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A Quality of Life Index for Spanish Regions: A Dynamic Application of the DP2 Distance Method

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This study proposes the construction of a composite Life Quality Index (LQI) for Spain's autonomous communities and cities using a dynamic version of the DP2 distance, originally developed by Pena-Trapero (1977). This methodology offers several advantages: (1) it enables both cross-sectional and temporal comparisons across territorial units; (2) it applies an objective weighting criterion; and (3) it eliminates redundant information among indicators. The results reveal that the LQI displays significant cyclical sensitivity, highlighting substantial differences across dimensions in both levels and trends. Moreover, the study underscores the need to expand the informational basis for certain dimensions such as Education, Leisure and Social Relations, Governance and Fundamental Rights, and General Life Experience.

Keywords: Wellbeing; quality of life; synthetic indexes; distance indicators; Spanish regions.

JEL Classification: C43; C46; D63; Y31.

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Un índice de calidad de vida para las regiones españolas. Una aplicación dinámica de la distancia DP2

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Este artículo propone la elaboración de un índice compuesto de calidad de vida (ICV) para las comunidades y ciudades autónomas españolas a partir de una versión dinámica de la distancia DP2 propuesta por Pena-Trapero (1977). Son varias las ventajas que presenta esta metodología. En primer lugar, permite realizar comparaciones transversales y temporales de las unidades territoriales seleccionadas; en segundo lugar, aplica un criterio de ponderación objetivo y; en tercer lugar, elimina la información redundante de los indicadores. Con los resultados obtenidos, se constata que el ICV muestra una gran sensibilidad cíclica advirtiendo la existencia de grandes diferencias por dimensiones, tantos en niveles como en variación. Por otra parte, se ha evidenciado la necesidad de ampliar la base informativa en algunas dimensiones, como *Educación, Ocio y relaciones sociales*, *Gobernanza y derechos básicos* y *Experiencia general de la vida*.

Palabras clave: Bienestar; calidad de vida; índices sintéticos; indicadores de distancia; regiones españolas.

Clasificación JEL: C43; C46; D63; Y31.

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1. Introduction

To evaluate standards of living, well-being, or quality of life, there is broad consensus on the need for a multidimensional approach. Although GDP remains extremely useful for many purposes, over the last decades its adequacy in reflecting social well-being has been questioned, primarily due to its failure to capture qualitative aspects and externalities. For this reason, various institutions—such as the United Nations and the OECD—have promoted alternative frameworks that aim to better address these broader dimensions.

This study falls within this line of research, particularly among those proposing tools to analyze and assess well-being or quality of life both over time, enabling an evaluation of its evolution, and, cross-sectionally, through comparisons among individuals or, as in this case, among territorial units.

From the outset, several challenges emerge in this undertaking, ranging from the conceptual delimitation of the notions of "standard of living", "well-being", and "quality of life"—essential for building an operational and empirically testable framework—to the complex task of identifying the relevant dimensions these notions encompass.

The index proposed in this study allows for both cross-sectional and temporal interpretations, enabling the analysis of its progression rather than being limited to static comparisons. Another novel element lies in the way dimension weights are obtained using an objective statistical criterion. This approach facilitates analysis of the explanatory power of each dimension, and of the indicators used within them.

Based on this general framework, the next section presents a review of different approaches to constructing quality of life indices. Then, the specific method applied in this study—a dynamic specification of the DP2 distance originally proposed by Pena-Trapero (1977)—is described. Afterwards, we analyze the main results, both in aggregate and across individual dimensions. Finally, the main conclusions are summarized.

2. Measuring Quality of Life

Quality of life is an abstract and non-directly observable concept—in other words, it is a latent variable dependent on a multitude of elements that interact in an indeterminate way. Consequently, any attempt to measure quality of life implicitly assumes that it can be indirectly captured through indicators that reflect its underlying components.

The United Nations was a pioneer in promoting approaches that considered more than just monetary indicators for assessing living standards, laying the groundwork for a multidimensional framework that has gained momentum and recognition over time. As stated by the Expert Committee, "the most satisfactory way to measure living standards [...] would be to quantify clearly defined aspects or components of general living conditions" (United Nations, 1961, p. 1).

The development of social indicators in the 1960s was a key milestone toward a broader understanding of social well-being (Atkinson *et al.*, 2002). In this context, Bauer (1966) advocated for greater use of surveys to collect richer data on social progress[‡]. A foundational example is Sweden's 1968 Living Conditions Survey, which embodies the so-called "Scandinavian approach" to well-being. Similarly, in the early 1970s, the OECD initiated a Social Indicators Programme with a more comprehensive vision of social conditions.

Multidimensional approaches to poverty and deprivation also contributed to this tradition, notably through the work of Townsend (1979), who laid the foundation for many synthetic indexes[§].

More recently, the creation of quality of life indexes accelerated following the influential reports by the European Commission and the Commission on the Measurement of Economic

[‡] See Noll (2004).
[§] On this issue, see also Atkinson (2003), Bourguignon and Chakravarty (2003), and Tsui (2002).

Performance and Social Progress (Stiglitz *et al.*, 2009), further driven by the efforts of Eurostat and the OECD.

Numerous proposals for composite indexes have since emerged[**]. For example, Osberg and Sharpe (2002) developed an Economic Well-being Index that includes per capita consumption flows, net accumulation of productive resources, income distribution, and economic security. Fleurbaey and Gaulier (2009) corrected GDP per capita by accounting for international income flows, labour conditions, unemployment risk, healthy life expectancy, household demographics, and inequality. Montgomery *et al.* (2000) used population surveys in developing countries to construct living standard measures.

Several studies focus on internal disparities within countries: Sarmiento & Ramírez (1997) for Colombia, Facchinetti & Siletti (2021) for Italy, and Hutton (1991) for the UK. In Spain, the FOESSA Foundation (2008) developed the FOESSA Index of Social Welfare, built upon 14 indicators across four domains: material well-being, income distribution, security, and social capital.

From a supranational perspective, Pérez Ruíz *et al.* (2025) constructed a Synthetic Indicator of Well-being and Quality of Life using Principal Component Analysis and Eurostat's regional (NUTS-2) data. Park (2004) proposed a global quality of life index suitable for territorial comparisons.

The capabilities approach, proposed by Sen (1987), also inspired relevant contributions, including works by Kakwani (1993), Majumder & Chakravarty (1996), Ramos & Silber (2005), Alkire (2002), and Gaertner & Xu (2008).

Several methodological synthesis documents—such as Fahey *et al.* (2003); Nolan & Whelan (2005); Maggino & Zumbo (2012); and Nardo *et al.* (2005)—review techniques and indicators for measuring well-being and living conditions. The latter served as a reference for the OECD's 2008 guidelines on constructing composite indicators.

Argüeso *et al.* (2013) examined two approaches to building multidimensional quality of life indicators, addressing the selection of dimensions and indicators, as well as aggregation techniques. Jurado & Pérez-Mayo (2012) developed a multidimensional quality of life index for Spain's regions.

Institutionally, the OECD's Better Life Initiative, influenced by the Stiglitz-Sen-Fitoussi framework, launched efforts to develop databases reflecting well-being and life quality. The initiative initially defined eleven dimensions of well-being. In parallel, Eurostat worked with the OECD and other agencies to structure existing indicators into nine dimensions, with eight reflecting individual capabilities and one addressing overall life experience, including subjective elements such as satisfaction, emotion, and meaning in life[††].

Since 2017, the Spanish National Statistics Institute (INE)[‡‡] has published an experimental statistic known as the "Multidimensional Life Quality Indicator" (MLQI) for autonomous communities and cities[§§]. The INE uses[***] the Adjusted Mazziotta-Pareto Index in its construction (INE, 2021; De Muro *et al.*, 2010; Mazziotta & Pareto, 2014).

The MLQI is structured into the following nine dimensions:

3. Material living conditions
4. Employment
5. Health

[**] See Pena-Trapero (2009), Somarriba (2008), or Esteban-Yago (2024) for a more comprehensive review.
[††] See Eurostat (2014 and 2017) and https://ec.europa.eu/eurostat/web/quality-of-life
[‡‡] See INE (2023) for the correspondence between dimensions and indicators used by NSI and Eurostat.
[§§] INE (2021).
[***] The MQLI methodology applies an adjustment to restrict the range within which the normalized indicator can vary. Specifically, INE calculates the selected indicators using a range of values between 85 and 115. See INE (2021).

6. Education
7. Leisure and social relations
8. Physical and personal safety
9. Governance and basic rights
10. Environment
11. General life experience

3. Methodology: Dynamic DP2 Distance

The most commonly used methods for constructing composite well-being indexes can be grouped into several categories[†††]: those based on factor analysis or principal component analysis; cluster or grouping techniques; approaches derived from econometric methods and data envelopment analysis. In most cases, these techniques rely on some form of distance measurement. The choice of the methodology depends on factors such as the type of indicators used, the desired aggregation and comparison approach, and whether the weighting should be objective or subjective (Mazziotta & Pareto, 2013).

Among the various available methodologies, this study applies an extension of the P2 distance—known as the DP2 index—originally proposed by Pena-Trapero (1977), and later developed by Zarzosa (1996) and Somarriba (2008).

This method is widely used in the analysis of well-being and quality of life. For instance, Zarzosa (1992) applied it to Spanish provinces using 1981 data; Somarriba (2008), and Somarriba & Pena-Trapero (2009), analyzed quality of life across EU countries using social indicators, including subjective data; and Somarriba *et al*. (2015) assessed the impact of the economic crisis on quality of life by comparing data from 2007 and 2011. Zarzosa & Somarriba (2013) constructed a quality of life indicator for Spanish provinces using 2007 data.

This methodology has also been employed in other contexts: De Maya *et al*. (2022, 2023); Holgado *et al*. (2012); Cuenca *et al*. (2010); Rodríguez-Martín (2012); and at the municipal level by Sánchez-Domínguez & Rodríguez-Ferrero (2003), López *et al*. (2003), Buendía *et al*. (2004, 2010), and Escobar (2006).

Two main issues arise in any effort to construct synthetic indexes. First, how to aggregate indicators across the selected dimensions; and second, how to assign appropriate weights to each indicator within a dimension and to each dimension within the overall index. The DP2 method offers solutions to both.

This approach begins by establishing a "reference state" for each indicator, represented by a "minimum vector". This prevents negative results and facilitates interpretation by comparing each territorial unit against a hypothetical area with the worst performance across all indicators. This procedure, applied with slight variations in works like Somarriba *et al*. (2015) and Sánchez de la Vega *et al*. (2019), allows for the observation of temporal trends in both individual dimensions and the overall index.

Another advantage is the method's use of hierarchical ordering: variables are incorporated sequentially based on the variance they explain, while redundant information is eliminated through a correction factor.

To formulate the method rigorously, consider m partial indicators for each of n elements in the population (in this case, Spain's autonomous communities and cities), and let $I_i(k)$ denote the value of element k in partial indicator i. It is assumed that if two territories have identical values for all indicators, their quality of life is equal; if at least one has a strictly higher value in any indicator, it should be deemed to have a higher quality of life. Based on this, a reference vector composed of the minimum values of each indicator is defined:

[†††] See Nardo *et al*. (2005), OECD (2008), or Pena-Trapero (2009).

$$I_i(o) = \min_k \{I_i(k)\} \quad (1)$$

Multidimensional distance functions are then proposed, which must satisfy the properties of a metric distance (identity, symmetry, triangle inequality, and non-negativity). This gives rise to *p*-metric distance measures, including Manhattan and Euclidean distances. However, as Pena-Trapero (2009) notes, three main challenges arise when constructing a synthetic distance indicator (SDI): (i) indicators often have different units of measurement; (ii) indicators may not be independent; and (iii) a weighting system is required to reflect each indicator's relative importance.

To address these issues, Pena-Trapero (1977, 2009), Zarzosa (1996), and Somarriba & Pena-Trapero (2009) outlined the properties an SDI must satisfy, including existence, monotonicity, uniqueness, invariance, homogeneity, transitivity, additivity, and reference base independence.

Although Euclidean distance is commonly used, it fails to meet several of these criteria. To overcome this, the Frechet distance (DF) is used:

$$DF(\mathrm{x_{i\bullet}}; \mathrm{x_{*\bullet}}) = \sum_{j=1}^{m} \frac{|x_{ij} - x_{*j}|}{\sigma_j} \quad (2)$$

However, this measure applies no weights and does not account for correlations among indicators.

Ivanovic (1963) introduced the I-distance (DI) by modifying the Frechet distance:

$$DI(x_{i\bullet}; \mathrm{x_{*\bullet}}) = \sum_{j=1}^{m} \frac{|x_{ij} - x_{*j}|}{\sigma_j} \prod_{i=1}^{j=1} (1 - r_{ij;1,2,\ldots,i-1}) \quad (3)$$

The factor that multiplies the synthetic indicator (DF), $\prod_{i=1}^{j=1}(1 - r_{ij;1,\,2,\,\ldots,\,i-1})$, is the product of the complements to one of the partial correlation coefficients between the j-th and i-th components (for i>j). This factor is introduced to account for duplicated information, as r_{ij} measures the association between indicators as they are sequentially incorporated. While the synthetic indicator (DI) satisfies most of the desirable properties, it does not fully eliminate potential redundancy or informational overlap (Pena-Trapero, 2009).

As an alternative to overcome this limitation, Pena-Trapero (1977 and 1979) proposed the DP2 distance by introducing a modification to the distance measure originally developed by Ivanovic (1963).

$$\mathrm{DP_2}(x_{i\bullet}; \mathrm{x_{*\bullet}}) = \sum_{j=1}^{m} \frac{|x_{ij} - x_{*j}|}{\sigma_j} \left(1 - R^2_{j;j-1,\ldots,2,1}\right) \quad (4)$$

In this formula, $R^2_{j;\,j-1,\ldots,2,1}$ denote the coefficient of determination from the regression of indicator *j* (x_j) on its preceding variables $x_{j-1}, x_{j-2}, \ldots, x_{2,1}$. This statistic quantifies the proportion of the variance *in* x_j that is accounted for by a linear combination of the prior variables. The factor $(1 - R^2_{j;\,j-1,\ldots,2,1})$, referred to as the *correction factor*, serves to eliminate redundancy by removing from the partial indicators any information already captured by the preceding ones.

The DP2 method satisfies all the properties which must satisfy a distance indicator, except for uniqueness, as the final result depends on the order in which indicators are incorporated. To solve this, Pena-Trapero introduced an iterative algorithm that determines the optimal entry order for each variable objectively, thus producing a synthetic indicator that is fully compliant and not affected by the reference base or initial distance measure.

A key strength of this method is that the correction factor assigns weight based on the proportion of new and non-redundant information provided by each indicator—thus avoiding subjective bias in weighting decisions—.

In conclusion, the DP2 indicator meets all the criteria for a robust distance-based indicator and enables intertemporal comparisons across territorial units.

Additionally, Zarzosa (1996) suggested a method for selecting variables based on the "Relative Ivanovic-Pena Global Information Content", which measures each variable's

discriminatory power across territorial units. Following Somarriba *et al.* (2015), this is computed from Ivanovic's (1974) determination coefficient:

$$DC_i = \frac{2}{m(m-1)} \sum_{j,l>j}^{k_i} m_{ji} m_{1i} \left| \frac{x_{ji} - x_{li}}{\overline{X_i}} \right| \quad (5)$$

Where m_{ji} is the number of regions sharing the same value x_{ji} and k_i is the number of different values the indicator takes. The DC value ranges from 0 (no discrimination) to 2 (maximum discrimination). If a variable takes the same value across all regions, its determination coefficient (DC) will be zero, indicating no discriminating power. Conversely In opposition, a value of 2 reflects maximum discriminating power, occurring when an indicator takes a non-zero value in only one region and is zero in all others.

To assess the impact of each variable, the relative individual information coefficient α_i is calculated:

$$\alpha_i = \frac{DC_i \, (1 - R^2_{i.i-1,\ldots 1})}{\sum_{i=1}^{n} DC_i \, (1 - R^2_{i.i-1,\ldots 1})} \quad (6)$$

The sum of all α_i values equals 1, providing a normalized measure of each variable's contribution.

4. Results

Regarding the indicators, this study uses the same set employed by Spain's National Statistics Institute (INE) in constructing the 2023 edition of the Multidimensional Life Quality Indicator (MQLI-INE), without applying any initial constraint such as requiring a minimum explained variance[‡‡‡]. In order to maintain comparability, this analysis also includes adjustments for those indicators where sign inversion was considered appropriate. Table 1 summarizes the number of indicators used in each of the nine dimensions.

Table 1. Number of indicators by dimensions.

Dimension	Number of Indicators
1. Economic Conditions	12
2. Employment	8
3. Health	8
4. Education	5
5. Leisure and Social Relations	7
6. Physical and Personal Safety	4
7. Governance and Basic Rights	4
8. Environment	5
9. General Life Experience	3
TOTAL	**56**

Note: Indicators and their sources can be consulted in INE (2021).

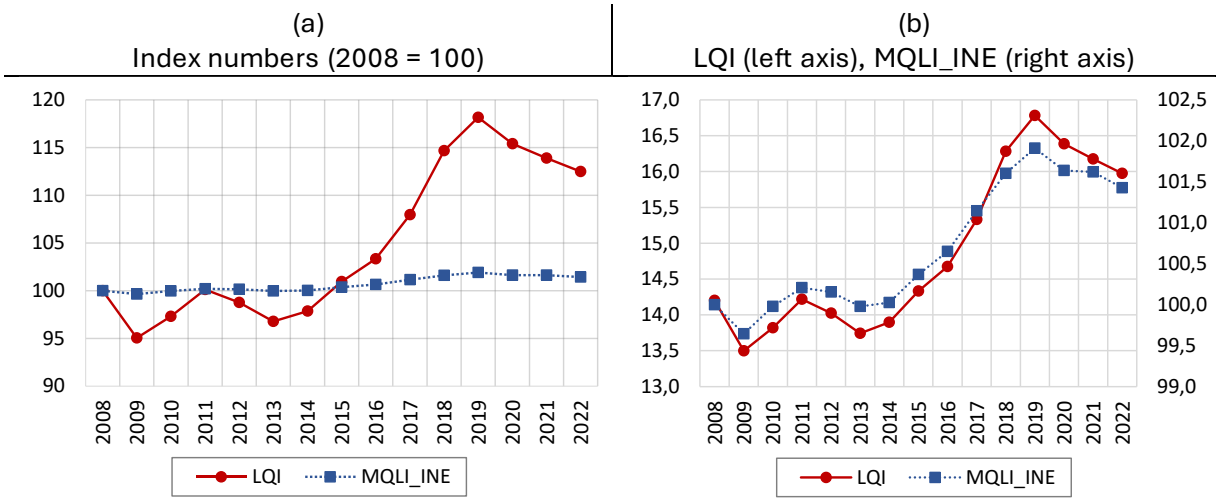
Below are the most relevant results derived from applying the DP2 methodology. We begin with the overall composite index—referred to here as the Life Quality Index (LQI).

Figure 1 compares the national evolution of the LQI with the INE's MQLI across the 2008–2022 period. The left panel shows both indices normalized to 2008 (index = 100), facilitating comparison. A key difference is that the LQI displays wider fluctuations (from just over 95 to above 118), whereas the MQLI_INE shows a narrower range (99.6 to 101.9). This discrepancy is attributable to the MQLI's construction process, which truncates values and smooths trends—potentially giving a misleading sense of stability.

[‡‡‡] See Sánchez de la Vega *et al.* (2019).

The right panel displays both indices in their original units (MQLI_INE in index values; LQI in standard deviation units). Despite different scales, both measures exhibit nearly identical temporal profiles, confirming their consistency in capturing changes reflected in the underlying indicators.

Figure 1. Evolution of the Quality of Life Index (LQI) and the Multidimensional Quality of Life Index by the National Institute of Statistics (MQLI_INE), 2008–2022.



Source: National Institute of Statistics and own elaboration.

While quality of life lacks a single definitive measure, selecting a robust set of multidimensional indicators enables the detection of meaningful trends in societal well-being.

The indices show a sharp drop in 2009, driven mainly by declines in economic conditions, employment, and, to a lesser extent, health. Although some recovery occurred over the next two years, the Great Recession period saw a sustained decline in life quality. Between 2013 and 2019, there was a continuous and notable improvement, abruptly interrupted in 2020 due to the COVID-19 pandemic.

Another comparable aspect is the resulting ranking of the autonomous regions and cities, both in terms of levels and relative variations (Tables 2 and 3, respectively).

Table 2 presents the rankings for the initial and final years of the analysis, where a significant degree of consistency in the resulting order can be observed. For instance, the top two positions—Navarra and La Rioja—remain unchanged across both approaches, while the bottom position only coincides in the final year, with small differences across the remainder. The greatest discrepancies are seen in the Basque Country in 2008 and in Asturias and Madrid in 2022, with a three-position difference between the two classifications.

With regard to changes in positions, there is also considerable similarity. Only two cases—Canary Islands and Madrid—exhibit movements in opposite directions, as they rise one position according to the LQI, but fall one place according to the MQLI_INE.

Although the INE's work is the only one that allows for a complete comparison, the resulting territorial rankings are broadly similar to those found in other studies. For the overlapping years, there is a high level of agreement with the results reported by Peiró *et al.* (2019) and Herrero *et al.* (2018).

Table 2. Ranking of autonomous regions and cities by LQI and MQLI_INE. Years 2008 and 2022.

	LQI		MQLI_INE		Position change	
	2008	2022	2008	2022	LQI	MQLI_INE
Total National	**11**	**11**	**13**	**12**	0	1
Andalusia	17	18	17	18	-1	-1
Aragón	6	4	5	3	2	2
Asturias, Principality of	4	9	3	6	-5	-3
Balearic Islands	8	7	7	7	1	0
Canary Islands	20	19	18	19	1	-1
Cantabria	5	5	4	5	0	-1
Castile and Leon	13	12	12	11	1	1
Castile - La Mancha	14	10	14	10	4	4
Catalonia	9	14	10	14	-5	-4
Valencian Community	10	8	9	8	2	1
Extremadura	16	13	15	13	3	2
Galicia	19	15	19	16	4	3
Madrid, Community of	7	6	8	9	1	-1
Murcia, Region of	12	17	11	15	-5	-4
Navarra, Foral Community of	1	1	1	1	0	0
Basque Country	3	3	6	4	0	2
Rioja, La	2	2	2	2	0	0
Ceuta	18	20	20	20	-2	0
Melilla	15	16	16	17	-1	-1

Note: A positive variation indicates a rise in the ranking (improvement); a negative one indicates a drop in the ranking (deterioration) between 2008 and 2022.

Source: INE and own elaboration.

Table 3 ranks regions by growth in life quality over the period of analysis. The two indices again display considerable consistency. Galicia shows the most significant improvement, while the Region of Murcia shows the least. The main exceptions are the Canary Islands and the Balearic Islands, whose ranks differ more notably across the indexes.

Table 3. Ranking of autonomous regions and cities by LQI and MQLI_INE growth, 2008–2022 (descending order).

LQI		MQLI_INE
Galicia	**1**	Galicia
Extremadura	**2**	Castile and Leon
Castile and Leon	**3**	Extremadura
Valencian Community	**4**	Valencian Community
Canary Islands	**5**	Basque Country
Aragón	**6**	Aragon
Basque Country	**7**	Balearic Islands
Madrid, Community of	**8**	Madrid, Community of
Castile - La Mancha	**9**	Andalusia
Andalusia	**10**	Castile - La Mancha
Balearic Islands	**11**	Cantabria
Cantabria	**12**	**Total National**
Total National	**13**	Canary Islands
Melilla	**14**	Rioja, La

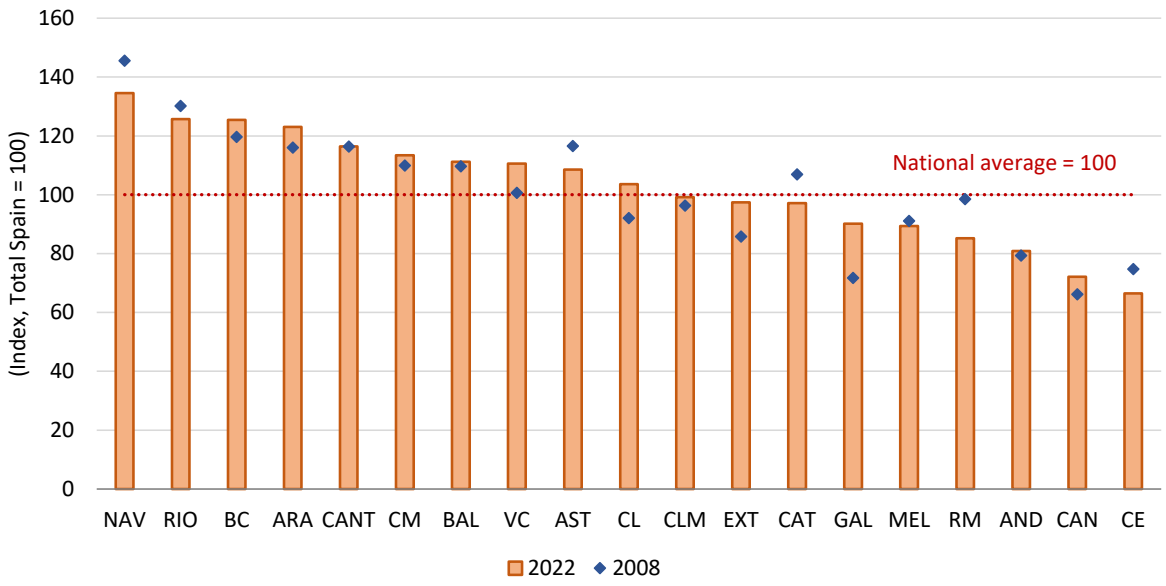
Rioja, La	**15**	Melilla
Principality of Asturias	**16**	Catalonia
Chartered Community of Navarre	**17**	Principality of Asturias
Catalonia	**18**	Chartered Community of Navarre
Ceuta	**19**	Ceuta
Region of Murcia	**20**	Region of Murcia

Source: INE and own elaboration.

Figure 2 shows the relative position of each region's LQI in 2008 and 2022, standardized to the national average (100). A common pattern emerges: most regions that were above the national average in 2008 moved farther away from it by 2022, except for Navarra, La Rioja, and Asturias. Catalonia is the only region that shifted from above-average in 2008 to below-average in 2022.

Figure 2. LQI of Spanish autonomous regions and cities, 2008 and 2022.

National average = 100. (Ranked by LQI in 2022).



Source: own elaboration.

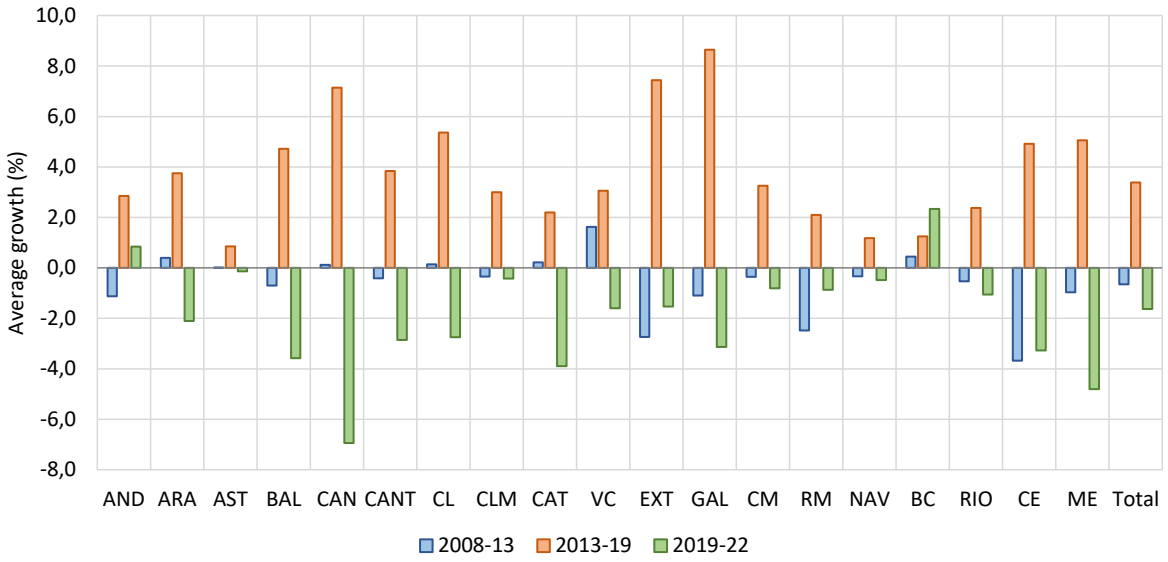
Note: Andalusia (AND), Aragon (ARA), Principality of Asturias (AST), Balearic Islands (BAL), Basque Country (BC), Canary Islands (CAN), Cantabria (CANT), Castile and Leon, (CL) Castile–La Mancha (CLM), Catalonia (CAT), Community of Madrid (CM), Extremadura (EXT), Galicia (GAL), La Rioja (RIO), Chartered Community of Navarre (NAV), Region of Murcia (RM), Valencian Community (VC), Ceuta (CE) and Melilla (ME).

Figure 3 illustrates the dynamics over three sub-periods—2008–2013, 2013–2019, and 2019–2022—expressed as annual average variations.

The first phase corresponds to a deep recession, also reflected in living conditions, as evidenced by a 0.65% average annual decline in the national LQI. Nonetheless, seven regions—Aragon, Asturias, Canary Islands, Castile and Leon, Catalonia, the Valencian Community, and the Basque Country—maintained or improved their quality of life.

In the subsequent recovery period (2013–2019), all territories recorded improvements, with the most significant increases in the Canary Islands, Extremadura, and Galicia. The final period saw a general decline in living standards, from which only Andalusia and the Basque Country emerged unscathed.

Figure 3. Average annual variation of LQI by period (%).



Source: own elaboration.

Note: Andalusia (AND), Aragon (ARA), Principality of Asturias (AST), Balearic Islands (BAL), Basque Country (BC), Canary Islands (CAN), Cantabria (CANT), Castile and Leon, (CL) Castile–La Mancha (CLM), Catalonia (CAT), Community of Madrid (CM), Extremadura (EXT), Galicia (GAL), La Rioja (RIO), Chartered Community of Navarre (NAV), Region of Murcia (RM), Valencian Community (VC), Ceuta (CE) and Melilla (ME).

To provide a brief overview [§§§] of the behaviour of the nine dimensions considered, Tables 4 and 5 present the synthetic index values and their evolution, expressed as index numbers (2008 = 100). Significant differences are apparent in the levels of the nine dimensions, which—due to the standardisation process—reflect the varying volatility of each dimension. Moreover, large differences are observed in their evolution: for example, Dimension 4 (Education) nearly doubles its index between 2008 and 2022, while Dimension 5 (Leisure and personal relationships) falls by 20.4%. Some dimensions show constant values over several years due to the inclusion of indicators that are not updated annually. This is the case for Dimensions 5, 7 (Governance and basic rights), and 9 (General life experience)[****].

[§§§] A detailed dimensional analysis can be found in Esteban-Yago (2024).

[****] In the case of the sub-dimension "Institutions and Public Services" within Dimension 7, "Governance and Basic Rights", the three indicators used are drawn from the 2013 module of the Life Conditions Survey. Consequently, only one data point per region is available for each indicator, which is repeated for each year of the period.

Table 4. Values of LQI dimensions. 2008–2022.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
DIM1	21.5	20.2	19.7	20.4	19.7	19.3	18.7	19.4	19.7	20.9	21.3	21.9	20.8	20.5	20.8
DIM2	13.0	11.9	11.6	10.6	10.3	9.9	10.2	10.6	11.0	11.6	13.2	13.7	14.1	13.8	14.7
DIM3	16.8	15.7	17.0	18.6	18.5	17.6	19.1	19.8	20.3	21.2	20.7	21.7	19.9	19.4	22.0
DIM4	3.8	3.9	4.3	4.5	4.6	4.9	4.6	4.7	4.7	5.0	5.3	5.5	5.8	7.2	7.5
DIM5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.7	15.7	15.7	15.5	15.5	15.5	14.6	12.4
DIM6	13.1	12.9	13.3	13.6	13.8	13.6	13.9	14.3	14.3	14.4	14.1	13.8	14.4	14.1	13.4
DIM7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.1
DIM8	9.7	9.9	11.2	11.7	11.8	12.2	12.1	11.7	12.2	12.1	12.2	12.4	11.8	11.8	11.2
DIM9	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	7.4	7.4	7.4	7.0	6.6
LQI	**14.2**	**13.5**	**13.8**	**14.2**	**14.0**	**13.7**	**13.9**	**14.3**	**14.7**	**15.3**	**16.3**	**16.8**	**16.4**	**16.2**	**16.0**

Source: own elaboration.

Table 5. Evolution of LQI dimensions. 2008–2022 (Index number: 2008 = 100).

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
DIM1	100.0	94.2	91.7	95.1	91.8	89.7	86.9	90.2	91.7	97.1	98.9	102.0	96.7	95.4	96.7
DIM2	100.0	91.7	88.8	81.8	79.2	75.7	78.5	81.3	84.4	88.8	101.4	105.4	108.2	106.1	112.6
DIM3	100.0	93.9	101.3	111.2	110.5	104.7	114.0	118.0	121.0	126.4	123.4	129.3	118.6	115.6	131.3
DIM4	100.0	102.2	112.7	118.5	122.7	128.8	122.3	124.8	125.2	131.6	140.2	145.7	154.3	190.4	199.1
DIM5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	101.2	101.2	101.2	99.4	99.4	99.4	93.6	79.6
DIM6	100.0	98.6	101.3	103.7	104.8	103.9	106.2	108.8	109.1	109.8	107.4	105.4	109.6	107.4	102.5
DIM7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.1
DIM8	100.0	102.7	115.8	120.7	121.9	125.9	124.8	120.5	125.6	125.4	126.1	127.8	121.6	121.4	115.9
DIM9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	137.0	137.0	137.0	129.7	121.2
LQI	**100.0**	**95.0**	**97.3**	**100.1**	**98.8**	**96.8**	**97.9**	**100.9**	**103.3**	**108.0**	**114.7**	**118.2**	**115.4**	**113.9**	**112.5**

Source: own elaboration.

Lastly, Table 6 outlines three indicators used to assess the relative importance of LQI dimensions. The first is the linear correlation coefficient of each dimension, reflecting its significance in explaining overall quality of life and determining its order of inclusion in the composite index. The second is the correction factor, representing the proportion of new, non-redundant information each dimension contributes. The third, the discrimination coefficient, indicates the extent to which each dimension helps explain regional differences. This information is complemented by the "individual relative information coefficient" (αi).

Table 6. Linear correlation, correction factor, discrimination coefficient, and individual relative information coefficient (α_i) of LQI dimensions.

	Dimension	Correlation	Dimension	Correction Factor
1	1. Economic conditions	0.7984	1. Economic conditions	1
2	2. Employment	0.7931	5. Leisure/Social relations	0.7011
3	5. Leisure/Social relations	0.7466	2. Employment	0.6563
4	4. Education	0.6729	7. Governance and Basic Rights	0.5518
5	8. Environment and Surroundings	0.6576	9. Overall Life Experience	0.5390
6	3. Health	0.6512	4. Education	0.5103
7	9. Overall Life Experience	0.4913	3. Health	0.4997
8	6. Physical and Personal Safety	0.3516	6. Physical and Personal Safety	0.3515
9	7. Governance and Basic Rights	0.1515	8. Environment and Surroundings	0.3491

	Dimension	Discrimination Coefficient	α_i
1	4. Education	0.4039	0.1711
2	7. Governance and Basic Rights	0.3821	0.1618
3	9. Overall Life Experience	0.3190	0.1351
4	2. Employment	0.2466	0.1044
5	8. Environment and Surroundings	0.2249	0.0952
6	1. Economic conditions	0.2215	0.0938
7	5. Leisure/Social relations	0.1985	0.0841
8	3. Health	0.1873	0.0793
9	6. Physical and Personal Safety	0.1773	0.0751

Source: own elaboration.

To aid interpretation, the dimensions are ranked by descending order for each indicator. The most correlated dimensions with quality of life are 1 (Economic conditions), 2 (Employment), and 5 (Leisure and social relations), while Dimension 7 (Governance and basic rights) ranks last. However, these rankings shift when considering the correction factor: although Economic conditions remains first, Employment and Governance swap positions, meaning that Employment shares more redundant information with Economic conditions than with Leisure and social relations. Interestingly, although Governance has the lowest correlation, it ranks fourth in terms of the correction factor. Regarding discriminatory power, all dimensions contribute to the construction of the LQI.

As can be seen, a given dimension may offer little discriminatory power yet explain much of the variation in quality of life—such is the case for Economic conditions. The opposite is also true: Dimensions 7 and 9, for instance, are relatively strong in discrimination but weakly correlated with overall quality of life.

To provide an overview of the interplay between dimensions and territories, Table 7 uses symbols (instead of values) to summarise the contribution of each dimension to the LQI variation across territories during the 2008–2022 period. This was computed based on the standardised values of partial indicators weighted by their correction factor.

The dimensions that generally contributed the most to improving quality of life were Health and Education. Conversely, Economic conditions and Leisure and social relations were those with the most negative contributions across a greater number of territories.

Table 7. Contribution of LQI dimensions to regional variations. 2008–2022.

	DIM. 1	DIM. 2	DIM. 3	DIM. 4	DIM. 5	DIM. 6	DIM. 7	DIM. 8	DIM. 9
Total National	→	↑	↑↑	↑↑	↓↓	→	→	↑	↑
Andalusia	↓	↑	↑↑	↑↑	↓↓	→	→	→	↑
Aragon	↓	↑	↑	↑↑	→	→	→	↑	→
Principality of Asturias	↓↓	→	↑↑	↑↑	↓↓	↑	→	↑	→
Balearic Islands	→	↑	↑↑	↑↑	↓	↑	↓	→	→
Canary Islands	↓↓	↑	↑↑	↑↑	↑↑	→	↓	↓	↑
Cantabria	↑	↑	↑	↑↑	↓↓	→	→	↑	→
Castile and Leon	→	↑	↑	↑	→	→	→	→	↑
Castile - La Mancha	→	↑	↑↑	↑↑	↓	→	→	→	→
Catalonia	↓↓	↑↑	↑↑	↑↑	↓↓	↑	↓	↑↑	↑↑
Valencian Community	↑	↑	↑	↑↑	→	↑	→	↑	→
Extremadura	→	↑	↑↑	↑↑	→	→	→	→	↑
Galicia	→	↑	↑	↑	↑	→	→	→	↑
Community of Madrid	→	↑	↑↑	↑↑	↓	→	→	→	↑
Region of Murcia	↓↓	↑↑	↑↑	↑↑	↓↓	↓↓	↓↓	↓↓	↑
Chartered Community of Navarre	↓↓	→	↑↑	↑↑	↓↓	↓	↓↓	→	↑
Basque Country	→	↑	↑↑	↑↑	→	→	→	↑	↑
La Rioja	↑↑	↑	↑↑	↑↑	↓↓	→	↓	→	↑
Ceuta	↓↓	↑↑	↑↑	↑↑	↓↓	↑	↓↓	↑↑	↑↑
Melilla	↓↓	→	↑↑	↑↑	↑↑	↓↓	↓	↓	↑

↑↑ very positive; ↑ moderately positive; → not significant; ↓↓ very negative; ↓ moderately negative.

Source: own elaboration.

5. Conclusions

In line with the recommendations of various international institutions, there has been a growing interest in developing multidimensional indicators that more accurately reflect how well people live—beyond what per capita GDP alone can capture. This has encouraged research efforts aimed at refining measurement methodologies, strengthening data quality, and grounding indicators in solid theoretical frameworks.

This study has reviewed multiple proposals for constructing such multidimensional indicators. This breadth of approaches reflects both the strong interest in the topic and the absence of a widely accepted consensus or universal alternative capable of fully capturing the many dimensions of human development, well-being, and life quality.

In terms of methodology, this paper adopted a dynamic version of the DP2 distance metric, which offers several important advantages. It applies an objective weighting criterion—improving on the common practice of equal weighting among indicators and dimensions—eliminates redundant information, and, like many established approaches, is based on the notion of distance. Moreover, the DP2 method provides valuable insights into indicator selection, enhancing the construction of robust indices.

Nonetheless, it remains essential to continue investing time and effort into the production of statistics with appropriate coverage and periodicity to track phenomena related to living standards and quality of life. It is equally important to explore new data sources—such as big data and social media—that can offer reliable information about diverse dimensions of life. In

particular, attention should be given to improving measurement in areas such as Leisure and Social Relations, and Governance and Basic Rights.

The results of this study generally mirror those produced by the Spanish National Statistics Institute (INE), although the DP2-based index reveals patterns more clearly. Regional rankings also show a high degree of consistency with other studies. Still, some discrepancies can be attributed to the INE's methodological choice to truncate indicator variation, which may limit sensitivity. Accordingly, the index presented in this study (LQI) can be considered an acceptable and complementary tool—particularly due to the additional information yielded by the applied methodology.

Therefore, deeper analysis of how individual indicators behave across the dimensions of the LQI is warranted. Such insights can serve as useful tools for guiding socio-economic policies aimed at improving the well-being of society as a whole.

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