result of the growing use of these indexes; compared to the adjusted GDP indexes or the indexes that derive from GDP, this approach does not provide a unanimous procedure for the measurement of heterogeneous dimensions of well-being, The key characteristics of these indicators is that they refer to the sectors being analysed and that they use a normalisation method and weights to aggregate.

The choice of sectors to be analysed is the issue, which apparently is easiest to deal with, as it is based on the judgement of those who carry out the research or build the indicator. The dimensions to be analysed should be such as to provide the most complete picture in the analysis of well-being, limiting the number of those to be excluded from the study.

With reference to aggregation, Brandolini (2008) specifies that both univariate statistical methods (Maasoumi, 1986) and multivariate statistical methods, such as principle components (Maasoumi e Nickelsburg, 1988) and cluster analysis (Hirschberg et al., 1991) can be used[15].

The issue of the weights to be attributed to the single dimensions is a more delicate and complex matter as it is the part of research where the effects of subjective judgements emerge and can jeopardise results. In their review of literature on the different methods used, Decancq and Lugo (2008) identify the attribution of equal weights for each dimension as the simplest method to apply. This method is, on one hand, considered “convenient, but also universally considered to be wrong” (Chowdhury and Squire, 2006), on the other, it is defended as, even though it would be ideal to attribute different weights to the different components, there is no reliable basis or tools to do this (Mayer and Jencks, 1989). A second method refers to the characteristics of the data available: the smaller the proportion of the population in the dimension

[15] For literature on building techniques of composite indicators please refer to Salzman (2003), Munda and Nardo (2005), Nardo et al. (2005), OCSE (2008), Munda (2012).

considered, the greater the weights attributed are, in the case of indicators on deprivation (Desai and Shah, 1988; Cerioli and Zani, 1990); conversely, when considering well-being indicators, the smaller the proportion of population in the dimension, the smaller the weights attributed (Osberg e Sharpe, 2002). It is also possible to attribute weights even on the basis of the quality of the data available, assigning smaller weights to the data where issues arise or where values are missing (Jacobs et al., 2004).

The overall quality of each composite indicator depends on the following elements: the information available (the data to measure variables is often unreliable), the individual indicators and variables chosen (i.e. the representation of reality used), on which the possible interpretation of the indicator is based. It is important to also bear in mind the size of the indicator (that is, if variables are better, the larger their scale or vice-versa), the relative importance (i.e. weights) attributed to the variables and the mathematical aggregation methods used (Munda e Nardo, 2005).

The subjective nature that underlies many decisions that need to be taken, be they required or compulsory, has meant that unanimous agreement on the use and completeness of the composite indicators has not been reached. The elements that render composite indicators valid tools for analysis can be summarised as follows (Nardo et al., 2005): as they represent aggregate measures and they are a relatively simple combination of heterogeneous components, they are able to synthesise complex or multidimensional problems, providing support to those responsible for the decision making process; they are easier to interpret compared with attempting to find a general trend in many different individual and separate indicators; they encourage comparisons and classifications between countries on complex matters; they measure progress of countries over time; they reduce the magnitude of a set of indicators or they include more information within the limits of an existing dimension; they place issues relating to performance and progress of countries at the centre of political debate.

According to Sharpe (2004), this statistical summary is particularly significant as it can gather aspects of reality and provide meaningful analysis to capture the attention of the media, and hence of the political leaders. The use of a single number is very effective in synthesising complex issues in a simple and understandable manner even for the general public. This communicative advantage is important as a single complete classification is more likely to attract attention than a multidimensional scorecard comparison, followed by complex reasoning on the relation between two or more indicators (Brandolini, 2008).

However, the use of composite indicators should not be taken as a given (Nardo et al., 2005): if they are poorly constructed or misinterpreted they can provide misleading policy messages; if they are not used together with other indicators, they may lead to simplistic policy conclusions; if the various phases of index building (e.g. selection of indicators, choice of model, weights) are not transparent or are based on conceptual or statistical principles that are not justified, they can

be used misleadingly (e.g. to support the desired policy); they can conceal serious omissions with reference to certain dimensions of the phenomenon and, therefore, increase the difficulty in determining the appropriate remedial measures; if the dimensions of performance are ignored, they can lead to inappropriate policies.

Booysen (2002) identifies other issues. Composite indicators may exclude one or more key elements of the dimensions being analysed; certain components of the indicator may be measured through different variables, and, hence, assessment may not be stable; they may not be able to reveal more than what an individual variable can reveal itself; data used in composite indicators are frequently inaccurate and non-comparable; there is frequently no sound motivation behind the weighting and aggregating techniques; composite indicators may lack practical value if they do not provide useful recommendations for specific policies. Official statisticians could forgo the assessment of composite indicators, as behind a single figure with possibly little value there may be a lot of work involved in the data collection process. On the other hand, the appeal in trying to synthesise complex and sometimes elusive processes (e.g. sustainability, or single market policy) into one figure and use this as a reference for policy decision making is equally tempting (Saisana et al., 2005). The construction of a composite index is, therefore, not a simple matter. It concerns the setting of hypotheses and the evaluation of decisions, which are rarely made explicit or insufficiently analysed in detail, that neither play a marginal role on results nor a neutral role in terms of policy implications. The coherence of these indexes is largely dependent on the adequacy of the choices made that need to have sound theoretical backing; recognising the limitations and difficulties associated with the construction of composite indicators does not imply forgoing the advantages that these offer, but supporting the methodological choices with a critical analysis of the available alternatives (Chiappero Martinetti e von Jacobi, 2012)[16].

3.1.2. SETS OF INDICATORS

The most direct way of providing a wider description of the living conditions and social progress of a community is by using a dashboard (or set) of indicators. These sets of indicators immediately reveal the multidimensional nature of progress, as they refer to descriptive measures of the living conditions of people in different countries by means of observation of variables that cover a vast number of domains (Afsa et al., 2008).

Recent initiatives in this area share some specific features that distinguish them from previous developments. Firstly, they often have a strong environmental focus in the context of the sustainable development framework. Secondly, they are shared and expanded on by the

[16]There is a representative sample of studies on composite indicators of development and progress, including lists of these indicators at Booysen (2002), Morse (2004), Gadrey and Jany-Catrice (2007), Goossens et al. (2007), Afsa et al. (2008), Bandura (2008), Mayer (2008), Eurostat (2008), Saisana (2008), Soares and Quintella (2008), Singh et al. (2009).

local stakeholders who use the indicators as part of the strategy to mobilise action on specific issues. Thirdly, these sets of indicators are frequently made to measure to satisfy the requirements of the policy-makers. In literature, different sets of indicators have been identified: most of the initiatives refer to local studies undertaken on a national or regional basis (e.g. the Equitable and Sustainable Well-being – BES - developed by the National Council for Economics and Labour - Cnel - and the Italian National Institute of Statistics – Istat in Italy), others stem from citizens' initiatives and research groups (e.g. the Calvert-Henderson quality of life indicators in the United States) or from official statistics (e.g. the Australian Bureau of Statistics reports on progress in Australia).

Further initiatives have instead been developed by international organisations and are used to monitor political achievements that can be measured with specific actions. Examples that fall under this category are provided under the aegis of the United Nations, whose indicators are concerned with the needs of the poorer countries. Specific initiatives for developed countries are, for example, those planned jointly by the Member States of the European Union to monitor different types of strategies (for example the EU strategy for sustainable development launched in Gothenburg in 2001, or the strategy on social protection and social inclusion processes adopted by the Nice European Council of 2000). The OECD also uses indicators to regularly monitor Member States performance across a certain number of dimensions (social conditions, environmental conditions, macroeconomic conditions) (Afsa et al., 2008).

Brandolini (2008) identifies four different development paths in the non – aggregative approach towards social measurements: first, the evaluation can be based on vector dominance; to this end a Gaertner study (1993), revealed that vector dominance occurs only in a quarter at most of comparisons between two countries picked out from politically or economically homogeneous groups, whilst it occurs in 90% of comparisons between groups which are economically diverse (a richer group and a poorer one). Secondly, multivariate statistical techniques can be used; for example, Schokkaert and Van Ootegem (1990) used factorial analysis to identify the functionings of a group of unemployed people in Belgium; the same technique was chosen by Nolan and Whelan (1996) in their study on deprivation in Ireland. Another alternative is the use of the Lorenz dominance criterion, along the path traced by Kolm (1977) and Atkinson and Bourguignon (1982). Finally, it is possible to specify a multidimensional index of inequality and poverty, that associates a real number to each multivariate distribution.

At a European level mention must be made of the European System of Social Indicators, the result of research undertaken by the Social Indicators Research Centre[17], a system of indicators

[17] The Leibniz Institute for the Social Sciences is the largest infrastructure institution for Social Sciences in Germany. Established in 1986 as the *German Social Science Infrastructure Services*, GESIS, it consisted of three independent institutions: the *Social Science Information Centre* (IZ) in Bonn, the *Central Archive for Empirical Social Research* in Cologne (ZA), and the *Centre for Survey Research and Methodology* (ZUMA) in Mannheim. Since 2007 GESIS has merged into one institute and in 2008 GESIS took on the name of Leibniz Institute for Social Sciences.

to continuously monitor and assess social and individual well-being of European citizens in terms of life quality, social cohesion and sustainability. A vast literature supports this project: Berger-Schmitt and Jankowitsch (1999), Berger-Schmitt and Noll (2000), Berger-Schmitt (2001), Noll (2002b). Even the Stiglitz-Sen-Fitoussi Report[18] (2009) states that the aim is to develop a simple set of indicators that can capture many of the aspects that are of main concern and that this set can be accompanied by an adjusted GDP indicator.

However, sets of indicators are not able to provide a synthetic representation of life quality and social progress. This limitation is sometimes overcome by using headline indicators, built as a subset of a wider selection, for communication purposes. Another method used to deal with the issue is to assign weights to the various indicators, even though this introduces arbitrary elements and does not avoid double counting. Finally, the descriptive indicators included on the dashboard can be useful to draw attention to areas which register modest levels of progress but provide little input on how to solve the issues that lead to these (Afsa et al., 2008).

3.2. SUBJECTIVE MEASURES

Research on Subjective well-being focuses on the subjective experience that individuals have of their lives. The underlying hypothesis is that well-being can be defined on the basis of people's experiences, in terms of perceptions and satisfaction achieved. The premise to this is that in order to understand individual perception of life quality, it is necessary to analyse first-hand how the person feels in his or her own context (Diener e Suh, 1997). The key difference with the other approaches is that subjective measures of well-being are primarily connected to personal judgement. This approach also has the advantage of not requiring a single definition of well-being as the proxy for subjective well-being are the self-reported answers given by individuals to the questionnaires, it is hence possible to define the indicators on the basis of the average, median or variance of the distribution of the responses (Afsa et al., 2008). Support to the validity of this approach is given by Diener (1994), Diener et al. (1999), Layard (2005) and Kahneman and Krueger (2006).

Veenhoven (2002) distinguishes objective approaches (e.g, the use of objective social indicators) from subjective approaches. In doing so he provides the definition to two concepts: substance, which relates to what is measured and evaluation, which refers to the data gathering process. It is said that measurement is objective when it concerns dimensions that exist regardless of whether there is subjective awareness of them and when measurement is based on explicit criteria and undertaken by external observers. Subjective indicators measure

[18] The Commission on the Measurement of Economic Performance and Social Progress (CMEPSP), generally referred to as the Stiglitz-Sen-Fitoussi Commission (after the surnames of its leaders) is a commission of inquiry created by the French government in 2008. The aim of the inquiry was to establish criteria, guidelines and 12 recommendations for a new measurement for wealth and social progress of a nation, without relying solely on Gross Domestic Product. For details see Stiglitz et al. (2009; 2010).

subjective variables (such as happiness and trust) using subjective evaluation techniques such as self-reports. This subjective substance consists of three interconnected components (Diener e Suh, 1997): the satisfaction relating to the kind of life led, together with the positive and negative effects. These effects refer to disposition and pleasant or unpleasant feelings, whilst satisfaction relating to one's own life refers to a psychological state of satisfaction. Both the effects and the judgements on the level of satisfaction are personal evaluations of people's lives; subjective well-being is not limited to the lack of negative experiences.

In order to ensure that the use of subjective indicators is valid, three conditions that allow a comparison between responses are required (Afsa et al., 2008). First of all, participants must be able to evaluate their life on a numerical scale and must not face difficulties in replying; secondly, they must interpret the questionnaire in the same way; thirdly, they must have the same judgement scale. The complexity of the issue has been highlighted by research that has shown how people who speak the same language and have the same cultural background interpret questions in a similar manner (van Praag, 1991), and other research that has proven how responses given by the same individuals vary over time (Krueger e Schkade, 2007).

In order to identify subjective well-being and the indicators set up to measure it, Veenhoven (2004) subdivides human well-being into four categories with a matrix that on the vertical axis separates opportunities and results obtained during a lifetime and on the horizontal axis the inner and outer qualities; with the former well-being is determined within the context where the individual operates, with the latter within the individual.

The matrix establishes four categories of subjective well-being and for each of these categories, indicators have been tracked over time to measure progress: "*Living in a good environment*" (Veenhoven, 1996; 2000; 2003; Estes, 1984; Slottje, 1991; Liu, 1977; Rogerson, 1997), "*Being able to cope with life*", "*Being of worth for the world*" (WWF, 2002) and "*Enjoying life*" (Andrews e Withey, 1976; Smith et al., 1969; Warr et al., 1979; Lynn, 1971; 1982; Neugarten et al., 1961).

	Outer qualities	*Inner qualities*
Life-chances	Living in a good environment	Being able to cope with life
Life-results	Being of worth for the world	Enjoying life

Figure 1: Matrix of subjective well-being.
Source: Veenhoven (2004).

Research at a micro level and for short periods of time correlate subjective well-being to objective variables (Afsa et al., 2008). This suggests that subjective well-being can be used

productively to understand economic behaviour: studies like those undertaken by Ferrer-i-Carbonell (2005) prove that in cross-section analysis between individuals over a short period of time, well-being is positively correlated to nominal income. At a macro level and over longer periods of time, happiness and well-being are not correlated with nominal income, confirming the Easterlin paradox[19].

According to Diener and Suh (1997) the main benefit of the measures of well-being is that they capture the essence of what is important for an individual as derived from experience; as objective social indicators are indirect measures of what people experience in relation to their living conditions, subjective well-being measures provide an important additional evaluation that can be used to assess what is summarised by objective indicators. If objective and subjective indicators converge, the researcher can draw more reliable conclusions on life quality. Another benefit of subjective well-being measurements is that when they are proven to be inadequate, they are frequently easier to adjust in subsequent studies compared to those that are based on objective indicators. Thirdly, by measuring the experience of well-being through a common dimension, such as the level of satisfaction, subjective well-being measures are easier than objective measures to compare different domains, as objective measures frequently use different units of measure. Ultimately, it would be theoretically possible to create a valid indicator of subjective well-being to be used for international comparisons that would have the advantage of synthesising all the different factors that influence people's lives.

Diener e Suh (1997) also highlight the limitations of these measures: first of all, the subjective randomness in the responses given by each individual cannot be totally removed; it would be naïve to believe that the responses provided by each individual are all equally valid and precise. Hence, subjective measures of well-being should be determined through different techniques that do not share common methodological flaws. Secondly, subjective measures of well-being could give values that do not correspond to the objective quality of a collective life at a local level, as they could be influenced by disposition or by personal relationships, rather than by real social factors; furthermore, even social expectations can affect individual subjective measures of well-being.

In literature, important contributions have been made by the *Advanced Quality of Life Index* proposed by Diener (1995), which considers both subjective/qualitative indicators and objective/quantitative indicators; by the H*appy Life Expectancy Index* developed by Veenhoven (1996), which aims to provide a substitute measure of the well-being of nations by combining life expectancy estimates (objective measure) with personal life satisfaction (subjective measure); by the *Inequality-Adjusted Happiness* (Veenhoven and Kalmijn, 2005), based on the mean and standard deviation of distribution in the responses on life satisfaction, giving equal weight to either criterion.

[19] To this extent, see Blanchflower and Oswald (2004).

Subjective measures of well-being are important but not on their own sufficient to assess society; it is essential to bear in mind that subjective well-being is given different relevance by individuals and by countries: societies and individuals attribute different value to the categories of subjective measures that ensure a good quality of life (Diener e Suh, 1997). If happiness is only one amongst many measures, other fundamental aspects must be given relevance. Therefore, it can be appropriate to aggregate and combine both subjective and objective variables in order to provide a more exhaustive measure.

3.3. NATIONAL AND EXTENDED ACCOUNTING

Although the research for alternative measures of GDP encourages taking into account economic, social and psychological dimensions that are set apart from national income, it is useful to run through some of the concepts, which relate to the System of National Accounts (SNA). These measures are important both when taken individually and when considered potential components of or starting points for alternative indicators.

The basis for these indicators is the core of SNA to which adjustments relating to consumption and capital goods are made in order to remove certain goods and services that could be considered not as final goods but as regrettable necessities, and to attribute a value to sources of well-being that are outside of the reference market.

National measures such as Gross National Product (GNP), Gross National Income (GNI), Net National Product (NNP) and Net National Income (NNI) include the production or the income arising from work of the residents of the country in question or from capital owned by the residents of the country. Internal measures such as GDP, Net Domestic Product (NDP) and Gross National Disposable Income refer to the production and the elements that determine income within the boundaries of the country, regardless of whether the owner of capital resides. The difference between the two measures is the income received by non-residents.

The difference between gross and net measures is that gross measures include fixed capital formation. Gross measures are higher than net ones as by definition the difference between the two is the same whether the measures are expressed at nominal or real value and whether reference is made to national or domestic accounting. However, the difference may change when considering income measures or product measures as different deflators are used (Ross e Murray, 2010). The use of net measures is supported by most of literature (Spant, 2003; Diewert, 2005)[20]; in fact, if we consider, for example, levels of NNI per capita, these are

[20] The first proposal to use Net National Product as a measure of well-being is from Weitzman (1976). His analysis shows how a rigorous interpretation of economic well-being can be given to Net National Product in an intertemporal model. Criticism to Weitzman's beliefs were brought forward by Asheim and Buchholz (2004) but also by Asheim and Weitzman himself (2001), through a review of the hypotheses.

systematically lower than levels of GDP per capita; therefore, the latter tends to overestimate the level of economic resources that contribute to well-being (Boarini et al., 2006).

3.4. ADJUSTED GDP AND EXTENDED ACCOUNTING

In literature, it is possible to distinguish another series of conceptualisations and measures that attempt to complement the notions of SNA with sustainability issues. These efforts have GDP or other indicators associated with SNA as their starting point and make adjustments on the basis of particular criteria.

3.4.1. MEASURE OF ECONOMIC WELFARE

In the seventies, in particular in the United States, the idea that economic growth had adverse effects on the physical and social deterioration of the environment began to circulate. This was accompanied by the dissolution of the optimistic expectations that had been associated with GDP growth in the previous years. In response, Nordhaus and Tobin (1972) developed the Measure of Economic Welfare (MEW) in order to better understand the relationship between economic growth and well-being.

The starting point for MEW is Net National Product adjusted for the following factors: a) non-market and leisure activities, measured through their opportunity cost; b) a reclassification of the final public expenditure on intermediate goods, consumption and net investment, together with a reclassification of some household expenditure. Education, medicine and public health expenditure are considered investments that increase productivity and yield household services; c) consumer durables; d) Instrumental or defence expenditure[21]; these expenses also include commuting to work costs, public service expenses such as police, rubbish collection and public hygiene, road maintenance and national defence; e) disamenities resulting from urbanisation. This category, which includes environmental damage costs resulting from environmental pollution, is measured by a disamenity premium, taken as the income differential between people who live in densely populated areas and people who live in rural areas[22]. This measure, also known as MEW-A, (from MEW-*actual*) must also be distinguished from the Measure of Economic Welfare- Sustainable (MEW-S), i.e. the quantity consumed over a year, in line with the sustained steady growth of per capita consumption at the trend rate of technological progress.

[21] Expenditure on defence is incurred to compensate for a decline in well-being. This idea was introduced by Leipert (1989).
[22] The choice of attributing higher values to income from urban areas compared to rural areas and vice versa can be controversial as there are rural areas which are particularly polluted.

The relationship between the two indexes is similar to the one between Gross National Product and Net National Product in standard national accounting: MEW-S measures the level of MEW-A that is compatible with capital stock conservation. MEW-A can be greater or less than MEW-S, depending on whether certain criteria for actual consumption and growth are met. If these criteria are satisfied, consumption per capita can increase at the trend rate of productivity growth. When MEW-A is lower than MEW-S, the economy is even better for future consumers; when actual MEW is greater than MEW-S, current consumption incorporates some of the elements of future progress (Nordhaus e Tobin, 1972).

2.3.1.2. *INDEX OF ECONOMIC ASPECT OF WELFARE*

The work undertaken by Nordhaus and Tobin was the starting point for the development of other measures of well-being. Amongst these is the Index of Economic Aspect of Welfare (IEAW), developed by Zolotas (1981). Even the IEAW has a measure which refers to consumption as its foundation and, like the MEW of Nordhaus and Tobin, it includes consumption durables, from which publicity expenditure is deducted as it does not contribute to economic well-being.

A particular element which distinguishes the IEAW from the MEW, thus correcting one of the greatest shortcomings of the latter, is the adjustment made to include environmental costs; in fact market prices for non-renewable sources of energy are too low both because they do not include the current consumption costs that weigh on future generations and because the prices for the purchase of resources from suppliers in developing countries are kept under control by developed countries. Half of the actual expenditure on the prevention of pollution as well as all the estimated damage resulting from pollution that was not able to be prevented is also written off. Other deductions refer to private medical expenses, whilst a certain value is attributed to services yielded from public capital, such as the availability of schools and consumer durables. An estimated value is also attributed to household chores, assuming that they take 5 hours a day, 365 days a year. Finally, an estimated value for free time is provided, distinguishing between leisure time as a final consumer good, in which case the value does not change in relation to changes in productivity, and leisure time as an intermediate input in the scope of recreational activities; in the latter case, the value changes with the increase in productivity. The IEAW only takes account of free time in the former meaning of the term (Zolotas, 1981; Hecht, 2002).

2.3.1.3. *INDEX OF SUSTAINABLE WELFARE*

The Index of Sustainable Welfare[23] (ISEW) was developed by Cobb and Daly (1989). It has a lot in common with the MEW or the MEW-S, but with two important extensions: an assessment of the depletion of natural resources and of income distribution[24].

The ISEW does not include any monetary evaluation of leisure time, whilst public non - defensive expenditure, the value of services relating to domestic labour, the value of services relating to consumer durables and economic adjustment are added to private consumption weighted for the inequality in income distribution[25]: Public defensive expenditure, expenses on durable consumer goods and environmental degradation costs are removed[26]. The ISEW is important as it was the first to take into account sustainability (through environmental degradation) and inequality in income distribution; however, it is an indicator that focuses mainly on economic well-being, disregarding non-economic aspects such as psychophysical well-being or the inequality in accessing resources and services[27].

2.3.1.4. *GENUINE PROGRESS INDICATOR*

An indicator which is very similar to the ISEW is the GPI (*Genuine Progress Indicator*), developed in 1995 by the *Redefining Progress* non-profit organisation[28]*.* Starting point for the calculation of GPI is GDP, to which numerous adjustments are made[29]: a) it is corrected for income distribution. Economic theory on marginal utility asserts that individuals who suffer from poverty have greater benefits from an increase in income than people who are richer. The adjustments are made to correct for this effect; b) it adds an estimate of the value of household and voluntary work, as GDP does not take account of these contributions to the economy since they do not give rise to cash flows; c) it considers non-market benefits arising from a higher level of education of the population; d) it deducts the cost of crime, by way of legal expenses, medical expenses and property damage; e) it deducts natural resources depletion costs that GDP

[23] The ISEW has attracted considerable interest. Studies based on the ISEW have been carried out by many countries with high income levels:in Germany (Diefenbacher, 1994), the Netherlands (Rosenberg et al, 1995), Sweden(Jackson e Stymne, 1996), Great Britain (Jackson et al, 1997), Austria (Stockhammer et al, 1997), Italy (Guenno e Tiezzi, 1998), Chile (Castaneda, 1999), Poland (Gil e Sleszynski, 2003). The methodology changes depending on the authors' preferences and the availability of data. The key conclusions however are the same for all these studies; "sustainable economic well-being" has increased at slower rate than GDP growth rates (Neumayer, 1999). For Italy, interesting contributions on local realities have been made by Pulselli et al. (2005) and Brugnoli (2009).

[24]Nordhaus and Tobin pointed out themselves in their paper that these elements were missing from their index.

[25] Economic adjustment considers two factors: the growth in net capital and the variation in the net internal position (the balance between national investment abroad and internal foreign investment)

[26]The effects of economic development on the environment are classified into two categories: the costs of environmental degradation and the depreciation of natural capital.

[27] In his criticism to the index, Neumayer (1999) highlighted the following limits: lack of solid theoretical background, in particular with reference to the reasoning behind the adjustments made to private consumption and to the selection of the components that contribute to welfare. Furthermore, according to Neumayer, the index is not capable of measuring current and future well-being simultaneously as the components to which it refers can either be valid for one or for the other.

[28] *Redefining Progress* is an organisation with headquarters in California that is dedicated to studies on sustainable economies and societies.

[29] The information relating to the composition of the GPI indicator are available on the website www.*rprogress.org*

includes as part of income. GPI instead takes account of degradation and loss of forest, farmland and non-renewable resources; f) it deducts pollution costs, as already mentioned, GDP frequently accounts for pollution twice: when it is created (by not considering externalities) and when the causes or the effects of it are removed. On the other hand GPI deducts the cost of water and air pollution, which are deemed to be a real threat to health and to the environment. Just as climate change and nuclear waste removal which give rise to long-term costs and that will have repercussions on future generations. These costs are not taken into consideration by the ordinary economic indicators, whist GPI considers the consumption of certain types of energy and chemical substances real costs. A cost is also attributed to carbon emissions, in order to quantify the economic, environmental and social effects of global warming; g) it considers leisure time dedicated to families or to other activities; h) GPI gives an estimate of the cost of purchase and consumption of consumer durables (such as electrical appliances), whilst it considers the services that these provide in the course of time as a benefit. A similar approach is taken in calculating the use of public infrastructure; i) it takes account of defensive expenditure; j) finally it also includes the effects of the dependence on or independence from foreign activities: if a country allows social capital to fall or if it finances consumption with loan capital, it is a sign that it is living beyond its own means. GPI values increases to social capital, as contributions to well-being, whilst foreign loan capital is considered a factor that reduces well-being. However, if foreign capital is used to make productive investments, the negative effects are cancelled, while if it is used to finance consumption, GPI is reduced.

An analysis of the levels of ISEW and GPI concludes that they are lower than GDP as they consider the depletion of natural resources and income distribution. The extent of the gap varies from country to country: Bleys (2005) and Gadrey and Jany-Catrice (2007) show how the gap between ISEW and GDP is much higher in the United Kingdom and in the United States than in Sweden, especially because of the different levels of income inequality.

4. OVERVIEW OF MULTIDIMENSIONAL WELL-BEING INDICATORS

4.1. THE INDICATORS OF THE HUMAN DEVELOPMENT REPORT

The Human Development Report is an independent publication, commissioned by the United Nations Development Programme (UNDP). It has been released on a yearly basis since 1990 and it contains different indicators, i.e. the HDI, the iHDI, the GII and the MPI, the last three introduced in the Report since 2010. The aim is to provide an alternative assessment of well-being, with a focus on human development. The following paragraphs provide a description of these.

4.1.1. HDI – *HUMAN DEVELOPMENT INDEX*

The HDI appears for the first time the Human Development Report in 1990 as a composite measurement of health, education and income, which it assesses on the basis of a wider concept of development than one based solely on income (UN, 2010).

It was conceived in 1990 by the Pakistani economist Mahbub ul Haq, as a result of the efforts undertaken in the mid-eighties to identify the conceptual framework for the study and development of measurements of well-being. This was an essential step as the results obtained were not immediately visible in income and growth statistics: greater access to knowledge, improved nutrition and sanitation, safer subsistence levels, improved security against crime and physical violence, safeguards for leisure time, political and cultural freedom and sense of community participation (Ul Haq, 1999).

In order to measure the dimensions, three sub-indices are taken into consideration:

- I_{life}: life expectancy at birth, calculated with a minimum value of 20 years and a maximum of 83.6 years[30] (identified for Japan), as a *proxy* for health.
- $I_{Education}$: as a proxy for education, it is composed by two indicators: average number of years of education received by people aged 25 and over (minimum 0; maximum 13.3, identified for the United States) and the number of years of schooling that a child of school entrance age (5 years) can expect to receive (minimum 0; maximum 18). The indicator for education is given by the geometric mean of the two sub-indicators[31]. The combined indicator has a maximum of 0.971 (New Zealand) and a minimum of 0.
- I_{Income}: the HDI uses gross national income per capita in purchasing power parity terms expressed in US dollars as a proxy for income (minimum 100$; maximum 87,478$, identified for Qatar).

The value referred to each country is calculated for each dimension on the basis of the following ratio:

$$\frac{actual\ value - minimum\ value}{maximum\ value - minimum\ value}$$

With the following steps:

[30] The maximum and minimum values that appear in the formulae refer to the HDR 2013, with 2012 data.
[31] Prior to 2010 the arithmetic mean was used instead of the geometric mean. The arithmetic mean attributes equal weight to the dimensions considered; the geometric mean takes account of the different progress of the dimensions considered. Poor performance recorded in one dimension has a direct effect on the overall result of the indicator; the geometric mean reduces the level of substitutability between dimensions.

- $I_{Life} = \frac{actual\ value - minimum\ value\ (20)}{maximum\ value\ (83.6) - minimum\ value\ (20)}$

- $I_{Education} = \frac{\left(\sqrt{MYSI \times EYSI}\right) - minimum\ value\ (0)}{maximum\ value\ (0.971) - minimum\ value\ (0)}$

where:

MYSI (*Mean Years of Schooling Index*) = $\frac{actual\ value - minimum\ value\ (0)}{maximum\ value\ (13.3) - minimum\ value (0)}$

EYSI (*Expected Years of Schooling Index*) = $\frac{actual\ value - minimum\ value\ (0)}{maximum\ value\ (18) - minimum\ value\ (0)}$

- $I_{Income} = \frac{\ln(actual\ value) - \ln(minimum\ value\ (100))}{\ln(maximum\ value (87{,}478)) - \ln(minimum\ value\ (100))}$

Once the sub-indices have been calculated, HDI is calculated as the geometric mean of these:

$$HDI = \sqrt[3]{I_{Life} \cdot I_{Education} \cdot I_{Income}}$$

4.1.2. iHDI- *INEQUALITY ADJUSTED HUMAN DEVELOPMENT INDEX*

In 2010 the Inequality Adjusted Human Development Index was introduced in the Human Development Report. The Report of 1990 had already highlighted that the HDI included only some of the choices made by people, whilst ignoring many other elements deemed relevant, be these of an economic or political nature or items such as social freedoms, protection against violence, security and discrimination (UN, 1990). In order to obtain a fuller picture of human development, it is necessary to go beyond the conventional dimensions of HDI.

Significant progress in health, education and income can sometimes disguise inequality, unsustainable production processes and loss of power on the part of groups of people. The iHDI not only considers the average human development in a country based on indicators of health, education and income, but also how the development is distributed. The HDI adjusted for inequality is also measured for 139 countries and attempts to show the loss of human development attributable to inequality in health, education and income (UN, 2010).

In order to calculate iHDI, it is necessary to first measure the inequality within the dimensions of the HDI with the following formula:

$$A_x = 1 - \frac{\sqrt[n]{X_1 + \ldots + X_n}}{\bar{X}}$$

Where:

- $\{X_1,\ldots,X_n\}$ represent the distribution underlying the dimension considered.
- A_x is the measure of inequality calculated for each dimension.

The geometric mean of the equation excludes values equal to zero; in fact, 1 is added to the mean years of schooling. In calculating the income level, the top 0.5 percentile of the distribution is truncated to reduce the impact of extremely high levels of income, whilst negative or zero incomes are replaced by the minimum positive value above the bottom 0.5 percentile of the distribution (UN, 2013).

Then each dimension index is adjusted for inequality:

$$I_x^* = (1 - A_x) * I_x$$

The inequality adjusted income index is I^*_{Income}, based on the adjusted income values, I_{Income^*}; this enables the iHDI to include the inequality effects of income.

The iHDI is calculated as the geometric mean of the three dimensions indices adjusted for inequality:

$$iHDI = \sqrt[3]{I^*_{Life} \cdot I^*_{Education} \cdot I^*_{Income}} =$$

$$= \sqrt[3]{(1 - A_{Life}) \cdot I_{Life} \cdot (1 - A_{Education}) \cdot I_{Education} \cdot (1 - A_{Income}) \cdot I_{Income^*}}$$

The HDI* that takes into consideration I_{Income^*} is calculated as follows:

$$HDI^* = \sqrt[3]{I_{Life} \cdot I_{Education} \cdot I_{Income^*}}$$

The percentage loss of information of the HDI, due to the inequality of the different dimensions is:

$$Loss = 1 - \frac{iHDI^*}{HDI^*} = 1 - \sqrt[3]{(1 - A_{Life}) \cdot (1 - A_{Education}) \cdot (1 - A_{Income})}$$

Assuming that the percentage loss is the same both in relation to average income and to its logarithm value, the iHDI can also be calculated as:

$$iHDI = \left(\frac{iHDI^*}{HDI^*}\right) \cdot HDI = \sqrt[3]{(1 - A_{Life}) \cdot (1 - A_{Education}) \cdot (1 - A_{Income})} \cdot HDI$$

4.1.3. *GENDER INEQUALITY INDEX*

The *Gender Inequality Index* (GII), measures gender-based inequality by taking into consideration three dimensions: reproductive health, empowerment and the labour market. It shows the loss of well-being in terms of potential human development caused by inequality in male and female achievements. The index has a range of values between 0, minimum, in the absence of inequality, and 1, which expresses the maximum inequality between male and female for all the dimensions considered (UN, 2013).

Reproductive health is given by the combination of two indicators: Maternal Mortality Ratio (MMR) and Adolescent Fertility Rate (AFR). Empowerment is measured by the Share of parliamentary seats held by each sex (PR) and Attainment at secondary and higher education levels (SE). Finally, labour market is measured by the Labour market participation rate (LFPR).

As a geometric mean cannot include zero values, all the components of the indicator have a minimum value of 0.1%. This implies that the maximum value for the Maternal Mortaliy Ratio is established at 1.000 deaths per 100.000 births. The rationale behind the fixing of an upper limit is that even if the number of deaths exceeded 1.000, this would not impact on the ability to provide support and improve prevention for pregnant women. Similarly, for countries that have a number of deaths between 1 and 10 per 100.000 births, there would be no change in conditions, thus, the minimum value is established at 10. The minimum value for parliamentary representation is established as 0.1%.

Aggregation across dimensions using a geometric mean for men and women provides the following:

$$G_F = \sqrt[3]{\left(\frac{10}{MMR} \cdot \frac{1}{AFR}\right)^{\frac{1}{2}} \cdot (PR_F \cdot SE_M)^{\frac{1}{2}} \cdot LFPR_F}$$

$$G_M = \sqrt[3]{1 \cdot (PR_M \cdot SE_M)^{\frac{1}{2}} \cdot LFPR_M}$$

Applying the harmonic mean[32] to the geometric means of both groups captures the inequality between men and women:

$$HARM(G_F, G_M) = \left[\frac{(G_F)^{-1} + (G_M)^{-1}}{2}\right]^{-1}$$

HARM (G_F,G_M) provides the value which expresses the inequality between men and women.

The value $G_{\bar{F},\bar{M}}$, a standard parameter, is then calculated as the geometric mean of the three dimensions considered; this value does not take into account gender differences, as the values of the dimensions are calculated as the arithmetic mean of the values:

$$G_{\bar{F},\bar{M}} = \sqrt[3]{\overline{Health} \cdot \overline{Empowerment} \cdot \overline{LFPR}}$$

Where:

- $\overline{Health} = \frac{\left(\sqrt{\frac{10}{MMR}\cdot\frac{1}{AFR}}+1\right)}{2}$
- $\overline{Empowerment} = \frac{\left(\sqrt{PR_F \cdot SE_F}+\sqrt{PR_M \cdot SE_M}\right)}{2}$
- $\overline{LFPR} = \frac{LFPR_F + LFPR_M}{2}$

The *Health* value should not be interpreted as the average of the corresponding male and female indices, but as the average distance between the norms established for the reproductive health indicators, fewer maternal deaths and fewer teenage pregnancies. On the basis of the above, the index can be calculated as:

$$GII = 1 - \frac{HARM(G_F, G_M)}{G_{\bar{F},\bar{M}}}$$

[32] The harmonic mean is the reciprocal of the sum of the reciprocals of the values; it is used when it makes sense to calculate the reciprocal of a certain value. In this case, the values determined for men and women are one the reciprocal of the other.

4.1.4. *MULTIDIMENSIONAL POVERTY INDEX*

The *Multidimensional Poverty Index* (MPI) combines the poverty measurements based on income and provides an estimate of the number of people who can be considered poor in multiple dimensions and who also face material deprivation within the family. The MPI identifies the deprivations at the level of education, health and living standards. It uses micro-data based on household surveys: each family member is given a deprivation score based on the deprivations in the household for each of the 10 components considered by the indicator (UN, 2013).

The maximum score is 100%; the maximum score for each dimension is 33.3%. Both education and health have two sub-indicators with equal weighting of 16.7%. The living standards dimension has six sub-indicators, so each one weighs 5.6%.

The aspects taken into consideration are:

Education:

- No household member has completed at least six years of schooling;
- There is at least one school-age child (up to grade 8) not attending school.

Health:

- There is at least one household member who is malnourished;
- There has been a case of child mortality

Living standards:

- Not having access to electricity;
- Not having access to clean drinking water;
- Not having access to improved sanitation;
- Having a home with a dirt, sand or dung floor;
- Using “dirty” cooking fuel
- Not having assets related to mobility (car, truck, animal cart) but having at least one asset amongst the following: bicycle, motorbike, refrigerator, telephone or television

In order to determine the deprivation score per family, the percentage weights of the dimensions are summed. If the score is between 20% and 33.3%, the family is at risk of poverty. If the score is higher than 33.3%, the family is considered multidimensionally poor. If the score is higher than 50% the family is considered severely poor.

The MPI is calculated as the average of the scores obtained for the population, but it can also be expressed as the product of the proportion of the multidimensionally poor in the population and the intensity of poverty:

$$MPI = H \cdot A$$

Where:

- $H = \frac{q}{n}$ is the proportion of population that lives in a state of poverty, *q* is the number of people who are multidimensionally poor and *n* is the total population.
- $A = \frac{\sum_1^q c}{q}$ is the intensity of poverty.

Finally, it is possible to calculate the contribution made by each dimension j to poverty as:

$$Contrib_j = \frac{\sum_1^q c_j / n}{MPI}$$

3.2. INTERNATIONAL EXPERIENCE

3.2.1. *CALVERT-HENDERSON[33] QUALITY OF LIFE INDICATORS*

The *Calvert-Henderson Quality of Life Indicators* are a set of indicators which evaluate the quality of life in the United States; the first report was published in 2000. This project was undertaken by independent researcher Hazel Henderson in cooperation with the Calvert Group, an investment management firm specialised in sustainable and responsible investments.

The set of indicators includes macroeconomic indicators, such as employment and income levels, natural environment indicators and indicators traditionally associated with a social dimension, such as health, education and public safety.

One of the distinctive features of the indicator is that it includes measurements of recreational, artistic and cultural activities, as well as measurements that describe human rights and national security.

The indicators of the *Calvert-Henderson Quality of Life* are the following (Table 1):

Table 1: "Calvert-Henderson" indicators

Education Indicator: assesses quantity, quality and distribution of education in the United States.
Employment Indicator: describe the structure of employment in the United States, it helps to define what is meant by "employment" and "unemployment" and what fluctuations in these over time determine.
Energy Indicator: describe how much energy is consumed in the United States and in what way. It also gives advice on what can be done to reduce the environmental impact of energy consumption.
Environment Indicator: provides detailed information on the state of the environment with particular attention to the production-consumption process.
Health Indicator: debates what is meant by "health" and examines the general health of Americans on the basis of their age, their gender and ethnic background.

[33] Information on the *Calvert-Henderson Quality of Life Indicators* is available from the website, http://ethicalmarketsqualityoflife.com, specifically created for dissemination purposes.

Human Rights Indicator: analyses the extent to which the *Bill of Rights* protects American citizens and the level of citizen participation in the electoral process.
Income Indicator: concentrates on the changes in living standards that also have a monetary impact. The indicator analyses and explains the trends, the level and the distribution of family income and wealth, considering the stagnant wages and their unequal growth over the last 25 years.
Infrastructure Indicator: explains the vital role that physical infrastructure plays in the economy and provides an example of how national accounting systems should monitor the physical capital of an economy.
National Security Indicator: explains the state of national military security.
Public Safety Indicator: analyses how society promotes public and private safety.
Recreation Indicator: offers a new approach to identifying the different ways in which Americans spend their free time and choose their recreational activities.
Housing Indicator: examines the kind of housing that Americans live in and the accessibility to housing that they have.

4.2.2. *CANADIAN INDEX OF WELL-BEING*

The Canadian Index of Well-being (CIW) is an aggregate index which measures the levels of well-being and its changes over time. The first CIW Report was published in 2011.

The CIW includes 8 domains, each one is based on 8 variables. Four main criteria were used to select the indicators (Michalos et al., 2011). The first criteria is validity, i.e. the measure by which the indicator is directly correlated to well-being. The second criteria is quality: an indicator should be obtained from reliable sources and improve the understanding of a concept. The third criteria is reliability, relating to the consistency in the measurement of the indicator over time. The fourth criteria is feasibility, i.e. data should be easily accessible.

The domains of the *Canadian Index of Well-being* are listed on Table 2:

Table 2: Domains of the "Canadian Index of Well-being"

Living Standards
Healthy Populations
Community Vitality
Democratic Engagement
Leisure and Culture
Time Use
Education
Environment

The timeframe considered for each domain is 1994-2008 and 100 is established as the baseline value in 1994 for each indicator, this changes year on year depending on the positive or negative percentage variations of the indicator.

The next step is to calculate for each year a composite score by calculating the mean value of the eight indicators for that year for each of the domains:

$$\mu_{i,j} = \left(\frac{\sum x_{k,j}}{8}\right)$$

Where:

- $\mu_{i,j}$ is the score of the i*th* domain in the jth year
- $x_{k,j}$ è is the value of each kth indicator in the jth year

These scores are used to calculate the *Canadian Index of Well-being*, mean average of the scores obtained for each of the eight domains in each year:

$$CIW_j = \left(\frac{\sum \mu_{i,j}}{8}\right)$$

Where:

- CIW_j is the *Canadian Index of Well-being* for the jth year.
- $\mu_{i,j}$ is the score of the ith domain in the jth year.

These values are then collated and compared with particular values of GDP per capita, similarly obtained by establishing 100 as the baseline value in 1994. From this comparison it is clear that the increase in GDP values in the period 1994-2008, equal to 31% was not supported by a comparable increase in the CIW index which grew only by 11% in the corresponding period (Michalos et al., 2011).

4.2.3. EUROPEAN SYSTEM OF SOCIAL INDICATORS

The *European System of Social Indicators* (ESSI), developed by the Social Indicators Research Centre, consists of a set of indicators used to monitor and analyse both individual well-being and social welfare of European citizens, in terms of life quality, social cohesion, sustainability and structural change in European societies.

The analysis of well-being through the European System of Social Indicators depends upon certain requirements being fulfilled:

- the use of a scientific approach in selecting the dimensions and indicators;
- the total coverage of all the domains and dimensions of well-being. This is true also for those dimensions that relate to social change;
- the coverage of the “European dimension”, for example by using measures of European identity or measures which express cohesion and/or conflict between Member States of the European Union;

- the search for and use of valid and reliable indicators;
- the use of the EWIt data sources available to guarantee the highest level of international and intercultural comparability of the indicators.

The starting point was to monitor individual and social well-being in Europe. From here, three key concepts were considered:

- Quality of Life;
- Social Cohesion;
- Sustainability.

It is around these concepts that the structure of the set was built. Whilst the concept of Quality of Life includes the dimensions of individual well-being, the notions of Social Cohesion and Sustainability are used to collate the main characteristics and dimensions of collective well-being.

From each of the three key concepts, two further dimensions, also known as goal dimensions, were developed: Quality of Life includes both "objective living conditions" and "subjective living conditions", the two main dimensions of individual well-being. The goal dimensions of Social Cohesion are the "forces that influence social connections", on the one hand inequalities, disparities and social exclusion mechanisms, on the other social inclusion, relationships and social capital development. The concept of sustainability includes "Natural Capital" and "Human Capital" as its two main dimensions (Berger-Schmitt, 2001).

It is from this conceptual framework that the 13 domains are developed (Table 3):

Table 3: "European System of Social Indicators" domains

Population, Households, Family
Income, Standard of Living and Consumption Patterns
Education and Vocational Training
Health
Housing
Social Security
Crime and Public Safety
Social and Political Participation and Integration
Transport and Mobility
Leisure, Media and Culture
Environment
Labour Market and Working Conditions
Total Life Situation

4.2.4. *INDEX OF INDIVIDUAL LIVING CONDITIONS*

The *Index of Individual Living Conditions* (IILC), also developed by the Social Indicators Research Centre, is based on the complex set of indicators of the *European System of Social Indicators*, of which it is an integral part.

The aim of the index is to summarise and simplify the information provided by the ESSI, taking into account the different dimensions to obtain a measurement of living conditions. It is calculated as the average of the scores of seven subindices, relating to different domains of well-being (Table 4):

Table 4: "Index of Individual Living Condition" domains

DOMAINS	VARIABLES
Income/ Standard of Living	Net income per family as a percentage of the median income
	Affordability of: keeping the house adequately warm; annual holiday trip; new clothes; meat consumption once every two days
	Possession of durable goods: car; colour TV; dishwasher; telephone.
	Ability in making ends meet
Housing	Rooms per person
	Availability of WC and bath
	State of repair: leaking roof; damp floor and walls; damp in window frames and from the floor.
Housing Area	Noise from neighbours or outside
	Pollution, crime or other problems caused by traffic and industry
	Crime or vandalism in the area
Education	Education level
Health	Self-perceived health
	Chronic health problems
	Limitations to daily activities from health problems
Social Relations	Family size
	Membership in clubs and organisations
	Frequency in meeting relatives and friends
Work	Job, job seeking, reasons for not looking for work

Each indicator receives a score between 1 and 5 on the basis of its value[34]. The score of the subindex is then calculated as an average of the scores obtained by its indicators.

$$\mu_i = \left(\frac{\sum x_{i,j}}{k} \right)$$

Where:

[34] The details of the index and the assigned scores are available in the following document http://www.gesis.org/fileadmin/upload/dienstleistung/daten/soz_indikatoren/eusi/Doku_Index_Constr.pdf

- μ_i: is the score of ith domain;
- x_j: is the value attributed to each jth indicator of the ith domain;
- k: is the number of indicators per domain.

The IILC is the average of the scores of the single domains, and it is calculated for all the Member States of the European Union:

$$IILC = \left(\frac{\sum \mu_i}{7}\right)$$

4.2.5. *LEGATUM PROSPERITY INDEX*

The *Legatum Propserity Index* (LPI) was developed by the *Legatum Institute*[35] and it is calculated for 142 countries. The results and values relating to the index have been published annually since 2009. The index considers 8 domains of well-being (Table 5) for a total of 89 indicators (Legatum Institute, 2013).

Table 5: "Legatum Prosperity Index" domains

Economy
Entrepreneurship and Opportunity
Governance
Education
Health
Safety and Security
Personal Freedom
Social capital

These 89 indicators are the result of a careful selection amongst 200 variables, chosen according to the following criteria:

- at least 80% of the countries should have data available for the variable;
- the variables should have a significant effect on the income or well-being (measured as a regression on the variables such as GDP per capita or life expectancy).

In order to develop the indicator, the variables must be standardised:

$$X_{i=}\frac{x_i - \mu}{\sigma}$$

[35] Legatum is an investment firm, based in Dubai. The activities of Legatum are carried out through five divisions: Legatum; Legatum *Capital*; Legatum Ventures, *Legatum Institute*, the Legatum Centre for development and entrepreneurship at MIT (LCDE) and the Legatum Foundation. The Legatum Institure, publisher of the index is a thinktank established in 2007 and based in Mayfair, London.

Subsequently the weights assigned to the standardised variables are calculated as a regression, whilst the variables that within each domain had a correlation of 40% or more are aggregated through factor analysis.

The score assigned to each domain is then calculated by adding the values of the standardised indicators of each country, multiplied by the weights attributed.

$$Score\ Dimension = X_i * W_i$$

Finally, the value of the global index is determined by summing the scores for each domain.

$$LPI = \sum Score\ Dimension$$

4.2.6. *MEASURES OF AUSTRALIA'S PROGRESS*

Measures of Australia's Progress (MAP) is a Report that has been published annually since 2002 by the Australian Bureau of Statistics. It provides a set of statistic indicators to understand the progress of Australian society. The Report (ABS, 2013) identifies 4 macro-domains, each one including various sub-domains. For 2013, the themes included were (Table 6) :

Table 6: "Measures of Australia's Progress" domains

MACRO-DOMAINS	**SUB-DOMAINS**
Society	Health
	Close Relationship
	Home
	Safety
	Learning and Knowledge
	Community Connections and Diversity
	A fair go
	Enriched Lives
Economy	Opportunity
	Job
	Prosperity
	A resilient Economy
	Enhancing Living Standards
	Fair outcomes
	International Economic Engagement
Environment	Healthy natural environment
	Appreciating the environment
	Protecting the environment
	Sustaining the environment
	Healthy built environment
	Working together for a healthy environment
Governance	Trust
	Effective governance
	Participation
	Informed Public Debate

	People's Rights and Responsibilities

4.2.7. *SOCIAL PROGRESS INDEX*

The *Social Progress Index* is a composite index, developed by the *Social Progress Imperative*[36]*.* It analyses the measure by which countries satisfy the social and environmental needs of their citizens, comparing the different aspects of social progress between 50 countries. The first Report was published in 2013.

The index condenses much of the research developed that goes beyond GDP measurement and includes contributions from fields such as sociology, economics, history and political sciences (Porter et al., 2013), in particular Sen's work on *capabilities* and other more recent contributions which have highlighted the role played by Institutions in determining economic and social performance.

The model underlying the index, is based on the following definition of social progress: "Social progress is defined as the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential" (Porter et al., 2013). This general definition can be broken down into three dimensions of social progress that define the basic framework of the model. Each dimension includes 4 components, for a grand total of 52 indicators, exclusively non economic indicators (table 7).

Table 7: "Social Progress Index" dimensions

DIMENSIONS	**COMPONENTS**
Basic Human Needs	Nutrition and Basic Medical Care
	Air, Water and Sanitation
	Shelter
	Personal Safety
Foundations of well-being	Access to Basic Knowledge
	Access to Information and Communications
	Health and Wellness
	Ecosystem Sustainability
Opportunity	Personal Rights
	Access to Higher Education
	Personal Freedom and Choice
	Equity and Inclusion

The aggregation of variables is achieved through factor analysis; this choice was driven by the quality and quantity of the data available on social progress. The index is the result of a weighted average of the scores of the 3 dimensions, which in turn are the result of the weighted

[36] Social Progress Imperative is a nonprofit US organisation, whose aim is to improve the lives of people all over the world, in particular those who are least well off by helping the government, the private sector and the nonprofit sector to collaborate more effectively and make better use of the available resources to solve pressing social and environmental problems.

average of the scores attributed to their components.

The factor analysis is carried out for each component by using the values of the standardised data. Subsequently, in order to guarantee comparability between the results, the scores are adjusted so that each component has an average of 50 and a standard deviation of 12,5:

$$Component = \frac{100}{8}((\sum w_i * indicator_i) + 4)$$

Where:

- w_i: is the ith weight as determined through factor analysis.

This adjustment ensures that no component has a value of less than 0 and above 100. For each of the three dimensions, the score is calculated as a non-weighted average of the scores of the components. These values are then used to calculate the global index:

$$SPI = \frac{1}{3} \sum_{Dimensions} (\frac{1}{4} \sum_{k \epsilon Dimensions} Component_k)$$

The *Social Progress Index* has a range of between 0 and 100. On a sample of 50 countries, the lowest score was observed was 32,13 (Sweden) and the highest was 64,81 (Ethiopia).

4.2.8. SUSTAINABLE *SOCIETY INDEX*

The *Sustainable Society Index* (SSI) calculates the level of sustainability for each of the 151 countries analysed. It considers three domains of well-being: Human Well-being, Environmental Well-being and Economic Well-being.

It was developed by the *Sustainable Society Foundation*[37] to provide public opinion, politicians and institutions with a tool to measure the level of sustainability of a society. The indicator is used to monitor the progress of a country towards sustainability, to establish priorities relating to sustainability, to compare progress between countries and for further research and development.

It is based on the *Brundtland*[38] definition and is formed by 21 indicators, aggregated into 8 categories (Table 8). These categories are attributed to the 3 dimensions of well-being, that determine the general index (Van de Kerk and Manuel, 2012).

[37] The Sustainable Society Foundation (SSF) was established in 2006 as a private initiative of Geurt van de Kerk and Arthur Manuel, with the objective of stimulating and assisting societies in their development towards sustainability.

[38] The Brundtland report (also known as "*Our Common Future*") is a document issued in 1987 by the World Commission on Environment and Development. It is the first document that introduces the concept of sustainable development. The term was coined by the coordinator at the time, Gro Harlem Brundtland, who was Chairman of the WCED for that year and who had commissioned the report. Her definition was the following: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

Table 8: "Sustainable Society Index" dimensions

DIMENSIONS OF WELL-BEING	CATEGORIES	INDICATORS
Human Well-being	Basic Needs	Sufficient Food
		Sufficient to Drink
		Safe Sanitation
	Health	Healthy Life
		Clean Air
		Clean Water
	Personal and Social Development	Education
		Gender Equality
		Income Distribution
		Good Governance
Environmental Well-being	Nature and Environment	Air Quality
		Biodiversity
	Natural Resources	Renewable Water Resources
		Consumption
	Climate and Energy	Renewable Energy
		Greenhouse Gas
Economic Well-being	Transition	Organic Farming
		Genuine Savings
	Economy	Gross Domestic Product
		Employment
		Public Debt

In the aggregation process, equal weight is given to all the variables. Furthermore, aggregation is carried out both for the 8 categories and for the 3 dimensions of well-being in order to determine the composite index.

The method used by the 2012 Report to aggregate is the geometric average; whilst up to the 2010 Report the arithmetic average was used. However the latter allows for compensation: lower scores for one indicator can be compensated by higher scores for another indicator. However, as sustainability, in its strictest sense, does not allow compensation a better method of aggregation is the geometric average, which suppresses this compensation (Van de Kerk e Manuel, 2012).[39].

The value of the indicator for each of the 8 categories can be obtained as follows:

$$\mu_j = \sqrt[n]{\prod_{k=1}^{n} F(x)_k}$$

Where:

- μ_j : is the value of the j-th category;
- $F(x)_k$: is the *k-th* score calculated for each of the 21 indicators;
- n: is the number of indicators in each category.

[39] What is aggregated is not the value of the indicator, but a score, herein referred to as F(x), derived from it. (SSF, 2012).

The value attributed to each of the 3 dimensions of well-being is determined in the same manner:

$$M_i = \sqrt[z]{\prod_{j=1}^{z} \mu_j}$$

Where:

- M_i : is the value of the i-th dimension of well-being;
- μ_j : is the value of the j-th category.

Once the values of the three dimensions of well-being have been identified through their geometric average, the value of the *Sustainable Society Index* is determined:

$$SSI = \sqrt[3]{\prod M_i}$$

4.2.9. *WORLD HAPPINESS INDEX*

The *World Happiness Index* (WHI) is an index developed by Pierre Le Roy, founder of *GLOBECO*[40]. The aim of the WHI is to provide an alternative description of GDP and of the state in which people in a globalised world live. It is calculated both at a worldwide and at a national level to classify countries(Globeco, 2013). In order to calculate the global index four dimensions are considered, each including 10 indicators (Table 9).

Table 9: "World Happiness Index" dimensions

Peace and Security
1) Number of nuclear warheads, 2) Military expense, 3) Number of victims in armed conflicts, 4) Number of blue helmets, 5) Corruption, 6) Number of violent death victims, 7) Number of refugees, 8) Number of victims from natural or technological catastrophes, 9) Economic and financial security, 10) Adult mortality rate
Freedom, democracy and human rights
1) Number of people who live "in freedom", 2) Average level of freedom, 3) Freedom of the press, 4) Death penalty rate, 5) Number of women in Parliament, 6) Female participation in education (primary and secondary school), 7) Infant mortality rate (age 0-5), 8) Primary school enrolment, 9) Secondary school enrolment, 10) Unemployment rate
Quality of Life

[40] *Globeco* is a French journal, established in 1996 by Pierre Le Roy, which deals mainly with globalization and internationalisation issues.

1) Income per capita, 2) Disparities in income per capita, 3) Life expectancy at birth , 4) Disparities in life expectancy at birth, 5) Gini Index, 6) Suicide rate, 7) CO_2 emissions, 8) Access to water and improved sanitation, 9) Proportion of land area covered by forest, 10) Air pollution
Research, development, information, communication, culture
1) and 2) Research and Development, 3) and 4) Female and male, primary, secondary, tertiary education rate, 5) Primary school enrolment in poor countries, 6) Disparities in school enrolment, 7) Number of daily newspapers, 8) Internet, 9) Number of films, 10) Number of holiday trips abroad.

For each indicator the base value is established at 100 for 2000, and it varies year on year following percentage increases or decreases (in the 2013 Report the final value is for the year 2011). Subsequently an average of the 10 indicators for each dimension is calculated with the values attributed for the year under consideration. With this method, a score for each dimension is determined.

$$\mu_i = \left(\frac{\sum x_k}{10}\right)$$

Where:

- μ_i is the score for the i-*th* dimension (with 2011 data);
- x_k is the value for each *k-th*.

To determine the WHI, an average of the values obtained for the dimensions is calculated.

$$WHI = \left(\frac{\sum \mu_i}{4}\right)$$

Where:

- μ_i is the score for the *i-th* dimension.

By comparing the result with GDP, it emerges that GDP has grown 5 times as fast as the WHI in the period examined. The increase in GDP in the period 2000-2011 was 49%, the increase in the WHI in the same period was 9% (Globeco, 2013).

The WHI is also calculated at a national level (in particular for 60 countries, representing 90% of world population) for classification purposes. In this case, for each dimension, 5 indicators are considered (or similar indicators depending on the availability of data) and classification is based on the calculation of the score for each country for each of the 5 indicators, using 100 as basis value for the starting year. The score is calculated for each dimension with the Borda Count Method. These scores, and the same method, are then used to achieve global classification of the countries (Table 10).

Table 10: “World Happiness Index” dimensions for countries

Peace and security
1) Armed conflicts, 2) Number of violent death victims, 3) Corruption, 4) Economic and financial security, 5) Internal security.
Freedom, democracy and human rights
1) Democracy, 2) Freedom of the press, 3) Women’s rights, 4) Children’s rights, 5) Death penalty
Quality of life
1) Income per capita, 2) GINI index, 3) Life expectancy at birth 4) Suicide rate, 5) Air pollution
Research, development, information, communication, culture
1) Research and development, 2) e 3) Education, 4) Daily newspapers, 5) Internet use

4.2.10. BES - EQUITABLE AND SUSTAINABLE WELL-BEING IN ITALY

The Benessere Equo e Sostenibile (BES - Equitable and Sustainable Well-being) is a set of indicators developed in 2010 as a joint initiative by CNEL (the National Council for Economy and Work) and ISTAT (the National Institute of Statistics). The aim was to create a common framework to measure the progress and well-being of Italian society on the basis of a multidimensional approach which combined GDP with other indicators, such as economic sustainability, social and environmental ones[41].

The BES project is based largely on the OECD *framework*[42] and on the conclusions reached by the *Stiglitz-Sen-Fitoussi* Commission (CNEL-ISTAT, 2012). The first Report, “BES 2013. Equitable and Sustainable Well-being in Italy” was published in March 2013.

One of the aims of the BES is to provide a measure of sustainability by identifying indicators that show the dynamics and future trends in current well-being levels.

Appropriate statistical indicators are also used to measure equity. In this respect it was quite a challenge as this aspect is often subject to less scrutiny and research even at an international level; the concept of equity is relative as inequality is conditioned by context, on the basis of which one determines what is worthy of measurement; like sustainability, equity can be determined in relation to wealth, income, society and between current and future generations (CNEL-ISTAT, 2012).

The choice of dimensions was determined bearing in mind that the aim was not to provide an exhaustive monitoring of each domain but to measure those aspects that contribute more significantly to the measurement of individual and social well-being.

[41] The indicators from the financial newspapers “Il Sole 24 Ore” (mid 1980s) and “Italia Oggi” (end of the 1990s), as well as the research undertaken by Grasso (2002) and the more recent Quars indicator by Sbilanciamoci (2012) have all lead to the development of the BES.

[42] This document is of paramount importance in the discussion surrounding the measurement of well-being and progress. One of the OECD’s tasks is to promote the sharing of information between countries. Published in 2010, the document establishes the conceptual background for the measurement of the progress of society. See Hall et al. (2010).

The Equitable and Sustainable Well-being is based on the analysis of a number of indicators, disaggregated both at a geographical and social group level in order to determine the existence and distribution of significant inequalities. Most of the indicators selected can be disaggregated up to a regional level. The BES takes into consideration both objective indicators and subjective ones, that gather the perceptions and opinions of citizens; these allow to gather complementary information on aspects and events that shape well-being and that could not otherwise be obtained. However, some particularly crucial indicators, such as the indicator on average wealth per capita, have been selected to close the information gap despite not being available at a regional level (CNEL-ISTAT, 2012; 2013).

Hereinafter are listed the 12 dimensions, for a total of 128 indicators selected by the CNEL-ISTAT Committee:

Table 11: dimensions "Benessere Equo e Sostenibile"

Health
Education and training
Work and life balance e conciliazione dei tempi di vita
Economic well-being
Social relations
Politics and Institutions
Safety
Subjective well-being
Paesaggio e patrimonio culturale
Environment
Research and Innovation
Quality of services

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CHAPTER 2

A synthetic index for Well-Being in the European Union

Abstract

For many years, the quantification and measurement of level of well-being in a society has become an object of study by researchers, economists, international organizations and institutions. The purpose of these researches and applications is mainly the collection of data as accurate and complete as possible, dictating the paths of economic and social development policies, in order to help the economic problem of allocating scarce resources within a community, where not all individual needs can be fully met. The present work is intended as a part of that field. It will undertake the construction of a composite index of multidimensional well-being, through an aggregation of data, able to balance the trade-off between immediacy and completeness of information and to trespass the limits that characterize the commonly used income related measures. The method of factor analysis, which aims at detecting a statistically sufficient number of variables, is used to represent most of the explained variance of the phenomenon. This analysis is applied to the reality of the European Union, characterized by deep transformation and cultural, economic and social inequalities.

1. INTRODUCTION

The analysis of quality of life and social well-being is considered one of the main issues of economic science in view of its important role in political, social and economic areas. The choice to evaluate well-being in the EU reflects the need to better understand a situation where, in recent years, the divide between income, access to services and growth prospects of the Northern countries and the Southern or ‘‘Mediterranean’’ ones is widening.

Indeed, politicians need precise information on how people live and how they perceive their lives in order to enhance economic integration and promote social cohesion. Possible disparities in well-being evidenced among nations, while having been for some time a matter of discussion in economic and political debate, are currently entering a phase in which their quantification is increasingly important (see for example: Grasso and Canova 2008; Somarriba and Pena 2009; Ivaldi and Testi 2011; Reig-Martìnez 2013).

In the majority of cases, the analysis has been based on indices such as GDP, income or similar, combined with certain indicators of economic equity (obtaining inequality indices and deprivation indices). However, social progress is no longer exclusively associated with higher living standard, as the qualitative dimension must also be taken into consideration. The concepts

of ‘‘quality of life’’ and ‘‘well-being’’ cannot be exclusively defined in terms of objective living conditions (income, house, etc.), and must also consider subjective aspects like the perception of the standard of living.

The main goal of this analysis is to provide an approach to measuring well-being in the European Union 27-Countries1 by creating a composite well-being index, the European Well-being Index (EWI), using the factorial analysis and adopting the social indicator approach. Such an aggregate indicator sets in the wake of well-known measures of socioeconomic well-being in the European Union, enlarging the number of variables included: indeed the EWI is conceptually structured to describe the European reality and to appreciate which policies in different countries can ensure best results. Factor analysis has been identified as a useful tool to select a set of variables that explain as much as possible of the phenomenon concerned. With this quantitative exercise, we rank all countries according to their EWI score, and display their strength and weakness concerning specific facets of the index.

The first part illustrates the theoretical structure, which EWI is built on. The second section illustrates how the index is constructed. The third section shows the results and the final section concludes.

2. THEORETICAL BASIS OF THE EUROPEAN WELL-BEING INDEX

To go beyond the mere income-related aspect of well-being, it is necessary to consider well-being as a multidimensional phenomenon involving all aspects of people’s lives. This multidimensionality makes the assessment of well-being more complex, because most of its dimensions are hard to identify and quantify and depend on subjective assessments. To deal with this problem, the ‘‘Social and Economic well-being indicators approach’’, inspired by Partha Dasgupta and already followed in literature (Grasso 2002; Distaso 2007; Grasso and Pareglio 2007) has been considered.

Dasgupta (2000) synthesizes the need of social well-being indicators in five purposes. The theoretical framework, outlined by Dasgupta, captures the various dimensions and provides support to the choice and implementation of public policies.

In this context, measures of well-being can take one of the following two forms: they can reflect the constituents of well-being, or, alternatively, the access people have to the determinants of well-being. Indices of health, welfare, freedom of choice are constituents. Indices, which reflect the availability of food, clothing, shelter, potable water, legal aid, education facilities, health care etc., could be considered as determinants of well-being. Changes in a suitable aggregate of either the constituents, or the determinants, can be made to serve as a

measure of changes in the well-being (Dasgupta 2000; Dasgupta et al. 1972; Dasgupta and Weale 1992).

The point is what kind of constituents and determinants are to be considered and how to use them together. The conceptual framework, which we refer to, is the following: participation in community life, satisfactory opportunity to choose and organize one's social life, development of capabilities and independency, and possibility to live in a respectful, healthy and safe environment, where the opportunities of future generations are preserved. This is a portrait of a good and healthy society (Maggino 2009b). This approach follows the new methodological perspectives in measuring progress and a policy view that looks at it in terms of good life, in which people feel good because the objective measurable conditions of lives deserve a positive evaluation (Michalos 2008). Such a comprehensive approach needs to integrate objective and subjective information (Diener and Suh 1997; Berger-Schmitt and Noll 2000; Dasgupta 2000; Goossens et al. 2007). In policy perspective, the need for subjective indicators arises during the assessment of policy results and the selection of policy objectives (Veenhoven 2002). The possibility to integrate objective and subjective information requires: (1) a precise definition of the two concepts; (2) an accurate clarification of the relationships between these components; (3) a methodological framework for integration (Maggino 2009b).

Sumner (1996) provides a distinction between objective and subjective definitions of well-being. It is based on the selection process of the criteria that are used to judge individuals' well-being. Objective definitions assume that the criteria can be set up without reference to the individuals' own preferences, interests, ideals, values, and attitudes; whereas in the subjective definitions they matter. However, according to more detailed definitions (Cummins et al. 1998; Maggino and Ruviglioni 2008), the distinction between objective and subjective components of quality of life appears even more clearly: Objective component at micro level (individual living conditions), referring to living conditions that can be taken back to widely accepted criteria and context indicators. Its specificity is defining and recognizing external references; Objective component at macro level, referring to economic, social, and health contexts—e.g. GDP per capita, literacy rates, life expectancy; Subjective component (subjective well-being), referring to the individual evaluation of one's life as a whole and/or in different specific contexts. It is assessed by individuals or groups' responses to questions about happiness, life satisfaction, utility, or benefit. Contrarily to the objective measures at micro level, no explicit standard is defined and no external reference can be established. As to the relationship between subjective and objective indicators, we have dealt: (1) with objective characteristics in terms of resources that people use to improve their lives and to pursue their life projects; (2) with subjective issues, instead, as evaluations of conditions of living. In this sense the terms ''objective'' and ''subjective'' should be respectively replaced with the terms ''descriptive'' and ''evaluative'' (Erikson 1993). Finally, we have elaborated the composite indicator of well-being. The

aggregating process allows to obtain not really an exhaustive description of reality, but rather an ‘‘indication’’, whose interpretation depends on the defined hierarchical design and applied methodology. The proposed composite indicator aims at describing synthetically a reality that is and remains complex (Maggino 2009b).

3. DATA

Data was collected from the European Union 27 countries (EU- 27), prior to the joining of Croatia, whose accession was ratified on July 1, 2013[43]. The decision to evaluate the well-being of the European Union stems from the need to understand in greater detail the situation within, as over the last years there has been an increasing divide in income, accessibility to services and growth prospects between the countries of the North and the countries of the South. What we are concerned with is first and foremost understanding what repercussions this divide has on the well-being of citizens, but also, from a different perspective, understanding specific issues, such as whether Germany, despite its rapid recovery and high levels of industrial production, has a satisfactory quality of life and whether the opposite is true for Italy and Spain.

In evaluating and studying multidimensional well-being, the European Union can be considered an ideal reality: it is formed of 27 nations all quite different, each with its own distinctive features and characteristics. This ensures that the indicator is a useful monitoring tool as it yields best results when the reality it is faced with is heterogeneous, highlighting those contexts which guarantee best outcomes. Not only do the countries of the European Union have very different health, educational and social services systems, they also have different cultural backgrounds which influence their judgement when faced with the same situation. An indicator like the one we are proposing can shed light on those elements that guarantee higher levels of well-being compared to others.

Data relating to the economic situation for the year 2012 of the 27 countries of the European Union are provided in Table 12.

[43] Although the inclusion of Croatia would have been interesting, the decision to exclude it was necessary for two reasons: first of all because our research started before Croatia officially joined the EU so a number of judgements and considerations had already been made; secondly, many databases used do not include Croatia in a number of their surveys.

Table 12: GDP and unemployment data. European Union, 2012

Country	Population January 1, 2013[1]	GDP 2012 at market prices (in millions of €)[1]	GDP 2012 per capita, PPP per inhabitant (€)[1]	GDP growth rate, average 2010-2012 (%)[2]	GDP growth expected 2014 (%, yoy)[3]	Unemployment rate[1]
European Union 27	502,965,165	12,923,838.20	25,600	1.3	2.6	10.5
Austria	8,451,860	307,003.8	33,300	1.86	1.6	4.3
Belgium	11,161,642	375,881.0	30,400	1.3	1.1	7.6
Bulgaria	7,284,552	39,667.7	12,100	1	1.5	12.3
Cyprus	865,878	17,720.2	23,300	-0.2	-3.9	11.9
Czech Republic	10,516,125	152,925.6	20,300	1.03	1.8	7
Denmark	5,602,628	245,252.0	32,100	0.73	1.7	7.5
Estonia	1,324,814	17,415.1	18,000	4.93	3	10.2
Finland	5,426,674	192,541.0	29,100	1.96	0.6	7.7
France	65,633,194	2,032,296.0	27,500	1.23	0.9	10.2
Germany	82,020,578	2,666,400.0	31,300	2.63	1.7	5.5
Greece	11,062,508	193,749.0	19,200	-6.13	0.6	24.3
Hungary	9,908,798	96,968.3	16,700	0.4	1.8	10.9
Ireland	4,591,087	163,938.3	33,200	0.5	1.7	14.7
Italy	59,685,227	1,567,010.0	25,200	-0.1	0.7	10.7
Latvia	2,023,825	22,256.9	14,700*	3.13	4.1	15
Lithuania	2,971,905	32,939.8	17,900	3.7	3.6	13.4
Luxembourg	537,039	42,899.2	67,000	4.5	1.8	5.1
Malta	421,364	6,829.5	22,100	1.83	1.9	6.4
Netherlands	16,779,575	599,338.0	32,800	0.53	0.2	5.3
Poland	38,533,299	381,204.1	16,800	3.46	2.5	10.1
Portugal	10,487,289	165,106.7	19,200	-0.96	0.8	15.9
Romania	20,057,458	131,747.0	12,600	0.6	2.1	7
Slovakia	5,410,836	71,096.0	19,100	3.2	2.1	14
Slovenia	2,058,821	35,318.6	20,900	-0.16	-1	8.9
Spain	46,704,308	1,029,002.0	24,400	-0.43	0.5	25
Sweden	9,555,893	407,714.0	32,700	3.6	2.8	8
United Kingdom	63,887,988	1,929,580.6	28,500	1.03	2.2	7.9

* = 2011 data Source: [1]Eurostat

[2] World Bank [3] European Commission

It is immediately apparent that Luxembourg is the country with the highest GDP per capita (67,000), nearly threefold the EU average (25,600) and over double compared to Germany's, which is considered the engine of Europe. It is also interesting to note the values of GDP per capita of the countries with a long-standing industrial tradition: Germany has the highest amount (31,300), whilst Italy has a significantly lower amount (25,200), in line with the European average but even with countries which are not considered very advanced such as Spain (24,400) and Cyprus (23,300); other countries with high values are France (27,500) and United Kingdom (28,500). Worthy of mention are also the Scandinavian countries with Sweden in top position (32,700), followed by Denmark (32,100) and Finland (29,100). High values are also registered for Austria (33,300), Netherlands (32,800) and Belgium (30,400), whilst the high value of Ireland (33,200) comes as a surprise, as it is included in the PIIGS, and has just recovered from a deep crisis. All the other countries are significantly below the EU average, such as Malta (22,100), Bulgaria (12,100) and Romania (12,600).

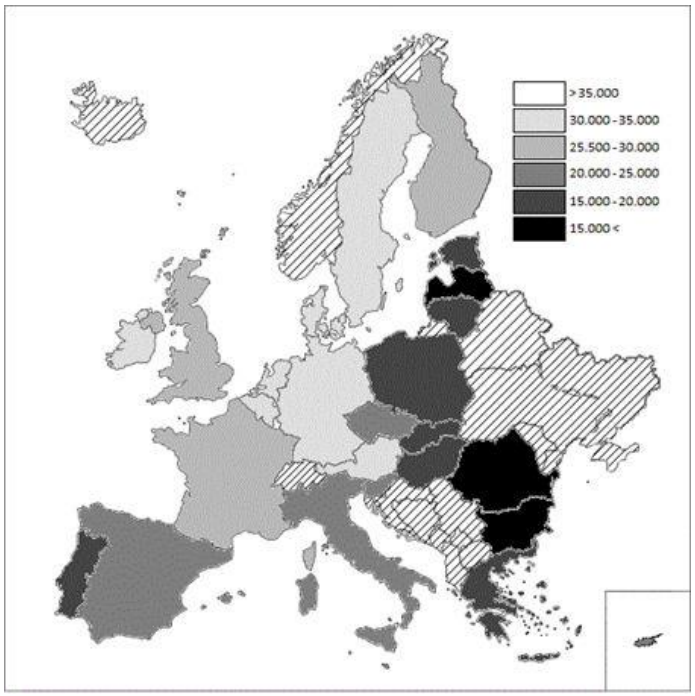

Figure 2: GDP per capita PPP, 2012

The classification of countries per GDP per capita more or less mirrors the classification of the countries based on unemployment rates. The highest rate is in Spain (25%) followed by Greece (24.3%), more than double the EU average (10.5%) and other countries such as Italy (10.7%) and France (10.2%), but also Bulgaria (12.3%), Estonia (10.2%) and Poland (10.1%). Higher than average EU unemployment rates are also recorded in Portugal (15.9%), Ireland (14.7%), Slovakia (14%) and Lithuania (13.4%), whilst significantly lower than average European rates are registered in United Kingdom (7.9%), Czech Republic (7%) and Romania (7%), as well as the Scandinavian countries, Sweden (8%), Finland (7.7%) e Denmark (7.5%). Finally, the lowest rates are in Germany (5.5%), Netherlands (5.3%), Luxembourg (5.1%) and Austria (4.3%).

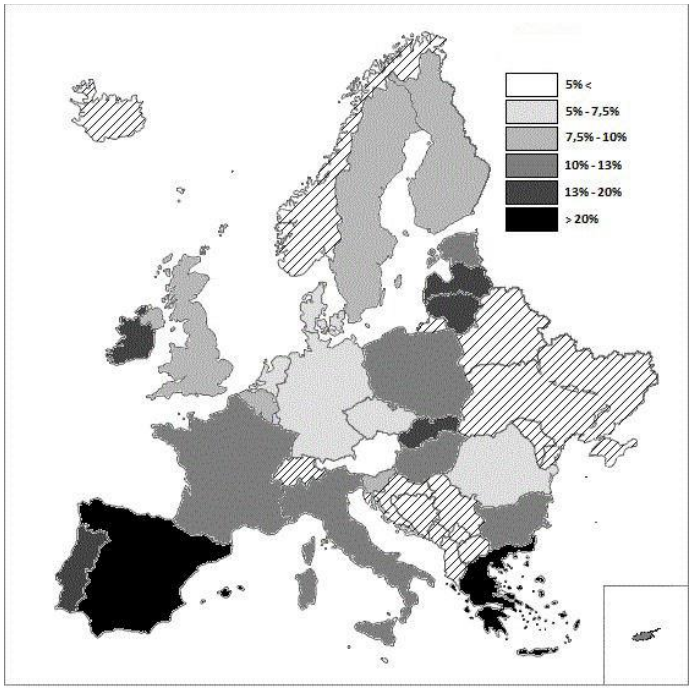

Figure 3: unemployment rate, 2012

From this brief outline a group of countries with significantly good data emerges, in particular Luxembourg, but also Austria, Germany, Netherlands and the Scandinavian countries. However, there are also countries with a good and stable situation (France, United Kingdom) and a group of countries which lag behind but show a tendency towards growth (Poland, the Baltic States and the Czech Republic). Finally, there is a group of countries which is significantly behind in terms of growth process (Bulgaria and Romania) and a group of countries including Italy, Spain and Cyprus which have average statistics but the growth prospects of which do not seem too rosy.

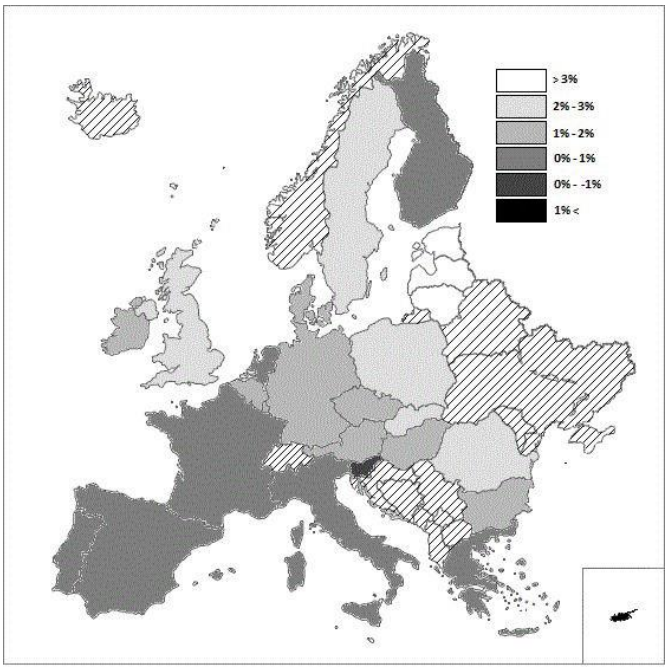

Figure 4: GDP growth expected for 2014

This is the picture that emerges from the observation of the main macroeconomic data; it is the EWI indicator which will provide information relating to the well-being levels in Europe and determine whether it is justifiable to talk about a two-speed Europe from all aspects, or whether this is a reasonable concept only in economic and monetary terms.

4. THEORETICAL FRAMEWORK AND METHODS

As pointed out by Michalos et al. (2010), one may distinguish three approaches to the development of indicators and indices of well-being. They are: Top-Down: constructing a conceptual framework of some sort describing one's understanding of well-being, including its constituents and determinants; Bottom-Up: exploring the great variety of available data that might be relevant to most people's understanding of well-being; Bi-Directional: constructing and exploring somewhat simultaneously. One might characterize the Top-Down approach as theoretical, the Bottom-Up approach as empirical and the Bi- Directional approach as pragmatic. We have decided to proceed in a pragmatic way with a Bi-Directional approach, following a consolidated methodology (Salzman 2003; Nardo et al. 2005; Maggino 2009a), which defines different stages in order to develop a composite indicator. Each stage requires specific decisions and choices about: 1. the analytical approach to verify the underlying dimensionality of selected elementary indicators (dimensional analysis); 2. the weights to define the importance of each elementary indicator to be aggregated (weighting criteria); 3. the aggregating technique to synthesize the elementary indicators values into composite indicators (aggregating-over-indicators techniques); 4. models and conceptual approaches to assess: a. the robustness of the synthetic index; b. the discriminant capacity of the index. Then we have primarily chosen a theoretical apparatus, which is the cornerstone of our indicator, as well as the dimensions to aggregate. The selection of variables has been carried out exploring the great deal of available data that might be relevant, in part through a careful analysis of the literature.

4.1. DIMENSIONAL ANALYSIS

The first decision is the choice of representative well-being dimensions. We decided to structure the EWI on the twelve dimensions proposed by the Benessere Equo e Sostenibile initial dashboard (CNEL-ISTAT 2012, 2013), that in the future will be jointly elaborated by the Italian National Institute of Statistics and the National Council of Economy and Labour to describe the Italian regional condition. This for two main reasons: first, it is
among the most recent experiences in the field, and takes into account all latest theoretical developments, including the recommendations of the Stiglitz-Sen-Fitoussi Commission (Stiglitz et

al. 2009). Secondly, the selected dimensions really cover the multidimensional nature of well-being: they are sufficiently different among themselves, fully describe the multidimensionality of the phenomenon and the risk of self correlation is avoided. The dimensions are listed below (Table 13):

Table 13: BES dimensions

Health
Education and Training
Work and life balance
Economic well-being
Social relationships
Politics and Institutions
Security
Subjective well-being
Landscape and Cultural heritage
Environment
Research and Innovation
Quality of services

With regard to ‘‘Health’’, ‘‘Work and Life balance’’, ‘‘Environment’’ (Zolotas 1981; Daly and Cobb 1989; Cun˜ado and de Gracia 2013) and ‘‘Economic well-being’’—although in this case studies show some attenuation of the correlation between this last concept and well-being (Easterlin 1974; Scitovsky 1976; Oswald 1997)—no doubt exists on their importance in relation to well-being; but some clarification is needed about other dimensions, well summarized by CNEL-ISTAT (2012).

Education and training. Education, training and skill level affect the well-being and open up opportunities otherwise precluded. Not only is education an intrinsic value, but it affects the well-being even directly. People highly educated live better, healthier and longer, and have more opportunities to find a job and to work in less risky environments. In addition, higher achievements in terms of education and training bring about conscious
access to cultural resources and creativity.

Social relationships. Relational networks represent important opportunities to pursue people’s own ends and widen their horizons. General interpersonal trust, high participation in associative networks and widespread presence of civic culture enhance both the individual and the social cohesion, enabling greater efficiency of public policies and lower transational cost.

Security. Personal safety is a foundational element of society and individual well-being. The most important impact of crime on well-being of people is the sense of vulnerability that it determines. The fear of being a victim of crime can affect personal freedom, quality of life and even territorial development.

Landscape and cultural heritage. The degree of conservation of landscape and artistic and monumental heritage is an intrinsic value and can make a territory a source of wealth for the community.

Research and innovation. Research and innovation are indirect determinant of wellbeing and the basis of social and economic progress.

Quality of services. We assume that, generally, public investment ameliorates the human environment where people live and work. Subjective well-being.

As we have seen above, the subjective indicators are useful complements to strictly objective indicators, as they allow us to assess the difference between what people report and what the objective indicators capture. We have considered appropriate to construct an index based on currently available data, coming directly from certified sources. They do not require ad hoc surveys, with the double result of avoiding the creation of additional costs and updating it easily and continuously (Jarman 1983; Gordon and Pantazis 1997; Ivaldi and Testi 2011). The analysis of the literature offers several ways to derive a priori which should be the most suitable variables to insert in the index (Berger-Schmitt and Noll 2000; Michalos et al. 2011; CNEL-ISTAT 2013; Porter et al. 2013), even if the choice is conditioned, of course, both by the availability of data and the purpose of the index itself. We have conduct a preliminary survey on the availability of data from Eurostat, WHO, OECD, European Commission and European Quality of Life Survey 2012. Once deleted the variables clearly incomplete or manifestly untrustworthy, we have ascertained that the data were comparable for all 27 countries. Indeed, we have not kept values of the same indicator from different sources in different countries. At this step we found insufficient harmonized data at European level for the domains ‘‘Landscape and Cultural heritage’’; for this reason we were compelled to eliminate that dimension from the Index. Thus, we have selected 162 variables, which should ensure sufficient completeness of information.

4.2. WEIGHTING CRITERIA

In the absence of dominance of one dimension over all others, some combination or aggregation is necessary in order to make well-being inter-individually comparable. The weighting of the relevant life domains is deemed a crucial, but very difficult issue by many authors. Therefore, we have opted for equal weighting. Equal weighting may result either from an ‘‘agnostic’’ attitude and a wish to reduce interference to a minimum, or from the lack of information about some kind of ‘‘consensus’’ view (Brandolini 2008). Decancq and Lugo (2013) identify equal weighting as the preferred and facilitating procedure, adopted in most of the applications. This happens mainly when: the theoretical scheme attaches to each indicator the same adequacy in defining the variable to measure; it does not allow hypotheses consistently derived on differential weightings; the statistical and empirical knowledge is not sufficient for defining weights; there is not agreement about the application of alternative procedures (Maggino 2009a). Indeed, although it would be desirable to assign different weights to the various factors considered, there are no reliable basis for doing this (Mayer and Jencks

1989) and in any case this does not mean no weighting, because equal weighting does imply an implicit judgment on the weights being equal (Nardo et al. 2005).

4.3. AGGREGATING-OVER-INDICATORS TECHNIQUE

One of the major problems of constructing quality of life synthetic measures is determining an appropriate aggregation method to incorporate multi-dimensional variables into an overall index. Clustering the items in a limited number of dimensions can simplify the interpretation of the information available in the list of variables, also highlighting any different pattern of the quality of life in different countries. In order to do so, different techniques may be implemented. We can group the items together according to the meaning of their underlying characteristics because of a priori criteria (for example all housing items together), or empirically, through data analysis. We have chosen the second way and carried out the study by the factor analysis.

Factor analysis is a statistical technique that aims at simplifying a complex data set by representing it in terms of a smaller number of underlying variables. This makes possible the study of the correlations between a large numbers of variables, grouping them around factors, so that they are arranged on factors highly correlated with each other (Dillon and Goldstein 1984). This methodology is attractive because of its flexibility: in fact, the only preliminary choice is the initial data set. Indeed, it allows explaining the variance of the phenomenon under scrutiny without requesting the estimation of parameters, which would compel to create a previous model. Such a method can summarise a set of sub-indicators while preserving the maximum possible proportion of the total variation in the original set. The largest factor loadings are assigned to the sub-indicators that have the largest variation across countries—a desirable property for cross-country comparisons, as sub-indicators that are similar across countries are of little interest and cannot possibly explain differences in performance (Nardo et al. 2005). Factorial analysis was initially developed by Pearson (1901) and Thurstone (1931; 1935; 1947). It satisfies two main objectives: 1) it provides an explanation for the correlation between observed variables in relation to a limited number of “non observable” factors; 2) it transforms the agglomerate of observations in a simple structure, which provides nearly as much information as was provided originally (Fabbris, 1997). Factorial analysis has not been used extensively in the study of well-being. It can be traced back to studies on deprivation (Nolan and Whelan, 1996; Ivaldi, 2006; Whelan et al., 2008; Soliani et al., 2011; Soliani et al., 2012), on the environment (European Commission, 2000; Esty et al., 2005) and on trade (Tarantola et al., 2002).

Given the bulk of data that we are seeking to analyse, factorial analysis can be a useful tool as it can reduce the number of factors required to explain a phenomenon, summarising the information included in a matrix of correlation or of variances-covariances to identify the dimensions which are latent and not directly observable (Stevens, 1986). If two variables have a strong correlation with

the same factor, a considerable amount of correlation between the variables can be explained by having this factor in common (Dillon e Goldstein, 1984). Therefore, by providing a means of identifying these common factors, factorial analysis guarantees a simple description of the complex network of interpolations, which exist within a set of associated variables (Carrol et al., 1953). This description allows for the definition of a limited number of independent components, which can be identified in the factors, within the correlation matrix: they explain as much as possible the variance between the variables included in the original information matrix. The interesting aspect of this method is its flexibility: the only preliminary choice is the initial set of data, which explains the variance of the phenomenon analysed without a need for the estimation of parameters, which would require the creation of a prior model.

4.4. ROBUSTNESS TEST

A strong point of this composite index of well-being lies in the fact that the factor analysis carried out on the entirety of the variables has made a skimming. Thus, it has been possible to consider only those variables that granted an amount of explained variance at least 70 % of each dimension. In this way, the variables making up the index convey a statistically significant portion of information provided by each of the eleven dimensions taken into account, i.e. of the overall well-being.

The index will be subsequently subjected to a test of robustness, through a sensitivity analysis, conducted by testing the general index subtracting in turn each of the eleven dimensions. Then the subtraction will cover two dimensions simultaneously. The index will be recalculate each time with this lacking part with factorial method and the results will be compared using the Spearman correlation coefficient

5. STRUCTURING[44] OF THE INDEX

5.1. SELECTION OF VARIABLES

Literature is divided on the different solutions to pre-determine which variables would be the most suitable to be included in an indicator, bearing in mind that the choice is conditioned by both the availability of data and the objectives of the indicator itself (Noble et al., 2003; Jarman, 1983, 1984; Carstairs and Morris 1991; Grasso 2002a; Whelan et al, 2010; Ivaldi and Di Gennaro, 2011). The choice of variables depends on several factors, although no rigorous and valid criteria seem to prevail. However, there is some common ground, as one of the main problems in the choice of

[44] SPSS Statistics 21.0 has been used for all calculations and tests.

variables to be included is the availability of data, which impacts on the choice and, therefore, on the composition of the indicator itself (Ivaldi, 2006).

In order to define the field of research, a preliminary analysis on the availability of data was undertaken, in particular data from the following sources: Eurostat, *WHO* (*World Health Organization*), OECD, *European Commission* and data available from the *European Quality of Life Survey 2012*, for all the countries analysed with reference to the latest available data. Once the variables, for which information was either incomplete or unreliable, were excluded, we ensured that the data was available for all 27 countries and that it was comparable, i.e. that each indicator was expressed in the same unit of measure for each national statistical survey, and that it was published by the same source for all countries. We avoided values for the same indicator provided by different sources in different countries (for example, the data on education was not sourced from ISTAT for Italy, from INSEE for France, etc.) in order to avoid the risk of having different criteria in the gathering and processing of data, which may have undermined results.

Both social objective indicators and subjective indicators were taken into consideration. A good indicator of well-being should include social and relational characteristics (such as trust and satisfaction) and measures of social and environmental sustainability as well as social objective indicators (Goossens et al., 2007). The use of subjective indicators allows for a more homogeneous evaluation as well as providing useful information. When considering the value of any objective variable there is no measure of how high or low values impact on two different countries which have a different culture and customs. What is considered unacceptable by one country, could be acceptable for another and vice versa. Subjective indicators can limit these kinds of issues: they provide a direct approach in the judgement on the quality of certain services or on the requirement for intervention, regardless of the objective values. Therefore, the combined use of objective and subjective indicators was deemed to give better results (Diener and Suh, 1997; Dasgupta, 2000).

Supported by some literature, sustainability issues were considered essential in order to reach optimal results: an entire dimension that could describe the environmental situation was identified and indicators which take into account economic and social sustainability were also included; finally, variables which describe inequality within each country were also identified, where possible.

Having concluded our analysis of literature, 162 variables for which information was almost complete, were chosen[45].

Our research showed that the availability of data on artistic and cultural heritage is not consistent across Europe. We, therefore, opted to exclude this dimension from the calculation of the indicator. Our results are shown in table 14:

[45] In order to use certain variables which expressed disadvantage rather than well-being the reciprocal of the value was taken into consideration.

Table 14: variables and sources EWI

DIMENSION	INDICATORS	SOURCE
HEALTH	Life expectancy	Eurostat
	Alcohol consumption	OECD
	Tobacco consumption	Special Eurobarometer
	People who perceive tensions	EQLS 2012
	People who are downhearted and/or depressed	EQLS 2012
	Deaths from transport accidents	Eurostat
	Deaths from HIV	Eurostat
	Deaths from cancer	Eurostat
	Deaths from diabetes	Eurostat
	Deaths from diseases of the nervous system	Eurostat
	Deaths from ischaemic heart diseases	Eurostat
	Deaths from chronical diseases	Eurostat
	Deaths from suicide	Eurostat
	Obesity rate	WHO
	Accidents at work	Eurostat
	Taking part in sports or physical activities	EQLS 2012
	Satisfaction with health	EQLS 2012
	Infant mortality rate	Eurostat
EDUCATION	Early leaving from education	Eurostat
	Access to cinemas, theatres and cultural centres	EQLS 2012
	Foreign language learning	Eurostat
	Young people not in employment, education or training	Eurostat
	Life-long learning	Eurostat
	Proficiency in language skills	OECD
	Proficiency in science subjects	OECD
	Proficiency in numeracy skills	OECD
	Individual's level of computer skills	Eurostat
	Individual's level of internet skills	Eurostat
	Secondary education	Eurostat
	Tertiary education	Eurostat
	Pre-primary education attendance	Eurostat
	People with low levels of education	Eurostat
	Satisfaction with education	EQLS 2012
WORK AND LIFE BALANCE	Employees able to take a day off for family reasons	EQLS 2012
	Employees with a fixed term contract	Eurostat
	Low-wage earners in relation to all employees	Eurostat
	Underemployed part-time workers	Eurostat
	Employees who work on Sundays	Eurostat
	Employees who work night-shifts	Eurostat
	Number of hours worked per week per part-time employee	Eurostat

	Number of hours worked per week per full-time employee	Eurostat
	People who have found it difficult to fulfill family responsibilities because of time spent on job	EQLS 2012
	Concern with finding a job of similar salary if present job is lost	EQLS 2012
	Satisfaction with time available to dedicate to work	EQLS 2012
	Satisfaction with present job	EQLS 2012
	Non-participation rate	Eurostat
	Employment rate	Eurostat
	Employment rate of older workers	Eurostat
	Time spent on own hobbies and interests	EQLS 2012
	Time spent on cooking and housework	EQLS 2012
ECONOMIC WELL-BEING	Lack of bath or shower	EQLS 2012
	Lack of indoor flushing toilet	EQLS 2012
	Inability to make ends meet	Eurostat
	Inequality of income distribution	Eurostat
	Lack of place to sit outside	EQLS 2012
	Share of persons who cannot afford a washing machine	Eurostat
	Share of persons who cannot afford a personal car	Eurostat
	Financial burden of the total housing cost	Eurostat
	Financial burden of the repayment of debts from hire purchases or loans	Eurostat
	Population in jobless households	Eurostat
	Possibility of having a meal with meat, chicken or fish every second day (if wanted)	EQLS 2012
	Possibility of keeping the home adequately warm	EQLS 2012
	Possibility of having a week's annual holiday away from home	EQLS 2012
	Real adjusted gross disposable income per capita	Eurostat
	Financial situation of the household compared with 12 months ago	EQLS 2012
	Expected financial situation for the next 12 months	EQLS 2012
	Satisfaction with accommodation	EQLS 2012
	Material deprivation rate	Eurostat
	At-risk-of-poverty rate	Eurostat
	At-risk-of-poverty rate for those employed	Eurostat
	Overcrowding rate	Eurostat
SOCIAL RELATIONSHIPS	General trust	EQLS 2012
	Share of persons who cannot afford a computer	Eurostat
	Share of persons who cannot afford a telephone	Eurostat
	Share of persons who cannot afford a colour TV	Eurostat
	Attendance at religious services apart from weddings, funerals, christenings	EQLS 2012

	Participating in social activities of a club, society or association	EQLS 2012
	People who do voluntary work	EQLS 2012
	People involved in caring for other children or those needing care	Eurostat
	People involved in caring for children or grandchildren	EQLS 2012
	People involved in caring for their elderly or disabled relatives	EQLS 2012
	People who feel left out of society	EQLS 2012
	People who feel lonely	EQLS 2012
	Possibility of limiting working hours to care for children	Eurostat
	Satisfaction with family life	EQLS 2012
	Social Exclusion Index	Eurostat
	Satisfaction with social life	EQLS 2012
POLICY AND INSTITUTIONS	Voter turnout at the last national elections	Eurostat
	Representation of women on boards of large listed companies	European Commission
	Trust in the local or municipal authorities	EQLS 2012
	Trust in the government	EQLS 2012
	Trust in the parliament	EQLS 2012
	Trust in the legal system	EQLS 2012
	Trust in the press	EQLS 2012
	Trust in the police	EQLS 2012
	Signed a petition (even by e-mail or online)	EQLS 2012
	Attended a protest or demonstration	EQLS 2012
	Attended a meeting of a trade union, political party or action group	EQLS 2012
	Percentage of women at a local political level	European Commission
	Percentage of women in the national government	European Commission
	Percentage of women in the national parliament	European Commission
	Contacted a politician or public official (other than routine contact through public services)	EQLS 2012
	Satisfaction with economic situation in the country	EQLS 2012
SECURITY	Police officers	Eurostat
	Aggressions	UN
	Drug-related crime	Eurostat
	Violent crimes	Eurostat
	Motor vehicle thefts	Eurostat
	Domestic burglaries	Eurostat
	Homicides	Eurostat
	Robberies	Eurostat
	Sexual assaults	UN
SUBJECTIVE WELL-BEING	Optimism about the future	EQLS 2012

	People who struggle to find their way in life	EQLS 2012
	People who feel that the value of what they do is not recognised by others	EQLS 2012
	People who believe they seldom have time to do things they really enjoy	EQLS 2012
	People who feel that what they do in life is worthwhile	EQLS 2012
	People who are frustrated by their work and financial situation	EQLS 2012
	People who feel generally happy	EQLS 2012
	People who feel free to decide how to live their life	EQLS 2012
	Satisfaction with present standard of living	EQLS 2012
	Stress due to difficulties in finding work – life balance	EQLS 2012
ENVIRONMENT	Woods damaged by defoliation	Eurostat
	Carbon dioxide emissions from new passenger cars	Eurostat
	Greenhouse gas emissions	Eurostat
	Sulphur dioxide emissions	Eurostat
	Energy from renewables	Eurostat
	Energy intensity of the economy	Eurostat
	Ecolabel licences	Eurostat
	EMAS registered organisations and sites	Eurostat
	Problems with air quality in the neighbourhood	EQLS 2012
	Problems with traffic congestion in the neighbourhood	EQLS 2012
	Waste generation by economic activities	Eurostat
	Water resources	Eurostat
	Noise from neighbours or from the street	Eurostat
	Sufficiency of sites designated under the EU Habitats Directive	Eurostat
RESEARCH AND INNOVATION	European high-tech patents	Eurostat
	High-tech exports	Eurostat
	Access to Internet	Eurostat
	Employment in high-tech sectors	Eurostat
	Employment in knowledge-intensive sectors	Eurostat
	Research and development personnel	Eurostat
	Public funding for research and development	Eurostat
	Human resources in science and technology	Eurostat
	Total number of researchers	Eurostat
	Turnover from innovation	Eurostat
QUALITY OF SERVICES	Access to postal services	EQLS 2012
	Access to public transport facilities	EQLS 2012
	Quality rating of child care services in the country	EQLS 2012
	Quality rating of long term care services in the country	EQLS 2012
	Quality rating of the social housing services in the country	EQLS 2012
	Quality rating of health services in the country	EQLS 2012

	Quality rating of public transport in the country	EQLS 2012
	Quality rating of the state pension system in the country	EQLS 2012
	Quality rating of the education system in the country	EQLS 2012
	Hospital beds	Eurostat
	Psychiatric care beds in hospitals	Eurostat
	Problems with litter or rubbish on the street	EQLS 2012
	Problems with quality of drinking water in the neighbourhood	EQLS 2012
	Quality of postal services	Eurostat
	Treatment of packaging waste rate	Eurostat
	Recycling rate for packaging waste	Eurostat

A factorial analysis has been implemented, in order to select the most significant ones. This has been done taking simultaneously into consideration three selection criteria:

- Kaiser criterion: on the basis of which it is necessary to retain all factors extracted which have an eigenvalue[46] greater than one because smaller values relate to factors which can explain less than what a single variable can explain;
- Explained variance criterion: in this case the basis for the selection is the cumulative explained variance. A level of explained variance of 65% - 70% is considered significant;
- *Scree test*: this method (Cattell, 1966) aims to give a graphical representation of the factors to be taken into consideration. The graph shows the value of the eigenvalue on the vertical axis and the number of eigenvalues on the horizontal axis. The eigenvalues are plotted as points connected by a single line. According to the Cattell method, the choice of factors should be limited to the point where there is a levelling in the slope of the line.

5.2. INDICATOR CALCULATION

The methodology chosen creates a well-being index through factorial analysis of the selected variables. In this case, the factorial scores, which represent the collocation of each observed variable in the representational space determined by the extracted factors, can be used as values of the index

The latent dimensions can be determined in several ways using different factor extraction techniques which factorial analysis makes use of. The most noteworthy and utilised of these are the analysis of principal components, the analysis of principal factors, classic factorial analysis. These are known as *Variance-oriented* (Kim e Mueller, 1978) for the characteristics of their algorithms.

[46] Each principal component extracted is associated with an eigenvalue, which expresses the proportion of variance that is reproduced by the component itself.

The classic factorial model is comprised of *q* common factors for all *p* variables with an additional specific factor for each variable. The aim is to transform the original matrix of variables in a matrix, which includes the highest number of factors possible, by excluding whatever is redundant in the variables. This method extracts $q<p$ common factors, i.e. a sufficient number to contain the information provided by the original *p* variables, by establishing a certain *V* variance in the variables and by considering only the first factors if the cumulative variance extracted from these is greater than *V.* The guiding principle of factorial analysis is to find a factorial solution where the correlation between the set of hypothetical factors and the set of variables is maximised.

The method starts from the premise of two sets of variables *Z* and *X*: the first includes a sequence of *p* observed variables, *X* includes *q* orthogonal unknown variables. The standardised transformed equations of the latter form the columns of the matrix of the factors to be determined.

However, in this work, a method of extraction[47] of the principal components was used to identify the latent dimension of factors. This method substitutes the original variables with a certain number of variables, obtained from a linear transformation of the original variables, thus reducing the number of variables required to describe a phenomenon. It is essentially a question of determining a series of transformed equations of the original matrix (namely, the principal components), which can explain as much as possible the variance of the original variables and which are orthogonal to each other. This occurs through a linear transformation of the variables, which projects the original variables on a new Cartesian system where the new variable with the greatest variance is projected on the first axis, whilst the new variable, which comes second in terms of variance, is projected on the second axis, and so on and so forth. Initially the coefficients of the first factor are determined in order to express the best linear combination possible between the variables, and, therefore, the percentage of variability explained. Subsequently, the coefficients of the second factor are determined to express the second best linear combination, on condition that the second component is orthogonal to the first. The remaining components are determined in the same manner until all the variance is exhausted. It is possible to extract as many components as there are original variables. However, when the aim is to reduce the quantitative description of a certain phenomenon, the result is all the more useful the less the number of components taken into consideration in applying the method. In general, the process is interrupted as soon as the part of variance of the *p* variables extracted from the first *q* components is sufficiently large (Stevens, 1986).

As the variables can become saturated in almost the same way by different factors, there is a problem with factor rotation. In order to interpret the factorial weights with greater ease, it is possible to carry out factorial axis rotations, which maintain the invariance of scale by simplifying the structure of the weights system. The axis rotation is a change in the position of the dimensions obtained during the extraction of factors phase, maintaining the variance explained of the initial dimensions

[47] It may be more appropriate to use the term *structuring* of factors, as these are not readily observable. However, extraction is the term most widely used both in theoretical literature, regardless of the epistemological attitudes of the authors, and in the instructions to the softwares dedicated to this technique (Albano, 2004).

as fixed as possible. It gains substance in the reduction of factorial weights, which were already relatively small in the first phase and in the increase, both positive and negative, of the values of the factorial weights which were prevalent in the first phase. Indeed, the matrix of saturations does not have a single solution and, through its mathematical transformation, it is possible to obtain an infinite number of matrices of the same order. It is for this reason that factors are transformed and analysed through an axis rotation procedure. In an unrotated solution, each variable is explained by two or more common factors, whilst in a rotated solution each variable is explained by a single common factor. Different methods are available for the rotations; they can be classified as orthogonal rotations, where the axis rotation is subject to the axes being perpendicular to each other, or as oblique rotations, where the constraint is partially or totally absent (Krzanowski e Marriott, 1995)

The availability of different factor rotation techniques makes the determination of factorial solution uncertain, as it is not possible to establish which of the rotations is the best in absolute terms; this is a consequence not only of the choice between orthogonal rotations and oblique rotations, but also within the two rotation techniques. The result is that different sets of factorial scores are equally plausible and that the choice between factorial solutions becomes arbitrary. Therefore, in factorial analysis uncertainty occurs at two levels: 1) in determining the solution that satisfies the statistical model; 2) in searching for a solution, which is of easier interpretation than the one obtained in the first instance (Guilford e Hoepfner, 1971). There has been considerable debate in literature on the subject (Morrison, 1976; Diday et al., 1994); nevertheless, having several mutually consistent interpretations regarding the search for information on the latent structure of the observed data, should be considered an advantage (Johnson e Wichern, 2002).

As the aim is to structure the indicator, it is essential to decide how to combine the selected indicators: to this end, a factorial analysis of the variables extracted previously was carried out, excluding those that did not satisfy the three selection criteria used (*scree plot*, eigenvalues and cumulated explained variance). In this way it was possible to use the factorial score as an index which represents the collocation of each country in the representational space identified by the extracted factor, which in turn encapsulates the information included in the partial indicators (Johnson, and Wichern 2002; Michelozzi et al. 1999; Hogan and Tchernis, 2004; Ivaldi and Testi, 2010; Ivaldi, 2013).

There are different ways to estimate[48] the factorial scores: the *Bartlett* method, the *Anderson-Rubin* method and the regression method. *Bartlett's* method is based on the ordinary least squares procedure and it minimizes the influence of the individual factors, which are used to explain the discrepancy between the observed scores and those obtained from the common factors. The *Anderson-Rubin* method calculates the factorial scores like *Bartlett's* method, with the additional constraint that the scores must be orthogonally placed (De Lillo et al., 2007). In this case, we have

[48] Whilst with the Principal Components Analysis scores can be calculated precisely as there is no random component, in the Factorial Analysis model, these can only be estimated.

opted for the regression method that allows us to estimate the score of the common factor as a linear combination of the original variables. The equation used to estimate the scores differs from a normal multiple regression, as it is not only the factorial scores, which are unknown, but also the dependent variable. The problem is estimating the weights, with the factorial scores being unknown, as these will be calculated subsequently. However, to obtain the weights, knowledge of the factorial scores is irrelevant; in this case the information included in the correlation between the manifest variables and the in the correlation between manifest variables and common factors (Albano e Molino, 2011).

The factorial scores' calculation used as a tool to build the indicator has been done for each of the eleven dimensions to obtain a set of sub-indicators, which are useful in evaluating the situation of the 27 countries for each of the different dimensions of well-being[49]. Finally, this calculation has been used to determine the indicator of global well-being using the dimensions calculated previously as the original variables[50].

6. RESULTS

In this section, through the set of indicators defined above, results will be assessed and compared. The scores have been reckoned and the rankings set up. The first three columns show the number of classes, nations and scores. Then the classes are to be defined. The literature suggests dividing the index distribution based on its parameters (Carstairs and Morris 1991), or on deciles of population. In our case, it seemed more appropriate the first method, which allows us to maintain the discriminatory features of the distribution (Carstairs 2000). Values ±(2/3) r, ±(4/3) r have been used as a cut-off for classes, together with 0, the mean value of the factor scores' distribution. The fifth and sixth columns represent the cumulative percentage of population within each class and within macro-groups with positive and negative scores (Table 15; Fig. 5).

Table 15: Factorial scores European Well-being Indicator

CLASSES	COUNTRIES	SCORES	% POP.	% CUMULATIVE	
1	Denmark	1.82268	1.11	7.43	63.69
	Sweden	1.70278	1.90		
	Finland	1.53211	1.08		
	The Netherlands	1.32714	3.34		
2	Austria	1.07076	1.68	18.09	
	Luxembourg	0.96055	0.11		

[49] A strong point of this composite index of well-being lies in the fact that the factor analysis carried out on the entirety of the variables has made a skimming. Thus it has been possible to consider only those variables that granted an amount of explained variance at least 70% of each dimension. In this way, the variables making up the index convey a statistically significant portion of information provided by each of the eleven dimensions taken into account, i. e. of the overall well-being.

[50] The index will be subsequently subjected to a test of robustness, through a sensitivity analysis, conducted by testing the general index subtracting in turn each of the eleven dimensions. Then the subtraction will cover two dimensions simultaneously. The index will be recalculated each time with this lacking part with factorial method and the results will be compared using the Spearman correlation coefficient.

	Germany	0.723	16.31		
3	United Kingdom	0.56207	12.70	38.17	
	Belgium	0.5328	2.22		
	Ireland	0.47355	0.91		
	France	0.43049	13.05		
	Spain	0.07518	9.29		
4	Slovenia	-0.14983	0.41	16.97	36.31
	Estonia	-0.16021	0.26		
	Malta	-0.21466	0.08		
	Portugal	-0.32037	2.09		
	Italy	-0.41646	11.87		
	Cyprus	-0.42227	0.17		
	Czech Republic	-0.51236	2.09		
5	Lithuania	-0.71924	0.59	11.70	
	Latvia	-0.77806	0.40		
	Slovakia	-0.85324	1.08		
	Hungary	-0.91475	1.97		
	Poland	-1.02575	7.66		
6	Greece	-1.36646	2.20	7.64	
	Romania	-1.64824	3.99		
	Bulgaria	-1.71119	1.45		

In Figure 5, classes are highlighted with decreasing colour gradient. The countries of the first class, Finland, Sweden, Denmark and the Netherlands, have reported high scores on almost all dimensions, positioning themselves in the first or second class in all of these. Sweden is the country that records the highest scores in ‘‘Health’’, ‘‘Economic Well-being’’, ‘‘Politics and Institutions’’. Finland emerges for ‘‘Education and Training’’ and ‘‘Research and Innovation’’; Denmark reports the highest scores in ‘‘Work and Life balance’’, ‘‘Social Relationships’’, ‘‘Subjective Well-being’’, ‘‘Environment’’ and ‘‘Quality of Services’’. The only exception is constituted by the dimension ‘‘Security’’, where data are those recorded by authorities, based on the number of complaints made, and the value is higher in Northern Europe. This could be explained by the different culture of legality that exists among Northern, Mediterranean and Eastern European countries; not, that is, to such a real condition of reduced safety, but rather to factors such as mistrust of authority, different perception of crime and greater acceptance and use of ‘‘private safety’’ phenomena in Mediterranean and Eastern Europe.

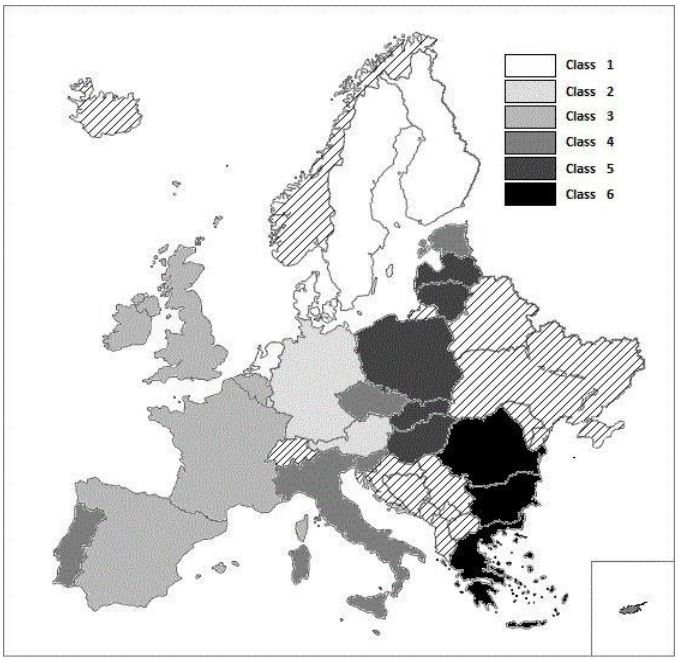

Figure 5: EWI Indicator classes

The result of the second class, which includes Austria, Luxembourg and Germany, reflects the satisfactory scores in all dimensions, except ‘‘Security’’, for which the above observations remain valid. Luxembourg has a good ranking, thanks to the results in ‘‘Economic well-being’’ and ‘‘Politics and Institutions’’. A partial gap is evident about the domain ‘‘Environment’’, where Austria shows a very high value, but Luxembourg and Germany record low scores; this can be justified, in the former case, by the small territorial size of Luxembourg and the lack of environmental guidelines and certifications, and, in the case of Germany, by the process of urbanization and industrialization, overall in its Eastern regions, where the current efforts in environmental protection, maybe, have not been rewarded yet by high positive values.

In the third class, there are three of the biggest European countries: France, the United Kingdom and Spain. They account for about 35 % of European population. Here we find articulated stratification and considerable complexity of the social structure, large migration phenomena, constant and widespread urbanization process and the consequences ofindustrialization, both in its last phase of sustained development (environmental depletion and massive exploitation of resources) and in the current slowdown (disadvantaged areas, deprivation and crime). This situation leads to a lacking distribution of well-being on all levels, due to the multiplicity of needs to meet, which make the choice of investment and allocation of resources difficult. France shows medium-high values in all dimensions, particularly regarding ‘‘Health’’, and the United Kingdom with regard to ‘‘Research and Innovation’’ and ‘‘Work and Life balance’’. Also the cases of Belgium and Ireland are interesting: the first one, apparently, has not been so heavily affected by the political deadlock experienced in recent years, bringing a fair result only in the domain ‘‘Politics and Institutions’’; this country also records high level of ‘‘Quality of Services’’. Ireland, within a framework of medium-high

values, soars in the domain ‘‘Environment’’. Finally, Spain, counted among the PIIGS, obtains a quite good result, mainly thanks to its environmental protection policies.

As regards the fourth class, we can consider two situations for many aspects opposite: Italy and Estonia. Italy is one of the founding countries of the European Union; Estonia is a relatively young nation, which only in recent years has managed to engender a serious development of market economy. Even within the same class, these two nations are examples of very different situations: Italy is in the midst of an economic and political crisis with long lasting problems of social fragmentation and political instability, and applies policies aimed primarily at reducing its huge public debt. Estonia, despite past decades of economic immobility, has been able to emerge focusing on education and research, setting goals not limited to the present, but projected on further development. The EWI has described this trend, assigning Estonia a better rank than Italy. Similar considerations can be made also for Slovenia and Czech Republic: in particular, the former reported values around the mean in various domains—and higher total score than Estonia, close to the nations with positive values. Finally, it should be noted, within the same class, the presence of Cyprus, Malta and Portugal.

In the last two classes are positioned countries characterized by economies that lag behind the others, but recently have begun a process of growth, helped by the ‘‘advantages of backwardness’’. Greece probably would get a better result if not for its recent troubles, while for the case of Romania and Bulgaria, also considering the benefits received from the particular score derived from dimension ‘‘Safety’’, lowest outcomes in nearly all domains have made their results hardly controvertible. A final overview shows that small portions of population live in countries with extreme values of well-being—very high or very low—: namely 7.43 % belongs to the countries of the first class and 7.64 % to the countries of the sixth class. The majority of population lies in classes close to the average scores, the most populous of which is the third, where live 38.17 %, while only 28.67 % belong to the fourth and fifth class. This describes a situation where the majority of the European population stays in countries placed in classes with positive scores (63.69 %), and only a lower proportion (36.31 %) in countries with negative scores. This is not to be considered entirely negative, because out of this 36.31 %, almost two-thirds (20.07 % of total) live in Eastern European countries that joined the EU only recently, and over time should improve their condition thanks to such a membership.

7. VALIDATION AND COMPARISONS

7.1. SENSITIVITY ANALYSIS

A sensitivity analysis was conducted to test the robustness. The procedure applied for the construction of the EWI was used without considering in turn each of well-being dimensions;

subsequently the same procedure was performed excluding dimensions in pairs. We obtained in this way factor global scores based on the scores of the dimensions— in the first case—and nine dimensions—when were subtracted in pairs. The results were compared with each other through the Spearman rank correlation coefficient. The test showed a high correlation between the indices thus constructed—the coefficient of Spearman lowest obtained was 0,987—making it possible to say that the verification of robustness was successful.

7.2. EWI AND HDI

We have also compared the EWI results with the GDP, the Human Development Index (HDI) and the Human Development Index adjusted for inequality (iHDI) through the Spearman rank correlation coefficient (Table 16 and Table 17). The EWI is correlated more with the gross domestic product, than with the HDI and the HDIi. The discrepancy between the EWI and the indicators developed in the human development report arises because the latter uses a reduced number of dimensions and indicators. Although the degree of identification of the component of well-being for these macro-indicators diverges from that obtained with an indicator created ad hoc, the EWI is consistent with the objective of the HDI and HDIi. Indeed, HDI and HDI provide a description of human development for all countries in the world, including those where the availability of data is scarce, so that any measurement similar to the one just described would be very difficult, or even impossible. On the other hand, the value of the Spearman coefficient between GDP and the EWI confirms that GDP per capita can be assumed as a reasonable approximation of well-being. Its value, however, suggests that this approximation is not complete and must be complemented by additional dimensions that income related indicators do not capture.

Table 16: *Sperman*'s *Rho* coefficient EWI, HDI and HDIi

Correlation

			HDI	HDIi	EWI
Spearman's Rho	HDI	Correlation coefficient	1.000	.937**	.842**
		Sig. (2-code)	.	.000	.000
		N	27	27	27
	HDIi	Correlation coefficient	.937**	1.000	.846**
		Sig. (2-code)	.000	.	.000
		N	27	27	27
	EWI	Correlation coefficient	**.842****	**.846****	1.000
		Sig. (2-code)	.000	.000	.
		N	27	27	27

Table 17: *Spearman*'s *Rho* coefficient EWI and GDP

Correlation

		GDP per capita	EWI
Spearman's Rho	Correlation coefficient	1.000	.897**
	Sig. (2-code)	.	.000

GDP	N	27	27
ıcapita	Correlation coefficient	.897**	1.000
EWI	Sig. (2-code)	.000	.
	N	27	27

8. CONCLUSIONS

The quantitative exercise carried out here is the representation of a phenomenon, extrapolated from a set of proxies and elaborated through statistical tools. Even a large number of data can ensure just a fair approximation and its statistical synthesis inevitably leads to further loss of information. However, the measurement of well-being based only on economic parameters can be misleading and the addition of social indicators, always keeping in mind the due caveats, can be a way to overcome this obstacle. Intertemporal analysis, currently impossible due to the lack of data, would demand a different, properly designed methodology. In this case, a specific study with time spans of about 5 years should provide useful information. However, we can note that even the simple updating of the indices with homogeneous data, that is the comparison between the year by year ‘‘photos’’ taken with our methodology, would make sense and offer interesting hints to whom interested in the short term, like policymakers usually are.

Besides the limits already underscored, we must remember that an index of this type offers a description of the national reality as a whole, not focusing on the important regional differences that distinguish each country. If one did the same exercise at NUTS 2 or NUTS 1 level, he/she might observe that the levels of well-being in Northern Italy regions could reach those of several territories in Central and Northern Europe, while Southern Italy would have an utterly different score. Reverse speech may cover areas such as the former Eastern Germany. What prevents an analysis of this kind is the lack of detailed harmonized data on a regional scale: were this type of data collected, we could obtain a more precise and correct perception of these realities. The obtained results provide apparently conflicting outcomes: on the one hand, GDP per capita can be considered a reasonable approximation of well-being; but, on the other hand, it is not sufficient to give a complete and exhaustive description of the said well-being, making it useful to expand the amount of essential information to complete as much as possible the evaluation. The high value of the coefficient of Spearman leads us to think that GDP per capita may give a roughly similar result to EWI, but it does not convey several essential elements, such as social relations, the protection of environment or the political and institutional context that can create more or less useful basis for the improvement of well-being. Spain, for example, gets a positive result into the third class of countries with France and the United Kingdom thanks to its high score in the dimension ‘‘Environment’’; considering only GDP per capita it would lie among countries with a value below the average. Similar considerations can

be made for Italy: the observation of the mere GDP per capita would suggest a position in line with the European average, but omitting a whole range of information through which one may deduce that its performance is not so positive. We should consider in this regard ‘‘Quality of Services’’, where Italy gets by far a negative score: the GDP simply records the cost of services, but not their quality. Even Estonia probably would not get her result, if the level and quality of education were not allowed for. Similar remarks are possible for many specific situations in different countries.

Therefore, the picture obtained from the calculation of EWI is consistent with the thesis of the Stiglitz-Sen-Fitoussi Commission, according to which GDP per capita can be a useful indicator, in order to measure well-being; the great error is assuming that this is enough, without performing a thorough analysis of the complementary data. Moreover, although countries such as Germany, France or the United Kingdom are included in the upper classes, inequalities within them remain considerable. There are probably more people who endure a particular situation of poverty in one of these large countries, for example, than how many actually suffer it in one of the countries appearing in the last three classes. The EWI deals with the reduction of well-being induced by the existence of inequalities within each nation, using variables that try to capture it. Pockets of poverty within each of these countries are of not negligible magnitude, and certainly, improvements in this sense are to be made.

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CHAPTER 3

Is there a two-speed Europe also in the well-being?

Abstract

Eurostat databases provide forty indicators relevant to measure the well-being in different countries. In this paper we propose to identify different levels of wellbeing in two European areas, by the analysis of a sample of Centre-North Europe (Sweden, Germany, France, Britain and the Netherlands, which are among the most advanced states), and a sample of Mediterranean countries (Italy, Spain, Portugal and Greece). The goal of the research is dual. First, the interest is to grasp and quantify the specificities of these countries in a phase when inequalities grow. Here, welfare is represented through 11 dimensions based on 77 variable. Second, that quantification and the eventual differences among the countries in the two areas are measured by Pena's Distance and MPI, two different methodologies, which allow the combination of variables in a way consistent with our objective. The former is a compensatory measure, while the second is non-compensatory. The attention is on the possible effects of compensability issues on the evaluation.

1. INTRODUCTION

The present study aims at assessing the level of well-being within countries of the European Union, turning the attention in particular to a sample of the Centre-North (Sweden, Germany, France, Britain and the Netherlands, i.e. nations of greater economic importance), and a sample of Mediterranean countries (Italy, Spain, Portugal and Greece). To the last group of countries, Ireland has been added, which, on the one hand, is geographically far from the Mediterranean, but, on the other hand, is part of the countries in difficulty. Therefore, it is possible to highlight the differences between countries described as “virtuous” by European Authorities and countries that are part of the so-called PIIGS. The final goal of the research is to get better understanding of the characteristics that countries assume in a context where the various dimensions of inequality grow.

The methodological starting point is the measure of well-being, taking into account, as far as possible, its various economic and social aspects. Numerous studies in this regard can be found in literature, from the capabilities approach (Sen, 1982, 1985 and 1993 between the various publications), to the dimensions of well-being approach (Narayan et al., 2000), and the central human capabilities approach (Nussbaum, 2000). They are complemented by a range of expressions, from well-being, to quality of life, empowerment, capability expansion, and happiness. In the present study well-being is intended as a set of good living conditions and actual subjective well-being (see

e.g. Noll, 2002). Then, welfare is described through 11 dimensions based on 77 variables, to analyse the differences in each of them between the countries concerned in the two areas through the combination of the variables. The way to do it is to use Pena's Distance method and Mazziotta-Pareto Index (MPI), two different methodologies, parametric and non-parametric, which allow the combination of variables in a manner consistent with our objective (Pena, 1977; Somarriba and Pena, 2009; Montero et al., 2010; Mazziotta and Pareto, 2007 and 2012).

This comparison allows also to understand if the variables used and the methodology chosen, could suffer from the compensability issue. Considerable attention has been devoted in recent years to the fundamental issue of compensability among the components of the index (a deficit in one dimension can be compensated by a surplus in another) and more and more often a non-compensatory approach has been adopted (e.g. the 'new' Human Development Index calculated by UNDP in 2010 is given by a geometric mean).

Indeed, it is essential to use a non-compensatory index. Munda and Nardo (2005) affirm that if one wants the weights to be interpreted as ''importance coefficients'' (or equivalently symmetrical importance of variables) non-compensatory aggregation procedures must be used''. MPI is based on the assumption of ''non-substitutability'' of the dimensions, to which equal importance is attributed; no compensation between them being allowed. In this way, it is possible to observe if such compensability issue affect well-being measurement.

The final aim of this work is to give a description of the situation between the two European realities, as well as to control for possible issues rising from the implementation of a non-compensatory aggregation technique.

2. METHODOLOGY

The index is constructed based on currently available data, coming directly from certified sources. They do not require costly *ad hoc* surveys and can be easily updated when necessary (Jarman, 1983; Gordon and Pantazis, 1997; Ivaldi and Testi, 2010; Soliani *et al.*, 2012). The analysis of the literature offers several ways to derive the most suitable variables to insert in the index (Berger-Schmitt and Noll, 2000; Michalos *et al.*, 2010; CNEL-ISTAT, 2013; Porter *et al.*, 2013), even if the choice is conditioned by the availability of data and the purpose of the study.

Clustering the items in a limited number of dimensions can simplify the interpretation of the information available in the list of variables and highlights various patterns of the quality of life in different countries. Thus, the index is based on the twelve dimensions of the *Benessere Equo e Sostenibile – BES* (CNEL- ISTAT, 2012 and 2013; Ivaldi *et al.*, 2015), but excludes the domain "Landscape and Cultural Heritage", for which is not possible to find sufficient harmonized data. BES includes the latest theoretical developments in the field, between which the recommendations of the

Stiglitz-Sen- Fitoussi Commission (Stiglitz *et al.*, 2009). The selected dimensions, listed below (Table 18), cover the multidimensional nature of well-being, and are sufficiently different among themselves, and fully describe the multidimensionality of the phenomena, avoiding the risk of self-correlation.

Table 18: Selected dimensions

Health
Education and Training
Work and life balance
Economic well-being
Social relationships
Politics and Institutions
Security
Subjective well-being
Landscape and Cultural heritage
Environment
Research and Innovation
Quality of services

A preliminary survey has been conducted on the availability of data from Eurostat, WHO, OECD, European Commission and European Quality of Life Survey 2012. Then I have selected 77 variables, which should ensure sufficient completeness of information. In absence of dominance of one dimension over all others, some combination or aggregation is necessary in order to make well-being inter-individually comparable. I have opted for equal weighting. This may result either from an "agnostic" attitude and a wish to reduce interference to a minimum, or from the lack of information about some kind of "consensus" view (Brandolini, 2008). Decancq and Lugo (2013) identify equal weighting as the preferred and facilitating procedure, adopted in most of the applications. Maggino (2009) maintains that different weights must not be used if there are no consistent hypotheses for defining them. Indeed, although it would be desirable to assign different weights to the various factors considered, there is often no reliable basis for doing this. However, equal weighting does imply an implicit judgment on the weights being equal (Nardo *et al.*, 2005). In any case, one of the major task of wellbeing measures is the search for the appropriate aggregation method to incorporate multi-dimensional variables into an overall index.

In order to do so, many techniques may be implemented. In this analysis, the measurement has been worked out through non parametric and parametric techniques. In particular, the MPI and the Pena's Distance, which allow the combination of variables in a way consistent with our goals (see in this regard: Pena, 1977; Somarriba and Pena, 2009; Montero *et al.*, 2010; Mazziotta and Pareto, 2007 and 2012).

2.1. MAZZIOTTA PARETO INDEX - MPI

Mazziotta Pareto Index (Mazziotta and Pareto, 2007 and 2012) is based on the assumption of "non-substitutability" of the dimensions, all of equal importance. No compensation between them is allowed. Applications of the MPI have been carried out in recent years to discuss the Millennium Development Goals (MDG) (De Muro *et al.*, 2011), verify social inequality in the Italian regions (Mazziotta *et al.*, 2010), measure the Italian health infrastructure endowment (Mazziotta and Pareto, 2011), and assess quality of life levels among Italian provinces (Mazziotta and Pareto, 2012) and to measure wellbeing in European Union (Ivaldi *et al.*, 2015).

The steps in the construction of the MPI are the following: first, normalization of the individual indicators by ''standardization'' and second, aggregation of the standardized indicators by arithmetic algorithm with penalty function based on ''horizontal variability'', i.e. the variability of standardized values for each unit. This variability, measured by the coefficient of variation, ensures that the score of the units, which have a higher imbalance between the values of the indicators, are penalized. Finally, the use of standardized deviation in calculating the synthetic index provides a measure, which is robust and not very sensitive to the removal of a single elementary indicator. The normalization process is carried out as follows:

$$z_{i,j} = 100 + \frac{(x_{i,j} - \mu_j)}{\sigma_j} 10$$

where $z_{i,j}$ is the standardized value of each statistic units, $x_{i,j}$ is the original value of each j-*th* variable, μ_j is the mean of each j-*th* indicator. σ_j is the standard deviation of each j-*th* indicator. Considering the average z-scores sum, the relative standard deviation and the consequent Coefficient of variation

$$\mu_{z_i} = \frac{\sum_{j=1}^{4} z_{i,j}}{4} \qquad \sigma_{z_i} = \sqrt{\frac{\sum_{j=1}^{4}(z_{i,j} - \mu_{z_i})}{4}} \qquad CV_{z_i} = \frac{\sigma_{z_i}}{\mu_{z_i}}$$

then the index is calculated as:

$$MPI_i = \mu_{z_i} - \sigma_{z_i} cv_{z_i}$$

This approach is characterized by the use of a function ($\sigma_{z_i} cv_{z_i}$) to penalize the units with ''unbalanced'' values of the partial composite indices. The penalty is based on the coefficient of variation and is zero if all values are equal. The purpose is to favor the areas that, mean being equal, have a greater balance among the different dimensions of well-being (Mazziotta and Pareto 2012).

Therefore, indicators were aggregated at each dimension level and then, such partial composite indices summed according to the MPI method.

2.2. PENA'S METHOD

The second methodology used is the Pena's method (P2 Distance or DP2 method). This method was proposed by Pena (1977) and has the properties of non-negativity, commutativity, triangular inequality, existence, determination, monotony, uniqueness, transitivity, invariance to change of origin and/or scale of the units in which the variables are defined, invariance to a change in the general conditions and exhaustiveness and reference base, and so forth (Pena, 1977; Somarriba and Pena, 2009; Montero *et al.*, 2010; Nayak and Mishra, 2012).

Pena's P2 Distance is introduced as follows:

$$DP2_i = \sum_{j=1}^{4} [(\frac{d_{ij}}{\sigma_j})(1 - R^2_{j,j-1,\dots 1})]$$

where *i* = 1, 2, …, n are the dimensions, j are the constituent indicators, X, such that $x_{i,j} \epsilon$ X; *i*= 1, 2, . . ., n; j = 1, 2, . . ., 4; $d_{i,j} = |x_{i,j} - x_{\rho,j}|$; ρ is the reference case pertaining to $min_i = (x_{i,j})$, σ_j is the standard deviation of the variable j. $R^2_{j,j-1,\dots 1}$ with j > 1, is the coefficient of determination in the regression of x_j over x_{j-1}, x_{j-2}, …, x_1.

As pointed out by Montero et al.(2010) and Mishra (57) , the quantity $\frac{d_{i,j}}{\sigma_j}$ is merely a change in the origin and the scale, and one may also use zero as the reference ρ point and $[max_i(x_{ij}) - min_i(x_{ij})]$ instead σ_j as a scaling factor, without any adverse effect on the formula.

The real issue, however, lays in the weights $(1 - R^2_{j,j-1,\dots 1})$. It may be noted that the first variable obtains an absolute weight of unity $(1 - R^2_1)$.The subsequent variable j = 2 obtains a weight $(1 - R^2_{2,1})$, and in general, the j-*th* variable obtains a weight $(1 - R^2_{j,j-1,\dots 1})$.In this way the weight assigned to each indicator follow a precise rule that has the goal to reduce the duplicity of information that often affect aggregation methods.

It is worth noting that the weights assigned to a variable will depend on its position in the order, making DP2-based composite synthetic indices indeterminate and arbitrary. To resolve the foresaid indeterminacy, the following iterative procedure has been suggested by Montero et al. (2010):

1. Initialize the weight vector, $w_j = 1 \; \forall \; j = 1, 2, 3, 4$, and define $\varepsilon =$ 0.00001, for purposes of accuracy.

2. Define $\partial_{i,j} = \frac{d_{i,j}}{\sigma_j} \; \forall \; j = 1, 2, 3, 4 \; and \; i = 1, 2, \dots, n$

3. Obtain $DF_i = \sum_{j=1}^{4}[(\frac{d_{i,j}}{\sigma_j})w_j]$; $i = 1, 2, \dots, \mathrm{n}$

4. Compute the Karl Pearson coefficient of correlation $r(DF, \partial_j)$ between DF and ∂_j $\forall\, j = 1,2,3,4$. Arrange $\left|r(DF, \partial_j)\right|$ in a descending order and re-index the associated variables ∂_j accordingly.

5. Compute $Z_i = \sum_{j=1}^{4}[(\frac{d_{i,j}}{\sigma_j})w_j; i = 1, 2, \dots, \mathrm{n};\ w_j\left(1 - R^2_{j,j-1,\dots 1}\right) \forall\, j = 1,2,3,4\ and\ w_j = 1$

6. If $\sum_{i=1}^{n}(DF_i - Z_i) \geq \varepsilon$ replace DF by Z go to step 4. Otherwise stop.

At the end, the two indexes will be standardized, in order to get them comparable. The index will be subsequently subjected to a test of robustness, through a sensitivity analysis, conducted by testing the general index subtracting in turn each of the eleven dimensions. Then the subtraction will cover two dimensions simultaneously. The index will be recalculate each time and the results will be compared using the Spearman correlation coefficient. Finally, also the two indexes have been compared through the Spearman correlation coefficient.

3. RESULTS

The two methodologies yield exactly the same rank (Spearman *rho*=1). Thus, no differences arise using a compensatory or a non-compensatory method in this case. Concerning the test of robustness, through a sensitivity analysis, conducted by testing the general index subtracting in turn each of the eleven dimensions, showed very high Spearman correlation coefficient (the lowest is 0.987).

After standardisation, the cut-off 0 offers two sets of countries: Sweden, Netherlands, Germany, Ireland, France and United Kingdom, Spain, Italy, Portugal, Greece (Table 19).

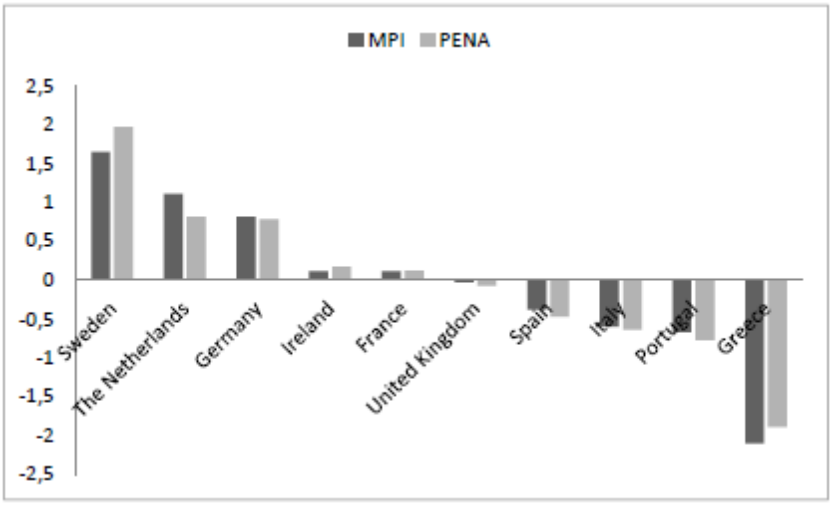
Table 19: MPI and Pena scores standardised

MPI	Score
Sweden	1,97
Netherlands	0,81
Germany	0,78
Ireland	0,17
France	0,12
United Kingdom	-0,07
Spain	-0,47
Italy	-0,64
Portugal	-0,77
Greece	-1,89

DP2	Score
Sweden	1,65
Netherlands	1,10
Germany	0,81
Ireland	0,11
France	0,11
United Kingdom	-0,03
Spain	-0,38
Italy	-0,60
Portugal	-0,67
Greece	-2,10

Figure 6 compares the standardized score of the two indexes. Quite unexpectedly, our sample appears divided into three groups: North Europe (Sweden, The Netherlands and Germany) has the top level of wellbeing; Ireland, France and United Kingdom are in the middle and, finally, the remaining PIIGS countries end the rank (figure 6).

Figure 6:Comparison between MPI and Pena Normalized Scores



The wellbeing in Sweden is by far higher than in The Netherlands, which immediately follow it. Indeed Sweden is first or second in nine dimensions out of eleven. On its turn, The Netherlands exhibit good ranks in nine variables, whereas are low just in social relationship and environment. Social relationship and health are the weak point of Germany, which is high in all other dimensions. The portrait of Ireland is really peculiar: it has great variability and is at the top in social relationship and environment, and at the third place in subjective well-being. In other dimension, it is in low positions. France is well placed in economic wellbeing and security, but middle-of-the-road in all other dimensions, with bad record in subjective wellbeing, since its citizens had a dark perception of their condition. Health and security are the black spots of the United Kingdom, which largely explain

its poor performance; however it is well placed just in social relationship. Spain, Italy and Portugal show similar results; we can underline the nice performance of Italy in health and the poor result of Portugal in economic wellbeing. At the end of the rank, Greece is last or second-last in all dimensions, but security, and far from all others countries.

4. CONCLUSIONS

Both methodologies offer identical outcome, and this indicates the robustness of the results obtained. The first outcome of our inquiry is the existence of three levels of wellbeing in the samples considered, with a locomotive and a snail. The great inequality among the different regions of the UE is evident, with Sweden that occupies the top place, whereas Greece is at the bottom, with a wide gap. Our analysis confirms the validity of the Scandinavian socio-economic model and of the "Rhenish capitalism", which are in the leading group. The second group includes Ireland, France and the United Kingdom, which are heterogeneous as their socioeconomic structure and welfare systems. The United Kingdom, last country of the second group, offers a performance worse than one can expect just looking at its economic growth. On the other hand, the outcome of Ireland is even better than the United Kingdom, thanks to specific social aspects, environment and optimism, expressed in the perceived wellbeing. Mediterranean countries are in the third group and close each other, with the exception of Greece, which has a marked detachment and appears very far from the other countries of the UE. From a methodological point of view, it is easy to note that, in this case, neither the use of a parametric or not parametric estimation, nor the choice between compensatory or non-compensatory aggregation, affect the result.

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CHAPTER 4

Quality of life in Italian cities: a temporal comparison between before the crisis and after.

Abstract

The purpose of this paper is to investigate the changes in well-being in the Italian reality, in particular, through the study of major cities. The study is based on a set of data provided by the Italian Institute of Statistics (ISTAT) with the aim to highlight the Italian local situation and the comparison between the well-being situation assessed in a pre-crisis context and the one observed after it, in order to understand how events have influenced levels of well-being in the main Italian cities. The paper aims to examine the quality of life (QoL) levels in the metropolitan cities, using data from the second URBES report (a report that provides data and information concerning the Italian urban situation), published in 2015, which investigates QoL and well-being in major Italian cities and provinces. It is based on the framework of the "Benessere Equo e Sostenibile" report that appraises well-being in Italian regions by a great deal of variables belonging to 12 different dimensions. Using this data source, the construction of a composite well-being index is implemented. The paper intends to show how the well-being level in Italian cities has changed in recent years, taking into consideration different dimensions of well-being. The need to consider different dimensions of well-being for its comprehensive evaluation is widely discussed in the literature, and the framework provided by ISTAT is innovative in this sense. The innovation of the work is the attempt to evaluate quality of life over time, trying to formalize a methodological path replicable in other situation, as well as assess the relevance of assigning weights to the different dimensions.

1. INTRODUCTION

The increasing number of studies on the Urban Quality of Life (UQoL) is directly related with the rise of the urban population in the world. Indeed, politicians and economists at local, national and international level, pay more and more attention to cities, as urban centres are crucial agents of economic growth, and a large body of literature has developed, proposing alternative methods for measuring the quality of life in regions and cities (see e.g. Blomquist 2007, Lambiri et al. 2007, Marans et al 2011).

As regarding the Italian cities, the situation is at a crucial stage. Indeed, a recent law (*L. 7/4/2014 n. 56*) modifies local authorities and creates new territorial entities: the "Metropolitan Cities" (Turin,

Milan, Venice, Genoa, Bologna, Florence, Naples, Bari, Reggio Calabria and Rome). Therefore, the bigger cities are going to play an even more central role in both institutional and economic contexts.

This work aims to examine the Quality of Life (QoL) levels in the Metropolitan Cities, using data from the URBES Report (Istat, 2013), published in 2013, which investigates quality of life and well-being in the major Italian cities. It is based on the framework of the BES Report (Cnel-Istat 2012, 2013), that appraises well-being in Italian regions by a great deal of variables belonging to twelve different dimensions. Using this data source it will proceed to the construction of a composite indicator. The purpose is to focus on changing and development of such quality of life levels through time. In this case, the period 2004-2011 is considered, mainly for two reasons: firstly, because this is the period of time for which the URBES report provides data; secondly because the aim is to understand how the situation has changed in Italian cities, starting from the period before the crisis, characterized by weak economic growth, to the period after the crisis, when its consequences had been burst.

The first part of the chapter briefly review the state of the art concerning quality of life and its change through time. In the second part the index for the year 2004 and for the year 2011 areconstructed. Finally, the third part contains results, comparisons and concluding remarks.

2. URBAN QUALITY OF LIFE AND QUALITY OF LIFE INDICATORS

QoL is associated with the concept of social well-being, and traditionally it has been related to mainly monetary figures. Then Townsend (1987) and the authors of the Scandinavian welfare approach (Erikson et al., 1987; Erikson 1993) singled out the multidimensionality of QoL, and after the contributions of Sen (1985, 1987, 1993, 1997), Dasgupta (2000, 2001), as well as the conclusions of the Stiglitz-Sen-Fitoussi Commission (Stiglitz et al., 2009), the multidimensionality of QoL is generally accepted. Therefore, there is widespread agreement (Brock, 1993; Diener and Suh, 1997; Dasgupta, 2000; Johansson, 2002; Offer, 2003; Sirgy et al., 2006; Goossens et al., 2007; Grasso and Canova, 2008; Bonatti, 2014; Ivaldi et al., 2016) that QoL can be analysed through economic, social and subjective approaches. This idea is appropriate also for the urban context: indeed, urbanization encourages fast social and economic growth, but, at the same time, it causes several troubles, such as high population density, traffic, scarcity of housing and resources, noise, and pollution (Li et al., 2009). Moreover, it is necessary to consider a wide range of dimensions and variables to make a proper assessment of the UQoL.

In urban economics, many studies deal with QoL: some of them put it at the centre of their analysis and attempt to find ways to quantify and measure it (Liu, 1976; Boyer and Savageu, 1981), while others deal with QoL indirectly and examine its role in determining urban processes such as growth, decline, and competitiveness (Findlay et al., 1988; Douglas, 1997; Glaeser et al., 2001; Wall,

2001; Moretti, 2003; Shapiro, 2006; Ivaldi, 2006; Soliani et al., 2012a; Combes et al., 2012 among others). Hence, to go beyond the mere income-related aspect of well-being, it is necessary to consider well-being as a multidimensional phenomenon involving all aspects of people's lives. This multidimensionality makes the assessment of well-being more complex, because most of its dimensions are hard to identify and quantify, and they depend on subjective assessments.

To deal with this problem, it has been decided to utilize a composite QoL index, rather than analysing it indirectly and examining its role in determining other different urban processes. This choice is motivated by a variety of reasons (Nardo et al., 2005): composite indexes represent aggregate and relatively simple measures of a combination of components of heterogeneous phenomena; they allow to summarize multidimensional or complex issues in order to provide support to decision-makers; they are easier to interpret as opposed to searching a trend in many separate indicators; and they reduce the size of a set of indicators or include more information within a certain size limit. According to Sharpe (2004), such a summary statistic is particularly significant, since it can really capture aspects of reality; by emphasizing the underlying meaning that emerges from their analysis, it is possible to attract interest from the media and draw the attention of policy makers. The use of a single number is very effective in synthesizing complex problems in a simple and understandable way for the public opinion. This communicative advantage is important, since a single ranking is more capable of drawing attention, compared to a comparison of multidimensional scorecards, followed by a more complex reasoning about the relationships between indicators (Brandolini, 2008).

Thus, these measures are increasingly recognized as a tool for policy making, and especially public communications on counties' relative performance in wide ranging fields such as the environment, the economy, or technological development (Griliches, 1990; Cox et al., 1992; Färe et al.,1994;KnoxLovellet al., 1995; Guerard, 2001; Osberg and Sharpe, 2002; Huggins, 2003; Somarriba and Pena, 2009; Ivaldi and Testi, 2011; Ivaldi and Soliani, 2014; Ivaldi et al., 2016 among others). The need for social QoL or well-being indicators is moreover synthesized by Dasgupta (2000) into five purposes. First, the need for an aggregate index of economic activity, which would help to set forth the performance of the economy. Second, we may wish to compare the state of affairs in different places, or between different groups of people, at a given point of time. The third reason is that we frequently wish to make welfare comparisons in the same place over time. The fourth stems from a desire to estimate the economic component of the standard of living an economy is capable of sustaining along alternative programmes. Finally, the fifth refers to the need of quality-of-life indexes as tools to evaluate alternative economic policies. The first three purposes express the need for indexes that focus on measures which can reflect the current living standard. In contrast, the fourth and fifth purposes express the need to evaluate alternative economic policies from different points of view. The theoretical framework, outlined by Dasgupta, captures the various dimensions and provides support to the choice and implementation of public policies. In this context,

measures of well-being can reflect the constituents of well-being, or alternatively, the access people have to the determinants of well-being. Indices of health, welfare and freedom of choice are constituents. Indices which reflect the availability of food, shelter, clothing, health care, education facilities, etc., are considered as determinants of well-being. Changes in a suitable aggregate of either the constituents, or the determinants, can be made to get measures of changes in the well-being (Dasgupta, 2000; Dasgupta and Weale, 1992; Dasgupta et al., 1972).

The focus is on the first three purposes, although the last two are clearly a result of the analysis carried out over the others. Even though the evaluation of economic activities and spatial comparisons are more common, few studies have focussed on temporal comparisons of QoL indexes between different economic units (Croci Angelini and Michelangeli, 2012, e.g.). Here the aim instead, is to make considerations of this kind, and for this reason the construction of the index will be such as to ensure its comparison over time. Finally, it should be noted that great confusion often arises about the terms “Quality of Life” and “Well-being”. Therefore, it is necessary to establish a distinction: the first term is mainly used when one speaks at the level of individuals, whilst the second is more frequent when one speaks about communities, localities, and societies. Similarly, “well-being” refers to actual experience, and “quality of life” to context and environments. However, in both cases, the terms are used with a broad range of meanings, and the ranges frequently overlap (Gasper, 2010). Given the difficulty in drawing the line which divides the two concepts, in this study “Quality of Life” idea has been chosen, with reference to the study by Noll (2002), that defines well-being as the constellation of good living conditions and positive subjective well-being. Here, in fact, no reference is made to the subjective conditions of the population considered.

3. MATHERIAL AND METHODS

The first step in elaborating a synthetic index of well-being is the selection of the dimensions and variables. As specified above, we consider the *URBES* Report available data (Istat 2013), which refers to particular indicators belonging to dimensions identified by *BES* (Cnel-Istat 2012, 2013); these dimensions are listed below (Table 20):

Table 20: BES dimensions

Health
Education and training
Work and life balance
Economic well-being
Policy and institutions
Security
Landscape and cultural heritage

Environment
Research and innovation
Quality of services

3.1. MULTIDIMENSIONAL INDEXES

In general terms, an indicator is a quantitative or a qualitative measure, derived from a series of observed facts, that can reveal relative positions of cities, regions or countries with respect to specific elements. When evaluated at regular intervals, an indicator can point out the direction of change across different units and through time. In the context of policy analysis, indicators are useful in identifying trends and drawing attention to particular issues. They can also be helpful in setting policy priorities and in benchmarking or monitoring performance.

Composite indicators which compare country performance are increasingly recognized as useful tools in policy analysis and public communication. They provide simple comparisons of countries that can be used to illustrate complex and sometimes elusive issues in wide ranging fields, e.g., environment, economy, society or technological development. These indicators often seem easier to interpret by the general public than finding a common trend in many separate indicators and have proven useful in benchmarking country performance.

In drawing up a multidimensional index, reference to specific methods of development and construction should be made. In doing this, we took into account the framework of Nardo et al. (2005), which consists of several steps.

First of all it is necessary to refer to a precise theoretical framework, in order to provide the basis for the selection and combination of single indicators into a meaningful composite indicator under a fitness-for-purpose principle; therefore it is fundamental to define the concept object of study. This was done in the previous paragraphs, with the discussion about Qol and Urban Qol.

The second step is data selection, since the strengths and weaknesses of composite indicators largely derive from the quality of the underlying variables. Ideally, variables should be selected on the basis of their relevance, analytical soundness, timeliness, accessibility, etc. While the choice of indicators must be guided by a theoretical framework, the data selection process can be quite subjective as there may be no single definitive set of indicators. The lack of relevant data also limits the constructor's ability to build sound composite indicators. Given a scarcity of internationally comparable quantitative (hard) data, composite indicators often include qualitative (soft) data from surveys or policy reviews, and proxy measures can be used when the desired data is unavailable or when cross-country comparability is limited.

After that, a multivariate analysis could be useful. An exploratory analysis should investigate the overall structure of the indicators, assess the suitability of the data set and explain the methodological choices, e.g., weighting, aggregation. Individual indicators are sometimes selected

in an arbitrary manner with little attention paid to the interrelationships between them. This step is helpful in assessing the suitability of the data set and will provide an understanding of the implications of the methodological choices, e.g., weighting and aggregation, during the construction phase of the composite indicator.

Information can be grouped and analyzed along at least two dimensions of the dataset: sub-indicators and countries: (i) Grouping information on sub-indicators: the analyst must first decide whether the nested structure of the composite indicator is well-defined and if the set of available sub-indicators is sufficient or appropriate to describe the phenomenon; (ii) Grouping information on countries: various alternative methods have been proposed and focus on multidimensional scaling or unfolding analysis. In our case the scarcity of data, imposed us to utilize all available variables given by the dataset.

The fourth step is the normalization, since indicators have to be normalized to render them comparable for weighting and aggregation. Indicators should be aggregated and weighted according to the underlying theoretical framework. When used in a benchmarking framework, weights can have a significant effect on the overall composite indicator and the country rankings. A number of weighting techniques exists. Some are derived from statistical models, such as factor analysis or from participatory methods. No matter which method is used, weights are essentially value judgements. While some analysts might choose weights based only on statistical methods, others might reward (punish) the components that are deemed more (less) influential depending on expert opinion to better reflect the policy priorities or theoretical factors. Weights may also be chosen to reflect the statistical quality of the data. Higher weights could be assigned to statistically reliable data with broad coverage. However, this method could be biased towards the readily available indicators, penalizing the information that is statistically more problematic to identify and measure. Most composite indicators rely on equal weighting, i.e., all variables are given the same weight. This could correspond to the case in which all variables are “worth” the same in the composite but also it could disguise the absence of statistical or empirical basis, e.g. when there is insufficient knowledge of causal relationships or a lack of consensus on the alternative. In any case, equal weighting does not mean "no weights", but implicitly implies the weights are equal. Moreover, if variables are grouped into components and those further aggregated into the composite, then applying equal weighting to the variables may imply an unequal weighting of the component (the components grouping the larger number of variables will have higher weight). This could result in an unbalanced structure of the composite index.

3.2. DIMENSIONS AND VARIABLES

In elaborating a synthetic index of well-being, the selection of the dimensions and variables covers a basic role. As specified above, we consider the *URBES* Report available data (Istat 2013),

which refers to particular indicators belonging to dimensions identified by *BES* (Cnel-Istat 2012, 2013); these dimensions are listed below (Table 21):

Table 21: BES dimensions

Health
Education and training
Work and life balance
Economic well-being
Policy and institutions
Security
Landscape and cultural heritage
Environment
Research and innovation
Quality of services

In contrast to the BES report, the URBES report does not take into account two dimensions: Social Relations and Subjective Well-being. This difference is mainly due to the lack of data at the metropolitan level. For this reason, since the index we set out to build refers directly to URBES data, we will not consider variables describing the two dimensions mentioned above.

In Table 22 dimensions and variables considered by URBES framework are reported.

Table 22: URBES Dimensions and variables considered

Health	Life expectancy at birth
	Infant mortality rate
	Traffic accidents
	Age-standardised cancer mortality rate (20-64 years old)
	Age-standardised mortality rate for dementia and related illnesses (people aged 65 and over)
Education and training	Number of graduates
Work and life balance	Employment rate of people 20-64 years old
	Non-participation rate
	Incidence rate of fatal occupational injuries or injuries leading to permanent disability
Economic well-being	*Per capita* adjusted disposable income
Policy and institutions	Voter turnout
	Proportion of women elected to municipal councils
Security	Homicide rate
Landscape and cultural heritage	Presence of Historic Parks/Gardens and other Urban Parks of recognised significant public interest
	Conservation of historic urban buildings
Environment	Volume of drinkable water daily supplied *per capita*
	Number of days exceeding the limit of PM10
	Square meters of urban parks and gardens per inhabitants

Research and innovation	Patent applications to the EPO
Quality of services	Citizens who benefit from infancy services
	Separate collection of waste
	Density of urban public transport networks

Considering “Health”, “Work and Life Time”, “Environment” (Zolotas, 1981, Daly and Cobb 1989, Cunado and de Garcia 2013) and “Economic well-being” - although studies show some attenuation of the correlation between the two concepts (Easterlin 1974, Scitovsky 1976, Oswald 1997) – their importance in relation to QoL is clearly established; but some clarifications are needed about other dimensions, as summarized by CNEL – ISTAT (2012).

Education and training. Education, training and skill level affect QoL directly: indeed highly educated people live better and longer, are healthier and have more opportunities to find a job. They also enjoy opportunities otherwise precluded.

Safety. The most important impact of crime on QoL of people is the sense of vulnerability that it determines. The fear of being a victim of crime affects personal freedom and even development.

Landscape and cultural heritage. The degree of conservation of landscape, artistic and monumental heritage can provide a territory with a source of wealth for the community.

Research and innovation. Research and innovation are indirect determinant of QoL and the basis of social and economic progress.

Quality of services. Generally, public investments enhance the human environment where people live and work.

In a previous work (Ivaldi et al., 2014) we elaborated a similar indicator for the present situation, using as proxy of “Education and training” two different indicators: “lever of literacy” and “level of numeracy”. These indicators are available for the year 2011, but not for 2004, because they refer to particular surveys submitted to pupils for the first time in 2008. Owing to this unavailability, we chose as a proxy of education the number of graduates.

Moreover, to expand and update the analysis, other five variables has been added, taken from the Istat database, in order to give more completeness to the analysis. These are “Number of children in nursery” and “Number of graduates” implemented the education dimension, “Neet” has been added to the work and life-time balance dimension, “Length of civil proceedings” as an additional variables to the policy and Institutions dimensions, and finally, to fulfil research and innovation dimension, the variable “Production specialization” has been considered.

Although the index here presented is not very dissimilar, it is necessary to reaffirm that the task of the article is to show the evolution of well-being in Italian cities, not to analyze particular statistical aggregation methods. Therefore, such a discussion is justified.

3.3 OBSERVATION ON DIMENSIONS

Table 23: Rotated Component Matrix

	Component		
	1	2	3
Economic well-being	**,962**	,078	,020
Work and life balance	**,923**	,059	,169
Quality of services	**,893**	-,086	-,225
Policy and institutions	**,884**	,178	-,112
Education and training	**,849**	,092	,009
Landscape and cultural heritage	**,848**	,093	,252
Research and innovation	**,828**	-,369	-,061
Health	,205	**,806**	,210
Security	-,078	**,757**	-,031
Environment	-,010	,118	**,977**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Factorial Analysis 2004

	Component		
	1	2	3
Research and innovation	**,911**	-,081	-,132
Economic well-being	**,904**	,295	,114
Quality of services	**,898**	,079	-,148
Work and life balance	**,892**	,059	,275
Landscape and cultural heritage	**,860**	-,020	,157
Policy and institutions	**,805**	,268	-,132
Education and training	**,759**	,403	,430
Health	,132	**,929**	,096
Security	,048	**,676**	-,388
Environment	,022	-,112	**,940**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Factorial Analysis 2011

In order to verify the relation between the dimension considered a factorial analysis (Table 23) has been made. It's possible therefore to identify the latent dimensions of the phenomenon and to make possible the study of the correlations between a large number of variables, grouping them around factors, so that they are arranged on factors highly correlated with each other (Dillon and Goldstein 1984, Stevens 2002). As for the present case, subsequent tests with different algorithms for extraction and rotation have showed a real stability of the extracted factors. However, it has seemed appropriate to apply the rotation Varimax that maximizes the variance between the factor loads with subsequent iterations; for each factor, high loads (correlations) result for a few variables, the rest being near zero (Kaiser, 1958; Abdi, 2003). The factorial analysis reveals that our six variables are distributed on three latent dimension in both cases.

The relation between our indicators can be described as follows. Not surprisingly, quality of services, economic well-being, landscape, work and life balance, research and innovation and policy and institutions are connected between them and explain about the 60% of variance in 2004 and 2011. Factorial analysis reveals the connection between them. In the most advanced cities, research activities are well developed, people enjoy higher salaries, and quality of services and protection of landscape and cultural heritage are better. In such a situation, labourers can put together their working time and leisure easily. In addition, the variables in the second factor are positively correlated, while in the third factor, only environment is noted.

3.4. WEIGHTING DIMENSIONS

In the absence of dominance of one dimension over all others, some combination or aggregation is necessary in order to make QoL inter-individually comparable. The weighting of the relevant life domains is deemed a crucial, but very difficult issue by many authors.

The adoption of equal weighting may be due to different reasons: an “agnostic” attitude; the wish to reduce interference to a minimum; or simply lack of information about some kind of common view (Brandolini 2008). It is often the preferred and facilitating procedure (Decancq and Lugo (2013), mainly when: the theoretical analysis reveals, for each indicator, the same adequacy in defining the variable to measure, and it does not allow sound and consistent hypotheses on differential weightings; the statistical and empirical knowledge is not enough for defining weights; there is no consensus about the application of alternative procedures (Maggino 2009). Therefore we opted for equal weighting, both for dimensions and variables. Indeed, even though it would be desirable to assign different weights to the various factors considered, there is no reliable basis for doing this (Mayer and Jencks 1989). However, this does not mean no weighting at all, because equal weighting does imply an implicit judgment on the weights being equal (Nardo et al. 2005). Equal weights for composite indicators were used for instance, as well as by previous works like Ivaldi et al. (2015). They constructed composite indices for each of the three factors using equal weights for the indicators. However, if variables are grouped into dimensions and those are further aggregated into the composite, then applying equal weighting to the variables may imply an unequal weighting of the dimension (the dimensions grouping the larger number of variables will have higher weight). This could result in an unbalanced structure in the composite index. Indeed, to find a weighting schemes for the aggregation process can be suitable, since not all the dimensions and variables has the same relevance in the overall composition of the index.

In this sense, a weighting scheme through Principal Component analysis would be implemented, in order to assess if weighting is fundamental or not, and to evaluate the significance of the selected variables. For example, as reported by Nardo et al. (2005), Gbetibouo et al. (2010) applied PCA to generate weights. The first principal component contains the most information so they argue, based on Filmer and Pritchett (2001), that the absolute value of the loading of the first single component is valid for assigning weights. However, with PCA method, weights cannot be estimated if no correlation exists between indicators. And not all the variables are significantly correlated. For this reason, In order to verify the relation between the dimensions considered, an Unobserved Component Model (UCM) to determine the weights, as described by Nardo et al. (2005), has been is done. In this way, it has been assessed the possibility to use such a weighting scheme for the index. Estimated weights are reported in Table 24.

Table 2411: Dimensions weights

	2004	2011
Health	0.128	0.139
Education	0.050	0.067
Work and life-balance	0.083	0.118
Economic well-being	0.157	0.142
Policy and institutions	0.058	0.044
Security	0.148	0.152
Landscape and culrutal heritage	0.089	0.086
Environment	0.098	0.109
Research and innovation	0.098	0.080
Quality of services	0.090	0.063

3.5. AGGREGATION METHOD

The next choice concerns an appropriate methodology to base the construction of the Index on. We opted for the additive index, one of the most common indexes used in well-being quantification: actually, the task of the research is not to focus on a particular range of methods, but rather on the changing features of well-being over time.

An additive index is then produced by adding up the weighted variables, calculating the corresponding Z scores by subtracting from each observation the average value of the observations and dividing the result by the corresponding standard deviation (Ivaldi and Testi 2010). The problem is that partial indicators are often quantified in different units of measure. This requires their standardization, to avoid that some of them have more relevance than the others (Jarman 1983, Jarman 1984, Townsend 1987, Townsend et al. 1988, Carstairs and Morris 1991, Forrest and Gordon 1993, Bartley and Blane 1994, DETR 2000, Fagerberg 2001, Muldur 2001, Testi and Ivaldi 2009, Ivaldi and Testi 2010, Ivaldi and Testi 2011, Bonatti 2014, Ivaldi et al. 2014). Standardization converts all indicators to a common scale. Thus, an indicator with extreme values will have intrinsically a greater effect on the composite indicator. This might be desirable if the intention is to reward exceptional behaviour, that is, if an extremely good result on few indicators is thought to be better than a lot of average scores. (Salzman 2003, Nardo et al. 2005).

The general formula of the index for each *i-th* city is therefore:

$$ADDITIVE_i = \sum w_{j,d} z_{i,j}$$

Where w_d is the weight of each *j-th* (j=1,...,m) variable belonging to its *d-th* dimension, $z_{i,j}$ is the *z-score* of each *i-th* (i=1,...,n) city for each *j-th* (j=1,...,m) partial indicator considered, specified by the following equations:

$$z_{i,j} = \frac{(X_{i,j} - \mu_j)}{\sigma_j}$$

Where:

- $X_{i,j}$ is the observation of each *i-th* (i=1,...,n) city for each *j-th* (j=1,...,m) partial indicator
- *μj* is the mean of each *j-th* variable.
- *σj ,* is the variance of each *j-th* variable.

Note that if initial distribution is non-normal, the variables are transformed (Osborne 2002), in particular to reduce distribution asymmetry (Bland and Altman 1996). Due to initial non-normal distribution, prior to standardisation a Box-Cox transformation was used on each variable to yield an approximately normal distribution (Box and Cox 1964). The Box-Cox power transformations are given by:

$$x(\delta) = \frac{(x^{\delta}-1)}{\delta} \quad \text{with} \quad \delta \neq 0$$

$$x(\delta) = \ln(x) \quad \text{with} \quad \delta = 0$$

One must use the values which, given an observations vector $x = x_1, x_2, x_3,...,x_n,$ maximize the logarithm of the likelihood function in order to select the value of the parameter δ.

$$f(x,\delta) = -\frac{n}{2}\ln\left(\sigma^2_{X(\delta)}\right) + (\delta - 1)\sum_{i=1}^{n}\ln(x_i).$$

The additive index can therefore assume both positive and negative values; there is neither a maximum nor a minimum value.

4. RESULTS

In this section, through the set of indicators and the methodology defined above, the results are assessed and compared, focusing on the comparison between the ranking obtained from the processing of data for the year 2004 and that for the year 2011. Table 25 and Table 26 show the results.

Table 2512: Indices for 2004

	not weighted			weighted

Milano	1.252
Bologna	0.900
Firenze	0.782
Genova	0.695
Torino	0.550
Roma	0.144
Venezia	-0.030
Bari	-1.301
Reggio di Calabria	-1.358
Napoli	-1.634

Milano	1.567
Bologna	1.170
Genova	1.110
Firenze	1.106
Torino	0.782
Venezia	0.546
Roma	0.370
Reggio di Calabria	-1.211
Bari	-1.357
Napoli	-1.677

Table 26: Indices for 2011

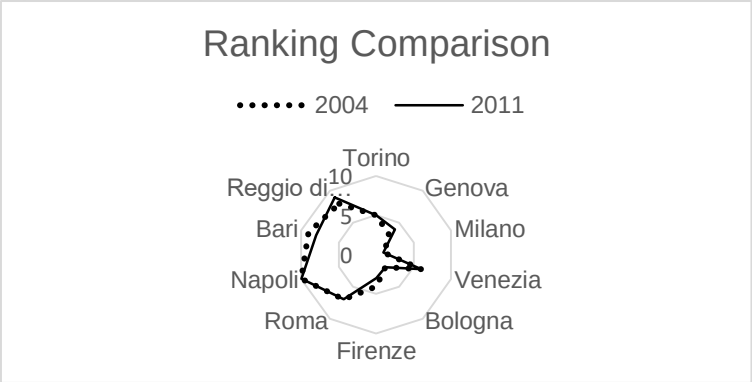
	not weighted
Milano	1.114
Bologna	1.026
Firenze	0.770
Torino	0.706
Genova	0.563
Venezia	0.086
Roma	0.051
Bari	-1.208
Reggio di Calabria	-1.552
Napoli	-1.556

	weighted
Milano	1.119
Bologna	1.004
Firenze	0.832
Genova	0.538
Torino	0.461
Venezia	0.225
Roma	0.181
Bari	-1.185
Reggio di Calabria	-1.507
Napoli	-1.669

It has been worked out the Spearman correlation of ranks of the cities in 2004 and 2011 between the weighted index and the index built with equal weighting. It is 0.964 in 2004 and 0.988 in 2011, showing that the addition of weights in the aggregation procedures only slightly changes the general result. Furthermore, also the Spearman correlation coefficient between 2004 and 2011 has been computed, in order to assess the relevance of temporal changes. It is 0.976 both when the weighted index and the non-weighted index are considered separately. A value quite close, but not equal to unity implies that minimal changes have taken place and the QoL levels in Italian cities have not kept constant. It means that some Italian cities has worsen or improved their rank.

Moreover, a graphical elaboration of the results was made. Figure 7 shows the differences that the ten metropolitan cities have highlighted between 2004 and 2011 (only the weighted index has been used for the sake of simplicity).

Figure 7: Rank comparison



Observing the data, we can state that al the statistic units of the study only moved of one position forward or backward. Milano and Bologna are the better cities in terms of well-being for the entire period. Genova, Firenze and Torino share the medium-higher part of the rank, while after Venezia and Roma, it is possible to find the cities of the southern part of Italy. Especially Napoli, is the last one in both years.

5. DISCUSSION

Numerous facts emerge from the observation of the results obtained. Focusing on the weighted index, because it seems to be necessary to consider some differentiation among dimensions (even though captured in a statistical way), first, it could be of great importance to analyse the various changes rank highlighted by the observation of the index over time.

Looking at the situation of each city and evolution of their position, only Firenze and Bari improved their position Firenze, in particular, shows increases in cancer mortality rate, number of graduates, per-capita income, occupation and the environmental variables. Bari, instead, experienced an increase in education and work and time balance variables especially.

Genova drops one position, probably because of relevant improvements only with regard to the age-standardised cancer mortality rate and separate collection of waste, in addition to an increase in *per capita* adjusted disposable income. Moreover, Genoa has increased the share of patent applications to the EPO, contrary to Milan.

Reggio di Calabria has dropped one position too. It could be due to very low values, with the exception of infant mortality rate, in the incidence rate of fatal occupational injuries or injuries leading to permanent disability and in *per capita* adjusted disposable income.

Milan has maintained its excellent rank: in spite of major improvements in the values of separate collection of waste, square meters of urban parks and gardens for inhabitants, number of days exceeding the limit of PM10 and -standardized cancer mortality rate, it shows considerable worsening in infant mortality rate, age-standardised mortality rate for dementia and related illnesses,

and non-participation rate. The collapse of patent applications to the EPO is of particular significance for one of the most industrial provinces: this figure is alarming in relation to research and development of enterprises.

The rank of Rome did not changed, even though it has significantly improved only the infant mortality rate, the number of citizens who benefit from infancy services and days exceeding the limit of PM10.

The last city in northern regions taken into account is Turin, which maintains the same position. Except for a significant improvement in days exceeding the limit of PM10, Turin keeps all values roughly constant during the period considered.

As regarding the cities that kept a score constantly under the average (i. e. 0), Napoli remains at the last place, because of improvements in infant mortality rate, in the homicide rate and in separate collection of waste. However, for all these cities of Southern Italy, in comparison to other cities, the situation of the volume of drinkable water daily supplied *per capita* remains critical.

Throughout the period considered, two distinct groups can be singled out: the one with values above the average score of 0, including the cities of Northern and Central Italy; the other, including the cities of the Southern regions, traditionally more deprived, with scores below the average. This means that, although the economic crisis has affected all different economic Italian realities, between North and South a huge divide remains.

Some considerations about employment data taken into consideration are needed: focusing on the employment rate, except for a few cases like Naples and Reggio Calabria, the cities maintained or increased their values over time. Furthermore, if we consider the cities of Northern and Central Italy, their figure is higher than the national average (that is 65.1 in 2004 and 61 in 2011); even in times of crisis, networks and socio-economic relations in Northern and Central regions can provide more employment opportunities.

6. CONCLUSIONS

The quantitative analysis we present is the representation of a phenomenon, extrapolated from a set of proxies and elaborated through statistical tools. Even a large number of data might ensure just a fair approximation and its statistical synthesis inevitably leads to further loss of information. However, the measurement of well-being based only on economic parameters could be misleading and the use of social indicators (always keeping in mind the *caveats* just mentioned) may be a way to overcome this obstacle. This exercise provides insights that could be useful for better tuning the political strategies of improvement of social environment, reducing poverty, and so on. Indeed a clear image of reality is the best point of departure for the policymaker: our work could help to draw such a picture. Indeed, considering only economic variables, could lead to not complete considerations;

Di Addario and Patacchini (2008) state that in the most populous Italian cities there are higher earning possibilities and income growth, but we have seen that the most populous cities do not have higher levels of QoL.

The research allows us to assess which cities actually improved and which worsened their situation. Overall, quality of life is highest in medium-sized cities of the Center-North, displaying relatively high scores in all the domains considered in both period considered, confirming similar results obtained in other works (for example in Colombo et al. 2014). Such considerations, however, do not depend just on available resources: they have historical roots in the social environment. Then family, civil society, tradition of fair administration and so on play a paramount role in determining the standard of living (Putnam 1994). The case of Genoa, which drops in the classification, can be explained just with the aftermath and the "long wave" of deindustrialization, which fiercely hit Genoa, and the crisis of its port: the result has been decline of familiar income, loss of confidence in the future, finally emigration of skilled labourers and soaring of average age of population.

This is true also for the three cities of Southern Italy, which are caught in a sort of poverty trap, involving also the quality of life we are testing. The relevance of organised crime, especially (but not only) there, is a paramount cause of social disease, which is obviously difficult to test, if not indirectly. In this case, some considerations have to be made since the phenomena of undeclared work and organized crime have a large impact. A recent study drawn up by Fedeli et al. (2015), shows that the presence of the organized crime increases the non-participation rate, while the incidence of micro criminality reduce it. Similar observations can be made concerning undeclared work, since it has huge impact on income and official employment rates. Therefore, in analysing the Italian context must take into account these elements, which have important effects on both variable income, both on QoL; indeed they make it difficult to describe accurately the situation.

Since we used indicators of objective variables, QoL assessment is likely to be also influenced by the "conversion efficiency", i.e. the efficiency with which individual resources are converted into well-being (Sen 1985, Binder and Broekel 2012). A measure of conversion efficiency would reflect the conditions under which individuals try to maximize the quality of life and would provide information about increments or decrements of quality of life among different cities and their different ways of "conversion". Difficulties in implementing such a concept, however, make it difficult to deal with this issue (Deutsch et al. 2003, Binder and Broekel 2011). This is an interesting challenge for future investigations on the temporal changes in the quality of life in an urban context.

Finally, the observation of the evolution of the index, coupled with the analysis of changes in underlying variables, allows an understanding of how changes in QoL have taken place, and how they have been affected by the dimensions considered.

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