UNIVERSITÀ DELLA CALABRIA

**Dipartimento di Economia,
Statistica e Finanza
Ponte Pietro Bucci, Cubo 0/C
87036 Arcavacata di Rende (Cosenza) - Italy**
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MEASURING WELL-BEING IN A MULTIDIMENSIONAL PERSPECTIVE: A MULTIVARIATE STATISTICAL APPLICATION TO ITALIAN REGIONS

Antonella Rita Ferrara
Dipartimento di Economia,
Statistica e Finanza
Università della Calabria
Ponte Pietro Bucci, Cubo 0/C
Tel.: +39 0984 492417
Fax: +39 0984 492421
e-mail: antonellarita.ferrara@unical.it

Rosanna Nisticò
Dipartimento di Economia,
Statistica e Finanza
Università della Calabria
Ponte Pietro Bucci, Cubo 1/C
Tel.: +39 0984 492449
Fax: +39 0984 492421
e-mail: r.nistico@unical.it

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Measuring Well-Being in a Multidimensional Perspective: a Multivariate Statistical Application to Italian Regions

Antonella Rita Ferrara and Rosanna Nisticò[*]

[**Abstract**] *The interest for the measurement of well-being has been increasing among scholars and major international institutions. This paper proposes a synthetic index for ten dimensions of well-being combining a set of 57 variables at the Italian regional level and an overall indicator of well-being by implementing a principal component analysis. We also investigate σ-convergence and γ-convergence across Italian regions over the period 2004-2010. We find that the regional well-being divide in Italy is, at least, as relevant as the economic divide, suggesting the importance of paying much more attention in public policies and academic debates to the quality-of-life features of the Italian scene. The analysis in terms of σ-convergence shows that the Italian regions tend to become more similar over time, both in terms of per-capita GDP and well-being, even if a gradual slowing-down of this process can be observed in recent years. Conversely, there is no evidence of intra-distributional mobility of the Italian regions over the entire distribution (γ-convergence) for either per-capita GDP or the well-being index.*

Keywords: well-being indicators; σ-convergence; γ-convergence; principal component analysis; Italy; regions.
Jel Classification: D63; I31; O18; R11.

1. Introduction

The issue of measurement of well-being beyond its economic features has gained momentum both in academic research and in public debate.

An impulse to the intensification of studies in this field has recently been provided by the publication of the Report by the "Commission for the Measurement of Economic Performance and Social Progress" (Stiglitz *et al*., 2009), but also by a number of initiatives promoted by prestigious international organizations: the UNDP, since the beginning of the Nineties, has been carrying out the pioneering work of calculating a Human Development Indicator (HDI); the OECD starting from 2011 provides a bi-annual assessment of well-being in member countries and in selected emerging economies (OECD 2013); the European Union organized a number of international conferences with the aim of going "beyond GDP" in order to construct well-being indicators, on the assumption that environmental protection, biodiversity and social cohesion are essential factors for progress; since 2011 the European Statistical System Committee (ESSC) has been working towards developing a set of Quality of Life indicators for EU countries.

At the same time, many countries have intensified their efforts to produce statistics for measuring well-being[1]. In Italy, a recent project carried on by the Italian National Institute of Statistics (ISTAT) in conjunction with the National Council for Economy and Labour (CNEL) has given rise to a data base covering 12 dimensions of "Equitable and Sustainable Well-Being" (whose Italian acronym, used hereafter, is BES) consisting of a set

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[1] The French government has commissioned the report of the "Stiglitz Commission"; in the United States, the 2010 Key National Indicators Act prescribes the creation of a system of indicators on well-being; in Canada, the *Canadian index of well-being* considers indicators of social and living conditions of the population; in Ireland the Central Statistics Office measures progress based on 109 indicators; in the Netherlands the Dutch Social and Cultural Planning Office provides the *Living Condition Index*; a task force on "Growth, well-being and quality of life" was launched by the German Parliament in 2010; the United Kingdom began in 2010 the "Measuring National Well-being Programme"; the National Statistical Office of Malta since 2005 carries out a Survey Income and Living Conditions.

of 134 outcome indicators[2]. They also provide a report in which well-being in Italy is examined from a multi-dimensional perspective in the spirit of the recommendations of the "Stiglitz Commission", with each chapter focusing on one specific issue. The BES report, however, does not attempt the final step of aggregating the data into a synthetic measure of well-being.

This paper aims to contribute to the empirical literature by investigating changes in ten different dimensions of well-being in Italian regions. From a strict economic standpoint, many indicators geographically group Italian regions into more developed areas clustered in the Centre-North of the country, while in the South, notwithstanding the existence of important entrepreneurial successes and high-tech clusters (see Cersosimo and Viesti 2013), areas of economic backwardness are still common (figure 1)[3]: the eight Mezzogiorno regions as a whole produce 25% of the national GDP and export only 10% of the overall Italian exportations, the South contains one third of the overall population but two thirds of the country's poor and 45% of the unemployed; labour productivity in the South is 20% lower than the Centre-North and the employment rate is less than 30% (Franco 2010). Behind the (economic) dualism between the two macro-areas, Italian regions differ in a number of other structural aspects which influence well-being. To give a few examples, Valle d'Aosta and Basilicata have a population density eleven and seven times lower than Campania or Lombardia, respectively; Lazio, Umbria and Marche have the highest percentage of people aged 30-34 university graduated, more than twice that Sicilia and Campania; the highest percentage of children up to age 3 using child-care services is found to live in Emilia Romagna (29%) and in Umbria (28%) while the lowest percentage is that of Calabria (2.4%); sedentary lifestyle in Sicilia and Campania concerns 60% aged 14 and over, against 14% in Trentino-Alto Adige and so on. We can continue with a long list of examples which highlight important regional differences in many aspects of the multifaceted phenomenon of the quality of life.

Thus, by adopting a multidimensional perspective, we calculate one synthetic indicator for each domain of well-being considered, combining a set of 57 variables at the regional level, by means of the principal component analysis. We then use these partial synthetic indicators to construct an overall index of well-being. As our goal was, other than the measurement of current well-being, to assess the process of convergence/divergence, we focused on dimensions for which variables were available for the same time interval, i.e. the period 2004-2010.

Compared with the BES report (CNEL-ISTAT 2013) our paper does not address the dimensions of "subjective well-being"; "politics and institutions", "landscape and cultural heritage" because not enough variables are available at regional level or because, in relation to these areas, data are accessible only for a too short period for the purpose of our analysis. However, in addition to the issues discussed in the BES report, we consider the "culture and free-time" dimension, another key aspect of well-being, on account of the intrinsic effects that culture and sport can have in terms of physical and psychological health, individual enjoyment and leisure, but also for the externalities they determine: cultural consumption has been shown to foster civic participation, social capital and social cohesion (Carlisle and Hanlon 2007; Diener 2009; Grossi *et al*. 2012; Peterson 2012)[4].

The goal of this paper, therefore, is threefold: a) to construct a synthetic indicator, by means of the principal component analysis, for each of the ten dimensions of well-being considered, for the period 2004-2010 for each of the Italian regions; b) to build an overall index of well-being derived from the indicators calculated in the previous step of the analysis; c) to assess the existence of processes of convergence across the Italian regions in terms of well-being using two non-parametric techniques, applied to both the partial and overall

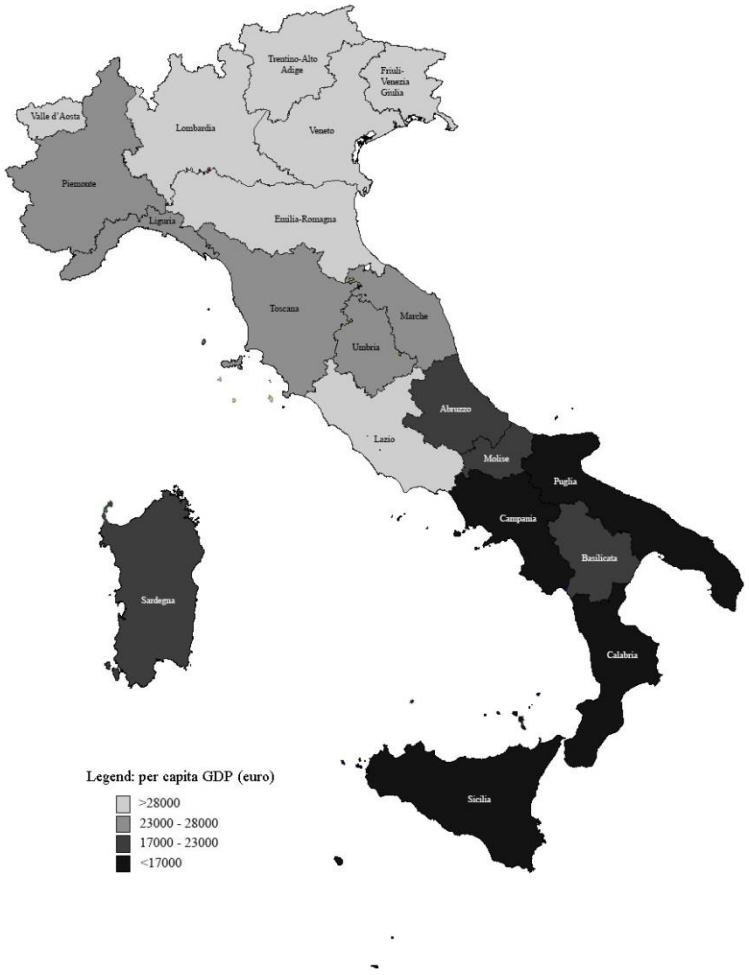
[2] The Bes data-base is available at www.istat.it

[3] Sub-national areas in Italy include eight regions (Valle d'Aosta, Piemonte, Lombardia, Trentino Alto Adige, Friuli-Venezia Giulia, Liguria, Emilia Romagna and Veneto) for the North; four regions for the Centre (Toscana, Marche, Umbria and Lazio) and eight regions for the South, or Mezzogiorno (Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia and Sardegna).

[4] As a matter of facts, some institutions, such as the Scottish Executive, have proposed to construct a specific index for measuring the benefit of culture and sport on quality of life and well-being (Scottish Executive 2005).

indicators which have been calculated. We also compare the dynamics of regional well-being with those of the traditional indicator of economic performance, per-capita GDP.

Figure 1. Italian regions by per-capita GDP (2010)



The contribution of our work to this area of research is, therefore, both conceptual and methodological. First, it expands the spectrum of domains and variables through which much of the empirical literature has measured well-being in Italy so far; further, it analyzes convergence for both single-domain indexes and the overall well-being indicator, thus capturing the dynamics of well-being by assessing changes in progress and in various aspects of the quality of life over time. A number of important initiatives used to construct multidimensional indexes do so for one year only (i. e. Annoni and Weziak-Bialowolska 2012; OECD 2011, 2013). Secondly, to the best of our knowledge, this is the first paper that uses principal component analysis in a two-step approach in order to calculate single domain sub-indexes, in the first step, and the overall well-being indicator in the second step, using as new variables the sub-indexes. Most of the empirical literature on measuring well-being, in fact, relies upon either composite indicators calculated as weighted averages of variables and sub –indexes (Berloffa and Modena 2012; Ferrara and Nisticò 2013; Marchante *et al*. 2006; OECD 2013) or mixed statistical strategies that use principal component analysis to assess the internal coherence of the different domains, whereas the final composite well-being indicator is calculated as a weighted average of the partial indexes (Annoni and Weziak-Bialowolska 2012).

The paper is structured as follows. Section 2 deals with related studies on measuring well-being. Section 3 presents the data and methodology used; section 4 shows the results for Italian regions regarding the different dimensions of well-being considered. In section 5 the results of the synthetic index of well-being are discussed. Section 6 presents the analysis of convergence across Italian regions in terms of well-being. The Section 7 concludes by discussing the results.

2. Related literature

Since its introduction, GDP is, at the same time, the most widely used indicator of the economic performance of a country, and the most criticized measure of well-being. Even those economists who contributed to defining national accounts, stated that the welfare of a nation could not be measured by the level of the Gross Domestic Product (see, for instance, Kuznets 1934). At the beginning of the Seventies, Nordhaus and Tobin (1973) wondered whether growth in terms of variation of the Gross National Product, is an obsolete concern of economic theory, proposing a primitive and experimental "measure of economic welfare (MEW), in which we attempt to allow for the more obvious discrepancies between GNP and economic welfare" (p. 512).

The literature dealing with well-being measurement holds that it is a multidimensional issue, thus it is necessary to capture information on different aspects which are relevant for people's quality of life. This poses two questions: the first one, on conceptual grounds, is to define which specific factors are relevant for individual well-being; the second, on empirical grounds, regards the collection and processing of information from very different ambits of human life. Both questions have not yet received an exhaustive or unanimous answer, but indeed they are the two key research strands to which the recent literature has contributed. Fleurbaey (2009) proposes a critical review of the literature splitting up these two strands into four different approaches: works aimed at obtaining a "corrected GDP" in order to take into consideration sustainability and nonmarket factors which influence well-being; studies on the measurement of the "gross national happiness"; the "capability approach" proposed by Sen (1985, 2000) stating that progress does not coincide with the level of opulence of a country, but rather with people's quality of life and freedom of choice (Nussbaum 2000; 2011); the strand of the construction of "synthetic indicators" which, following the path of the UNDP Human Development Index, are based on the weighted average of indicators of different aspects of human well-being[5]. The report of the "Stiglitz Commission" supports the idea that it is necessary to integrate the measurement of activities more closely related to the material standards of living (income, consumption, wealth) with elements regarding sustainability and social cohesion (health, education, social and natural environment, personal safety, the right to work and decent housing). Bleys (2012) proposes a scheme for classifying 23 of the indicators available in the literature.

With regard to the Italian case, few studies attempt to provide summary statistics alternative to GDP or an analysis of well-being at the regional level. Berloffa and Modena (2012) calculate for Italy as a whole and the Lombardia region in particular, a "revised version" of the Index of Economic Well-Being (IEBW) developed by the Centre for the Study of Living Standards (Osberg 1985; Osberg and Sharpe 2002, 2005). Their revised version adds two indicators: the proportion of temporary workers in the economic security dimension and the age wage gap in the equality dimension. The authors use composite indicators and a subjective weighting procedure to aggregate the partial indexes. They note that the inclusion of the two new variables lowers well-being both in Italy and in the Lombardia region, when compared to the "base IEWB", the index when the two variables are not included. Capriati (2011) builds a "real freedom index", given by the weighted average of seven variables, to analyze Italian regional disparities through the dynamics of the coefficient of variation of the index in three-year intervals from 1998 to 2007. Convergence across Italian regions in the period 1998-2008 is the focus of the study of Ferrara and Nisticò (2013) carried out both through the standard economic approach and by considering several quality of life aspects. They construct two composite indicators of well-

[5] For a survey on the latter approach see Bandura (2008), Gadrey and Jany-Catrice (2006), Stiglitz *et al*. (2009); Annoni and Weziak-Bialowolska (2012); Costanza *et al.* (2009).

being finding that, though large disparities persist across the Italian regions as regards different aspects of well-being, there is evidence that over the ten years considered in the analysis dispersion across Italian regions declined. For both Spanish and Italian regions, Murias *et al*. (2013) calculated a composite indicator of well-being by combining five variables (consumption per capita, research and development, higher education, the Gini index, unemployment rate) through a technique based on data envelopment analysis (DEA). Although limited to just one year and few variables, their results show that regional disparities in terms of economic well-being are less marked than those resulting from traditional per-capita income indicators. Two studies adopt an historical perspective: Felice (2007) considers seven social indicators, including the UN Human Development Index and an "improved" Human Development Index in ten-year intervals from 1871 to 2001, analyzing the dynamics of regional disparities in each decade; Iuzzolino *et al*. (2011) analyze convergence of Italian regions from national unification in 1861 to 2009 focusing on the per-capita GDP flanked by indicators of human development, in particular education and health.

3. Data and Methods

The data used in this study are extracted from ISTAT databases: the BES statistics, the specific data set published in 2013 for monitoring equitable and sustainable well-being in Italy, and the ISTAT-DPS database, a set of territorial indicators for development and cohesion policies. The description of the variables used in the analysis, their definition and source are reported in table A1 of the Appendix.

The methodological strategy is to use the principal component analysis (hereafter PCA) in order to obtain a synthetic indicator of well-being. Further, two non-parametric statistics are used to assess convergence across Italian regions.

PCA enables us to eliminate the arbitrariness which characterizes the weighting of variables in building composite indicators. We can also evaluate the internal consistency of the indicators for each well-being dimension by analyzing the structure of correlations between variables and other specific related tests, such as the Measures of Sampling Adequacy and Bartlett test. PCA is a multivariate statistical method for extracting synthetic measures from a set of variables by transforming them into a smaller set of uncorrelated variables, the principal components, capturing most of the variation present in the original data. Although since many components such as v variables in the data set are required to reproduce the total variability, much of this variability can be accounted for by a small number of p principal components. If so, the p principal component can replace the v variables without much loss of information and with the advantage that the original data set is reduced in $p<v$ principal components. The principal components are given by the uncorrelated linear combination of the original variables whose variances are as large as possible. The first principal component is the normalized linear combination with maximum variance[6]. Each of the subsequent principal components is the normalized linear combination of the original variables with the maximum variance, subject to the constraint of being orthogonal to the previous components.

As our aim is to obtain a synthetic indicator for each dimension of well-being, we concentrate our attention on just the first principal component, after having verified that the results are satisfactory in terms of percentage of total variance explained and correlations with the variables analyzed (Table 1)[7].

The principal components are extracted by the variance-covariance matrix, after the transformation of the original data by dividing the variables by the average in order to eliminate differences in the unit of measurement yet preserving differences in the variability present in each variable.

We follow a two-step approach to build our well-being index. Although the literature on the construction of well-being indexes has recently used PCA as an intermediate tool for checking the internal consistency of variables within different dimensions in order to refine the original data set (see, for instance, Annoni and

[6] This means that the sum of the squared coefficient of the linear combination is equal to 1.

[7] The correlation matrix for each well-being dimension and the whole SPSS output are available on request from the authors.

Weziak-Bialowolska 2012), this multivariate technique has not been applied to the construction of the overall synthetic indicator of well-being. In the first step, the original variables for all Italian regions, grouped in ten sets, are reduced by PCA to ten synthetic indicators, one for each well-being domain, for every year of the period 2004–2010. Thus, from the original database of 57 variables we generate a new series of variables which represent, for every year, the synthetic indicators of the different dimensions of well-being in the Italian regions. In the second step, we apply the PCA in order to extract from the ten synthetic indexes, an overall indicator of well-being (RWBI). As in the first step, the principal component is extracted from the covariance matrix of the first principal components calculated in the previous step.

Table 1 – ***Variance explained by the first principal component (%) for each well-being dimension and for the well-being synthetic index by year***

	Nr. of variables	2004	2005	2006	2007	2008	2009	2010
Culture and free time	7	79	79	80	83	81	80	80
Education	5	84	88	92	92	85	84	76
Employment	8	91	91	91	89	89	87	86
Environment	6	63	65	71	71	72	72	71
Essential public services	6	45	57	56	60	59	66	64
Health	5	88	75	73	61	67	80	82
Material living conditions	5	96	93	94	92	93	91	92
Personal security	5	52	52	57	57	59	56	53
Research and innovation	9	76	72	76	79	79	79	81
Social relations	10	92	91	92	91	93	91	92
Regional Well-Being Index	10	53	51	47	46	50	50	47

Further, we use the synthetic indicators of each domain and the RWBI to assess convergence across Italian regions during the seven year period considered in the analysis. As in Marchante *et al*. (2006) and in Ferrara and Nisticò (2013), the paper investigates the convergence across regions in well-being levels by means of two non-parametric statistics, known as σ-convergence (Friedman 1992; Sala-i-Martin 1994), and γ-convergence (Boyle and McCarty 1997), the latter using Kendall's index of rank concordance (Siegel 1956). Adapting the Sala-i-Martin (1996) approach on GDP convergence across countries, we can say that the Italian regions are converging in the sense of σ if the dispersion of their well-being decreases over time. Following the literature (Giannias *et al.* 1997; Marchante *et al.* 2006; Jordà and Sarabia 2014), the measure of dispersion used in the paper is the coefficient of variation calculated on the scaled values of the first principal components:

$$sY_{1,d}^{t} = \frac{(Y_{1,d}^{t} - Y_{1,d\,min})}{(Y_{1,d\,max} - Y_{1,d\,min})},$$

Where $Y_{1,d}^{t}$ is the value of the first principal component for dimension *d* and year *t*; $Y_{1,d\,min}$ and $Y_{1,d\,max}$ are the minimum and the maximum value of the first principal component for dimension *d* in the period under consideration, respectively[8]. $sY_{1,d}^{t}$ assumes values between 0 and 1.

If the coefficient of variation in *T* is lower (higher) than the coefficient of variation in *t*, with $T_{=2005}^{2010}$ and *T*>*t*, then σ-convergence (divergence) is present. Following O'Leary (2001) we also calculate the rate of σ-convergence as the rate of change between the coefficient of variation at time *T* and *t*, where a negative (positive) value implies convergence (divergence). However, some authors assess convergence by referring to the mobility of unities (countries, regions) over time within the given distribution of the relevant variable, known as β-convergence: if the relevant variable in regions starting out in a less advantageous position has a faster growth than in those regions that at the beginning show higher values, there is absolute β-convergence. Although the concepts of σ and β-convergence are related, they do not always show up together[9]. Thus, we

[8] We find similar results by considering the minimum and the maximum values of the first principal component in each year.

[9] As a matter of fact, the existence of β-convergence is a necessary, but not sufficient, condition for the existence of σ-convergence: mobility within the distribution (β-convergence) does not ensure that dispersion shrinks over time (σ-

investigate β-convergence in well-being levels of Italian regions following the approach proposed by Boyle and McCarthy (1997) which assesses the extent of intra-distributional mobility over time by focusing on the change in the ranking of each region with respect to well-being. This measure is Kendall's index of rank concordance proposed by Siegel (1956). The literature refers to this method of assessing β-convergence as γ-convergence. We consider the binary version of Kendall's index, which takes into account the concordance between the ranks in year *T* and the initial year (in our case 2004), for the different dimensions of well-being, as well as the RWBI:

$$k_T = \frac{Var\left[AR\left(sY_{1,d}^{T}\right)_z + AR\left(sY_{1,d}^{2004}\right)_z\right]}{Var\left[2 * AR\left(sY_{1,d}^{2004}\right)_z\right]};\ k_T = \frac{Var\left[AR\left(sRWBI^{T}\right)_z + AR\left(sRWBI^{2004}\right)_z\right]}{Var[2 * AR\left(sRWBI^{2004}\right)_z]}$$

where $AR\left(Y_{1,d}^{T}\right)_z$ is the rank of region *z*'s indicator of the well-being dimension *d* in year *T*; analogously $AR(RWBI^{T})_z$ is the rank of the synthetic indicator of well-being for region *z* in the year *T*. k_T ranges between 0 and 1: the closer k_T is to zero the greater is the mobility within the distribution and the stronger is γ-convergence.

As in Boyle and McCarthy (1997) we test the null hypothesis that no association exists between ranks in year *T* and in 2004. If the null hypothesis is rejected we have no γ-convergence. In the binary version of Kendall's index the test statistic is the following:

$$\chi^2 = 2 * (S - 1) * k_T$$

It is distributed as chi-squared with $(S - 1)$ degree of freedom, where *S*=20 is the total number of Italian regions.

Finally, in order to compare the trend in well-being convergence with that of the traditional indicator of economic progress, we also calculate σ and γ-convergence for per-capita GDP.

4. Results: synthetic indicators of the different dimensions of well-being (step 1)

We consider ten dimensions of well-being: Culture and free time, Education, Employment, Environment, Essential public services, Health, Material living conditions, Personal Security, Research and innovation, Social relations. Below we offer a brief description of each dimension and the results of the principal component analysis.

4.1 *Culture and free time*

Consumption of cultural goods and other leisure and free time activities provide benefits both at the social and economic levels, influencing the growth of human capital, enhancing social capital and relationships, improving the individual's mental and physical status. Grossi *et al*. (2012) find that access to culture plays a primary role in determining psychological well-being; Koonlaan *et al*. (2000) show the existence of a negative correlation between the frequency of attending various kinds of cultural events (movies, concerts, museums, exhibitions) and mortality risk. Similar conclusions stem from Hyppa *et al*. (2006) and Bygren *et al*. (2009). Daykin *et al*. (2008) carry out a review of the literature on the impact of the performing arts on adolescents' behavior, social skills and interactions.

In line with the influence of consumption of cultural goods, also sport influences well-being through its impact on physical and psychological health and the opportunity it offers for social interactions (Galloway 2006).

Seven variables are used for describing the culture and free time dimension of well-being (table A1). Two indicators refer to reading: newspaper reading (C1) measured as the percentage of people aged 6 and over who read newspapers at least once a week, and book reading (C5) measured as the percentage of people aged 6 and over who have read books in the previous 12 months. Four indicators concern attendance at cultural or leisure events, measured as the percentage of persons aged 6 and over who have attended at least once in the last year:

convergence); on the other hand, σ-convergence implies (is sufficient for) β-convergence, but it is not a necessary condition (Sala-i-Martin 1996).

theater exhibitions (C2), live classical music concerts (C3), sport events (C4), museums (C6). The last indicator is sport (C7) measured as the percentage of persons aged 3 and over who say they practice sports.

The first principal component accounts for 79% of the total variance contained in the seven original variables in 2004 and 2005, and 80% or over in the following years (table 1). The validation of the analysis is also assessed by means of Kaiser's measure of sampling adequacy (hereafter MSA) falling within the meritorious range (0.8 or above, except for 2004 when it was 0.7) for the overall set of variables; it also exceeds the threshold value for individual variables except for sports events (which ranges between 0.3 and 0.4)[10]. As a further validation of the suitability of the correlation structure of the data, we use the Bartlett Test of Sphericity and find a small p-value for all years (<0.001); this means that our correlation matrix is significantly different from a zero correlations matrix, so we should continue with the analysis (Hair *et al.* 2014, p. 103).

Correlations with the first principal component are all positive, that is they show the expected sign. Communality values indicate that the amount of variance accounted for by the first principal component is, in each year, 0.8 or above in five variables (museum visits, book reading, newspaper reading, classical live music concerts, sport). Communality ranges between 0.6 and 0.7 for theater attendance (C2), whereas small communalities (between 0.4 and 0.3) are found for the remaining variable (sports events). We can thus consider the value of the first principal component as the synthetic index of the cultural and free time dimension of well-being.

The highest index values are those for Trentino-Alto-Adige, at the top for every year considered, and Friuli-Venezia Giulia in second position, except for 2006 (table 2). At the bottom of the ranking we find, along with the Southern regions, a Central region (Molise), often among the last four positions. Changes in regional rankings between 2004 and 2010 are not notable, except for Campania, who fell five positions. Among the seven regions who improved their ranking, we find four Mezzogiorno regions (Calabria, Sicilia, Sardegna and Basilicata); on the contrary, eight regions saw their relative rank lower, while in four cases it did not change.

Table 2 – ***Culture and free time Index by region and year***

	2004		2005		2006		2007		2008		2009		2010		2010		Δ (2010-2004)
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Ranks**
1	Trentino-A.A.	3.61	Trentino-A.A.	3.63	Trentino-A.A.	3.70	Trentino-A.A.	3.72	Trentino-A.A.	3.72	Trentino-A.A.	3.65	Trentino-A.A.	3.52	Campania		5
2	Friuli-V.G.	3.08	Friuli-V.G.	3.06	Lombardia	3.02	Friuli-V.G.	3.05	Friuli-V.G.	3.16	Friuli-V.G.	3.14	Friuli-V.G.	3.08	Emilia-Romagna		2
3	Veneto	3.04	Lombardia	3.05	Emilia-Romagna	3.01	Lombardia	3.03	Valle d'Aosta	3.03	Lombardia	2.89	Lombardia	3.02	Toscana		2
4	Lombardia	2.98	Lazio	3.02	Veneto	3.00	Piemonte	2.99	Veneto	3.02	Lazio	2.87	Veneto	2.95	Puglia		2
5	Emilia-Romagna	2.89	Veneto	2.90	Toscana	2.86	Veneto	2.96	Lombardia	2.96	Emilia-Romagna	2.85	Lazio	2.93	Veneto		1
6	Toscana	2.85	Piemonte	2.79	Valle d'Aosta	2.78	Emilia-Romagna	2.90	Lazio	2.94	Veneto	2.84	Valle d'Aosta	2.90	Piemonte		1
7	Lazio	2.80	Emilia-Romagna	2.76	Friuli-V.G.	2.75	Valle d'Aosta	2.89	Emilia-Romagna	2.82	Piemonte	2.79	Emilia-Romagna	2.77	Umbria		1
8	Piemonte	2.78	Toscana	2.72	Piemonte	2.74	Lazio	2.86	Toscana	2.74	Valle d'Aosta	2.78	Toscana	2.76	Abruzzo		1
9	Valle d'Aosta	2.71	Valle d'Aosta	2.70	Lazio	2.70	Liguria	2.74	Piemonte	2.74	Toscana	2.69	Piemonte	2.71	Trentino-A.A.		0
10	Liguria	2.67	Marche	2.64	Umbria	2.62	Toscana	2.60	Liguria	2.64	Marche	2.67	Liguria	2.70	Friuli-V.G.		0
11	Marche	2.60	Umbria	2.48	Marche	2.61	Umbria	2.45	Umbria	2.45	Liguria	2.59	Marche	2.51	Liguria		0
12	Umbria	2.42	Liguria	2.41	Liguria	2.59	Sardegna	2.43	Marche	2.44	Umbria	2.48	Sardegna	2.49	Marche		0
13	Abruzzo	2.41	Abruzzo	2.39	Sardegna	2.36	Marche	2.37	Sardegna	2.44	Sardegna	2.37	Umbria	2.44	Lombardia		-1
14	Sardegna	2.31	Sardegna	2.39	Abruzzo	2.34	Abruzzo	2.30	Abruzzo	2.28	Abruzzo	2.29	Abruzzo	2.37	Basilicata		-1
15	Campania	2.01	Basilicata	2.02	Basilicata	2.14	Basilicata	2.11	Basilicata	2.10	Basilicata	2.08	Basilicata	1.95	Lazio		-2
16	Basilicata	1.97	Calabria	1.94	Puglia	1.97	Molise	1.92	Campania	1.88	Sicilia	1.99	Molise	1.95	Sardegna		-2
17	Puglia	1.91	Puglia	1.93	Molise	1.94	Campania	1.88	Molise	1.87	Campania	1.98	Sicilia	1.94	Molise		-2
18	Molise	1.88	Campania	1.91	Campania	1.90	Sicilia	1.86	Sicilia	1.83	Molise	1.93	Calabria	1.94	Sicilia		-2
19	Sicilia	1.85	Molise	1.87	Sicilia	1.82	Puglia	1.82	Calabria	1.82	Calabria	1.80	Puglia	1.83	Calabria		-2
20	Calabria	1.62	Sicilia	1.78	Calabria	1.77	Calabria	1.70	Puglia	1.75	Puglia	1.80	Campania	1.80	Valle d'Aosta		-3

4.2 *Education*

Education influences many important aspects of people's lives (Michalos 2008). Beginning from the pioneering works of Becker (1964), Mincer (1974) and Schultz (1971) a copious literature assesses the

[10] Kaiser (1970) has classified the values of MSA ≥0.9 as marvelous; ≥0.8 as meritorious; ≥0.7 as middling; ≥0.6 as mediocre; ≥0.5 as miserable and below 0.5 as unacceptable (Hair *et al.* 2014).

individual returns from education in terms of productivity and earnings (Harmon *et al*. 2003; Hanushek and Woessmann 2008), but education also entails externalities or spillover effects which affect the whole progress of society. External impacts of education are investigated both in terms of economic outcomes and the broader benefits for collectivity (Acemoglu and Angrist 2001; Lochner and Moretti 2004; Milligan *et al*. 2004; Moretti 2004, Miyamoto and Chevalier 2010, OECD 2010, Sianesi and Van Reenen 2003; Hanushek and Woessmann 2007; OECD 1998). These studies find that more and higher-quality education are positively linked to better public health and environmental care, to greater respect for civil rights (lower crime and wider participation in political and community life), to greater social cohesion. Recent literature deals with private non-monetary returns of schooling (Yakovlev and Leguizamon 2012; Ooreopoulus and Salvanes 2009; Vila 2000; Wolfe and Zuvekas 1997): higher levels of education may entail improvements in decision making and, thus, in work satisfaction; further, they may lead to better individual prestige, health status and social relations, all of which are in turn likely to feed back into greater well-being.

For the construction of the education index we selected five variables (Table A1).

Considering that lower secondary school is compulsory in Italy, we have focused our attention on two indicators related to higher levels of educational attainment: the percentage of people aged 30-34 with tertiary education (E1) and the percentage of people aged 25-64 having completed secondary education (E5). The first indicator is included among the targets set by the Europe 2020 strategy with the goal of bringing the share of people aged 30-34 with a university degree to 40% by 2020; the latter indicator is usually employed in international comparisons for assessing the level of formal education of a country (CNEL-ISTAT 2013). The acquisition of higher education is indicative of people's aspirations based on both cognitive-cultural and professional-remunerative motivations.

Two indicators are included to capture the problem of school drops-out. The first is the rate of early leavers from education and training (E2), that is given by the percentage of people aged 18-24 with only the lower secondary school diploma and are not enrolled in a training program. This is also a target indicator of the Europe 2020 strategy, which aims to reduce the proportion of drops-out in European countries to below 10% by 2020; the second is the rate of upper secondary school leavers (E3), which is given by the total school leavers within the first two years of upper secondary school as a percentage of the students enrolled in the second year of higher secondary school.

The final indicator used is the rate of participation in long-life learning (E4), given by the percentage of people aged 25-64 participating in formal, or informal, educational programs.

Table 3 – ***Education Index by region and year***

	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Trentino-A.A.	0.32	Trentino-A.A.	0.51	Umbria	0.68	Umbria	1.14	Trentino-A.A.	0.34	Trentino-A.A.	0.54	Trentino-A.A.	0.68	Friuli-V.G.	9
2	Friuli-V.G.	0.18	Veneto	0.18	Trentino-A.A.	0.48	Friuli-V.G.	0.18	Marche	0.14	Puglia	-0.13	Marche	-0.11	Umbria	6
3	Umbria	0.08	Marche	0.10	Emilia-Romagna	0.40	Emilia-Romagna	0.14	Veneto	-0.48	Veneto	-0.14	Veneto	-0.15	Abruzzo	5
4	Veneto	-0.17	Friuli-V.G.	0.04	Marche	0.08	Veneto	0.10	Calabria	-0.49	Basilicata	-0.24	Calabria	-0.20	Lombardia	3
5	Emilia-Romagna	-0.17	Emilia-Romagna	0.03	Veneto	0.06	Marche	-0.07	Basilicata	-0.51	Emilia-Romagna	-0.30	Puglia	-0.53	Toscana	2
6	Marche	-0.17	Umbria	-0.44	Friuli-V.G.	-0.08	Calabria	-0.16	Umbria	-0.55	Calabria	-0.31	Emilia-Romagna	-0.60	Emilia-Romagna	1
7	Lazio	-0.37	Basilicata	-0.46	Molise	-0.24	Trentino-A.A.	-0.27	Friuli-V.G.	-0.73	Friuli-V.G.	-0.32	Piemonte	-0.73	Lazio	1
8	Calabria	-0.64	Lazio	-0.55	Abruzzo	-0.47	Abruzzo	-0.38	Puglia	-0.77	Umbria	-0.34	Lazio	-1.01	Molise	1
9	Piemonte	-0.68	Toscana	-0.68	Lazio	-0.62	Piemonte	-0.52	Emilia-Romagna	-0.85	Lazio	-0.79	Umbria	-1.03	Valle d'Aosta	1
10	Abruzzo	-0.79	Calabria	-0.69	Toscana	-0.91	Basilicata	-0.56	Lazio	-0.94	Piemonte	-0.86	Basilicata	-1.08	Sicilia	1
11	Toscana	-0.81	Piemonte	-0.84	Piemonte	-0.95	Lazio	-0.65	Piemonte	-0.94	Marche	-0.91	Friuli-V.G.	-1.12	Trentino-A.A.	0
12	Basilicata	-0.84	Abruzzo	-0.86	Puglia	-1.04	Molise	-1.19	Molise	-1.02	Toscana	-0.97	Liguria	-1.14	Campania	0
13	Molise	-1.14	Liguria	-1.16	Basilicata	-1.27	Puglia	-1.36	Toscana	-1.03	Abruzzo	-1.04	Toscana	-1.17	Veneto	-1
14	Lombardia	-1.29	Molise	-1.18	Calabria	-1.35	Toscana	-1.51	Abruzzo	-1.13	Molise	-1.15	Molise	-1.17	Sardegna	-1
15	Liguria	-1.34	Lombardia	-1.35	Liguria	-1.52	Campania	-1.58	Campania	-1.30	Campania	-1.21	Abruzzo	-1.23	Piemonte	-2
16	Campania	-1.53	Puglia	-1.51	Lombardia	-1.62	Liguria	-1.78	Liguria	-1.41	Liguria	-1.34	Campania	-1.36	Basilicata	-2
17	Valle d'Aosta	-1.62	Sardegna	-1.96	Campania	-1.67	Lombardia	-2.04	Lombardia	-1.81	Lombardia	-1.34	Lombardia	-1.39	Liguria	-3
18	Puglia	-1.73	Valle d'Aosta	-2.19	Sardegna	-1.93	Valle d'Aosta	-2.18	Sicilia	-1.98	Sicilia	-1.78	Valle d'Aosta	-1.54	Marche	-4
19	Sicilia	-1.78	Campania	-2.23	Sicilia	-2.17	Sicilia	-2.65	Valle d'Aosta	-2.30	Sardegna	-2.39	Sardegna	-1.79	Calabria	-4
20	Sardegna	-1.81	Sicilia	-2.24	Valle d'Aosta	-3.11	Sardegna	-3.12	Sardegna	-2.73	Valle d'Aosta	-2.80	Sicilia	-2.00	Puglia	-13

We obtain the synthetic indicator of the education dimension of well-being by calculating the value of the first principal component. It explains 79% of the total variance contained in the five original variables in 2010 and assumes higher values in previous years, ranging from 84% in 2004 and 2009 to 92% in 2006 and 2007. The correlations among the variables produce an overall MSA that is, according to Kaiser's classification, middling (0.7 or above) for the years 2007-2008 and meritorious (0.8 or above) for the remaining years, supported also by a Bartlett test <0.0001; the MSA for each variable is meritorious in 68% of cases and middling for the others, except for just one variable (E3) only in 2008. A very high amount of the variance (0,9) in the rate of early leavers from education and training (E3) is accounted for by the first principal component whereas communalities are lower (up to 0.5) for the other variables.
The first principal component shows positive correlations with people with tertiary education (E1), participation in long-life learning (E4), people who completed their secondary education (E5), and negative for the remaining two variables, the rate of early leavers from education and training (E2) and the rate of upper secondary school leavers.
The education index describes a much more complex situation at regional level with respect to that observed for the dimensions previously analyzed: although the first ten positions in the rankings are generally dominated by Northern regions, we also find Southern and Central regions, with their rankings changing year to year (table A4). Looking at the changes between the beginning and the end of the period, it is worth noting that two Southern regions, Puglia and Calabria, show significant improvements in this dimension. On the whole, just two regions (Trentino-Alto Adige, Campania) do not change their position; Puglia makes spectacular progress gaining thirteen positions, with Calabria and Marche coming next, being four positions ahead with respect to seven years earlier. At the opposite end of the ranking, we observe that ten regions move backward: the biggest decline occurs for Friuli-Venezia Giulia, which moves back nine positions, followed by Umbria (-6) and Abruzzo (-5).

4.3 Employment

The employment dimension is crucial in defining well-being, both from the perspective of the opportunity for individuals to fulfill their job aspirations and from the perspective of earnings people must have to satisfy needs, personal ambitions and desires. Further, according to Solow (1990, p. 27), "we live in a society in which social status and self-esteem are strongly linked to employment and income [...] The way others look at us, and the way in which we see ourselves, depends on the income and, at a given level of income, from work." Having a job enables people to develop new competencies and relationships, giving them the opportunity to enrich their social capital (OECD 2013). On the contrary, the lack of employment is, according to Sylos Labini (1990, p. 265), a reason of "civil mortification: it generates frustration, confusion and sometimes anguish of living" . Although the standard neoclassical theory assumes the existence of a "disutility of work", a number of studies show the negative impact of unemployment on individual satisfaction and well-being, not caused just by the loss of income (Ratzel 2012; Clark and Oswald 1994; Gerlach and Stephan 1996; Winkelmann and Winkelmann, 1998; Frey and Stutzer 2002, Clark 2003, 2006). In Italy, there are marked regional disparities in the real possibility of finding employment. Moreover, with regard to job opportunities, age and gender discrimination varies considerably across regions (Cersosimo and Nisticò 2013). In the South of Italy unemployment currently affects 40% of the people aged between 15 and 24 (45% if we consider just girls), a percentage more than twice that of the North-East of Italy. One-fifth of young Southern people between 25 and 34 years are unemployed (almost a quarter if women only are considered) in comparison with a much lower percentage in the North (just 7%). In the South less than three young people in ten are employed, about one in two in the North.
We selected eight indicators for describing the employment dimension of well-being (Table A1). The first is the commonly used indicator for measuring the availability of jobs: the employment rate (L1). However, following CNEL-ISTAT (2013) we calculated the employment rate for people aged 20-64 years, with the aim of considering the percentage of population of employed among those that are thought to have completed

secondary school, avoiding considering younger people who, because of economic hardship or other reasons leave school at the compulsory level (lower secondary school in Italy). On the opposite ground of the lack of work, instead of the usual unemployment rate we use the non-partecipation rate (L2) which is measured as the sum of the unemployed and the "potential" labour force aged 15-74, that is people not searching for a job during the previous four weeks, but available for work, divided by the sum of the labour force aged 15-74 and the "potential" labour force aged 15-74. This indicator is a suitable measure of the job market, once the peculiarities of the Italian welfare system have been taken into account (CNEL-ISTAT report 2013). The share of currently employed persons with temporary jobs for at least 5 years (L3) aims to capture job (in)security. It is given by the share of temporary employees and short term-contract workers who started their current job 5 years previously as a percentage of the total temporary employees and short term contract workers.

Another important feature of employment affecting individual well-being is the incidence of the irregular jobs which undermines the principle of equity that should guide labour relations (Solow 1990). The share of persons employed not in a regular occupation (L4), is given by the percentage of workers not in compliance with labour, fiscal and retirement laws on total in work.

Gender inequality in job opportunities and difficulties faced by women in balancing life and work are captured, respectively, by the ratio of female to male employment rate (L6), and the ratio between the employment rate of women aged 25-49 with at least one child of compulsory school age (6-13), and the employment rate of women aged 25-49 without children (L5).

Table 4 – ***Employment Index by region and year***

	2004		2005		2006		2007		2008		2009		2010		2010-2004	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Trentino-A.A.	-0.53	Trentino-A.A.	-0.59	Trentino-A.A.	-0.57	Trentino-A.A.	-0.50	Trentino-A.A.	-0.56	Trentino-A.A.	-0.52	Trentino-A.A.	-0.56	Piemonte	4
2	Valle d'Aosta	-0.56	Valle d'Aosta	-0.69	Valle d'Aosta	-0.65	Emilia-Romagna	-0.63	Emilia-Romagna	-0.70	Veneto	-0.72	Valle d'Aosta	-0.70	Emilia-Romagna	1
3	Emilia-Romagna	-0.72	Emilia-Romagna	-0.70	Emilia-Romagna	-0.71	Veneto	-0.68	Veneto	-0.72	Emilia-Romagna	-0.76	Veneto	-0.80	Friuli-V.G.	1
4	Veneto	-0.79	Lombardia	-0.79	Veneto	-0.78	Valle d'Aosta	-0.74	Valle d'Aosta	-0.79	Valle d'Aosta	-0.79	Emilia-Romagna	-0.85	Abruzzo	1
5	Lombardia	-0.83	Veneto	-0.80	Lombardia	-0.83	Marche	-0.78	Lombardia	-0.84	Lombardia	-0.89	Lombardia	-0.86	Trentino-A.A.	0
6	Friuli-V.G.	-0.91	Friuli-V.G.	-0.82	Marche	-0.87	Lombardia	-0.80	Marche	-0.86	Friuli-V.G.	-0.92	Marche	-0.88	Valle d'Aosta	0
7	Piemonte	-1.07	Marche	-0.99	Friuli-V.G.	-0.93	Friuli-V.G.	-0.94	Friuli-V.G.	-0.94	Toscana	-0.96	Friuli-V.G.	-0.89	Lombardia	0
8	Marche	-1.08	Toscana	-1.00	Piemonte	-0.98	Piemonte	-0.94	Toscana	-0.95	Marche	-1.03	Toscana	-1.05	Liguria	0
9	Toscana	-1.09	Piemonte	-1.03	Toscana	-1.03	Toscana	-0.95	Piemonte	-1.05	Liguria	-1.10	Umbria	-1.13	Molise	0
10	Liguria	-1.32	Liguria	-1.26	Liguria	-1.22	Umbria	-1.19	Umbria	-1.13	Umbria	-1.18	Liguria	-1.14	Sardegna	0
11	Umbria	-1.35	Umbria	-1.44	Umbria	-1.32	Liguria	-1.24	Liguria	-1.30	Piemonte	-1.19	Piemonte	-1.17	Puglia	0
12	Abruzzo	-1.70	Abruzzo	-1.65	Abruzzo	-1.58	Abruzzo	-1.55	Abruzzo	-1.52	Abruzzo	-1.54	Lazio	-1.57	Basilicata	0
13	Lazio	-1.92	Lazio	-1.83	Lazio	-1.83	Lazio	-1.76	Lazio	-1.73	Lazio	-1.69	Abruzzo	-1.65	Campania	0
14	Molise	-2.38	Molise	-2.41	Molise	-2.42	Molise	-2.23	Molise	-2.47	Molise	-2.40	Molise	-2.27	Sicilia	0
15	Sardegna	-2.63	Sardegna	-2.55	Sardegna	-2.53	Sardegna	-2.51	Sardegna	-2.64	Sardegna	-2.51	Sardegna	-2.38	Calabria	0
16	Puglia	-2.78	Puglia	-2.77	Basilicata	-2.73	Puglia	-2.67	Puglia	-2.69	Puglia	-2.53	Puglia	-2.47	Veneto	-1
17	Basilicata	-2.80	Basilicata	-2.79	Puglia	-2.75	Basilicata	-2.72	Basilicata	-2.91	Basilicata	-2.81	Basilicata	-2.74	Toscana	-1
18	Campania	-3.17	Campania	-3.18	Campania	-3.15	Campania	-3.06	Campania	-3.11	Campania	-2.96	Campania	-2.93	Lazio	-1
19	Sicilia	-3.41	Sicilia	-3.42	Sicilia	-3.27	Sicilia	-3.25	Sicilia	-3.34	Sicilia	-3.06	Sicilia	-3.04	Marche	-2
20	Calabria	-3.58	Calabria	-3.78	Calabria	-3.57	Calabria	-3.42	Calabria	-3.51	Calabria	-3.37	Calabria	-3.52	Umbria	-2

One of the variables used focuses on the problem of the incidence of long term unemployment (L7), that discourages job searching and deteriorates human capital, making it more difficult for people to find a job. The final variable is the youth unemployment rate (L8), a hot issue in the agenda of Italian policy makers and a major societal concern.

The share of the variance present in the seven variables explained by the first principal component is quite high: 91% for years 2004-2006; 89% in 2007-2008; 87% in 2009 and 86% in 2010 (table 1). Bartlett's test finds that correlations, when taken collectively, are significant at 0.0001 level, whereas the MSA for all the data set, as well as for each variable in 91% of cases, fall in the meritorious (0.8 or above) range. In the remaining cases it is never below 0.7. The component matrix shows that correlations with the first principal component are positive for three variables (the employment rate (L1); the relative employment rate for women with children (L5); the ratio of female employment to male employment rate (L6)) and negative for the remaining indicators. Higher communality values (0.9 or above) regard the youth unemployment rate (L8), the

non-participation rate (L2), the employment rate (L1), the share of irregular workers (L3) and the ratio of female to male employment rate suggesting the strong influence of these variables in characterizing the index value.
The national divide in the labour dimension is even more marked than those analyzed so far: for each year all the Southern regions fall in the lower positions. In terms of the ranking of the employment index, it is worth noting that most regions (55%) do not vary position over the period 2004-2010, while just five Center-North regions move upwards: three by one position (Veneto, Toscana and Lazio) and two by two positions (Marche and Umbria), (table 4).

4.4 Environment

The environment is an essential aspect of well-being, above all for its impact on human health. For example, air and noise pollution, hazardous substances and contaminants, have been shown to be linked to hill health (Graff Zivin and Neidell 2013). Further, people derive pleasure directly from the natural beauty and livability of places, since the biophysical context affects our daily lives (Dodds 1997). Moreover many derive satisfaction from the possibility of limiting the degradation of the planet and the over exploitation of natural resources (Oecd 2013). Graff Zivin and Neidell (2013) highlight three strands of the recent economic literature on the relationship between the environment and individual well-being: the effects of pollution on the optimizing behavior in residential sorting (Chay and Greenstone 2005); the costs of avoidance behavior consisting in activities aimed at averting toxic exposure (Courant and Porter 1981; Harrington and Portney 1987; Bartik 1988); a number of studies on the effects of environmental pollution on human capital, productivity, cognitive development and performance (Strauss and Thomas 1998; Cunha and Heckman 2007; Currie and Hyson 1999; Currie and Stabile 2006; Graff Zivin and Neidell 2012; Hanna and Oliva 2011; Lavy, Ebstein and Roth 2012; Almond, Edlund and Palme 2009). Stiglitz *et al*. (2009) link environmental quality to the issue of sustainability, through the "magnitude of exhaustible resources that we leave to future generations" (p. 61). This perspective moves the analysis from the question of measuring the present to the prediction of the well-being of future generations.
The environmental index calculated on the basis of available data refers to those aspects of well-being involving environmental quality and local livability. We consider six variables to describe important aspects of this dimension of well-being (table A1): three variables capture the first aspect and reflect the idea that environmental quality is better the lower the fertilizers per hectare used in agriculture (A1), the greater the number of air quality monitoring stations in relation to the number of city dwellers (A2), the percentage of energy consumption provided by renewable sources (A4); three variables refer to the dimension of local livability, which rises when air pollution (A3) and population density (A6) are lower and when a wider percentage of land is under a special protection (A5).
The structure of correlations meets the necessary threshold with values falling in the acceptable range (above 0.50) for each year, both for the overall set of variables and individual variables, and the Bartlett test shows that non zero correlations exist at the significance level of 0.05.
The first principal component explains a quota of the total variance ranging from 63% in 2004 to 72% in 2008 and 2009. It is positively correlated with the monitoring of air quality, energy consumption covered by renewable sources, special protection areas, while it has negative correlations with fertilizers used in agriculture, air pollution and population density. Communalities are large for energy consumption covered by renewable sources (0.9 every year) and monitoring of air quality (0.7 or above in four out of seven years).
Over the period 2004-2006 the maximum values for the Environment index were reached by Valle d'Aosta and Trentino-Alto Adige, two Northern regions at the foot of the Alps, where care for the environment is a major concern not just because the local economic system relies heavily upon tourism, but also for the society in general for reasons linked to the cultural and historical values of small mountain towns (table 5). The following positions are occupied by some Center-South regions characterized by low levels of air pollution, population density and relatively high percentage of land protected as special areas: Abruzzo was in third

position until 2006, replaced by Calabria in 2007 and Molise in the last three years. More mobility is found at the opposite end of the scale. In the first half of the period the worst performances were recorded by three Northern regions (Lombardia in 2004 and 2005; Veneto in 2006 and Emilia Romagna in 2007) replaced later by Campania, that from 2008 shows a sharp decline in the environmental index ranking. Looking at the whole period of the analysis, we observe a clear deterioration of the ranking for Friuli-Venezia Giulia, which moves from the fourth to the ninth position, Campania (from 16th in 2004 to 20th in 2010), Veneto, Marche and Piemonte (which all fall by three positions), whereas Toscana, Lazio and Umbria, besides Valle d'Aosta and Trentino Alto Adige, do not see their rank change. On the contrary, seven regions improve their position; in particular five Mezzogiorno regions (Sicilia, Puglia, Sardegna, Basilicata and Molise, the latter reaching the third position in 2010).

Table 5– *Environment Index by region and year*

	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Valle d'Aosta	8.54	Valle d'Aosta	8.43	Valle d'Aosta	9.32	Valle d'Aosta	8.87	Valle d'Aosta	8.28	Valle d'Aosta	8.23	Valle d'Aosta	6.69	Friuli-V. G.	5
2	Trentino-A.A.	4.49	Trentino-A.A.	3.68	Trentino-A.A.	3.85	Trentino-A.A.	4.37	Trentino-A.A.	4.34	Trentino-A.A.	3.63	Trentino-A.A.	3.25	Campania	4
3	Abruzzo	1.39	Abruzzo	1.34	Abruzzo	1.16	Calabria	1.64	Molise	1.25	Molise	1.43	Molise	1.69	Marche	3
4	Friuli-V. G.	0.90	Molise	0.91	Friuli-V. G.	1.01	Toscana	1.58	Abruzzo	0.82	Abruzzo	1.09	Basilicata	1.03	Piemonte	3
5	Calabria	0.80	Calabria	0.82	Sardegna	0.95	Abruzzo	1.50	Basilicata	0.82	Basilicata	1.02	Abruzzo	0.83	Veneto	3
6	Basilicata	0.76	Friuli-V.G.	0.68	Umbria	0.93	Molise	1.50	Toscana	0.73	Calabria	0.80	Calabria	0.82	Abruzzo	2
7	Umbria	0.74	Toscana	0.67	Basilicata	0.90	Basilicata	1.39	Sardegna	0.71	Sardegna	0.70	Umbria	0.67	Liguria	2
8	Molise	0.73	Basilicata	0.66	Calabria	0.82	Umbria	1.15	Friuli-V. G.	0.62	Friuli-V. G.	0.60	Sardegna	0.58	Calabria	1
9	Liguria	0.58	Umbria	0.62	Toscana	0.72	Piemonte	1.12	Calabria	0.61	Toscana	0.56	Friuli-V. G.	0.42	Lazio	0
10	Toscana	0.53	Sardegna	0.52	Molise	0.58	Sardegna	1.10	Umbria	0.45	Umbria	0.46	Toscana	0.37	Toscana	0
11	Sardegna	0.50	Liguria	0.21	Liguria	0.46	Friuli-V. G.	0.89	Liguria	0.28	Sicilia	0.16	Liguria	0.12	Trentino-A.A.	0
12	Piemonte	0.25	Piemonte	0.18	Sicilia	0.30	Sicilia	0.86	Marche	0.16	Piemonte	0.09	Sicilia	-0.03	Umbria	0
13	Marche	0.22	Sicilia	0.18	Piemonte	0.28	Lazio	0.86	Sicilia	0.13	Puglia	0.00	Puglia	-0.06	Valle d'Aosta	0
14	Lazio	0.18	Marche	0.03	Marche	0.13	Campania	0.85	Piemonte	0.12	Liguria	-0.02	Lazio	-0.27	Emilia-Romagna	-1
15	Veneto	0.11	Lazio	0.01	Lazio	0.12	Liguria	0.85	Puglia	-0.10	Marche	-0.03	Piemonte	-0.35	Lombardia	-1
16	Campania	0.04	Campania	0.00	Puglia	0.08	Puglia	0.80	Emilia-Romagna	-0.11	Emilia-Romagna	-0.09	Marche	-0.38	Basilicata	-2
17	Puglia	0.03	Puglia	-0.06	Emilia-Romagna	0.05	Lombardia	0.73	Lazio	-0.12	Lazio	-0.12	Emilia-Romagna	-0.51	Sardegna	-3
18	Emilia-Romagna	0.01	Emilia-Romagna	-0.07	Lombardia	-0.10	Veneto	0.67	Veneto	-0.16	Veneto	-0.21	Veneto	-0.69	Puglia	-4
19	Sicilia	-0.07	Veneto	-0.19	Campania	-0.14	Marche	0.60	Lombardia	-0.24	Lombardia	-0.40	Lombardia	-0.73	Molise	-5
20	Lombardia	-0.18	Lombardia	-0.30	Veneto	-0.18	Emilia-Romagna	0.50	Campania	-0.49	Campania	-0.59	Campania	-0.75	Sicilia	-7

4.5 Essential public services

A key role in determining people's well-being is played by the possibility to access essential services, such as the provision and quality of child and elderly care, water and electricity and waste management. These services are *ipso facto* important for social and civic progress; further, they involve spillovers into other quality of life dimensions: for example, increasing the availability of child and elderly care would favour women's participation in the labour market; analogously, urban waste management protects and improve the quality of the environment. Striking regional disparities in the provision of these essential services are found in Italy. Notwithstanding the improvements after the unification of Italy, citizens who live in the Mezzogiorno still have to contend with central and local government services of much lower quantity, quality, accessibility and efficiency than those in the North (Cersosimo and Nisticò 2013).

We select six variables for assessing the quality of essential services provided to citizens (table A1). The first one regards the health services and, in particular, the problem of long waiting lists for treatment (Q1), calculated as the percentage of population who renounced medical care because of the length of the waiting lists. The differentiated urban waste collection (Q2), is given by the percentage of urban waste handled through separate (recyclable vs non-recyclable) waste collection out of total urban waste collected, is aimed at capturing the progress in recycling urban waste. Two indicators refer to care for children and the elderly: the percentage of children up to age 3 in child-care provision out of the total population aged up to 3 years (Q3) and the percentage of elderly receiving home assistance out of total elderly population aged 65 years and over (Q4); the last two variables look at the inefficiency in the provision of electricity and water: the percentage of households who report irregularities in water supply (Q6) and the frequency of long lasting power cuts (Q5).

The variance of the original variables explained by the first principal component ranges between 45% in 2004 and 66% in 2009. The overall MSA (0.6 or above) and Bartlett's test (sig. <0.0001) confirm the existence of a good correlation among variables; analogously, the MSA for each variable falls above the acceptable range except for one variable (elderly assisted at home- Q4) and for two years (2004, 2005). The first principal component is positively correlated with differentiated urban waste collection (Q2), child care services (Q3) and elderly assisted at home (Q4); conversely, the elements of the component matrix are negative for the variables: waiting lists for treatment (Q1), break downs in electric power provision (Q5), and, finally, irregularities in water supply (Q6).

The amount of variance accounted for by the first principal component is higher for waiting lists for treatment and irregularities in water supply (for which communality values are 0.6 or above) and for irregularities in electric power provision (with communality values of 0.5 or above). Communalities are lower for the elderly assisted at home (0.3 or below).

The synthetic index reproduces the historical divide between Northern and Southern Italy, with the latter at the foot of the rankings (table 5). This confirms that the civic divide in Italy, in terms of the provision of essential public services, is at least as important as the economic and productive divide. Notwithstanding this, among the ten regions that gained positions between 2004 and 2010 we find five Southern regions (Campania, Sardegna, Calabria, Abruzzo, Basilicata). It's worth noting the big jump by Umbria and Friuli-Venezia Giulia, who occupy in 2010 the first and the second position in the regional ranking after moving up by ten and nine positions, respectively.

Table 6 – ***Essential Public Services Index by region and year***

	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Valle d'Aosta	3.23	Valle d'Aosta	1.51	Friuli-V.G.	1.09	Friuli-V.G.	1.23	Friuli-V.G.	0.99	Emilia-Romagna	1.17	Umbria	1.05	Toscana	8
2	Emilia-Romagna	1.49	Trentino-A.A.	0.90	Trentino-A.A.	0.66	Emilia-Romagna	1.21	Emilia-Romagna	0.66	Friuli-V.G.	1.07	Friuli-V.G.	1.04	Lombardia	5
3	Lombardia	1.09	Friuli-V.G.	0.67	Valle d'Aosta	0.65	Valle d'Aosta	0.81	Umbria	0.61	Trentino-A.A.	0.55	Emilia-Romagna	1.01	Veneto	5
4	Trentino-A.A.	1.06	Liguria	0.45	Emilia-Romagna	0.45	Trentino-A.A.	0.78	Valle d'Aosta	0.57	Valle d'Aosta	0.48	Valle d'Aosta	0.71	Piemonte	4
5	Toscana	0.94	Lombardia	0.43	Veneto	0.43	Veneto	0.71	Liguria	0.39	Veneto	0.47	Trentino-A.A.	0.69	Molise	4
6	Veneto	0.82	Emilia-Romagna	0.40	Liguria	0.38	Lombardia	0.52	Trentino-A.A.	0.38	Liguria	0.40	Marche	0.58	Valle d'Aosta	3
7	Marche	0.75	Umbria	0.20	Umbria	0.30	Piemonte	0.07	Veneto	0.20	Lombardia	0.37	Liguria	0.48	Puglia	3
8	Piemonte	0.61	Veneto	0.17	Lombardia	0.13	Liguria	0.00	Lombardia	0.18	Basilicata	-0.01	Lombardia	0.39	Emilia-Romagna	1
9	Liguria	0.60	Piemonte	-0.07	Abruzzo	-0.04	Umbria	-0.10	Basilicata	0.07	Umbria	-0.02	Abruzzo	0.39	Trentino-A.A.	1
10	Friuli-V.G.	0.54	Marche	-0.10	Molise	-0.12	Marche	-0.18	Abruzzo	-0.18	Marche	-0.04	Basilicata	0.35	Sicilia	1
11	Umbria	0.32	Abruzzo	-0.40	Basilicata	-0.20	Molise	-0.19	Molise	-0.46	Piemonte	-0.25	Veneto	0.25	Marche	-1
12	Abruzzo	0.01	Molise	-0.50	Marche	-0.20	Abruzzo	-0.24	Piemonte	-0.71	Lazio	-0.92	Piemonte	-0.27	Lazio	-1
13	Molise	-0.32	Toscana	-0.69	Piemonte	-0.28	Toscana	-0.28	Marche	-0.87	Toscana	-1.13	Toscana	-0.60	Liguria	-2
14	Basilicata	-0.37	Lazio	-1.29	Lazio	-1.05	Lazio	-0.86	Lazio	-1.26	Sardegna	-1.20	Lazio	-0.63	Campania	-2
15	Lazio	-0.42	Campania	-1.53	Toscana	-1.12	Basilicata	-0.93	Toscana	-1.36	Campania	-1.57	Campania	-1.20	Sardegna	-2
16	Puglia	-0.72	Puglia	-1.60	Puglia	-2.17	Sardegna	-1.06	Sardegna	-1.46	Puglia	-1.84	Sardegna	-1.49	Calabria	-2
17	Campania	-0.95	Basilicata	-2.05	Campania	-2.26	Puglia	-1.66	Campania	-1.51	Abruzzo	-1.87	Molise	-1.61	Abruzzo	-3
18	Sardegna	-0.99	Sardegna	-2.09	Calabria	-2.44	Campania	-2.00	Puglia	-2.31	Molise	-2.17	Calabria	-1.68	Basilicata	-4
19	Sicilia	-1.33	Sicilia	-2.75	Sardegna	-2.55	Calabria	-2.58	Sicilia	-3.15	Sicilia	-3.00	Puglia	-1.76	Friuli-V.G.	-8
20	Calabria	-1.52	Calabria	-2.88	Sicilia	-2.69	Sicilia	-2.74	Calabria	-3.20	Calabria	-3.39	Sicilia	-2.32	Umbria	-10

4.6 Health

Health is among the most important factors people indicate as influencing their well-being (ONS 2011, WHO 2013, OECD 2013) and has been the most common dimension in the construction of composite well-being indicators since the pioneering initiative of the UNDP Human Development Index. Many studies state a two way relationship between health and well-being: mental and physical health influence professional and personal relationships as they free people from medical or other care needs, increase their probability of finding work, and of participating in social activities; conversely, good quality of life increases the individual's attention on prevention and medical check-ups, enhance immune systems, increase longevity and reproductive health, and, in the case of disease, provide access to adequate care (Deiner and Chan 2011; Dolan et al. 2008; Shields and Wheatley Price 2005; Howell et al. 2007).

The health index is calculated from five basic indicators (table A1). The first one (H1) is the life expectancy at birth (UNDP 1990, 2010). The infant mortality rate (H2) is given by deaths during the first years of life per 10,000 live births. The remaining three variables refer to habits or lifestyles that present health risks. Overweight or obesity constitute a danger for health: they are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer (WHO 2014; Darnton-Hill *et al.* 2004). Overweight or obesity (H3) is given by the average body mass index of the population (BMI), an index used by WHO to classify people as "normal weight" (BMI of 18.5 to less than 25), overweight (BMI of 25 to less than 30) or obese (BMI of 30 or more). A sedentary lifestyle (H4), can damage physical and psychological health: there is evidence that physical activity reduces anxiety and depression (Stoll et al. 2012; Ross and Hayes 1988, World Health Organization 2010), while a sedentary lifestyle, by contributing to obesity, causes the same risks as chronic diseases. Analogously, a balanced diet is important for good health (NatCen Social Research 2012; Swinburn *et al.* 2004): we consider as indicator the percentage of people aged 3 years or more who consume at least four portions of fruit and vegetables a day (H5).

Table 7 – *Health Index by region and year*

	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
7	Friuli-V.G.	-0.23	Trentino-A.A.	-0.29	Valle d'Aosta	-0.28	Piemonte	-0.50	Piemonte	-0.55	Trentino-A.A.	-0.14	Trentino-A.A.	-0.20	Marche	6
5	Trentino-A.A.	-0.41	Veneto	-0.34	Friuli-V.G.	-0.47	Trentino-A.A.	-0.93	Valle d'Aosta	-1.11	Valle d'Aosta	-0.29	Toscana	-0.34	Valle d'Aosta	5
1	Piemonte	-0.43	Friuli-V.G.	-0.36	Trentino-A.A.	-0.49	Friuli-V.G.	-0.94	Liguria	-0.75	Piemonte	-0.40	Friuli-V.G.	-0.37	Friuli-V.G.	2
6	Veneto	-0.44	Piemonte	-0.45	Lombardia	-0.56	Basilicata	-1.03	Lombardia	-0.66	Liguria	-0.41	Emilia-Romagna	-0.42	Piemonte	2
2	Valle d'Aosta	-0.47	Toscana	-0.47	Veneto	-0.59	Veneto	-1.12	Trentino-A.A.	-0.37	Friuli-V.G.	-0.44	Piemonte	-0.42	Veneto	2
11	Marche	-0.54	Emilia-Romagna	-0.48	Liguria	-0.60	Emilia-Romagna	-1.17	Veneto	-0.59	Emilia-Romagna	-0.49	Veneto	-0.45	Campania	2
4	Lombardia	-0.56	Marche	-0.57	Emilia-Romagna	-0.60	Toscana	-1.20	Friuli-V.G.	-0.43	Veneto	-0.51	Lombardia	-0.54	Liguria	1
3	Liguria	-0.57	Liguria	-0.59	Piemonte	-0.64	Valle d'Aosta	-1.24	Emilia-Romagna	-0.68	Toscana	-0.54	Umbria	-0.61	Lazio	1
8	Emilia-Romagna	-0.63	Lombardia	-0.59	Toscana	-0.66	Lombardia	-1.25	Toscana	-0.72	Lombardia	-0.55	Liguria	-0.69	Abruzzo	1
9	Toscana	-0.76	Umbria	-0.67	Marche	-0.82	Marche	-1.29	Umbria	-0.82	Umbria	-0.56	Valle d'Aosta	-0.73	Molise	1
10	Umbria	-0.80	Valle d'Aosta	-0.70	Umbria	-0.86	Sardegna	-1.37	Marche	-0.70	Marche	-0.70	Sardegna	-0.79	Basilicata	1
12	Lazio	-0.86	Sardegna	-0.75	Sardegna	-0.92	Umbria	-1.38	Lazio	-0.99	Sardegna	-0.73	Marche	-0.85	Sicilia	1
20	Sardegna	-0.96	Molise	-0.82	Lazio	-1.04	Liguria	-1.48	Abruzzo	-1.40	Lazio	-0.88	Lazio	-0.87	Lombardia	0
13	Abruzzo	-1.22	Lazio	-0.85	Molise	-1.04	Lazio	-1.49	Molise	-1.28	Abruzzo	-1.00	Puglia	-1.21	Trentino-A.A.	-1
14	Molise	-1.24	Abruzzo	-0.99	Abruzzo	-1.10	Molise	-1.58	Campania	-1.44	Molise	-1.19	Abruzzo	-1.22	Sardegna	-2
17	Basilicata	-1.41	Campania	-1.29	Basilicata	-1.28	Abruzzo	-1.80	Puglia	-1.32	Campania	-1.26	Molise	-1.22	Calabria	-2
15	Campania	-1.42	Puglia	-1.36	Puglia	-1.33	Puglia	-1.82	Basilicata	-1.54	Puglia	-1.27	Basilicata	-1.25	Umbria	-3
16	Puglia	-1.43	Basilicata	-1.40	Campania	-1.47	Campania	-1.87	Calabria	-1.48	Calabria	-1.31	Calabria	-1.30	Puglia	-4
19	Sicilia	-1.55	Sicilia	-1.50	Sicilia	-1.50	Calabria	-1.93	Sicilia	-1.62	Basilicata	-1.33	Campania	-1.37	Emilia-Romagna	-5
18	Calabria	-1.66	Calabria	-1.55	Calabria	-1.81	Sicilia	-1.93	Sardegna	-0.96	Sicilia	-1.53	Sicilia	-1.51	Toscana	-8

Our synthetic indicator of the health dimension, the first principal component, explains a quota of the total variance present in the five variables used to compute it ranging from 61% in 2007 to 88% in 2004 (table 1). Bartlett's test finds that the correlations, when taken jointly, are significant at the 0.0001 level, whereas the overall measure of sampling adequacy assumes middling values (0.7) or above. Examination of the values of each variable identifies middling or meritorious (0.8 or above) measures of sampling adequacy. Communalities are large for nutrition, sedentary lifestyle, infant mortality rate (0.8 or above), and overweight or obesity (0.7), whereas they are quite small (up to 0.3) for life expectancy.

The first principal component is positively linked to life expectancy at birth (H1) and nutrition (H5) and has a negative association with the infant mortality rate (H2), overweight or obesity (H3), sedentariness (H4); as a consequence, it appears as a reliable synthetic indicator of health dimension of well-being.

Despite the health index reports at the top and at the bottom of the rankings the usual divide between the North and the South of Italy, characterized by the backwardness of the Mezzogiorno regions, the changes in the ranking over the seven years show that a Central region (Marche) and four Northern regions (Valle d'Aosta, Friuli Venezia Giulia, Piemonte and Veneto) experienced the largest fall (table 7). At the opposite end, there is an improvement for three Southern regions (Sardegna, Calabria, Puglia). The largest improvements were found in Emilia-Romagna and Toscana which gained five and eight positions, respectively.. Only one region (Lombardia) did not change its rank.

4.7 Material living conditions

Material living conditions, determining people's ability to satisfy their needs and aspirations, are an essential component of well-being (OECD 2013). The index of material conditions is based on five variables (table A1). We consider dimensions that can be summed up in monetary units and dimensions related to aspects of daily life, such as housing. Among the first group of variables, we include not only the disposable household income per person (M1), but also indicators of inequalities (disposable income inequality-M2), poverty (people at risk of relative poverty-M3) and social distress (jobless households-M4). Further, the percentage of people living in houses with "structural problems" (M5) reflects social and economic disadvantage in material living standards, affecting essential needs such as personal security, privacy, health, the quality of family relationships and the possibility to receive visits (OECD 2008).

Table 8 – *Material Living Conditions Index by region and year*

	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Emilia-Romagna	-0.71	Emilia-Romagna	-0.68	Valle d'Aosta	-0.62	Trentino-A.A.	-0.56	Trentino-A.A.	-0.60	Trentino-A.A.	-0.62	Trentino-A.A.	-0.55	Lombardia	2
2	Lombardia	-0.75	Veneto	-0.71	Trentino-A.A.	-0.73	Friuli-V.G.	-0.64	Veneto	-0.70	Lombardia	-0.70	Emilia-Romagna	-0.72	Friuli-V.G.	2
3	Veneto	-0.76	Toscana	-0.72	Emilia-Romagna	-0.76	Emilia-Romagna	-0.66	Emilia-Romagna	-0.73	Veneto	-0.71	Veneto	-0.74	Toscana	2
4	Friuli-V.G.	-0.77	Valle d'Aosta	-0.74	Veneto	-0.77	Valle d'Aosta	-0.70	Lombardia	-0.73	Emilia-Romagna	-0.72	Lombardia	-0.78	Marche	2
5	Toscana	-0.79	Trentino-A.A.	-0.76	Toscana	-0.77	Veneto	-0.72	Friuli-V.G.	-0.74	Valle d'Aosta	-0.75	Valle d'Aosta	-0.79	Emilia-Romagna	1
6	Trentino-A.A.	-0.83	Lombardia	-0.78	Friuli-V.G.	-0.82	Lombardia	-0.81	Toscana	-0.79	Friuli-V.G.	-0.77	Friuli-V.G.	-0.86	Abruzzo	1
7	Valle d'Aosta	-0.94	Friuli-V.G.	-0.81	Lombardia	-0.86	Toscana	-0.83	Valle d'Aosta	-0.83	Toscana	-0.78	Toscana	-0.87	Molise	1
8	Marche	-0.99	Umbria	-0.99	Marche	-0.94	Piemonte	-0.83	Marche	-0.85	Piemonte	-0.88	Liguria	-0.87	Campania	1
9	Umbria	-1.05	Marche	-0.99	Piemonte	-0.98	Marche	-0.84	Piemonte	-0.93	Liguria	-0.89	Umbria	-0.92	Veneto	0
10	Liguria	-1.06	Piemonte	-1.00	Umbria	-1.20	Umbria	-0.99	Umbria	-0.99	Marche	-0.90	Marche	-0.94	Umbria	0
11	Piemonte	-1.12	Abruzzo	-1.26	Abruzzo	-1.23	Liguria	-1.19	Liguria	-1.10	Umbria	-1.03	Piemonte	-1.06	Piemonte	0
12	Abruzzo	-1.37	Liguria	-1.29	Liguria	-1.26	Abruzzo	-1.32	Abruzzo	-1.27	Lazio	-1.31	Lazio	-1.20	Basilicata	0
13	Lazio	-1.47	Lazio	-1.42	Lazio	-1.50	Lazio	-1.36	Lazio	-1.29	Abruzzo	-1.45	Abruzzo	-1.47	Puglia	0
14	Molise	-1.93	Molise	-1.89	Sardegna	-2.02	Sardegna	-2.00	Molise	-1.90	Sardegna	-1.78	Sardegna	-1.58	Calabria	0
15	Sardegna	-2.04	Sardegna	-1.96	Basilicata	-2.07	Molise	-2.00	Sardegna	-2.04	Molise	-2.01	Molise	-1.80	Lazio	-1
16	Basilicata	-2.42	Basilicata	-2.28	Molise	-2.20	Basilicata	-2.17	Puglia	-2.13	Puglia	-2.22	Basilicata	-2.20	Sardegna	-1
17	Puglia	-2.60	Puglia	-2.62	Puglia	-2.72	Puglia	-2.32	Basilicata	-2.37	Basilicata	-2.43	Puglia	-2.25	Sicilia	-1
18	Calabria	-3.31	Calabria	-3.21	Calabria	-3.35	Calabria	-3.24	Sicilia	-3.32	Calabria	-3.15	Calabria	-3.15	Valle d'Aosta	-2
19	Campania	-3.34	Campania	-3.22	Campania	-3.45	Campania	-3.49	Calabria	-3.35	Sicilia	-3.21	Sicilia	-3.20	Liguria	-2
20	Sicilia	-3.80	Sicilia	-3.51	Sicilia	-3.57	Sicilia	-3.49	Campania	-3.67	Campania	-3.34	Campania	-3.42	Trentino-A.A.	-5

Applying the PCA technique we get good results in terms of synthesizing the information contained in the original variables. In fact, the first principal component always explains over 90% of the variability present in the 5 variables considered: it reaches 96% in 2004, whereas the lowest value is 91% in 2009 (table 1). The measure of sampling adequacy falls in 91% of the cases in the meritorious (0.80 or above) or middling (0.70 or above) range and never below 0.50; analogously, the Bartlett test and the overall MSA (0.6 or above) confirm the significance of the correlations. The component matrix shows a positive correlation between the first principal component and disposable household income per inhabitant (M1), whereas correlations are negative for the other variables, confirming the interpretation of the first component as an index of good living conditions.

People at risk of relative poverty (M3) and people living in jobless households (M4) are the variables with the highest communality values, which indicate that a large amount of the variance in these variables is accounted for by the first principal component.

The values assumed by the synthetic index of material living conditions reproduces the North-South divide in Italy: the Northern and Central regions are firmly at the top of the rankings, while the bottom positions are always occupied by the Southern regions (table 8). During the last four years Trentino-Alto-Adige was the best performer moving up 5 places. In the two initial years Emilia Romagna occupies the top position, but it then moves to third (2006-2008) and second position (2010). At the bottom of the ranking we find Sicilia (2004-2007) and Campania (2008-2010).

However, the regional dynamics in the 2004-2010 period highlight that along with Trentino-Alto Adige four other regions (Liguria, Valle d'Aosta, Sicilia and Sardegna) experience improvements in the ranking of the material living condition index. For 30% of Italian regions the position in the ranking remains unchanged at the beginning and end of the period but the relative performance worsens for 40%.

4.8 Personal security

The security dimension of well-being reflects the perceived threat to people's lives and personal freedom. The fear of being a crime victim has impact on individual well-being, determining anxiety and limiting personal freedom (OECD 2013). In Italy there are still remarkable regional disparities as regards law enforcement and security: citizens who live in Southern regions have a twice higher chance than those in the North-East of the country of being a victim of murder, extortion or robbery. Young people in Southern regions are much more likely to be involved in crimes against persons or private property than their peers in the North-West of the country (ISTAT 2011; Cersosimo and Nisticò 2013).

We selected five variables for describing the personal security dimension of well-being (table A1). Four indicators are objective measures of the incidence of crimes: the burglary rate (T1) measures the number of burglaries per 1,000 households; the pick-pocketing rate (T2) measures the number of pick-pocketing per 1.000 people; the robbery rate (T3) measures the number of robberies per 1000 people and the homicide rate (T4) measures the number of homicides per 100,000 people. The fifth indicator is a subjective measure of people's feelings about personal insecurity: the perception of the crime risk in the area (T5) given by the percentage of households who are very much concerned by the crime risk in the area where they live.

Table 9 – *Personal Security Index by region and year*

	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)		
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Basilicata	-0.47	Valle d'Aosta	-0.39	Basilicata	-0.38	Basilicata	-0.51	Valle d'Aosta	-0.29	Basilicata	-0.25	Valle d'Aosta	-0.53	Trentino-A.A.	3
2	Molise	-0.56	Marche	-0.58	Molise	-0.53	Molise	-0.55	Basilicata	-0.38	Molise	-0.60	Basilicata	-0.58	Abruzzo	2
3	Marche	-0.58	Basilicata	-0.60	Marche	-0.82	Marche	-0.85	Molise	-0.63	Marche	-0.77	Molise	-0.73	Basilicata	1
4	Abruzzo	-0.85	Friuli-V.G.	-0.87	Friuli-V.G.	-0.83	Valle d'Aosta	-0.86	Marche	-0.64	Friuli-V.G.	-0.81	Marche	-0.88	Molise	1
5	Friuli-V.G.	-1.01	Molise	-0.90	Abruzzo	-0.83	Friuli-V.G.	-0.90	Abruzzo	-0.76	Valle d'Aosta	-0.84	Friuli-V.G.	-0.95	Marche	1
6	Valle d'Aosta	-1.18	Abruzzo	-0.91	Valle d'Aosta	-0.89	Abruzzo	-1.09	Friuli-V.G.	-0.77	Abruzzo	-0.97	Abruzzo	-1.07	Toscana	1
7	Sardegna	-1.19	Sardegna	-1.27	Sardegna	-1.06	Sardegna	-1.24	Trentino-A.A.	-1.05	Sardegna	-1.15	Sardegna	-1.12	Sicilia	1
8	Trentino-A.A.	-1.23	Veneto	-1.27	Veneto	-1.36	Trentino-A.A.	-1.27	Veneto	-1.14	Veneto	-1.29	Veneto	-1.25	Lazio	1
9	Toscana	-1.26	Toscana	-1.35	Trentino-A.A.	-1.39	Veneto	-1.32	Toscana	-1.50	Toscana	-1.41	Umbria	-1.50	Puglia	1
10	Veneto	-1.27	Trentino-A.A.	-1.36	Toscana	-1.48	Toscana	-1.36	Umbria	-1.56	Umbria	-1.62	Toscana	-1.58	Friuli-V.G.	0
11	Umbria	-1.28	Umbria	-1.58	Sicilia	-1.60	Umbria	-1.56	Emilia-Romagna	-1.63	Sicilia	-1.85	Trentino-A.A.	-1.63	Sardegna	0
12	Sicilia	-1.63	Emilia-Romagna	-1.63	Umbria	-1.72	Emilia-Romagna	-1.79	Sicilia	-1.73	Emilia-Romagna	-1.86	Emilia-Romagna	-1.70	Lombardia	0
13	Emilia-Romagna	-1.81	Sicilia	-1.72	Emilia-Romagna	-1.81	Sicilia	-1.97	Sardegna	-1.85	Trentino-A.A.	-1.92	Sicilia	-1.83	Calabria	0
14	Lombardia	-2.15	Lombardia	-1.99	Calabria	-2.30	Piemonte	-2.36	Piemonte	-1.95	Piemonte	-2.32	Lombardia	-2.32	Liguria	0
15	Lazio	-2.41	Piemonte	-2.08	Lombardia	-2.37	Lombardia	-2.43	Lombardia	-2.13	Lombardia	-2.45	Piemonte	-2.43	Emilia-Romagna	-1
16	Piemonte	-2.41	Lazio	-2.46	Piemonte	-2.53	Puglia	-2.90	Lazio	-2.39	Lazio	-2.56	Lazio	-2.89	Piemonte	-1
17	Calabria	-2.42	Puglia	-2.88	Puglia	-2.60	Calabria	-2.92	Puglia	-2.96	Liguria	-3.22	Calabria	-3.18	Campania	-1
18	Liguria	-2.89	Liguria	-2.92	Lazio	-3.06	Lazio	-2.98	Liguria	-3.18	Calabria	-3.27	Liguria	-3.46	Veneto	-2
19	Puglia	-3.36	Calabria	-3.08	Liguria	-3.60	Liguria	-3.48	Calabria	-4.15	Puglia	-3.33	Campania	-3.56	Umbria	-2
20	Campania	-5.05	Campania	-5.08	Campania	-4.93	Campania	-4.75	Campania	-4.31	Campania	-4.39	Puglia	-3.78	Valle d'Aosta	-5

The first principal component explains a percentage of the total variance ranging between 52% for years 2004-2005 to 59% in 2008 (table 1). The overall MSA is above the threshold of acceptance (0.5 or above) and the Bartlett test confirms the significance of correlations at the level of 0.0001. The MSA for each variable also falls within the acceptable range except for one variable (burglary rate) in just one year (2006). All the communalities are sufficiently high (0.5 or above), but they show larger values for the robbery rate (0.9), homicide rate and pick-pocketing rate (0.8 or above), household perception of crime risk (0.7). The first principal component is negatively correlated with all the variables considered in the analysis, suggesting that it is, indeed, a reliable index of the personal security dimension of well-being.

The security index shows differentiated regional performances, not reproducing the recurrent divide from North and South Italy (table 9). In fact, in each year we find in the first ten positions both Northern and

Mezzogiorno regions. Among the latter, Basilicata is, in four out of seven years, at the top of the ranking, but a good performance is showed also by Abruzzo, Sardegna and Molise. Best performing Central region is Marche, whereas, among the Northern regions, Valle d'Aosta has the highest value of the index in three years (2005, 2008 and 2010), Friuli-Venezia Giulia, Veneto and Trentino-Alto Adige are always among the top ten. During the seven year period the best improvement in the ranking is experienced by Valle d'Aosta, who gains five positions; five regions show smaller positive changes. Nine regions went backward, especially Trentino-Alto Adige who lost three positions between 2004 and 2010, whereas five regions did not alter their rank.

4.9 Research and innovation

Research and innovation represent basic components of social and economic progress. Many aspects of quality of life are improved by research and innovation through the development of technologies across different sectors which interact with other well-being dimensions: for example, innovations in energy (e.g. energies from renewable sources, such as bio-fuel, solar energy), transport (e.g. lighter, safer and more energy efficient transport) and chemistry (e.g. green processing) influence environmental quality; new technologies enhance medical care (e.g. gene therapy and genetic testing) and people's health; innovations in information and communications (e.g. mobile phones, tablets, cloud computing) foster people's connections and improve education methods, and so on. Research and innovation also influence professional life and work satisfaction when they are used to produce changes in the organization of business. The direct impact of innovation on subjective well-being remains, however, quite an unexplored field of study (Dolan and Metcalfe 2012), while the influence of research and innovation on economic well-being and competitiveness has received more attention (Annoni and Dijkstra 2013, Annoni and Kozovska 2010; Hong *et al*. 2012; Huggins and Davies 2006; IMD 2008; McCann and Oxley 2012; Schwab and Porter 2007).

We selected five variables for describing this domain of well-being (table A1). We consider the region's potential to innovate by means of the R&D expenditure by public administration, universities and public and private enterprises as percentage of GDP (R1), and the patents registered by the European Patent Office per million of inhabitants (R3). Two indicators describe research and innovation by looking at the region's potential to adapt to changing demand through the availability of human capital with technological skills: the R&D workers (R4), measured as the number of researchers, technicians and other personnel involved in R&D in the public administration, universities, public and private enterprises per 1,000 inhabitants; finally, as a proxy of the innovative potential of human capital, we consider graduates in Science and Technology (R5), the number of science graduates per 1,000 inhabitants aged 20-29.

Table 10– ***Research and innovation Index by region and year***

	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Piemonte	3,92	Emilia-Romagna	4,26	Emilia-Romagna	4,22	Emilia-Romagna	4,28	Emilia-Romagna	4,07	Friuli-V.G.	3,96	Emilia-Romagna	4,00	Piemonte	3
2	Emilia-Romagna	3,57	Piemonte	3,76	Friuli-V.G.	3,71	Piemonte	3,61	Friuli-V.G.	3,78	Emilia-Romagna	3,91	Friuli-V.G.	3,91	Lazio	3
3	Lombardia	3,28	Lombardia	3,62	Lombardia	3,59	Lombardia	3,52	Piemonte	3,70	Lombardia	3,53	Lombardia	3,38	Abruzzo	3
4	Friuli-V.G.	3,00	Friuli-V.G.	3,36	Piemonte	3,59	Friuli-V.G.	3,52	Lombardia	3,51	Piemonte	3,36	Piemonte	3,36	Sicilia	3
5	Veneto	2,70	Veneto	3,11	Veneto	3,08	Veneto	3,22	Veneto	3,23	Veneto	3,19	Veneto	3,17	Toscana	2
6	Toscana	2,23	Toscana	2,70	Toscana	2,58	Toscana	2,58	Toscana	2,64	Trentino-A.A.	2,80	Trentino-A.A.	2,89	Valle d'Aosta	1
7	Lazio	1,91	Lazio	2,46	Marche	2,29	Marche	2,44	Trentino-A.A.	2,36	Toscana	2,59	Liguria	2,63	Puglia	1
8	Abruzzo	1,79	Marche	2,22	Liguria	2,20	Liguria	2,28	Liguria	2,34	Liguria	2,37	Toscana	2,58	Lombardia	0
9	Marche	1,66	Liguria	2,05	Lazio	2,15	Trentino-A.A.	2,23	Lazio	2,30	Marche	2,37	Marche	2,46	Veneto	0
10	Liguria	1,66	Trentino-A.A.	2,02	Trentino-A.A.	1,93	Lazio	2,21	Marche	2,29	Lazio	2,01	Lazio	2,09	Marche	0
11	Trentino-A.A.	1,60	Abruzzo	1,95	Abruzzo	1,86	Umbria	1,92	Umbria	1,71	Valle d'Aosta	1,68	Abruzzo	1,61	Umbria	0
12	Umbria	1,58	Umbria	1,91	Umbria	1,81	Abruzzo	1,91	Abruzzo	1,70	Abruzzo	1,64	Umbria	1,58	Molise	0
13	Valle d'Aosta	1,16	Valle d'Aosta	1,52	Valle d'Aosta	1,30	Campania	1,24	Campania	1,33	Umbria	1,54	Campania	1,24	Calabria	0
14	Campania	0,94	Campania	1,28	Campania	1,23	Valle d'Aosta	1,07	Valle d'Aosta	1,12	Campania	1,27	Valle d'Aosta	1,21	Emilia-Romagna	-1
15	Sicilia	0,82	Sicilia	1,09	Basilicata	1,02	Basilicata	1,06	Sardegna	1,12	Sardegna	1,04	Sardegna	1,14	Campania	-1
16	Puglia	0,77	Sardegna	1,04	Sicilia	0,98	Sardegna	1,01	Basilicata	1,06	Basilicata	1,02	Basilicata	1,07	Friuli-V.G.	-2
17	Sardegna	0,76	Puglia	0,99	Sardegna	0,97	Puglia	0,98	Puglia	1,00	Puglia	0,99	Puglia	0,95	Sardegna	-2
18	Basilicata	0,66	Basilicata	0,88	Puglia	0,92	Sicilia	0,94	Sicilia	0,99	Sicilia	0,93	Sicilia	0,91	Basilicata	-2
19	Molise	0,54	Molise	0,73	Molise	0,59	Calabria	0,63	Calabria	0,59	Molise	0,59	Molise	0,57	Liguria	-3
20	Calabria	0,33	Calabria	0,64	Calabria	0,59	Molise	0,60	Molise	0,57	Calabria	0,57	Calabria	0,53	Trentino-A.A.	-5

The share of total variance explained by the first principal component ranges between 72% in 2005 and 81% in 2010 (table 1). Good correlations are reported by the MSA both when it is calculated for all the variables, and for each variable individually, falling in the middling range (0.7 or above), and by the Bartlett test (sig. <0.0001). Communality figures are sufficiently high for all variables (greater than 0.5), but they are larger for patents (0.9) and capacity to exports (0.7 or above). The first principal component shows positive correlations with all the variables; it can be considered a suitable synthetic indicator of the research and innovation domain of well-being.

As regards Research and innovation, the best performers are five Northern regions (Piemonte, Emilia-Romagna, Lombardia, Friuli-Venezia Giulia and Veneto), (table 10). The Southern regions are at the bottom of the ranking, except for Abruzzo, which is in the middle. The worst performing regions are Calabria and Molise, which occupy the last two positions. During the seven year period, six regions did not change their rank, whereas seven regions experienced an improvement; particularly noteworthy is the positive move by Trentino-Alto-Adige and Liguria which gained five and three positions, respectively. At the opposite end Piemonte, Lazio, Abruzzo and Sicilia lost out the most.

4.10 Social Relations

The importance of social relations at individual and community level has been extensively investigated by social scientists (Cersosimo and Nisticò 2008). Coleman (1990) defines social capital as a network of relations between agents. Social capital is a resource that can generate trust in economic and social relations. In Coleman's words (1990, p. 302), it is a resource "lodged neither in individuals nor in physical implements of production, (but inherent) in the structure of relations between persons and among persons". Social capital influences transaction costs and thereby efficiency, by enhancing the level of trust between agents (Guiso, Sapienza, and Zingales 2004; Trigilia 2001) or generating shared values and community norms which support cooperative outcomes (Aoki 2001, Spagnolo 1999). Developing the original ideas of Bourdieu (1986) and Coleman (1990), Aoki (2001, p. 209) defines social capital as "the present value sum of future benefits, including intangible goods such as status, social approval, and emotional stability, that individual agents expect to derive from cooperative association with the community in the social exchange game. In order to derive returns from it, individuals must invest in it and maintain it through social exchange."

Table 11 – *Social relations Index by region and year*

	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Trentino-A.A.	4.09	Friuli-V.G.	4.08	Friuli-V.G.	3.94	Friuli-V.G.	3.65	Friuli-V.G.	3.89	Friuli-V.G.	3.70	Friuli-V.G.	3.67	Emilia-Romagna	8
2	Veneto	2.77	Valle d'Aosta	2.69	Valle d'Aosta	2.68	Piemonte	2.80	Piemonte	2.75	Piemonte	2.68	Toscana	2.68	Trentino-A.A.	7
3	Emilia-Romagna	2.64	Lombardia	2.55	Lombardia	2.64	Valle d'Aosta	2.68	Toscana	2.71	Umbria	2.56	Lombardia	2.55	Veneto	5
4	Lombardia	2.59	Toscana	2.54	Toscana	2.59	Umbria	2.57	Veneto	2.68	Valle d'Aosta	2.54	Umbria	2.54	Lazio	5
5	Friuli-V.G.	2.53	Piemonte	2.53	Piemonte	2.57	Lombardia	2.56	Valle d'Aosta	2.60	Lombardia	2.52	Valle d'Aosta	2.52	Basilicata	3
6	Valle d'Aosta	2.44	Veneto	2.40	Veneto	2.45	Toscana	2.53	Trentino-A.A.	2.40	Toscana	2.46	Piemonte	2.49	Marche	2
7	Toscana	2.35	Umbria	2.39	Umbria	2.38	Trentino-A.A.	2.37	Lombardia	2.35	Trentino-A.A.	2.27	Veneto	2.36	Liguria	2
8	Piemonte	2.18	Sardegna	2.24	Marche	2.21	Veneto	2.20	Marche	2.32	Sardegna	2.19	Trentino-A.A.	2.17	Puglia	2
9	Umbria	2.12	Trentino-A.A.	2.11	Trentino-A.A.	2.14	Sicilia	2.14	Umbria	2.16	Marche	2.17	Sicilia	2.15	Abruzzo	1
10	Marche	2.09	Marche	1.98	Sicilia	1.98	Emilia-Romagna	2.07	Sicilia	2.09	Veneto	2.15	Sardegna	2.01	Campania	0
11	Sardegna	1.94	Sicilia	1.95	Emilia-Romagna	1.93	Marche	2.01	Emilia-Romagna	1.99	Sicilia	2.09	Emilia-Romagna	2.00	Lombardia	-1
12	Liguria	1.80	Basilicata	1.85	Molise	1.93	Sardegna	2.00	Sardegna	1.89	Emilia-Romagna	1.98	Marche	1.91	Valle d'Aosta	-1
13	Basilicata	1.75	Liguria	1.74	Sardegna	1.91	Molise	1.85	Molise	1.79	Molise	1.85	Molise	1.87	Sardegna	-1
14	Abruzzo	1.71	Emilia-Romagna	1.73	Liguria	1.71	Abruzzo	1.63	Liguria	1.72	Liguria	1.76	Liguria	1.80	Calabria	-1
15	Lazio	1.65	Molise	1.66	Basilicata	1.43	Basilicata	1.61	Abruzzo	1.53	Basilicata	1.55	Abruzzo	1.65	Piemonte	-2
16	Puglia	1.42	Abruzzo	1.43	Puglia	1.41	Liguria	1.55	Basilicata	1.50	Abruzzo	1.42	Basilicata	1.58	Friuli-V.G.	-4
17	Molise	1.37	Puglia	1.39	Abruzzo	1.34	Puglia	1.39	Calabria	1.38	Calabria	1.42	Calabria	1.58	Molise	-4
18	Calabria	1.28	Calabria	1.39	Calabria	1.34	Calabria	1.33	Puglia	1.36	Puglia	1.37	Puglia	1.34	Toscana	-5
19	Campania	1.28	Lazio	1.27	Campania	1.25	Lazio	1.29	Lazio	1.16	Campania	1.36	Campania	1.26	Umbria	-5
20	Sicilia	1.22	Campania	1.26	Lazio	1.18	Campania	1.23	Campania	1.16	Lazio	1.28	Lazio	1.14	Sicilia	-11

We describe the social relations domain of well-being by means of five variables, two of which measure the quality of personal connections in terms of the subjective satisfaction with family (S1) and friends (S2), respectively (table A1). Two further indicators rely instead on objective measures: the share of population who have funded associations (S5) and the percentage of the population who performed volunteer work (S4) for associations or volunteer groups. The final indicator is a composite measure calculated by ISTAT by synthetizing people's participation in social and cultural meetings, professional associations, trade unions, clubs or religious groups (S3).
The first principal component explains over 90% of the variance contained in the five original variables (table 1). The overall measure of sampling adequacy, as well as that referred to each variable, fall in each year in the meritorious range (0.8 or above) and Bartlett's test finds that correlations are significant at the 0.0001 level. All variables show high figures of communalities (0.7 or above): they reach values of 0.9 or above for three variables (the synthetic indicator of social participation, volunteer work and the share of population who funded associations), suggesting that a great amount of the variance in these variables is accounted for by the first principal component. The component matrix shows all positive correlations with the first principal component, thus we can interpret the latter as an index of the social relations dimension of well-being.
For this dimension the divide North-South of Italy is less pronounced. In fact, not all the Southern regions are positioned at the lower end of the table (for example Sicilia and Sardegna), and, conversely, some Central and Northern regions, are not found among the top twelve: this is the case of Liguria and Lazio. Emilia Romagna at the beginning of the period occupied the third rank, but thereafter dropped to the middle of the ranking or below. Emilia Romagna had the worst dynamics, falling 8 places between 2004 and 2010, followed by Trentino-Alto-Adige (-7) and Veneto (-5) (table 11). Conversely, regions who improved the most their ranking are Sicilia, who gained 11 positions, Umbria and Toscana who, at the end of the period, moved up five places with respect to 2004.

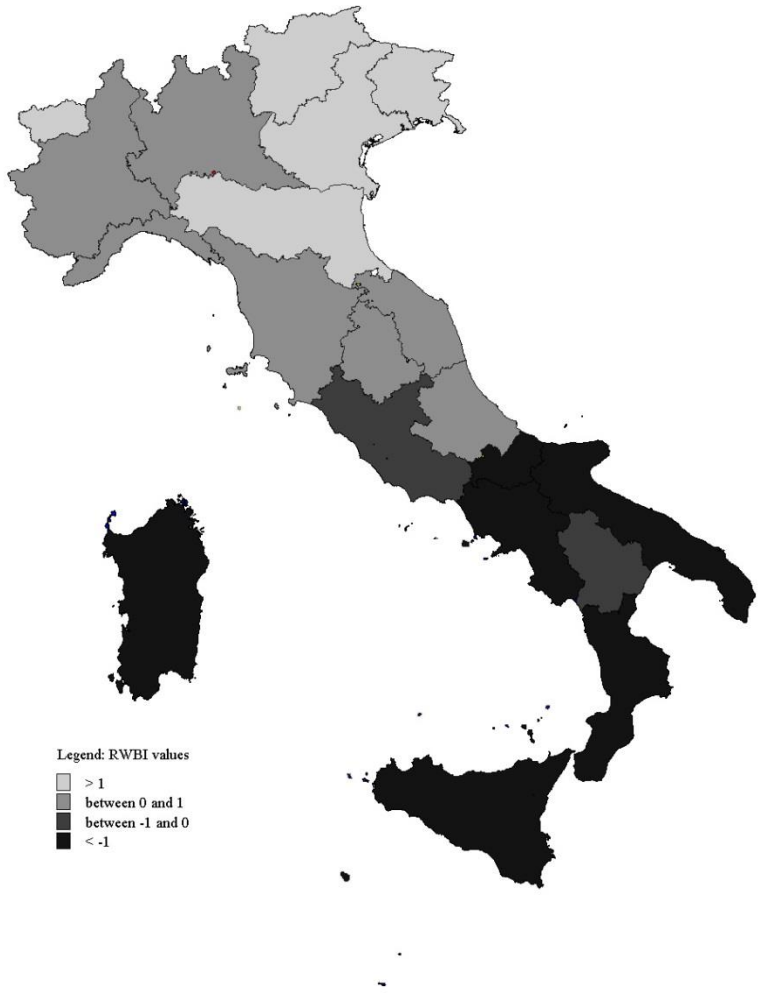
5. Results: well-being in Italian regions (step 2)

Following the same methodology, we derive the synthetic regional well-being indicator (RWBI) considering as variables the values of the indexes obtained by means of the principal component analysis for each individual dimension of well-being considered. Thus, we have ten variables, represented by the indexes of Culture and free time, Education, Employment, Environment, Essential public services, Health, Material living conditions, Personal security, Research and innovation and Social relations.
The first principal component explains a percentage of the total variance in these ten variables ranging between 46% in 2007 and 53% in 2004 (table 1). The overall MSA value falls within the acceptable range, assuming values of 0.7 or above and Bartlett's test shows that non zero correlations exist at the significance level of 0.0001. Examination of the values for each variable, however, indicates that the Environment index has MSA values under 0.50 in all years and should therefore be deleted from the analysis; however, because of the importance given to environmental factors in the literature, we decided, in first approximation, to keep this indicator. The amount of variance accounted for by the first principal component is higher (0.5 or above) for six of the indexes considered in the analysis: culture and free time (ranging from 0.5 to 0.7), employment (from 0.6 to 0.9), essential public services (from 0.6 to 0.9), health (from 0.5 to 0.8 except for 2008 when the communality value is 0.4), material living conditions (from 0.6 to 0.9), social relations (from 0.5 to 0.7). On the contrary, a small amount of the variance in four sub-indexes (education, environment, personal security and research and innovation) has been extracted by the first principal component. Therefore, the latter is a good synthesis of the major part of the different dimensions selected in the analysis as essential aspects for describing well-being. The first principal component is positively correlated with all the indexes of the different domains, thus confirming that it can indeed be considered a suitable overall indicator of regional well-being.

Results show, there is a sharp demarcation between the North and the South of the country: every year the first ten positions are all occupied by Centre-North regions and the last ten by the eight Mezzogiorno regions along with Liguria and Lazio (Figure 2).

The most evident feature of the dynamics of the well-being index over time is the absence of changes at the five top and bottom positions of the rankings (table 12). At the beginning of the period 2004-2010, the first five positions are occupied by Valle d'Aosta, Trentino-Alto Adige, Friuli-Venezia Giulia, Emilia Romagna and Veneto and this remains unchanged throughout the whole period. Similarly, the same five regions occupy the bottom five positions at the beginning and at the end of the period. The region that suffers the lack of well-being the most is Campania, which occupies the bottom rank in five years out of seven, whereas the best performance in terms of well-being is observed throughout the whole period in Valle d'Aosta.

Figure 2. Regional Well-Being Index in the Italian regions (2010)



As for the analysis for the individual indicators, the final column of table 12 gives, for each region, the absolute variation of the rank between 2004 and 2010. By looking at the position determined according to the changes in the rank of the Italian regions at the beginning and at the end of the period we can definitively confirm the relatively marked level of inertia of well-being in Italy, as shown by the long list of regions whose variation in rank is equal to zero. Notwithstanding this prevailing trend, five regions improve their relative position in the ranking, and six regions are worse off. Umbria, which initially occupied the tenth position in the overall well-being ranking, records the highest improvement (of three positions), followed by Basilicata and Marche with two positions onwards and Liguria and Sardegna who move ahead by just one place. Toscana, which was in sixth position in 2004, shows the worst change in terms of its well-being ranking, slipping down by three positions.

Figure 3 plots Italian regions considering the well-being index, on y-axis, and per capita-GDP divided by average GDP, on x-axis, in 2004 (figure 2a) and in 2010 (figure 2b). It is worth noting the positive linear relation between the two indexes, as confirmed by the fairly high coefficient of correlation (0.8 in 2004 and 0,9 in 2010). This is not really surprising since per-capita GDP and RWBI indeed synthetize regional progress, albeit from different perspectives: the first from a productive standpoint and the latter from the multifaceted dimension of quality of life. The results are consistent with the literature on regional comparisons of well-being indicators and GDP (Berloffa and Modena 2012; Ferrara and Nisticò 2013; Marchante *et al*. 2006). Moreover, figure 2 illustrates the substantially unchanged position of regions at the beginning and at the end of the period: regions who in 2004 were positioned below the x-axis on the left, as well as regions who occupied in 2004 the upper-right side of the figure, still remain there in 2010.

Table 12 – *Regional well-being Index by region and year*

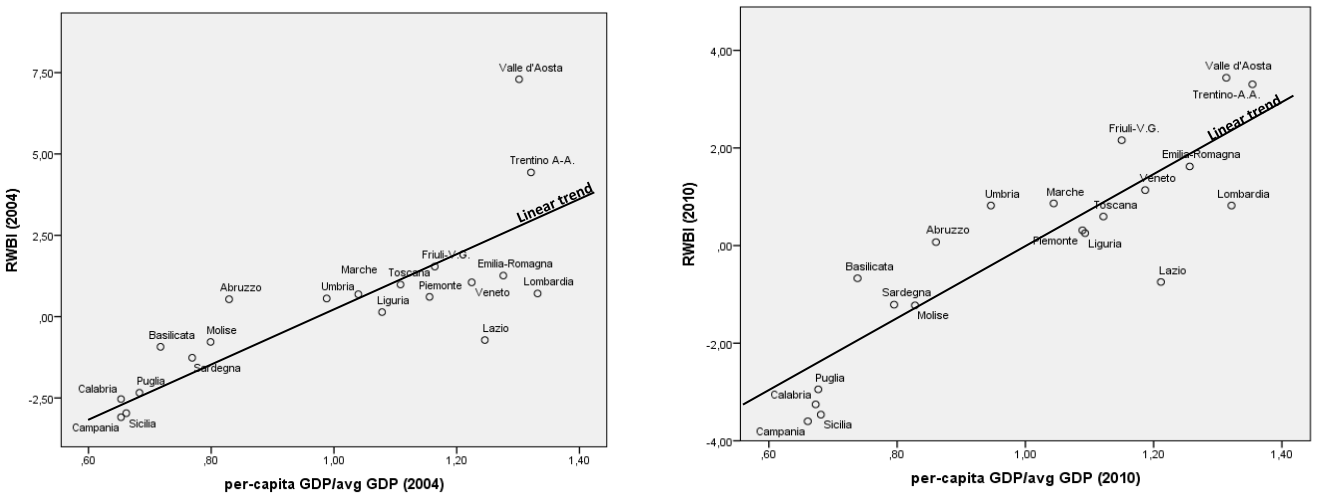
	2004		2005		2006		2007		2008		2009		2010		Δ (2010-2004)	
Position	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Index value**	**Regions**	**Ranks**
1	Valle d'Aosta	7.30	Valle d'Aosta	5.58	Valle d'Aosta	7.27	Valle d'Aosta	4.15	Valle d'Aosta	5.85	Valle d'Aosta	5.22	Valle d'Aosta	3.44	Toscana	3
2	Trentino-A.A.	4.43	Trentino-A.A.	3.50	Trentino-A.A.	3.80	Trentino-A.A.	3.48	Trentino-A.A.	4.03	Trentino-A.A.	3.57	Trentino-A.A.	3.30	Molise	2
3	Friuli-V.G.	1.54	Friuli-V.G.	1.59	Friuli-V.G.	1.76	Friuli-V.G.	2.21	Friuli-V.G.	1.77	Friuli-V.G.	2.28	Friuli-V.G.	2.16	Lombardia	1
4	Emilia-Romagna	1.26	Emilia-Romagna	1.08	Emilia-Romagna	0.81	Emilia-Romagna	2.15	Emilia-Romagna	0.96	Emilia-Romagna	1.77	Emilia-Romagna	1.62	Piemonte	1
5	Veneto	1.05	Veneto	0.79	Umbria	0.57	Veneto	1.72	Veneto	0.78	Veneto	1.27	Veneto	1.14	Abruzzo	1
6	Toscana	0.99	Lombardia	0.50	Veneto	0.56	Piemonte	1.22	Umbria	0.48	Lombardia	0.90	Marche	0.86	Lazio	1
7	Lombardia	0.71	Toscana	0.44	Abruzzo	0.47	Lombardia	1.02	Lombardia	0.28	Marche	0.67	Umbria	0.82	Valle d'Aosta	0
8	Marche	0.69	Marche	0.43	Toscana	0.33	Toscana	0.92	Marche	0.18	Piemonte	0.62	Lombardia	0.82	Trentino-A.A.	0
9	Piemonte	0.61	Piemonte	0.33	Lombardia	0.28	Marche	0.75	Toscana	0.17	Toscana	0.55	Toscana	0.59	Friuli-V.G.	0
10	Umbria	0.56	Umbria	0.21	Marche	0.23	Umbria	0.66	Abruzzo	0.14	Umbria	0.36	Piemonte	0.31	Emilia-Romagna	0
11	Abruzzo	0.53	Abruzzo	0.20	Piemonte	0.14	Abruzzo	0.17	Piemonte	0.10	Liguria	0.30	Liguria	0.25	Veneto	0
12	Liguria	0.14	Liguria	-0.41	Liguria	-0.15	Liguria	-0.30	Liguria	-0.30	Basilicata	-0.52	Abruzzo	0.07	Puglia	0
13	Lazio	-0.72	Molise	-1.03	Basilicata	-0.41	Molise	-0.76	Molise	-0.45	Abruzzo	-0.53	Basilicata	-0.67	Calabria	0
14	Molise	-0.78	Lazio	-1.23	Molise	-0.72	Lazio	-0.80	Basilicata	-0.54	Lazio	-0.79	Lazio	-0.75	Sicilia	0
15	Basilicata	-0.93	Basilicata	-1.96	Lazio	-1.16	Basilicata	-1.03	Lazio	-1.18	Sardegna	-0.91	Sardegna	-1.21	Campania	0
16	Sardegna	-1.26	Sardegna	-2.00	Sardegna	-1.26	Sardegna	-1.57	Sardegna	-1.38	Molise	-1.36	Molise	-1.22	Liguria	-1
17	Puglia	-2.34	Puglia	-3.06	Puglia	-2.58	Puglia	-2.68	Puglia	-2.94	Puglia	-2.61	Puglia	-2.95	Sardegna	-1
18	Calabria	-2.53	Calabria	-3.80	Calabria	-2.70	Calabria	-3.40	Sicilia	-3.43	Sicilia	-3.30	Calabria	-3.25	Marche	-2
19	Sicilia	-2.97	Sicilia	-3.83	Sicilia	-2.92	Sicilia	-3.88	Campania	-3.94	Campania	-3.46	Sicilia	-3.46	Basilicata	-2
20	Campania	-3.09	Campania	-4.00	Campania	-3.67	Campania	-3.89	Calabria	-4.00	Calabria	-3.68	Campania	-3.60	Umbria	-3

6. Regional convergence

In order to assess convergence we calculated the coefficient of variation and the rate of σ-convergence of Italian regions both for the RWBI index and the per-capita GDP for the whole period and for two sub-periods: from 2004 to 2007 and from 2008 to 2010 (table 13).

During the seven years 2004-2010 Italian regions converge. As regards per-capita GDP the coefficient of variation decreased by 2% over the entire period. The even stronger change (-18%) for the RWBI confirms the existence of σ-convergence: regions became more similar in terms of well-being and at a much higher rate than in terms of per-capita GDP, as shown by the trend lines in figure 4. However, if we look at the two sub-periods we can see that the rates of σ-convergence are negative for both indicators in years 2004-2007, but they had different signs in the following period (2008-2010). After 2007, disparities in per-capita GDP increase slightly. A similar dynamic characterized all European regions, which showed a progressive narrowing of economic disparities until 2007 and an opposite trend thereafter, as a consequence of the economic and financial crises (European Commission, 2013). On the contrary, in terms of well-being, the immediate effect of the crisis on Italian regions disparities seems to be a marked, albeit brief, rise of the coefficient of variation followed, however, by a new convergence process, although, possibly, less intense than in the first sub-period (2004-2007).

Figure 3 – *Italian regions by per-capita GDP and well-being index*



Despite all this, if we compare the values of the σ convergence between 2007 and 2010, both indicators exhibit the same rate of divergence (1%), whereas in the sub-period before the advent of crisis (2004-2007) Italian regions converge more in terms of RWBI (-19%) than in per-capita GDP (-3%).

It is worth noting that both indicators have, at the beginning of the period, the same value of the coefficient of variation, that is also the highest dispersion showed by the Italian regions over the whole period. Similarly, they reached the minimum coefficient of variation in the same year (2007), coinciding with the advent of the global economic crisis, but at different levels: the minimum dispersion as regards overall well-being is significantly lower than for per-capita GDP.

Table 13 – *σ-convergence for each of the indexes of overall well-being, for the overall index of well- being and for per-capita GDP*

	CV			σ-convergence rate			MIN		MAX	
	2004	2007	2010	2004-2007	2007-2010	2004-2010		*year*		*year*
Culture and free time	0.58	0.65	0.68	0.12	0.05	0.17	0.58	*2004*	0.70	*2008*
Education	0.7	0.5	0.6	-0.29	0.2	-0.14	0.42	*2009*	0.70	*2004*
Employment	0.55	0.55	0.49	-0.001	-0.11	-0.11	0.49	*2010*	0.56	*2008*
Environment	1.68	1.75	1.24	0.04	-0.29	-0.26	1.24	*2010*	1.75	*2007*
Essential public services	0.64	0.5	0.52	-0.22	0.05	-0.18	0.48	*2009*	0.64	*2004*
Health	0.57	0.67	0.59	0.18	-0.13	0.03	0.45	*2006*	0.67	*2007*
Material living conditions	0.45	0.5	0.47	0.1	-0.06	0.03	0.45	*2004*	0.50	*2009*
Personal security	0.34	0.38	0.54	0.14	0.41	0.6	0.33	*2005*	0.54	*2010*
Research and innovation	0.75	0.77	0.73	0.02	-0.04	-0.02	0.73	*2010*	0.78	*2006*
Social relations	0.82	0.73	0.64	-0.1	-0.13	-0.22	0.64	*2010*	0.83	*2005*
RWBI	0.73	0.59	0.59	-0.19	0.01	-0.18	0.59	*2007*	0.73	*2004*
per-capita GDP	0.73	0.71	0.71	-0.03	0.01	-0.02	0.71	*2007*	0.73	*2004*

Considering the results of σ-convergence for each of the ten partial indicators, we find that some of them exhibit a smooth increasing trend until 2007 (security, material conditions and research and innovation) with upward intervals in the following years (personal security and material conditions), while research and innovation remain quite flat. As regard the other sub-indicators (culture and free time, health, essential public services, education, environment, social relations), we can observe fluctuations over the entire period (figure

5). This implies that there has been no continuous trend towards σ-convergence in all the ambits of well-being; on the contrary, in some important dimensions, such as security and culture and free time, significant divergences persist. A slight divergence exists over the whole period also for material living conditions. The health index dispersion, instead, increases in the first sub-period, but slows down sharply afterwards, which determines convergence.

Conversely, for the six remaining dimensions of well-being (environment, employment, education, essential public services, social relations and research and innovation) we find convergence throughout the seven years.

However, two sub-indicators that did not show an overall negative σ-convergence rate (material conditions and health) experienced convergence in the second sub-period.

The environment index showed the highest σ-convergence rate (26%) with a decreasing trend throughout the period except for one upward adjustment in 2007. This indicator, however, exhibits the highest coefficient of variation in each year. This means that regional dispersion in environmental performance is higher than in other dimensions of well-being.

As regards γ-convergence, focusing on the mobility of regions over time within the cross-regional distribution of each dimension, we consider Kendall's index of rank concordance (table 14). For the index of each dimension of well-being as well as for the two indicators, RWBI and per-capita GDP, Kendall's index tends to one. Thus, there is no evidence of rank mobility within the distribution. This means that the process of σ-convergence did not affect the relative positions of Italian regions much, although differences were reduced over time. In other words, backward regions were not able to improve their conditions enough to modify their position in the regional ranking. The results of the test of the hypothesis clearly confirm the absence of γ-convergence: the null hypothesis of no association among the ranks in different years (which means convergence is happening) is always rejected with a significance level of at least 5%. In fact, in many cases, we find that the result of non-convergence is even stronger, being statistically significant at 1%. This happens for the environment indicator just in 2009, for the education indicator in 2005 and 2007, and every year for the other indicators (employment, material living conditions, social relations, research and innovation, personal security, culture and free time, RWBI and per-capita GDP) except for health, just in 2010, and essential public services. In conclusion, neither significant improvements nor worsening occurred for the overall well-being indicator, the per-capita GDP and each single dimension index in regional intra-distributional mobility over the studied period.

7. Conclusions

Recent years have witnessed an explosion of studies on the measuring well-being beyond its productive and economic features. Scholars shared the awareness that well-being is a multidimensional concept. This has given rise to the necessity to dispose of indicators and data-bases on the wide number of factors that researchers consider crucial in affecting progress and quality of life. Many institutions and national governments are at work to define suitable measures of well-being domains. In Italy the BES project made available in 2013 a database of 134 outcome indicators regarding 12 dimensions for an "equitable and sustainable well-being".

Focusing on the Italian regions, the aim of this paper was threefold: to construct synthetic indexes for 10 different dimensions of well-being, combining 57 different variables; to then use these partial synthetic indexes to construct an overall indicator of well-being; finally, to assess well-being and per-capita GDP convergence/divergence processes across regions over the period 2004-2010. With these goals in mind we implemented a two-step principal component analysis in order to calculate single domain indexes, in the first step, and the overall regional well-being indicator, in the second step, using as input the ten indicators previously generated. Regional convergence on single domain and overall well-being indexes was investigated by means of two non-parametric techniques, σ-convergence and γ-convergence.

The results in terms of principal component analysis reproduce, for half of the dimensions of well-being (material living conditions, social relations, essential services, health index, research and innovation), the historical Italian divide between Northern and Southern regions, with the latter occupying the bottom positions. As a consequence, these results highlight the fact that the regional well-being divide in Italy is at least as significant as the economic divide, suggesting the importance of paying much more attention in public policies and academic debates, still mostly focused on the productive gaps, to the quality-of-life features of the Italian progress. However, the analysis in terms of σ-convergence shows that Italian regions tend to became more similar over time, both in terms of per-capita GDP and overall well-being, even if there has been a gradual slowing-down of this process in recent years, after the global economic crisis. Moreover, convergence in terms of well-being occurs at a much faster rate than in terms of per-capita GDP. After the crisis the two indicators, RWBI and per-capita GDP, have different convergence trends: disparities in GDP increase slightly; on the contrary, in terms of RWBI the first effect on Italian regions of the crisis seems to be a rise of the coefficient of variation, followed, however, by a new convergence process, albeit less intense than in the first sub-period (2004-2007).

Our results show different patterns for the different dimensions of well-being highlighting the persistence of disparities across regions in important quality-of-life aspects. In fact, significant divergences characterize security and culture and free time domains during the whole period considered. Analogously, if we look at the entire time interval, the divergence across Italian regions slightly increases as regards health and material living conditions, even if they experienced a substantial recovery in the after-crisis period (2007-2010). Moreover, in four dimensions -education, environment, essential public services and research and innovation-, convergence is not a continuous process, though at the end of the period Italian regions are found to be more similar than at the beginning. As a consequence, for just two dimensions of well-being, employment and social relations, we find that dispersion across regions has fallen both over the entire study period and the two sub-periods considered.

The analysis of mobility among ranks within the distribution (γ convergence) showed that for each partial indicator, for RWBI and for per-capita GDP, the value of Kendall's index tends to one. This implies that the null hypothesis of no association among ranks is always firmly rejected: the relative positions of the regions did not change substantially, even if our results indicate that a process of σ-convergence has been at work.

Figure 4- *RWBI and per-capita GDP coefficients of variation*

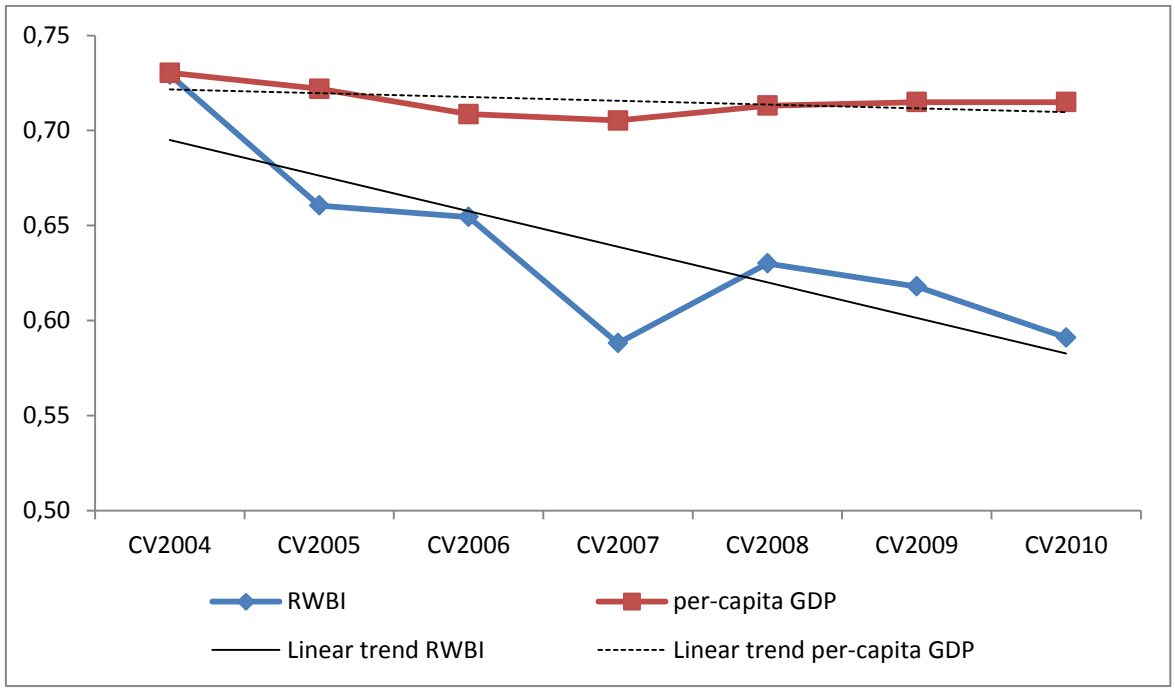


Figure 5 -*Partial Indicators Coefficients of Variation*

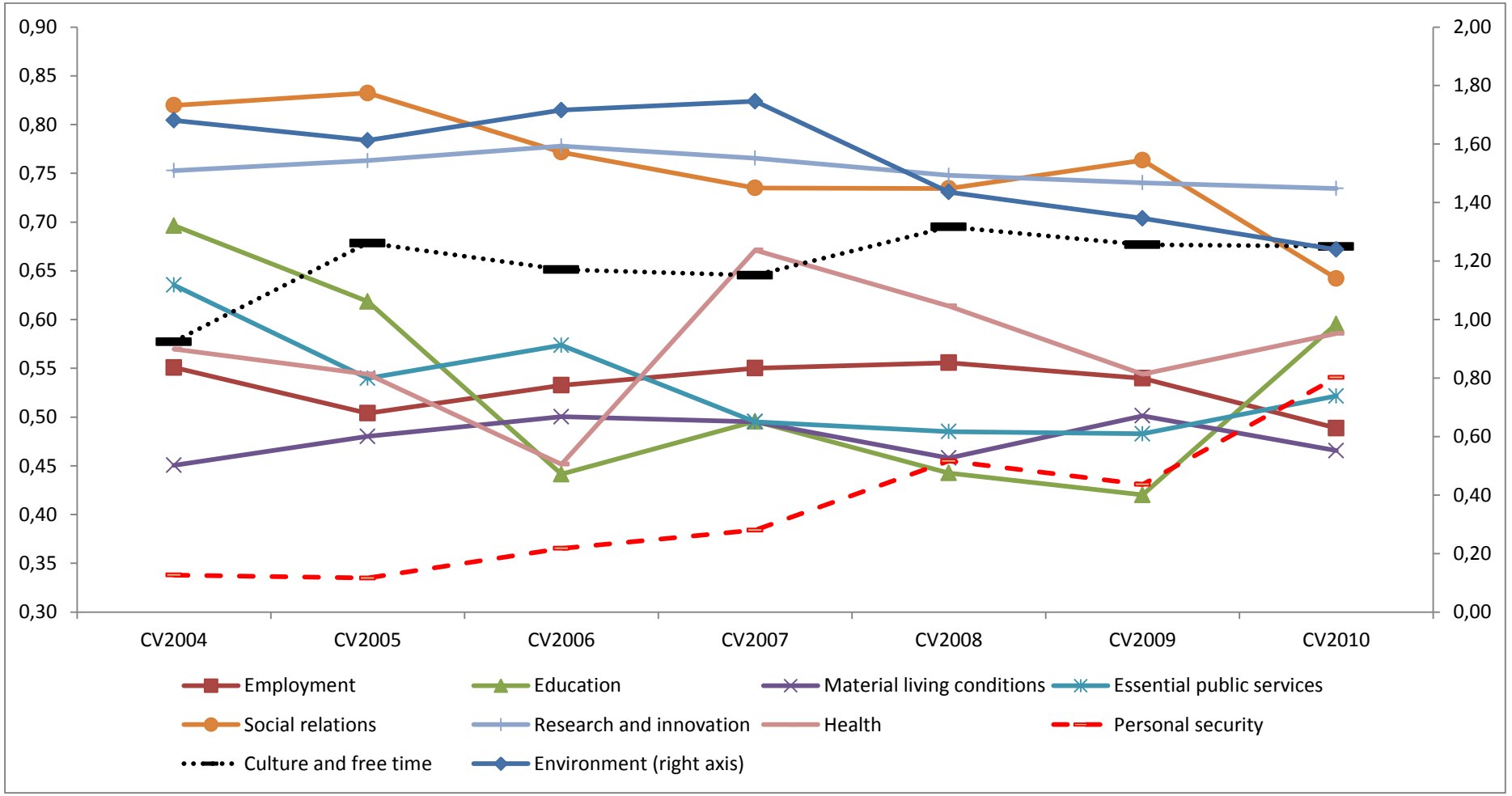


Table 14 - *Kendall's index - γ convergence*

Year	Culture and free	Education	Employment	Environment	Essential public services	Health	Material living conditions	Personal security	Research and Innovation	Social relations	RWBI	per-capita GDP
2004	1	1	1	1	1	1	1	1	1	1	1	
2005	0.9774 ***	0.9632 ***	0.997 ***	0.9639 ***	0.9218 **	0.9617 ***	0.982 ***	0.9759 ***	0.994 ***	0.9887 ***	0.9985 ***	1 ***
2006	0.9737 ***	0.9361 **	0.997 ***	0.9444 **	0.8767 **	0.9684 ***	0.9617 ***	0.9872 ***	0.9812 ***	0.991 ***	0.9752 ***	1 ***
2007	0.9744 ***	0.9549 ***	0.9925 ***	0.903 **	0.9293 **	0.909 ***	0.9699 ***	0.9865 ***	0.9759 ***	0.9827 ***	0.994 ***	1 ***
2008	0.9752 ***	0.894 **	0.9932 ***	0.9293 **	0.8519 **	0.9556 ***	0.9812 ***	0.9662 ***	0.9722 ***	0.9789 ***	0.9842 ***	1 ***
2009	0.9782 ***	0.8353 **	0.9887 ***	0.918 **	0.8865 **	0.9579 ***	0.9729 ***	0.9827 ***	0.9639 ***	0.9797 ***	0.9857 ***	1 ***
2010	0.9729 ***	0.8571 **	0.9887 ***	0.9316 **	0.8594 **	0.9226 **	0.9789 ***	0.9789 ***	0.9662 ***	0.9744 ***	0.9865 ***	1 ***

* reject null hypothesis at 10%
** reject null hypothesis at 5%
*** reject null hypothesis at 1%
****reject null hypothesis at 0.5%

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Appendix

Table A1 – Well-being dimensions: indicators, definitions and source (database subsections in parenthesis)

Indicators	Description	Definition	Source
Culture and free time			
C1	**Newspaper reading**	Persons aged 6 and over who read newspapers at least once a week per 100 people with the same characteristics.	i.stat (Culture, leisure and time use)
C2	**Theater attendance**	Percentage of persons aged 6 and over who have attended theater at least once in the last year.	i.stat (Culture, leisure and time use)
C3	**Live classical music concerts**	Percentage of persons aged 6 and over who have attended classical live music concerts at least once in the last year.	i.stat (Culture, leisure and time use)
C4	**Sport events**	Percentage of persons aged 6 and over who have attended sport events at least once in the last year.	i.stat (Culture, leisure and time use)
C5	**Books reading**	Persons aged 6 and over who read books in the previous 12 months per 100 people with the same characteristics.	i.stat (Culture, leisure and time use)
C6	**Museums visits**	Percentage of persons aged 6 and over who have visited museums at least once in the last year.	i.stat (Culture, leisure and time use)
C7	**Sport**	Percentage of persons aged 3 and over who practise sports.	i.stat (Culture, leisure and time use)
Education			
E1	**People with tertiary education**	Percentage of people aged 30-34 with tertiary education (ISCED 5 or 6).	BES (Education)
E2	**Rate of early leavers from education and training**	Percentage of people aged 18-24 with only lower secondary school diploma (ISCED 2) and are not enrolled in a training program.	BES (Education)
E3	**Rate of upper secondary school leavers**	Total school leavers within the first two years of upper secondary school as a percentage of the students enrolled in the second year of higher secondary school.	ISTAT- DPS (Education)
E4	**Participation in long-life learning**	Percentage of people aged 25-64 participating in formal or non-formal educational programs.	BES (Education)
E5	**People with at least upper secondary education**	Percentage of people aged 25-64 having completed secondary education (ISCED level not below 3a, 3b or 3c).	BES (Education)
Employment			
L1	**Employment rate**	Employed persons aged 20-64 / persons aged 20-64 *100.	BES (Work and life balance)
L2	**Non-participation rate**	Unemployed and the potential labour force aged 15-74 (people not searching for a job during the previous 4 weeks but available for work) / Labour force aged 15-74 and the potential labour force aged 15-74.	BES (Work and life balance)
L3	**Share of employed persons with temporary jobs for at least 5 years**	The share of currently employed persons with temporary jobs for at least 5 years.	BES (Work and life balance)
L4	**Share of workers not in regular occupation**	Percentage of workers not in compliance with labour, fiscal and pension laws.	BES (Work and life balance)
L5	**Ratio between the employment rate of women aged 25-49 with at least one child of compulsory school age (6-13), and the employment rate of women aged 25-49 without children**	Employment rate of women aged 25-49 with at least one child under compulsory school age (6-13) / Employment rate of women aged 25-49 without children.	BES (Work and life balance)
L6	**Ratio of female employment rate to male employment rate**	Ratio of female to male employment rate percent.	ISTAT-DPS (Labour)
L7	**Incidence of long term unemployment**	Share of persons looking for employment for more	ISTAT-DPS (Labour)

		than 12 months in % of the total of persons seeking employment.	
L8	**Youth unemployment rate**	Percentage of persons aged 15-24 years looking for employment on the labour force of the same age group.	ISTAT-DPS (Labour)
Environment			
A1	**Fertilizers used in agriculture**	Simple fertilizers (Nitrogen, Phosphorus, Potassium) used per hectare of Utilized Agriculture Area (in quintals).	ISTAT-DPS (Environment)
A2	**Monitoring of air quality**	Number of air monitoring stations, per 100.000 inhabitants.	ISTAT-DPS (Cities)
A3	**Air pollution**	Number of days during which the level of PM10 was higher than the limit of 50 µg/m3 in regional capital cities (days/365)*100.	BES (Environment)
A4	**Energy consumption provided by renewable sources**	Electricity produced by renewable sources (GWh) as percentage of electricity internal gross consumption.	BES (Environment)
A5	**Special Protection Areas**	Percentage of regional land (ha) designed as Special Protection Areas.	ISTAT-DPS (Environment)
A6	**Population density**	Population per square kilometre of land area.	I.Stat (Population)
Essential public services			
Q1	**Waiting lists for treatments**	Individuals who give up the chance to see a specialist or undergo therapeutic treatment (not dental) because of the length of waiting lists as percentage of residents.	BES (Quality of services)
Q2	**Differentiated urban waste collection**	Percentage of differentiated (recyclable vs non recyclable) urban waste collection out of total urban waste	BES (Quality of services)
Q3	**Child care services**	Percentage of children up to age 3 using child-care services - day-care centers, mini day-care facilities or supplementary and innovative services - of which 70% in day-care centres, out of the total population aged up to 3 years	BES (Quality of services)
Q4	**Elderly assisted at home**	Percentage of elderly people who benefited from integrated home assistance service (Adi) out of the total elderly population (65 and over).	BES (Quality of services)
Q5	**Irregularities in electric power provision**	Frequency of accidental long lasting power cuts (cuts without notice longer than 3 minutes) (average number per consumer).	BES (Quality of services)
Q6	**Irregularities in water supply**	Percentage of households who report irregularities in water supply.	BES (Quality of services)
Gross domestic product			
GDP	**Per-capita GDP**	Gross domestic product (GDP) at current market prices by NUTS 2 regions, euro per inhabitants.	Eurostat (Regional economic statistics)
Health			
H1	**Life expectancy**	Life expectancy expresses the average number of years that a child born in a given calendar year can expect to live if exposed during his whole life to the risks of death observed in the same year at different ages.	BES (Health)
H2	**Infant mortality rate**	Deaths in the first year of life per 10,000 live births	BES (Health)
H3	**Overweight or oBESity**	Standardized percentage of people aged 18 years and over who are overweight or obese: the indicator refers to the Body Mass Index (BMI). The indicator is standardized using the Italian 2001 Census population as standard population.	BES (Health)
H4	**Sedentary lifestyle**	Standardized percentage of people aged 14 years and	BES (Health)

		over who do not practice any physical activity: Proportion of people aged 14 and over who do not play sports either continuously or intermittently during their spare time, and people aged 14 and over who do not physical activity, such as walking at least 2 km, cycling, swimming, etc.	
H5	**Nutrition**	Standardized percentage of people aged 3 years and over who consume at least 4 portions of fruit and vegetables a day. The indicator is standardized using the Italian 2001 Census population as standard population.	BES (Health)
Material living conditions			
M1	**Disposable household income per inhabitant**	Disposable household income on the total number of inhabitants.	ISTAT (Regional economic accounts)
M2	**Disposable income inequality**	Ratio of total equivalised income received by 20% of the population with the highest income to that received by 20% of the population with the lowest income.	BES (Economic Well-Being)
M3	**People at risk of relative poverty**	Percentage of persons at risk of poverty, with an equivalised income less than or equal to 60% of the median equivalised income.	BES (Economic Well-Being)
M4	**People living in jobless households**	Percentage of individuals living in households with at least one component aged 18-59 years (with the exception of households where all members are full time students under 25 years) where nobody works or receives an occupational pension.	BES (Economic Well-Being)
M5	**People suffering poor housing conditions**	Percentage of people in overcrowded dwellings without basic facilities or with structural defects.	BES (Economic Well-Being)
Personal Security			
T1	**Burglary rate**	Number of burglaries per 1,000 households.	BES (Security)
T2	**Pick-pocketing rate**	Number of pick-pocketing per 1,000 people.	BES (security)
T3	**Robbery rate**	Number of robberies per 1,000 people.	BES (Security)
T4	**Homicide rate**	Number of homicide per 100,000 people.	BES (Security)
T5	**Perception of crime risk**	Percentage of households who are very much worried by the crime risk in the area where they live.	ISTAT DPS (Legality and safety)
Research and Innovation			
R1	**R&D expenditure**	R&D expenditure by Public administration, universities and public and private companies as percentage of GDP	BES (Research and Innovation)
R2	**Capacity to export**	Percentage of the value of the goods' exports on GDP.	ISTAT-DPS (Internationalization)
R3	**Patents**	Number of patents registered by the European Patent Office per million inhabitants	BES-ISTAT - DPS (Research and Innovation)
R4	**R&D workers**	Researchers, technicians and other personnel involved in R&D in the public administrations, University, public and private companies, per 1,000 inhabitants.	ISTAT - DPS (Research and Innovation)
R5	**Graduates in Science and Technology**	People aged 20-29 with degree in scientific and technological disciplines, per 1,000 inhabitants.	ISTAT - DPS (Research and Innovation)
Social Relations			
S1	**Satisfaction with family relations**	Share of population aged 14 and over who are very satisfied with their family relationships.	BES (Social relationships)
S2		Share of population aged 14 and over who are very	BES (Social

	Satisfaction with friendship relation	satisfied with the relationship with friends	relationships)
S3	**Synthetic indicator of social participation**	Based on the aggregation of the following indicators: People aged 14 and over who during the past 12 months have participated in meetings of associations (cultural/recreational, ecological, civil rights, peace); People aged 14 and over who in the past 12 months have participated in meetings of trade unions and professional associations; People aged 14 and over who during the past 12 months have attended meetings of political parties and/or have worked free for a party; People aged 14 and over who pay monthly or periodical dues for a club/sports club; People aged 14 and over who during the past 12 months have participated in meetings or activities (cultural, sporting, recreational, spiritual), organized or promoted by religious or spiritual organizations/groups.	BES (Social relationships)
S4	**Volunteer work**	Percentage of the population aged 14 and over who in the past 12 months performed non-paid volunteer work for associations or volunteer groups.	BES (Social relationships)
S5	**Share of population who funded associations**	Share of population aged 14 and over who in the past 12 months have funded associations.	BES (Social relationships)