

SUB-REGIONAL DISPARITIES: AN INTEGRATED AND DYNAMIC MODEL FOR ASSESSING QUALITY OF LIFE INEQUALITY

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SUMMARY

Recently, the quality of life (QoL) has become a commonly used concept with a growing significance also in the local development policies. However, there is no sufficient attention to the QoL framework at local level. Thus, starting from the assumption that a reduction in local disparities may also favour an increase in the regional performance compared to other non-regional contexts, we propose an integrate and dynamic model able to monitor QoL components in order to assess sub-regional disparities. The model was applied to the Basilicata region, a lagging rural region of South of Italy. A dashboard of indicators within 10 QoL domains was identified, considering two periods (2001 and 2011), by applying a non-compensatory aggregation method to combine them. Despite an average improvement for most of QoL components in the considered period, the results of the spatial autocorrelation analysis highlighted, in most cases, a clustered distribution, with the tendency of clusters to generate a carry-over effect (both in positive and negative) on the neighbouring municipalities. About 32-33% of municipalities tends to move from moderate to high advantage condition, while municipalities in a risk condition tend to move on to a moderate disadvantage condition. It follows that significantly deficient QoL components, acting synergistically, generate a self-reinforcing process. The proposed model, overcoming some limits related to data availability, allows an integrated knowledge and monitoring of sub-regional inequalities in order to implement target actions to smooth out them.

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1. Introduzione

This study is part of a very interesting debate concerning the use of alternative indicators to GDP to evaluate, with a view to sustainability, the level of well-being of a region (Böhringer and Jochem, 2007). The idea has long been acquired that growth and well-being do not necessarily coincide (Max-Neef, 1995). Most studies include various measures of income as an explanatory variable in happiness equations and it is very often suggested that there is a positive albeit relatively weak relationship between absolute income and happiness (Easterlin, 1974; Diener et al., 1999; Di Tella et al., 2001; Clark, 2003). In particular, it has often been argued that inequality affects happiness more than levels of income (Ballas et al., 2007).

Thus, going beyond GDP, a wide-ranging critical analysis on well-being has allowed to highlight various approaches to its measurement, according to the theoretical framework, the final goal, the disciplinary area, but also the scale of application (Bleys, 2012).

Mostly, great attention is focused on interurban comparisons of QoL for local and public policy decisions (Randall and Williams, 2001; Türksever and Atalik, 2001; Gauthier et al., 2005; Florida et al., 2011), differently we want also to focus on the spectrum of conditions contributing to the quality of rural life (Brereton et al., 2011; Cagliero et al., 2011; Boncinelli et al., 2015; Prete et al., 2017). Thus, the evaluation of quality of life represents an additional tool for the traditional evaluation of local and/or rural development projects/programs. Indeed, it often happens to assess a development intervention following its own predefined framework, i.e. the objectives and indicators identified ex-ante. This approach leads to a non-dynamic evaluation, which risks to reduce the information space to the indicators and themes of the project/program, thus losing information that could be of great importance for understanding how to improve future interventions according to a broader overview. Instead the analytical space of projects should be analysed both with respect to the capacity to provide a constructive role on beneficiaries in expanding their capabilities (for example the availability of a school) and on downstream changes, i.e. the final impacts (for example education improvement).

Differently, we propose a systemic approach to decision making, based on an integrated and dynamic vision of reality, consisting of interacting components in such a way that the whole is something more than the sum of the parts. The Basilicata region was selected as a case study; it is characterized by a rural connotation and a diversified socioeconomic and environmental context possibly influencing the quality of life of local communities.

The paper is structured as follows: after a description of the study area, section 2 presents the methodology to lastly identify territorial imbalances: in detail, after describing the theoretical structure and domains, we analysed the composite indicators for each domain; thus, we applied the spatial autocorrelation analysis to measure the incidence of “spatial factor” in order to identify sub-regional disparities. Section 3 shows results and discussion. Finally, Section 4 concludes.

2. Materials and methods

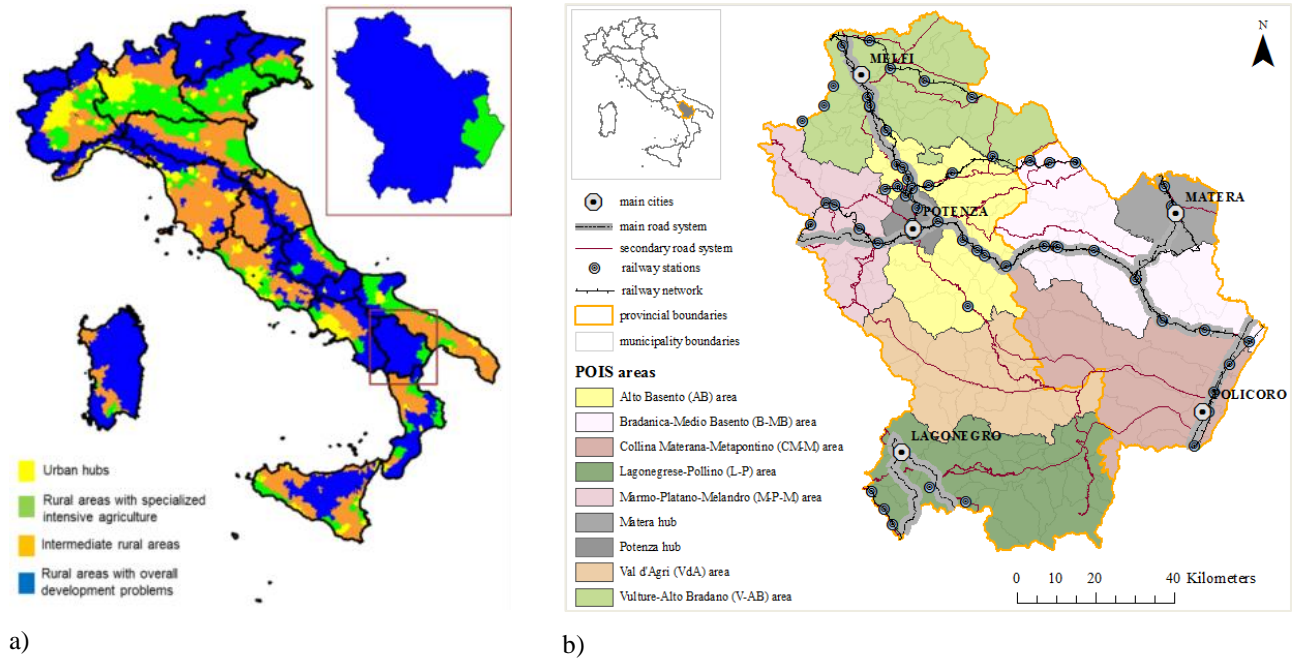
2.1 Study area

The empirical analysis focuses on the Basilicata region, one of the twenty regions of Italy, located in the South of the country (40° 30' 14" North, 16° 6' 50" East). The Basilicata region (NUTS6 II) (EC, 2016), with surface area of 9,992 km² and population density of about 61 inhabitants per km², is divided into two administrative provinces (NUTS III) and 131 municipalities (NUTS V). It is characterized by high geomorphological diversity (46.8% of the area is mountainous, 45.2% is hilly and only 8% is covered by flat morphology). Its elevation ranges between 0 and 2,267 m a.s.l. The study area is identified in EU programming as a Predominantly rural territory (OECD, 2009), whereby rural development programs substantially affect the entire area (National Rural Network 2014-2020) (Fig. 1a). The regional territory is

⁶ European administrative classification.

largely occupied by agricultural activities, with the presence of two main hubs (Potenza and Matera) and a high diffusion of small municipalities and limited demographic density compared to the rest of Italy and Europe as a whole, with problems of depopulation and development (Regional Cohesion Policy for 2014-2020 cycle). We used the Integrated Service Offer Plans (POIS) areas classification, which distinguishes the territory in 7 areas for a better description of results (Fig.1b).

Figure 1a) - Urban-rural typologies at national level (National Rural Network 2014-2020), b) - Study area with Integrated Service Offer Plans (POIS) areas classification



2.2 Theoretical framework and selected indicators

The definition of QoL, which best fits with our objective, is part of capability approach (Sen, 1985). The capability approach looks at well-being of a community beyond the economic dimension based on income or consumption. Besides the availability of economic resources and the diffusion of productive activities to guarantee adequate employment and income levels, well-being is also the result of other tangible and intangible conditions offered to communities, which can guarantee a safe, pleasant and stimulating collective life. These aspects constitute the constructs, i.e. the thematic areas or domains, linked to quality of life concept. Each domain is represented by the indicators that operatively describe the concept to be measured. We selected a set of indicators for each domain on a local (municipal) level. For the choice we have taken into account the empirical studies present in the literature and the regulatory framework on the topic as reported in the table 1. Furthermore, we considered their analytical stability, measurability, territorial and temporal coverage, relevance with respect to the phenomenon to be measured (OECD, 2008, p. 15). We used data from different databases and in some cases we resorted to proxy variables in order to compensate for data lacking (see Table 1).

Table 1 - The list of selected indicators for each domain

| Domains | Description | Selected indicators | Source |
|----------------------------------|--|---|--------------------------------------|
| Economic well-being | It include income, wealth, spending on consumer goods, durable goods possession and housing conditions (Christakopoulou <i>et al.</i> , 2001; Türksever and Atalik, 2001; Sirgy and Cornwell, 2002; Fey <i>et al.</i> , 2006; Hoffer and Levy, 2010; Zenker <i>et al.</i> , 2013). | - Adjusted average per-capita income ⁷ | Tax register of the Finance Ministry |
| | | - Incidence of families with potential economic hardship | 8milaCENSUS (Istat) |
| | | - Incidence of improper housing | 8milaCENSUS (Istat) |
| | | - Incidence of population under crowding conditions | 8milaCENSUS (Istat) |
| | | - Underutilization of housing Index | 8milaCENSUS (Istat) |
| | | - Quality of housing | 8milaCENSUS (Istat) |
| Education and training | It is a fundamental resource to participate actively in the life of society (Lee and Guest, 1983). The process of learning involves all of life and aims to improve roles and competences. Apart from increasing a person's value on the labour market, continuous upgrading of skills also results in increasing self-esteem and self-efficacy (Sabates and Hammond, 2008; Watson <i>et al.</i> , 2018). | - Incidence of illiterates | 8milaCENSUS (Istat) |
| | | - Early exit from education and training system | 8milaCENSUS (Istat) |
| | | - Incidence of young people with university education | 8milaCENSUS (Istat) |
| | | - Gender differentials for higher education | 8milaCENSUS (Istat) |
| | | - Adults in lifelong learning | 8milaCENSUS (Istat) |
| Work | It is one of aspects that most contribute to affect quality of life, as widely discussed and demonstrated in the literature (Zenker <i>et al.</i> , 2013). The effects of unemployment and in particular long-term unemployment are consistently related to low <i>QoL</i> levels, both from a financial as well as from a mental perspective (Clark and Oswald, 1994; Theodossiou, 1998; Winkelmann and Winkelmann, 1998; Clark, 2003; Dolan <i>et al.</i> , 2008). A job properly remunerated, reasonably stable and appropriate to skills contribute decisively to well-being (Witte, 1999; Bardasi and Francesconi, 2004). | - Employment rate | 8milaCENSUS (Istat) |
| | | - Unemployment rate | 8milaCENSUS (Istat) |
| | | - Incidence of young people aged 15-29 who do not study and do not work | 8milaCENSUS (Istat) |
| | | - Index of older workers | 8milaCENSUS (Istat) |
| | | - Gender differentials for work | 8milaCENSUS (Istat) |
| Mobility and quality of services | Mobility and job opportunities are closely related, particularly in the urban-rural dynamics (Tervo, 2008). The negative effects of long "commuting time" appear fairly straightforward, since commuting consumes time resources from other | - Student mobility | 8milaCENSUS (Istat) |

⁷ Average per capita overall income weighted with Gini concentration index

| | | | |
|---|--|---|--|
| | <p>activities, affecting subjective well-being (Lorenz, 2018; Türksever and Atalik, 2001; McCrea <i>et al.</i>, 2005; Stutzer and Frey, 2008; Faggian and Royuela, 2010; Insch and Florek, 2010). Equity in public transport services is a fundamental issue in the field of social justice, which implies also economic and environmental sustainability. Moreover, the accessibility and quality of health facilities represents a basic condition for prevention and receiving adequate care (Baum <i>et al.</i>, 2010; McCrea <i>et al.</i>, 2005; Türksever and Atalik, 2001; Zenker <i>et al.</i>, 2013). While, non-basic factors include the diffusion of social, sporting and cultural services (Türksever and Atalik, 2001; Faggian and Royuela, 2010; Insch and Florek, 2010; Mulligan and Carruthers, 2011; Zenker <i>et al.</i>, 2013). Also the digital economy has a prominent place in EU legislation and policies for economic development and for social and territorial cohesion, which make it less dependent on the location and geographical accessibility factors of production consumption sites; very important in rural and marginal areas (Matteucci, 2014). Finally, an increase in separate waste collection, with consequent recovery of materials and resources that can be reused, has positive environmental and economic implications for current and future generations (Black and Hughes, 2001; Christakopoulou <i>et al.</i>, 2001; Crowe, 2008).</p> | <ul style="list-style-type: none"> - Occupational mobility - Public mobility (public transport use) - Slow mobility (walking on a bicycle) - Accessibility and accommodation capacity for hospitals⁸ - Children who have used municipal services for children | <p>8milaCENSUS (Istat)</p> <p>8milaCENSUS (Istat)</p> <p>8milaCENSUS (Istat)</p> <p>Our elaborations GIS - Regional Technical Map</p> <p>ISTAT - Statistical Atlas of Municipalities</p> |
| <p>Social relationships and vulnerabilities</p> | <p>A climate of interpersonal trust, high participation in association networks and widespread presence of civic culture increase individual wellbeing and social cohesion (Black and Hughes, 2001; Shaver and Tudball, 2001; Hoffer and Levy, 2010), allowing better performance and efficiency of public policies and lower cost of economic transactions (Costanza <i>et al.</i>, 2007). Furthermore the concept of social vulnerability was considered to capture an implicit demand for attention and/or assistance.</p> | <ul style="list-style-type: none"> - Spread non-profit institutions - Incidence of people living alone - Incidence of families in distress of assistance | <p>ISTAT - Industrial and services census</p> <p>8milaCENSUS (Istat)</p> <p>8milaCENSUS (Istat)</p> |
| <p>Politics and institutions</p> | <p>The trust expressed by citizens towards institutions, as well as their civic and political participation, foster cooperation and social cohesion, allowing greater efficiency in public policies (Charron <i>et al.</i>, 2014; Frey and Stutzer, 2000; Holmberg <i>et al.</i>, 2009); Thus it is an important determinant of quality of life (Hagerty <i>et al.</i>, 2001; Bérenger and Verdier-Chouchane, 2007), well-being (Charron <i>et al.</i>, 2014) and happiness (Frey and Stutzer, 2000; Fey <i>et al.</i>, 2006). Moreover, within local endogenous development, financial autonomy is indicated as an indispensable prerequisite for proper functioning of institutions, a guarantee not only of possibility to implement its policy direction, but also its vitality (Fey <i>et al.</i>, 2006).</p> | <ul style="list-style-type: none"> - Local electoral participation - Women and political representation at local level - Average age of local political representatives - Index of local financial autonomy⁹ | <p>Ministry of the Interior</p> <p>Ministry of the Interior</p> <p>Ministry of the Interior</p> <p>Ministry of the Interior</p> |

⁸ Evaluation of hospital service quality, normalized according to the time needed to reach the structure from each municipality.

⁹ Sum of tax revenues and extra-tax revenue compared to the sum of tax revenue, income from current contributions and transfers and extra-tax revenue.

| | | | |
|---------------------------------|---|--|--|
| Safety | The safety domain refers to one's own safety perception, the measurement of which can be expressed through crime and violence reports (Glaeser and Sacerdote, 1999). Safety can be also associated with road accidents, which could represent a discriminating factor related to road network management. Road accidents can affect feeling of safety in road traffic, as they having consequences for health, but they also have consequences related to the economic burden borne by society. | - Accident index | ISTAT - Statistical Atlas of Municipalities - Automobile Club of Italy (ACI) |
| Landscape and cultural heritage | Landscape is an integral part of cultural heritage, that is the historical legacy of community, and as such is considered by Italian Constitution, which associates it in the protection of " <i>historical and artistic heritage of nation</i> " (Article 9). In particular, in rural context one of strategic objectives within rural development plans is to counter rural areas abandonment and to preserve rural landscape, , since " <i>constitutes a fundamental resource, determining added value for productions with denomination of origin, being a key element for tourism development and biodiversity linked to the quality of cultivated areas (...) and therefore representing</i> (National Strategic Plan for rural development 2007-2013). | - Diffusion and accommodation capacity of agritourist farms - Abandonment of rural areas | ISTAT - Statistical Atlas of Municipalities ISTAT -Agricultural Census |
| Environment | Living in a vital and resilient environment is essential for the quality of life of society through clean air and water, and uncontaminated food; this is only possible in a "healthy" environmental context, in which nature is able to integrate with productive and social human activities (Welsch, 2002; van Praag and Baarsma, 2005; Welsch, 2006; Brereton <i>et al.</i> , 2008). Natural heritage constitutes the fundamental basis for supply of goods and services essential to human well-being, as demonstrated by important international research projects, as Millennium Ecosystem Assessment (MEA, 2005) and the Economics of Ecosystems and Biodiversity (De Groot <i>et al.</i> , 2012), and by a rich scientific literature on the subject (Bowler <i>et al.</i> , 2010; Keniger <i>et al.</i> , 2013; Hartig <i>et al.</i> , 2014). | - Incidence of CO2 emissions from vehicles (kg CO2/km) - Incidence of protected areas and natural parks ¹⁰ | Car club of Italy (ACI) Inventory of air emissions (INEMAR) Ministry of Environment and Protection of the Territory and the Sea |
| Research and innovation | Research and innovation are indirect determinants of quality of life, as they are the basis of social and economic progress (Flora <i>et al.</i> , 2004). Dolan and Metcalfe (2012) highlighted that the relation between subjective well-being and innovation is high; this relationship has potentially important implications for productivity and economic growth. For instance, a 33% increase in life satisfaction is associated with 8% higher imagination. | - Incidence of employment in high-medium specialization professions | 8milaCENSUS (Istat) |

¹⁰ Percentage ratio between protected natural areas and municipal area.

2.3 Building-up the composite indicators and clustering

The choice to aggregate the elementary indicators in composite indexes arises from need to have systematic information on a complex and multidimensional concept (QoL). Indeed, although losing part of the original information, a synthetic measure allows for a direct spatial and temporal comparison, as well as for easy communication of performance to policy-makers and citizens. The main distinction between aggregation methods is based on the assumption of compensability/non-compensability (substitutability/non-substitutability of indicators). In particular, looking to non-compensatory aggregation functions, as quality of life aspects of territories cannot assume compensatory features (Maggino, 2006), we adopted the Adjusted MPI (Mazziotta and Pareto, 2015), which allows to make ‘absolute’ comparisons of unit values over time.

The method of penalty for coefficient of variation - AMPI - involves standardising indicators by using a transformation criterion to release them from their units of measurement and variability. Therefore, basic indicators have been corrected so as to be ranged within the same scale, by transforming each indicator with respect to the two goalposts, i.e. the minimum and maximum representing variation range of each indicator for the whole period considered; thus each indicator becomes a standardised variable with an average of 100 and a mean square deviation of 10 with values comprised within the range 70-130.

Given the matrix $X = \{x_{ij}\}$ of n rows (territorial units - municipalities) and m columns (elementary indicators) and p layer (years), the normalized matrix is calculated $R = \{r_{ij}\}$, in which

$$r_{ijt} = \frac{(x_{ijt} - \text{Min}_{x_j})}{\text{Max}_{x_j} - \text{Min}_{x_j}} 60 + 70 \quad [1]$$

where x_{ijt} is the value of indicator j in the unit i for the year t and Min_{x_j} and Max_{x_j} are goalposts of indicator j . If the indicator j has negative polarity¹¹, complement to 200 of (2) is calculated.

Goalposts are fixed to set total for base year equal to 100, using the procedure described below.

Let Rif_{x_j} be the reference value of indicator j . $\text{Inf}_{x_j} = \min(x_{ijt})$ e $\text{Sup}_{x_j} = \max(x_{ijt})$, goalposts are as follows:

$$\begin{cases} \text{Min}_{x_j} = \text{Rif}_{x_j} - \Delta_{x_j} \\ \text{Max}_{x_j} = \text{Rif}_{x_j} + \Delta_{x_j} \end{cases} \quad [2]$$

where $\Delta_{x_j} = (\text{Sup}_{x_j} - \text{Inf}_{x_j})/2$

The aggregation function has been ‘corrected’ by means of a penalty coefficient which depends, for each territorial unit, on indicators variability with respect to the average value (‘horizontal variability’).

$$\text{AMPI}_i^{+/-} = M_{r_i} - S_{r_i} \text{cv}_{r_i} \quad [3]$$

where the arithmetic mean of standardized indicators is corrected by subtracting a quantity (product $S_{r_i} \text{cv}_{r_i}$) proportional to mean square deviation, a direct function of variation coefficient. This variability, measured through variation coefficient (cv_{r_i}), allows to penalize score of units that have a greater imbalance between indicators values and, therefore, an unbalanced endowment. The use of standardized deviations (S_{r_i}) makes it possible to construct a robust measure not sensitive to the elimination of a single elementary indicator (Mazziotta et al., 2010).

To identify sub-regional imbalances, first the presence of global spatial autocorrelation, by Moran I statistic, was tested within the dataset (Moran, 1948). The Global Moran’s Index (GMI) application, allowed to highlight the degree of spatial dispersion, randomization or clustering for each domain. Thus, GMI assumes values between -1 (maximum dispersion) and +1 (maximum clustering). Then, we identified the clustered municipalities, though a local spatial autocorrelation analysis, used in several contexts, such as crime mapping, industrial clusters or road accidents (Anselin et al., 2008; Mitra et al., 2010; Brachert et al., 2011; Prasannakumar et al., 2011; Prete et al., 2017). It allows to explicitly measure geographical context

¹¹ ‘Polarity’ of an elementary indicator is the sign of relationship between indicator and phenomenon to be measured (+ if the indicator represents a dimension considered positive and - if it represents a dimension considered negative).

and the impact of place within each domain, i.e. territorial concentration of QoL values (in the case of positive interdependence) or different QoL values (in the case of negative interdependence). Specifically, we applied the Getis-Ord G_i^* (Getis and Ord, 1992); the expression characterizing the Getis-Ord G_i^* is as follows:

$$G_i^* = \frac{\sum_{j=1}^n w_{i,j} x_j - \bar{X} \sum_{j=1}^n w_{i,j}}{S \sqrt{\frac{[n \sum_{j=1}^n w_{i,j}^2 - (\sum_{j=1}^n w_{i,j})^2]}{n-1}}}$$

where x_j is value attributed to feature j , $w_{i,j}$ is spatial weight between features i and j , n is equal to the total number of features and: $\bar{X} = \frac{\sum_{j=1}^n x_j}{n}$, $S = \sqrt{\frac{\sum_{j=1}^n x_j^2}{n} - (\bar{X})^2}$.

Finally, we synthesized the clusters arising from Getis-Ord G_i^* ($-3 \leq G_i^* \leq +3$) in order to outline the overall QoL framework and trend. We have, therefore, identified five classes which describe a marginality condition (>3 QoL's domains fail = $G_i^* < -1$), moderate disadvantage (1-3 QoL's domains fail = $G_i^* < -1$), risk condition (just one QoL domain fails = $G_i^* < 0$), moderate advantage (1-3 QoL's domains not fail = $G_i^* > 1$), high advantage ($>$ QoL's domains not fail = $G_i^* > 1$).

3. Results and discussion

Applying the proposed method in the section 2, we detected an improvement between 2001 and 2011 for Economic well-being domain with an average value increased from 97 to 101, a reduction of St. dev. from 4.86 to 4.44 and with a marked increase of clustered distribution (in 2011 a GMI = 0.294, $p < 0.001$). More in detail, the local spatial autocorrelation analysis highlighted for Economic well-being in 2001 the presence of a negative cluster in the central part of the region (at the border between the two provinces), extending also towards the East VdA area; in 2011 this cluster tends to involve other municipalities towards CMM area. On the contrary positive clusters are located in the West part of VdA area and LP area with the tendency to "incorporate" other municipalities as well. In both cases it could be spoken of carry-over effect (Fig. 2a). For Education and Training domain, which increased from 97 to 101, with a considerable decrease of regional imbalances (St. dev. from 6.48 to 4.97) (Fig. 2b), though it is possible to identify four negative clusters located in MPM area, VdA area and between AB and CMM areas (11 municipalities are affected by a marginality condition from an economic point of view). This means the education dynamics (respect to minimum values) are spatially related to economic factors. Moreover, this area results "outside" to the possibility of access to secondary school services, if not with very long travel times (> 60 min). For Work domain, which increases on average from 92 to 103 (St. dev. from 6.33 to 5.99) and with an increase of clustered distribution (\cdot). We found working disadvantages in CMM and BMB areas and in the East LP area, while working advantage are in the West VAB area, where the workforce is absorbed to a large extent by an important car manufacturer and its subcontractors (Fig. 2c). For Landscape and cultural heritage from 98 to 100 (St. dev. from 9.14 to 8.20) and a clustered distribution. Although we found a negative cluster in the LP area, which roughly encompasses the municipalities falling within Pollino National Park. This leads to a progressive phenomenon of recolonization and natural expansion of forest, with consequences on biodiversity and landscape (loss of cultural and/or aesthetic values) (Benayas et al., 2007). In this case, despite the existence of valuable natural areas and the existence of historical centers and cultural testimonies (e.g. arberesh culture), there is an inadequate exploitation of environmental, monumental and historical-cultural resources, highlighted by a high degree of rural space abandonment (between 65% and 75%) and a lack of accommodation facilities. In particular, to preserve the rural heritage, rural development planning provided incentives aimed at favouring the multi-functionality of farms; they have led to the construction of many structures, of which only a part (on average 5 out of 8) have continued the activity at the end of exercise obligation period. Indeed, the fragmented farming business structures, the conductors senilisation, the insufficient valorisation of local food production (quality marks) and the low quality of tourist

establishments show a lack of coordination between the responsible bodies and the promotion, implementation and management of initiatives aimed at improving fruition of environmental and cultural assets, with negative repercussions also in other domains. Indeed, observing the other quality of life domains, more or less widespread criticalities are evident in the park boundaries, above all related to education, reduced employment opportunities, problems linked to accessibility to services and a condition of social vulnerability linked to demographic aging. On the contrary positive clusters are found from Matera municipality towards the Ionian coast, which tends to interest Matera province, where active farms have very often implemented the accommodation capacity (increase of beds) (Fig. 2g). For Environment from 96 to 98 (St. dev. from 9.13 to 10.04). The clustering distribution is strongly influenced by incidence of protected areas, whereby municipalities affected by protected surfaces are found to have the highest increasing values (many municipalities fall completely within protected areas) (Fig. 2i).

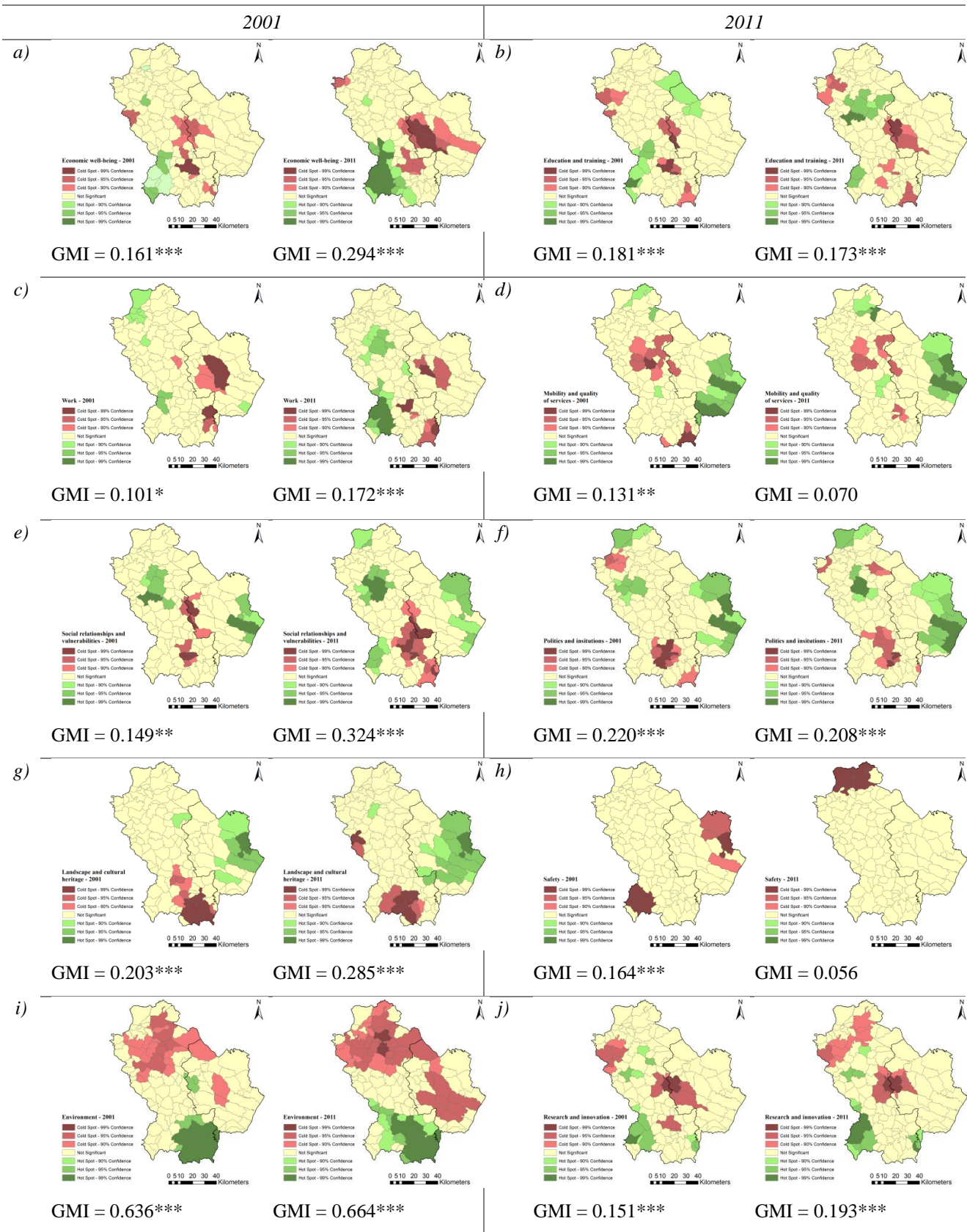
On the contrary it is possible to observe a weak worsening for Mobility and quality of services domain: the average value decreased from 100 to 98 (St. dev. from 3.41 to 3.42) (Fig. 2d), especially in the maximum value. We detected a negative cluster in the AB area, mainly due to a strong use of private vehicle towards Potenza hub, even for short distances. In line with a fairly generalized situation throughout the Italian country, the phenomenon of population daily mobility, above all for work reasons, is a growing phenomenon, affecting mainly the hinterland of cities. In particular, student and work mobility increased respectively of around 11% and 10% in 2011 compared to the previous period. The analysis of mobility reveals a very low utilization rate of public mobility (on average only about 13% of population) and a reduction of slow mobility (on foot or by bicycle). On the contrary the municipalities along the Ionian coast constitute a cluster characterized by advantageous conditions with a tendency to affect the northern area towards the Matera hub.

For Social relationships and vulnerabilities domain from 100 to 98 with an increase of St. dev. from 5.88 to 6.93) and in particular an increase of GMI from 0.149 ($p < 0.01$) to 0.324 ($p < 0.001$). The tendency towards an increase in the elderly population living alone or in only elderly people families, especially in some internal areas in the centre of the region, highlights a social vulnerability condition that deserves proper consideration in structures and services planning (e.g. integrated homecare assistance) (Fig. 2e). For Safety from 101 to 99 (St. dev. from 6.19 to 5.90); more in detail in the Potenza and Matera hubs there is an improvement while in the VAB and area a worsening has taken place; in any case it is not easy to deduce there is a tendency or not for some areas to be subject to a high rate of accidents, for example linked to road infrastructures in relation to road traffic (Fig. 2h).

For Research and Innovation from 102 to 98 (St. dev. from 4.97 to 4.93); in 2001 a negative cluster was found in the North-West, which tends to widen towards the North and a negative cluster in both 2001 and 2001 in the central part of the region between the two provinces, in MPM area with the tendency to incorporate other municipalities towards the North of the region. Positive clusters are close to Potenza hub in the West LP area and in the South-East LP area (Fig. 2j).

Finally for Politics and institutions domain maintains an average value almost constant between 2001 and 2011 equal to 99 (St. dev. from 4.28 to 4.95 and $GMI = 0.2$, $p < 0.001$). Part of V-AB area, AB area and Matera hub towards the Ionian coast constitute clusters in advantageous conditions. On the contrary, two negative clusters can be identified in 2001: in the South-West V-AB area and between VdA and L-P area, linked to an aging population and poor local autonomy (Fig. 2f).

Figure 2 – AMPI hotspots and coldspots for each domain at 2001 and 2011



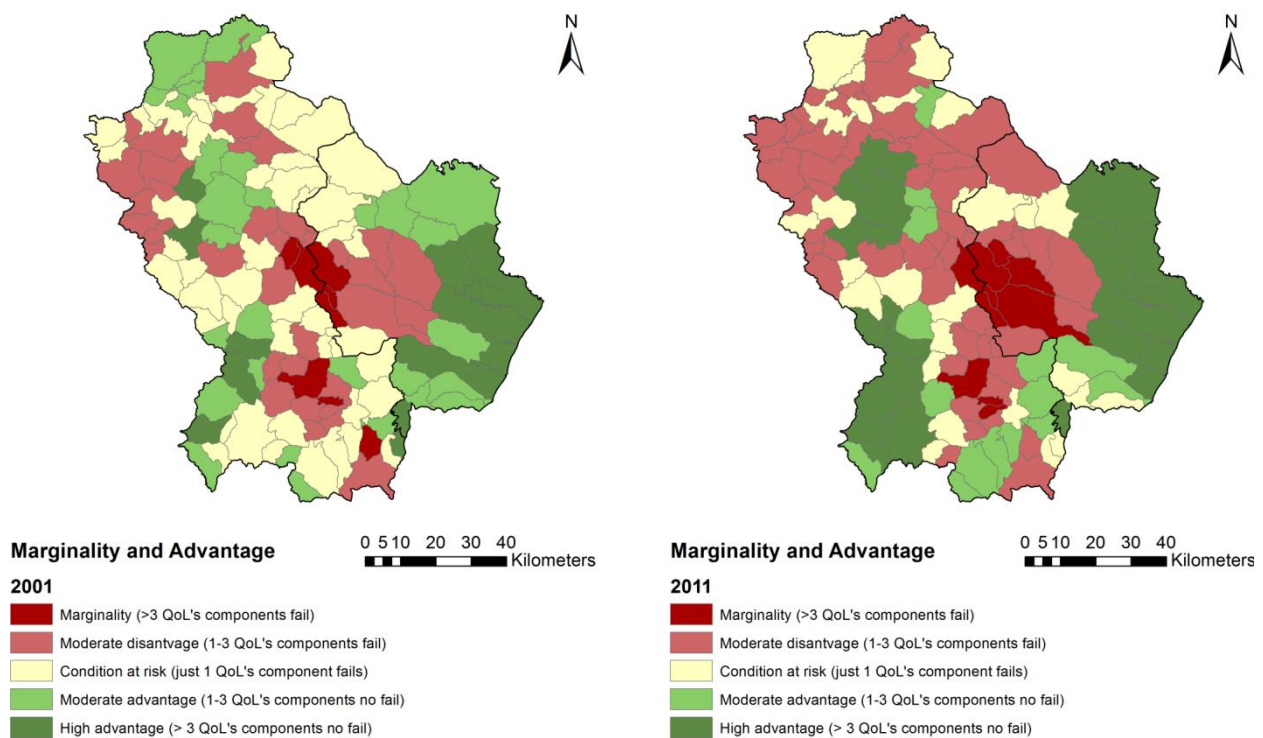
* p<0.05; ** p<0.01; *** p<0.001

Finally the synthesis of G_i^* cluster maps in two marginality and advantage maps for 2001 and 2011 allowed to outline the overall QoL framework and trend (see Fig. 3).

More in detail, we found a constantly marginal area, which tends to widen and affect several municipalities (about 6-7% of regional municipalities) (carry-over effect). The marginal areas are concentrated in the central-southern part of the study area and between the two provinces. In these areas the difficulties in achieving an adequate level of education add up to economic backwardness and to greater difficulties in finding adequate employment levels. This leads, in the absence of appropriate development policies, to demographic drift, to high rates of youth emigration, to population aging, etc. About 32-33% of municipalities tends to move from moderate to high advantage, while the municipalities in a risk condition tend to move on to a moderate disadvantage condition. It follows that significantly deficient QoL components, acting synergistically, generate a self-reinforcing process, that can be defined as a “downward spiral”, and vice versa. In particular, the areas evolving towards an advantage condition include Potenza hub and his belt municipalities. In Matera province there are municipalities border-line, with significant productive realities, self-sustaining development and consistent connections with external production systems. The economic activities relevant for this area are those belonging to the agro-food sector, tourism (in particular Matera), manufacturing and advanced services. The West LP area testify the presence of a certain wealth of endogenous resources to be exploited (tourist riches, Pollino Park, quality agro-food productions), but also to enhance, according to guidelines of sustainable development, able to increase the sense of belonging of local populations and preserving their local integrity and at the same time the protection of territory. Also West VdA area represents a dynamic area, indeed many municipalities fall into the basin interested in the extraction of oil; this has certainly contributed to raising the level of economic well-being.

Finally, the VAB area move from an advantage condition in 2001 to a risk condition in 2011. This is mainly due to mobility and the increase in accident rate. In the decade, services centralization, especially in Potenza hub, has led to an increase in the means that every day travel along the highway 658; an old road no longer suited to the needs of territory, which requires structural interventions both for safety reasons, both for its expansion as a central infrastructure for the entire Region.

Figure 3 - Marginality and advantage conditions in 2001 and 2011



4. Conclusions

The proposed methodological framework can represent a useful tool to implement actions aimed at reducing sub-regional disparities and promote social inclusion. One of the most interesting aspects is the use within the assessment of final impact of interventions carried out in terms of QoL. The non-compensatory nature of composite indicators, overcoming the use of measures to adjust GDP, guarantees the possibility of “rewarding” the units (in this case municipalities) characterized by a balance of all indicators; In this way, the methodological framework valuable information for those interested in and working to bring about improvements to living conditions within local communities – particularly those who want to pursue holistic solutions and integrated approaches. This aspect is extremely relevant as it allows us to explicit the cause-effect relationships (self-reinforcing process) that trigger and to generate long-term joint analyses and assessments useful in planning local development policies. Specifically, it can be used in the formulation of development programs, which take into account a balanced growth of each QoL domain.

Moreover, the proposed model has a dynamic nature, since it allows a characterization of territory functional to the actions implemented to be reviewed periodically, so as to propose a reclassification of territory, which overcoming the urban-rural dichotomy, give a punctual information with respect to the trends within the area under examination.

This study showed territorial contexts with negative growth dynamics but that have resources not fully exploited. It is therefore on these areas that more attention should be focused, even if this should not mean abandoning the support and valorisation of the potential inherent in the areas at risk, which tend to move towards a disadvantage condition, according to a process we could call carry-over effect. To encourage development opportunities it is necessary, as well as improving working conditions, to pay particular attention to problems related to the offer and accessibility of services. The possibility to guarantee the coverage or the capillarity of services would reduce the internal migratory balance of the most marginal areas. In a long-term perspective, the abandonment of these areas could undermine the maintenance of the territory by reducing “non-market” services (ecosystem services). Indeed, as shown by the analysis, the most marginal municipalities are those with a greater ecological value, as happens in the Gallipoli Cognato Regional Park or Pollino National Park. The smaller municipalities are particularly sensitive and, therefore, require more attention, for example, by promoting forms of association between municipalities (Dgls. 267/2000).

It is clear that the proposed model of analysis depends first of all on the selected variables. Indeed, although the methodology allows to obtain a knowledge base useful for determining more specific and targeted policy instruments on the territory, further refinements would be needed to improve the dashboard of indicators, with a greater focus also on qualitative and subjective indicators. For example, there is lack of qualitative information on healthcare, other qualitative factors linked to work (e.g. having a job properly remunerated, reasonably safe and appropriate to skills) or information concerning one’s own safety and subjective well-being. Moreover, surveys (micro-data) can more in detail verify the local specificities, giving a more and more accurate reading of territory. Mainly within Landscape and cultural heritage and Environment domains lack an adequate discrimination of the territory with respect to the capacity to affect people’s well-being. As we have seen, the application of composite indicators depends on the (almost) perfect availability of elementary indicators in space and time. Therefore, it is desirable that synthesis can be carried out for matrices composed of an appropriately number of selected non-replaceable indicators and always valued over the years for all municipalities. Moreover, it is useful to underline that results do not have an adequate updating with respect to some dynamics evolving with the much faster paces; thus a verification would be useful, proposing the methodology adopted using more recent data.

Nonetheless, the proposed model, overcoming some limits related to data availability, allows an integrated knowledge and monitoring of sub-regional inequalities in order to implement increasingly targeted actions to smooth out them.

5. References

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