

Article

Territorial Cohesion in Rural Areas: An Analysis of Determinants in the Post-Economic Crisis Context

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Abstract: One of the main consequences of the impacts of the past economic and financial crisis, which began in 2007–2008, has been the increase in inequalities between countries, regions, and territories of the EU. In the rural sphere, these disparities are not only observed in an urban–rural dichotomy, but are also evident between rural–rural territories. In this context, it is relevant to develop research based on the concept of territorial cohesion aimed at overcoming the development challenges faced by different types of rural territories. This paper addresses the empirical analysis of territorial cohesion in the rural areas of Andalusia (Spain), one of the European regions most affected by the economic crisis. To this effect, a methodology was designed that measures the level of territorial cohesion of different types of rural territories and identifies the factors that influence this cohesion in each case. The results show that factors such as employment and innovation, economic diversification, availability of natural resources and environmental quality, or information and communication technologies (ICTs) contribute to territorial cohesion in rural areas.

Keywords: territorial cohesion; rural areas; territorial disparities; cohesion factors; composite indices; Spain

1. Introduction

The promotion of economic, social, and territorial cohesion has been one of the main pillars on which the construction of the European Union (EU) rests. This general principle has been expressed over the years through the objectives and priorities that have guided the Union's successive strategic guidelines in each programming period [1]. Currently, this is still a relevant issue on the current European political agenda, as reflected in its 'Europe 2020' growth strategy [2], which was designed based on the conviction that territorial coordination is a strategic factor on the path to inclusive economic growth [3].

However, despite the past and present efforts of EU policies to achieve territorial cohesion and the achievements in this regard that have been made in different stages and time contexts [4–8], the reality is that European territories suffer from many important territorial imbalances at various scales and of very different types [9]. The most recent EU enlargement and, above all, the recent financial and economic crisis of 2007–2008 that devastated most European regions and countries, have been identified as the main elements that have contributed to increasing current territorial inequalities [1,10,11]. Indeed, previous research has concluded that periods of economic prosperity stimulate regional convergence dynamics, while situations of crisis or recession lead to divergent territorial processes [12–15]. These situations occur between countries, but also between regions and territories belonging to the same country [16]. The trajectory followed by the region of Andalusia during the economic crisis (with unemployment rates tripling) is a clear example of this, where disparities

can be observed not only in comparison with other Spanish and European regions, but also internally between their territories.

In addition to the analysis of inequalities between countries, regions, and territories, some authors point to the need for this type of study in rural areas, taking advantage of the close relationship between European regional policy and rural development policy [17,18]. In effect, the rural milieu is diverse, the potential ways of development are multiple, and the disparities between rural–rural territories are a reality [19]. In the case of Andalusia, previous studies show that there are indeed significant inequalities between the different types of rural territories [20,21].

In the rural milieu, these inequalities take many forms that reinforce each other, both from the individual perspective with vertical inequalities, and from the collective perspective with horizontal inequalities [22]. It is in this second dimension where inequalities between rural territories can be found when these are understood as the result of a social construction.

In this context, it is useful to apply the concept of territorial cohesion because it allows the development of the territory to be geared towards meeting the major challenges it faces [23]. This is a concept that has been gaining ground in the political agenda of the institutions since its origin within the European Union (EU) in the 1990s. This is mainly reflected through three key elements: (i) The incorporation of the territorial dimension in the Second Cohesion Report [24]; (ii) the publication of the Green Paper on Territorial Cohesion [25]; and (iii) the regulatory recognition given to territorial cohesion in the Lisbon Treaty as one of the three fundamental pillars of EU Regional Policy.

Despite the importance that the concept of territorial cohesion has been acquiring within the EU and the progress made in the fields of different scientific disciplines to clarify its meaning, several authors warn of the inaccuracy that still exists in the definition of this concept [26–31]. This lack of definition makes it even more difficult to measure the territorial cohesion of a given territory, but it does arouse scientific interest in advancing the design of methodologies that can be used to analyze it and thus provide new knowledge.

Under these circumstances—the context of territorial imbalances, the need to move towards convergence of territories, and the difficulty of measuring a concept with a markedly abstract component—give rise to the need to undertake research capable of addressing the analysis and measurement of territorial cohesion [32]. Among the few studies that have empirically addressed the measurement of territorial cohesion, apart from those carried out by the European Spatial Planning Observation Network (ESPON program), those conducted at the European level [1,33–37] and in Latin America [23,38] stand out.

This is a series of studies in which territorial cohesion is measured in different contexts and at different territorial scales, but which in no case focus on the rural environment. Similarly, although all of the works contemplate the diversity of contexts in which the analyzed territorial units are developed, this has not been sufficiently incorporated in the empirical analysis. This has led to the fact that, on many occasions, very different regions and territories have been contemplated as a homogeneous ‘whole’. For this reason, despite these advances, which undoubtedly represent an important methodological reference, it is of interest to develop studies that consider the analysis of territorial cohesion and the search for factors that affect it through territories with characteristics of homogeneity among themselves, both in their initial conditions and in their level of territorial resources [21].

Hence, the main objective of this paper is to conduct an analysis of territorial cohesion in rural areas of Andalusia, one of the European regions most affected by the past economic crisis, considering the different contexts in which their territories are developing. Specifically, the purpose is to measure the territorial cohesion of the different rural areas and identify the main factors associated with it. The identification of these specific factors for each type of territory is useful in guiding the design of specific policies that seek a harmonious and balanced development of rural areas.

2. Territorial Cohesion: Progress in the Concept to Articulate Its Measurement

The concept of territorial cohesion emerges explicitly and in detail in the Second Cohesion Report [24], during Michel Barnier's mandate as European Commissioner for Regional Policy [39]. Since then, several works have addressed the analysis of this term, giving rise to a broad debate on its meaning. The main contributions made in this regard include: (i) Those that deepen the evolution of the conceptualization of the term, taking into account its French roots [40], the evolution of the European model of society [41], the new forms of governance [42], the principle of subsidiarity [43], and its link with sustainable development [44]; (ii) those that highlight the diversity of paths to define territorial cohesion, giving rise to multiple conceptualizations [45]; (iii) those that focus on the analysis of policy objectives [46] and on the establishment of principles and guidelines for effective policy implementation [47–49]; and (iv) those that establish a conceptual interpretation and provide a methodology of analysis [23,35,50].

In spite of everything, the scientific literature shows a lack of consensus on the existence of a precise and widely accepted definition of the term 'territorial cohesion' and, as a result, from an operational and practical point of view, calls for progress in identifying the main dimensions and elements that make it up [34,51]. In order to identify these dimensions, some authors stress the need to first consider the implications of studying the analytical parts of the term 'territory' [52,53]. Accordingly, in the field of disciplines such as human geography or development economics, territory can be understood as a metric topographic space characterized by three elements or subsystems [54–59]: (i) Specific territorial resources available to the territory; (ii) territorial actors or agents (the State, civil society and associations, and private actors); and (iii) institutional arrangements that articulate the processes of transformation and development aimed at solving the common or specific problems faced by territories. The relationship established between these three elements is decisive in the processes of territorial convergence (or divergence) and must therefore be considered in cohesion analyses.

Based on these elements and on those provided in other studies, mainly developed by the European ESPON program [60–62], but also by the European Commission [63–65] and by researchers in the field of geography and economics [35,51], five basic dimensions can be established that provide theoretical support for the design of a methodology to measure territorial cohesion:

1. Economic dimension: As a fundamental basis for addressing the main challenges facing territories (i.e., the constant increase in global competition) and thus contributing to the ultimate objectives of growth and development [66–69].
2. Social dimension: Founded on the skills and abilities of individuals and their ability to establish relationships with other territorial actors through the formation of social networks. These networks act as a link for the deployment of economic initiatives aimed at ensuring the population's well-being [70,71].
3. Environmental dimension: Based on the recognition that the environment is the support of life. Therefore, environmental integration must be made effective in development processes, placing this dimension on the same level of value as economic and social issues [62,68,69].
4. Institutional dimension: Understood as the regulatory framework under which formal and informal agreements are made to guarantee the proper functioning of the system and the development of the other dimensions. Relational capital and governance are key elements in this sphere [72–74].
5. Integrated spatial development dimension: Based on the principles of balanced territorial development aimed at promoting a polycentric territorial structure, both in terms of the morphology of territories and the relationships established between the settlements or municipalities that comprise them [64,68].

The identification of these dimensions clarifies the meaning of the concept, but, above all, it enables the most appropriate components to be associated with each dimension in order to measure territorial cohesion accordingly. Figure 1 shows the analytical model used for this purpose.

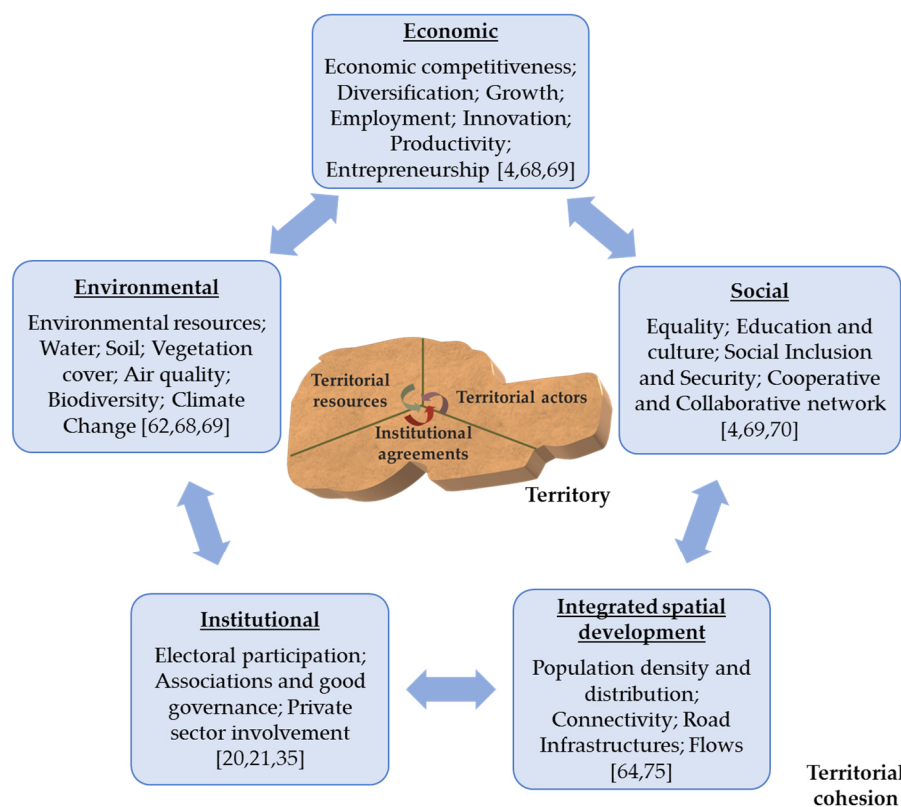


Figure 1. Analytical model: Dimensions and variables associated with territorial cohesion.

3. Methodology

3.1. Research Scope and Unit Analysis

The geographical area of the research is the rural milieu of Andalusia. This is a Spanish region (NUTS 2) located in southern Europe, at the gateway to the African continent (Figure 2). It is one of the most important regions in the EU, not only because of its strategic location, but also because of its large size in terms of surface area (it occupies 87,597 km²) and population (with over 8.4 million inhabitants), which places it ahead of many European countries.



Figure 2. Location of the research area (shaded area).

This is a region with a markedly rural character, generally characterized by (i) an economy based on the important role played by the agricultural sector and the agri-food industry; (ii) the presence of a multitude of associative networks of different kinds and different areas of activity that are deeply rooted in the territory; (iii) the richness of its ecosystems, natural spaces, and biodiversity; (iv) the existence of a varied network of institutions that facilitate the processes of governance and development of territories; and (v) a correct territorial articulation based on the presence of a close rural–rural and rural–urban interrelationship that facilitates an adequate demographic balance.

The greater or lesser presence of each of these elements and the multiple relationships that can be established between them gives the Andalusian rural milieu one of its main characteristics, heterogeneity. In fact, the current rural space is the product of history, of movements of polarization, of spatial planning, of an intense process of development through the implementation of European initiatives and policies, of its integration into the world market, and, more recently, of its response to external factors, such as the economic crisis. This crisis has had an impact on the dynamics of transformation in this region, causing a wide diversity of territorial dynamics, and thus increasing the disparity and inequality between its rural territories [21,75,76]. All of these characteristics highlight the opportunity and suitability of conducting an analysis of territorial cohesion in this geographical area.

For this purpose, the territorial unit of analysis selected is the rural county (LAU 1). From an instrumental and practical perspective, in the case of Andalusia, the rural territory coincides with the county scope of application of the rural development programs. Andalusia has 52 rural counties, each of which is managed by a Local Action Group, covering approximately 80% of the regional territory, and bringing almost seven hundred municipalities and more than 3 million inhabitants.

3.2. Research Methodology and Stages

The five stages of the methodology used to achieve the main objective and the statistical methods involved in each are shown in Figure 3.

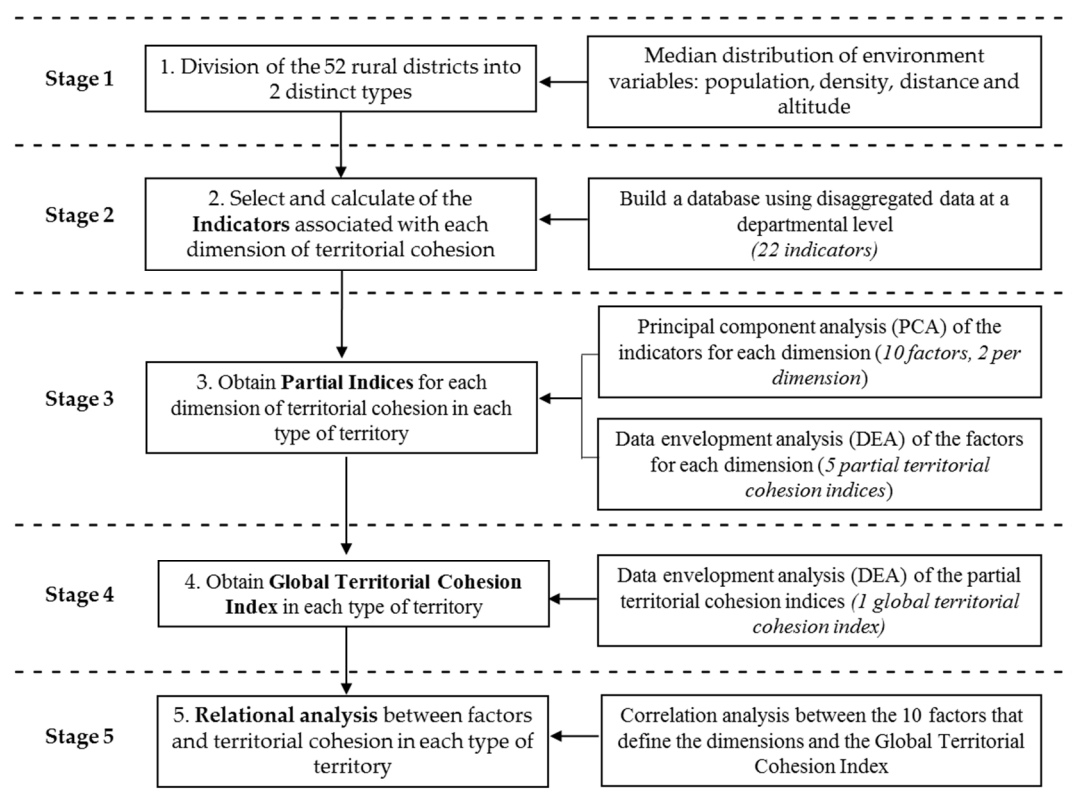


Figure 3. Research methodology.

3.2.1. Identifying Territorial Contexts

The first stage of the methodology was to identify different territorial contexts for cohesion analysis. This is a fundamental stage prior to the measurement of cohesion and the identification of the factors affecting it, since, as stated in the introduction section, this type of analysis, which compares some counties with others, must be performed in territorial contexts that are more or less similar in terms of the location and the territorial resources they have. In Andalusia, at least two main types of rural environment can be identified both in terms of the position of the counties (mountainous areas as opposed to valley, fertile plain, and coastal areas) and in terms of the demographic potential they present [21].

In this sense, an analysis was performed in which the 52 rural counties were divided into two groups. This division was made on the basis of the following variables: (i) Population; (ii) population density; (iii) proximity to the main city of the NUTS 3 area; and (iv) low altitude above sea level. These are four variables that can be considered categorical variables, i.e., they can be used to establish classes or categories of environment that are favorable to the processes of rural development and territorial cohesion. These variables were condensed into a single one that has a positive connotation in terms of environment when it increases in numerical value. In order to add them, each of the four was given an equal weighting, and they were previously standardized to avoid the presence of different measurement units distorting the weighting. Finally, the two groups were formed using the median of the distribution [77].

3.2.2. Selection of Indicators to Measure Territorial Cohesion

Table 1 shows the variables and indicators selected to measure each of the dimensions of territorial cohesion. This selection was made on the basis of the contributions derived from the bibliographic review previously presented and the availability of the information provided by official statistical sources. There is a total of 22 indicators, expressed in the sense “the more the merrier”, so that an increase in the numerical value reflects an increase in territorial cohesion. The data refer to years after the economic crisis. Depending on the indicator, the year varies between 2013 and 2017.

Table 1. Indicators of territorial cohesion for each dimension.

Dimension	Variable	Indicator	Notation	Definition
Economic	Employment	Employment rate	EMPL	Employed-to-Active population ratio (100–unemployment rate) (%)
	Growth	Income growth (2013–2016)	INCOME	Percentage increase in the county's income (%)
	Innovation and investment	Business investment	INVEST	Investment in the creation of new businesses (€/pers)
	Economic structure	Economic diversification	DIVER	Based on the inverse of the Herfindahl–Hirschman Index (HHI). Data correspond to the number of new business and professional activities weighted by the population corresponding to the primary sectors, construction, industry, and services (<i>dimensionless</i>)
	Economic dynamism	Economic activity index	EAI	Total number of new business and professional activities weighted by population (<i>dimensionless</i>)

Table 1. Cont.

Dimension	Variable	Indicator	Notation	Definition
Social	Education and training	University education	UNI	Percentage of the population with university education (%)
	Inclusion	Gender Equality	INCLU	Percentage of women councilors in town halls in relation to the total number of councilors (%)
	Equity	Income decentralization	EQUITY	Based on the inverse of the Herfindahl–Hirschman Index (HHI). It represents similar levels of per capita income among the municipalities that make up the region (<i>dimensionless</i>)
	Cooperatives	Cooperative networks	COOP	Number of cooperatives per thousand total population (<i>dimensionless</i>)
Environment	Climate change	Inverse CO2 emissions	CC	Based on the inverse value of total CO2 emissions (1/CO2 emissions) (1/Mt CO2 equivalent)
	Biodiversity	Natura 2000	NATU	Percentage of surface area designated as Special Area of Conservation (SAC) and Special Protection Area (SPA) versus total surface area (%)
	Nature	Forest surface area	FOREST	Percentage of surface area covered by natural vegetation and forests versus total surface area (%)
	Invulnerability	Surface area with low risk of erosion	INVUL	Percentage of surface area with erosion levels classified as low or medium (%)
	Availability of resources	Water distribution	WATER	Percentage of region covered by reservoirs, marshland, salt flats, aquaculture, and rivers, streams, and other wetlands versus total surface area (%).
Institutional	Participation	Average voter turnout in elections	PART	Average percentage of votes in general, regional, and local elections per total voters (%)
	Investment	Expenditure vs. Income per capita	EXPEN	Percentage of expenditure per capita versus income per capita (%)
	Partnership	Private sector participation	PRIV	Percentage of private members and businesses on the board of directors of Rural Development Groups (%)
	Associations	Association networks	ASSOC	Number of sector and business associations, cooperatives, and civic associations in the overall structure of Rural Development Group (%)
Integrated spatial development	Density	Population density	DENS	Population per square kilometer (<i>pers/km2</i>).
	Flows	Population increase (2012–2016)	FLOW	Rate of change in population, expressed as a percentage, in the period 2012–2016 (%)
	Connectivity	Internet penetration	ADSL	Number of ADSL per thousand inhabitants (<i>dimensionless</i>)
	Connection	Road network	ROAD	Proportion of surface area of motorway, freeways, and road links in relation to total regional surface area (%)

3.2.3. Obtaining Partial Indices in Each Type of Territory

In order to obtain the five partial indexes of territorial cohesion (one for each dimension), two fundamental steps were followed. Both were applied independently in each of the two groups of territories previously identified. Firstly, a factorial analysis (principal components method and varimax

orthogonal rotation) was conducted with the indicators included in each of the five dimensions, and then the resulting factors in each of these were grouped together to form the five synthetic indices. The aggregation of these factors was undertaken using the Data Envelopment Analysis (DEA) technique. The suitability of the use of this technique lies mainly in the fact that it allows the weighting of the factors to be obtained through an objective and endogenous calculation, in a way that is neither arbitrary nor based on personal opinion.

DEA is originally a non-parametric procedure that uses a linear programming technique to evaluate the relative efficiency of a set of production or decision units. To this end, it compares the behavior of this set of units through their capacity to transform inputs into outputs, taking as a reference a frontier constituted by the best production practices observed in that set (for a more in-depth analysis of the mathematical development of the model underlying this technique, see the original work by Charnes et al. [78]).

In recent years, other applications of the DEA technique have been developed, including its usefulness in the elaboration of synthetic indices from partial indicators. Among the studies that have made this specific use of DEA, those performed in the field of sustainability [79,80], quality of life, welfare and human development [81–84], and territorial analysis [20,21,77,85] are highlighted. The model proposed below is based on this literature.

Our objective is the construction of a composite index associated with each county from a set of factors corresponding to different facets of territorial cohesion. To this end and under the multi-criteria decision analysis approach, DEA analysis can be assimilated to a function that aggregates output and inputs into a single value measure [86,87]. Assuming a single input for each county analyzed and making it equal to the unit, the following model is proposed:

$$\text{Max}_{\mu_{ro}} h_0 = \sum_{r=1}^R \mu_{ro} I_{ro} \quad (1)$$

Subject to:

$$\sum_{r=1}^R \mu_{ro} I_{rk} \leq 1 \quad k = 1, \dots, K \quad (2)$$

$$\mu_{ro} \geq 0 \quad r = 1, \dots, R \quad (3)$$

where h_0 is territorial cohesion (in the corresponding dimension) of the county analyzed; μ_{ro} is the weight of indicator/factor r , the most favorable for the attributes of the county; and I_{rk} represents the value of indicator/factor r .

It is therefore a question of maximizing the weighted sum of certain characteristics or attributes that favor territorial cohesion (maximization of a set of indicators or factors, I). It operates with a virtual input equal to the unit for all of the counties (first set of restrictions). The weightings are those that are most favorable for the attributes of the region being analyzed.

At this stage, this DEA model was applied five times, once for each dimension of territorial cohesion, to obtain the five partial indices. This makes it possible to rank the counties according to their levels of relative performance in each of the dimensions. Specifically, the model that was applied is a CCR (named for Charnes, Cooper and Rhodes who initially proposed the model in 1978) focused on outputs and with a virtual input equal to the unit, and the software used for the calculations was the Banxia Frontier Analyst.

3.2.4. Obtaining the Global Territorial Cohesion Index in Each Type of Territory

The elaboration of the global territorial cohesion index (GTCI) associated with each county was performed by adding the five partial indexes obtained in the previous phase. This aggregation was undertaken using the DEA model developed in the previous phase. This made it possible to rank

rural counties according to their overall levels of territorial cohesion. This process was conducted independently in each set of counties belonging to the two groups of territories previously identified.

3.2.5. Identifying the Factors Associated with Territorial Cohesion for Each Type of Territory

Lastly, once the territorial cohesion indices of each of the counties were estimated, the next step was to identify the factors that might be associated with territorial cohesion in each type of rural territory. To this end, a correlation analysis (Spearman coefficient) was performed between the factors that define the different dimensions contemplated and the GTCI.

4. Results and Discussion

The identification of different territorial contexts for analyzing territorial cohesion made it possible to establish two groups or categories of rural counties with environments that are more or less favorable to the processes of rural development and territorial cohesion (Figure 4).

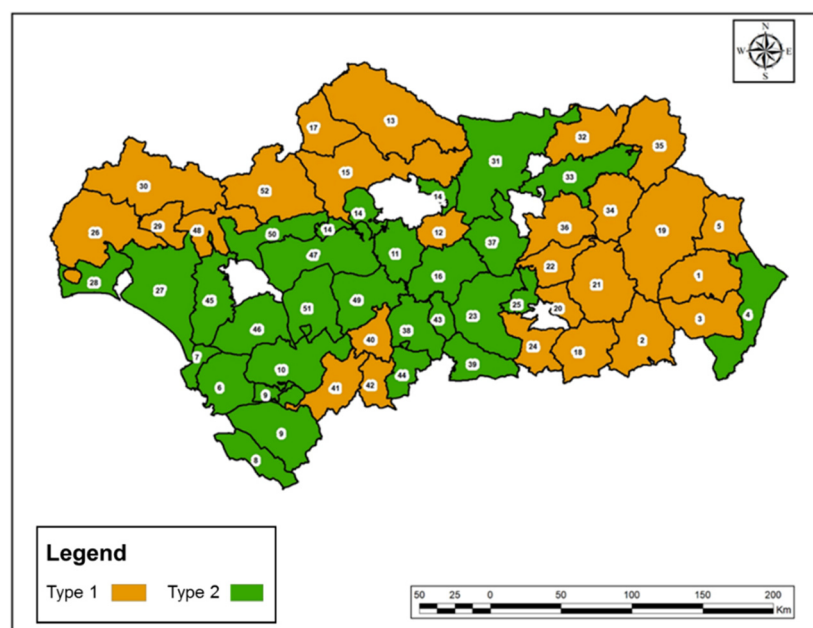


Figure 4. Types of rural territory.

Based on the main characteristics of the counties, two groups or types of rural territories can be found:

- Type 1 covers remote peripheral areas, generally located in mountainous areas with significant demographic and educational problems. They have a valuable natural heritage and an agricultural and livestock sector with an important weight in the rural economy of the counties. These are the rural areas which, a priori, present the least favorable environments for progressing in their development and territorial cohesion.
- Type 2 includes counties with favorable orography and geographical location, in some cases near the main cities of the counties and, in others, with good communication with the main centers of development in the region. They have great demographic potential and, in addition to an important agricultural and agri-food sector, the industrial and service sectors stand out.

The application of the factor analysis performed independently in each of the two types of rural territories for each of the dimensions of territorial cohesion allowed the original 22 indicators to be reduced to a total of 10 factors in each of the types (two for each dimension) (Table 2). The results of the factor analyses are summarized in Appendix A (Tables A1 and A2).

Table 2. Factors linked to the dimensions of territorial cohesion.

Type 1	Type 2
<i>Economic dimension</i>	
F1. Economic growth, employment, and innovation	F1. Economic growth, diversification, and employment
F2. Economic activity and diversification	F2. Entrepreneurship, innovation, and economic activity
<i>Social dimension</i>	
F3. Training and gender equality	F3. Training and territorial equity
F4. Cooperatives and territorial equity	F4. Cooperatives and gender equality
<i>Environmental dimension</i>	
F5. Resource availability and environmental quality	F5. Resource availability and environmental quality
F6. Biodiversity, forests, and natural areas	F6. Biodiversity, forests, and natural areas
<i>Institutional dimension</i>	
F7. Public expenditure and citizen participation	F7. Public expenditure and citizen participation
F8. Private initiative and territorial governance	F8. Private initiative and territorial governance
<i>Integrated spatial development dimension</i>	
F9. Density, flows, and internet access	F9. Density and flow
F10. Road network and communication	F10. Road network, communication, and internet access

A partial territorial cohesion index (PTCI) relating to each dimension was obtained by applying the DEA based on the resulting factors. The GTCI was also obtained by aggregating indices using the DEA. Tables 3 and 4 summarize the results obtained in each analysis for the counties of each type of territory.

Table 3. Partial and global territorial cohesion indices for type 1 counties.

No.	Counties	PTCI_Eco	PTCI_Soc	PTCI_Env	PTCI_Inst	PTCI_Space	GTCI
1	Almanzora	88.22	25	41.07	71	36	76.64
2	Alpujarra-Sierra Nevada Almeriense	100	29	75.56	81	65.87	100
3	Filabres Alhamilla	99.44	34.03	65.37	85	41.44	93.79
5	Los Vélez	98.79	100	38.78	52	55.32	100
12	Guadajoz y Campiña Este	71.86	100	3	97	61.6	100
13	Los Pedroches	100	46.88	51.5	98	34	100
15	Sierra Morena Cordobesa	50.42	73	75.33	77.42	36	85.25
17	Valle del Alto Guadiato	33	54	43.07	75	37	60.19
18	Alpujarra-Sierra Nevada de Granada	37.51	39	65.3	49	51	61.43
19	Altiplano de Granada	77.08	47.81	40.18	72	24.98	72.39
20	Arco Noroeste de la Vega de Granada	46.72	94	77	100	100	100
21	Guadix	75.21	38	46.6	79.26	76.62	81.02
22	Montes de Granada	82.28	77	24	100	100	100
24	Valle Lecrin Temple Costa	65.39	66	39.74	88	72.48	80.1
26	Andévalo Occidental	37.24	45	113	15	43	96
29	Cuenca minera de Riotinto	3	67.12	62	49	52	70.7
30	Sierra de Aracena y Picos de Aroche	58	56	100	92	50	100
32	Condado de Jaén	45.5	55.23	59.1	78.11	38	70.05
34	Sierra de Cazorla	65.44	65.91	66	97	36	90.06
35	Sierra de Segura	78.59	48	100	77.42	26	100
36	Sierra Mágina	53.11	80	37	93	68.05	81.08
40	Guadalteba	100	74	26.61	46.08	55	100
41	Serranía de Ronda	51.5	75	81	26	44	90.15
42	Sierra de las Nieves	71.67	90	70.15	62	49	98.91
48	Corredor de la Plata	38	77	61.16	47	75	76.9
52	Sierra Morena Sevillana	41.15	48.65	92.54	33	41	79

Table 4. Partial and global territorial cohesion indices for type 2 counties.

No.	Counties	PTCI_Eco	PTCI_Soc	PTCI_Env	PTCI_Inst	PTCI_Space	GTCI
4	Levante Almeriense	100	26	82.45	70.58	77	100
6	Campaña de Jerez	71	100	76.65	86.09	88.22	100
7	Costa Noroeste de Cádiz	19	69.45	79	100	100	100
8	Litoral de la Janda	52	60	61.55	96.27	61	84.21
9	Los Alcornocales	31.82	83.53	100	30.7	67	94
10	Sierra de Cádiz	53	35.92	44	76.05	33.26	55.7
11	Campaña Sur de Córdoba	84.16	70.61	47	83.16	53.56	80.52
14	Medio Guadalquivir	100	39.45	64.72	88.83	42	92.38
16	Subbética Cordobesa	76.49	53.74	35.85	98.39	33.35	78.24
23	Poniente Granadino	87	89.89	45.68	100	36	100
25	Vega Sierra-Elvira	47.57	100	46	62.42	100	100
27	Condado de Huelva	45.59	100	93.81	84.32	53.44	100
28	Costa Occidental de Huelva	32.87	100	100	59.88	71	100
31	Campaña Norte de Jaén	60.68	86.2	62.84	79	38	79.38
33	La Loma y las Villas	67.9	66.04	30.61	84	37	66.19
37	Sierra Sur de Jaén	89.44	72.52	23.23	68	24.16	84.04
38	Antequera	84.58	84.4	45.26	36	48	91.92
39	Axarquía	66.19	61.56	34	79.34	55.12	67.9
43	Territorio Nororiental de Málaga	96.66	86	31.56	41	49	100
44	Valle del Guadalhorce	63	60.75	27.35	38.69	58.63	63.24
45	Aljarafe-Doñana	39.13	93.17	100	75.16	57	100
46	Bajo Guadalquivir	24.24	98.56	56	94.77	59.17	96.26
47	Campaña y los Alcores de Sevilla	59.51	92.04	59	71	49.59	83.01
49	Estepa Sierra Sur Sevilla	100	68	49	100	41	100
50	Gran Vega de Sevilla	35.12	81.15	52.22	67	62.83	68.19
51	Serranía Suroeste Sevillana	62	65.41	31.19	74.96	38	61.26

The results for the economic dimension (PTCI_Eco) show that three type 1 counties ('Alpujarra Sierra Nevada Almeriense', 'Los Pedroches', and 'Gudalteba') and three type 2 counties ('Levante Almeriense', 'Medio Guadalquivir', and 'Estepa Sierra Sur Sevillana') are the most favorable or efficient (with indices equal to one hundred). In the case of the type 1 counties, 'Alpujarra Sierra Nevada de Almería' stands out from the rest due to factors such as innovation and the level of entrepreneurship, which has earned it recognition in past editions by the Andalusian Center for Entrepreneurship. 'Gudalteba' and, above all, 'Los Pedroches' stand out for the dynamism and diversification of their economies, closely linked to the agricultural and livestock sector. In the type 2 counties, 'Levante Almeriense' stands out mainly for its economic dynamism, closely linked to horticulture and the agri-food sector and its high level of employment; the 'Medio Guadalquivir' county for the levels of investment in the creation of new industries; and 'Estepa Sierra Sur' for the diversification of its economy and the high levels of economic growth experienced in recent years.

The results obtained for the social dimension partial indices (PTCI_Soc) show that, in type 1, there are two counties that show the most favorable situation ('Los Vélez' and 'Guadajoz y Campiña Este'), and there are four counties that can be observed in type 2 ('Campaña de Jerez', 'Vega Sierra Elvira', 'Condado de Huelva', and 'Costa Occidental de Huelva'). In the case of the type 1 counties, 'Los Vélez' stands out from the rest because of the equitable distribution of income among the municipalities that make up the county, and 'Guadajoz and Campiña' Este because of the high rates of representation of women in decision-making positions. In the case of type 2 regions, 'Campaña de Jerez' stands out for its high levels of decentralization of income and territorial equity, 'Vega Sierra Elvira' for the high levels of training of the population, 'Condado de Huelva' for cooperative promotion, and 'Costa Occidental de Huelva' for inclusion and gender equality.

The results for the environmental dimension (PTCI_Env) show that two type 1 counties ('Sierra de Aracena and Picos de Aroche' and 'Sierra de Segura') and three type 2 counties ('Los Alcornocales', 'Aljarafe Doñana', and 'Costa Occidental de Huelva') present the most favorable situation. In all cases, these are regions with a high availability of natural resources, forest areas, and Protected Natural Parks.

The results obtained for the institutional dimension (PTCI_Inst) show that two type 1 regions ('Arco Noroeste de la Vega de Granada' and 'Montes de Granada') and three type 2 counties ('Costa Noroeste de Cádiz', 'Poniente Granadino', and 'Estepa Sierra Sur') are the best positioned.

In the case of the type 1 counties, ‘Arco Noroeste de la Vega de Granada’ stands out from the rest because of the high investment made by institutions in public services, and ‘Montes de Granada’ because of the involvement of the private sector in the development of the county. In the case of type 2 counties, ‘Costa Noroeste de Cádiz’ also stands out for the involvement of the private sector, ‘Poniente Granadino’ for the high levels of public spending per inhabitant, and ‘Estepa Sierra Sur’ for the degree of civil, sectoral, and business associationism.

The results for the integrated spatial development dimension (PTCI_Space) show that two type 1 counties (‘Arco Noroeste de la Vega de Granada’ and ‘Montes de Granada’) and two type 2 counties (‘Costa Noroeste de Cádiz’ and ‘Vega Sierra Elvira’) have the most favorable position. In type 1, ‘Arco Noroeste de la Vega de Granada’ stands out mainly because of the increase in population flow in recent years and the high penetration of internet into the county’s households, while ‘Montes de Granada’ does so mainly because of the road connections through highways, motorways, and road links. In type 2, ‘Costa Noroeste de Cádiz’ stands out from the rest because of its population density, and ‘Vega Sierra Elvira’ because of its high per capita levels of internet access and its good road connections with the main city of the NUTS3 area.

The results obtained for the GTCI show that nine type 1 and ten type 2 counties present the most favorable situation (those with indices equal to 100). These counties, the type of territory to which they belong, and their geographical locations are shown in Figure 5.

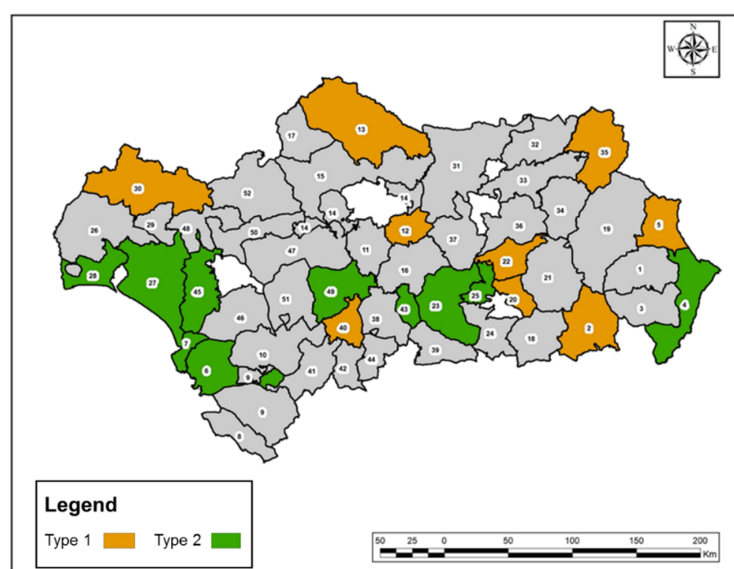


Figure 5. Location of the regions with the highest GTCI.

Among this group of regions with an index equal to 100, “Arco Noroeste de la Vega de Granada” in type 1 and “Estepa Sierra Sur” in type 2 are the ones that are most often repeated as a reference for the counties that still have the capacity to improve. Knowing the set of counties that in each type of territory act as a reference for those that are not at the optimum level can be useful in identifying the factors and dimensions in which adjustments must be made to advance the processes of cohesion.

In coherence with the phases of the methodology, Tables 5 and 6 present the results of the cohesion analyses performed in each type of territory between the factors and the global index of territorial cohesion.

In the case of type 1 counties, of the ten factors considered in the analysis, two of them are significantly and positively correlated with the global index of territorial cohesion. In both cases, these are factors related to the economic dimension. Thus, the results show that, in this type of peripheral and remote territory with significant demographic problems, those counties that have experienced the greatest economic growth, with high employment rates and economic dynamism and diversification, are those that acquire the highest level of territorial cohesion.

Table 5. Correlation indices in type 1 territories.

Factors	GTCI	
	Coefficients	
	Pearson	Spearman
F1. Economic growth, employment, and innovation	0.423 (*)	0.350 (*)
F2. Economic activity and diversification	0.374 (*)	0.349 (*)
F3. Training and gender equality	0.241	0.232
F4. Cooperatives and territorial equity	0.128	0.074
F5. Resource availability and environmental quality	−0.136	−0.27
F6. Biodiversity, forests, and natural areas	0.164	0.127
F7. Public expenditure and citizen participation	0.112	0.185
F8. Private initiative and territorial governance	0.112	0.15
F9. Density, flows, and internet access	−0.13	−0.141
F10. Road network and communication	0.282	0.228

* The correlation is significant at the 0.05 level (two-tailed).

Table 6. Correlation indices in type 2 territories.

Factors	GTCI	
	Coefficients	
	Pearson	Spearman
F1. Economic growth, diversification, and employment	−0.126	−0.145
F2. Entrepreneurship, innovation, and economic activity	0.257	0.176
F3. Training and territorial equity	0.123	0.086
F4. Cooperatives and gender equality	0.18	0.255
F5. Resource availability and environmental quality	0.198	0.17
F6. Biodiversity, forests, and natural areas	0.609 (**)	0.597 (**)
F7. Public expenditure and citizen participation	−0.141	−0.189
F8. Private initiative and territorial governance	0.137	0.194
F9. Density and flow	0.123	0.127
F10. Road network, communication, and internet access	0.414 (*)	0.418 (*)

** The correlation is significant at the 0.01 level (two-tailed). * The correlation is significant at the 0.05 level (two-tailed).

These results are in line with those obtained in other research conducted in the same geographical area as the one analyzed in this research [20,21,85]. These studies show that the diversification of the economy is a decisive factor for the resilience, development, and cohesion of rural territories. Additionally, other studies that focused on another Spanish region [69] and on the European regional level [88,89] highlight that diversification, innovation, and entrepreneurship act as drivers that contribute to the development of territories and regions.

In the case of type 2 counties, of the ten factors considered in the analysis, two of them are also significantly and positively correlated with the global index of territorial cohesion. One relates to the environmental dimension and the other to the integrated spatial development dimension. Thus, the results show that, in this type of territory with a more favorable geographical situation and demographic potential, those counties with quality environmental resources and connection infrastructures, both road and internet access, are those with the highest levels of territorial cohesion.

Factors relating to the availability of natural resources, the presence of forest areas, or high levels of biodiversity have also been previously identified as drivers of development in rural Andalusia [20,21] and in other European [90] and North American [91] areas. Similarly, factors associated with the accessibility and connectivity of rural territories and investment in transport infrastructure have proved to be decisive for the cohesion of rural territories in Andalusia [21] and northern Spain [92]

5. Conclusions

This research has made progress in the conceptualization of territorial cohesion, but, above all, in the design of a methodological proposal that allows an empirical approach to be taken to its evaluation and measurement, as well as to the analysis of the factors that affect it. To analyze the applicability and operability of this methodological proposal, the research was developed in the rural milieu of the region of Andalusia.

In this regard, it is important to note that the difficulty of a methodological approach to a concept that is still somewhat diffuse is compounded by others of an instrumental and practical nature, since studies of territorial cohesion at the regional level face a twofold problem: (i) Identifying smaller territorial units on which to perform analyses, and (ii) finding in those units the information needed to address them. Regarding the first problem, the two smaller units with administrative entities in Spain are the province (NUTS3) and the municipality (LAU2). However, neither of them is recommended for the analysis of territorial cohesion, since, in the first case, the internal heterogeneity of the unit is very high and includes both rural and urban areas, and the second case is too disaggregated for territorial studies. Consequently, it is necessary to identify intermediate territorial units that serve the purposes of territorial cohesion analysis. In the rural area, the units that have autonomy at that level for planning and promoting their development are the rural counties. However, in relation to the second problem previously mentioned, it is important to highlight that there is information that could further enrich the empirical analysis, but this is not disaggregated at the county or municipal level, which limits the possibilities of the study.

However, despite these difficulties, the proposed methodology has a number of features that make it practically useful and applicable in this and any other geographical area: (i) It is based on an extensive bibliographical review of both scientific literature and documents derived from the work of the main European institutions; (ii) it presents an integrated and holistic vision of the concept of territorial cohesion and the different dimensions that make it up; (iii) it simplifies the complexity of the concept and makes it operational and measurable; (iv) measurement is based on a careful selection of indicators and is performed in stages through the aggregation of elements facilitating the understanding of the analysis. In any case, it should be remembered that the methodological tools used to measure territorial cohesion only provide relative—not absolute—results, given that rural counties are classified and hierarchized by making comparisons between them.

This is a consistent methodology with significant potential in a context where data availability will tend to be increasingly immediate, thus ensuring the automation of monitoring in the evolution of indicators. Monitoring could contribute to improved decision-making by policymakers, leading to better design and implementation of interventions, assistance for more efficient resource allocation, and quality and transparency of achievements.

The results derived from the application of the methodology reveal some elements that promote processes of territorial cohesion in rural Andalusia. Specifically, in type 1 territories, the cohesion and development of their counties should be based on the diversification of the sources of income of the local population, taking advantage of the various opportunities offered by their natural and cultural heritage. This diversification should be based on innovation and entrepreneurship, including in the agricultural sector and the food industry, boosting local production activities, and seeking new value chains.

In type 2 territories, the challenge for cohesion is to understand that both rural and urban areas are part of the same territory. It is therefore necessary to intensify relations and connections between the two, making available to economic and social actors the appropriate resources and road infrastructure to make this interaction possible. Territorial planning, approached in an integrated and sustainable manner, which also takes into account the value of natural areas, should play a key role in avoiding the risk of imbalances in urban–rural relations in these areas.

In this respect, it can be concluded that high levels of economic growth, employment, innovation, and diversification of the economy, as well as the availability of both natural resources that provide

environmental quality and infrastructure for road connections and internet access, are factors that contribute to the cohesion of Andalusian rural territories.

The results obtained also show that the relationship between these factors and the processes of territorial cohesion depends on the type of territory and its characteristics. These results highlight two important conclusions that should be taken into account because of their implication for the design of public policies: (i) Policies should incorporate in their proposals instruments that enable the promotion and activation of the specific factors that contribute to territorial cohesion, and (ii) a different territorial reality requires flexible policies that enable the correct use of the principle of subsidiarity. This flexibility implies objectives and measures adapted to different realities and prioritized in different ways in order to allow territories to move forward by acting on the problems that affect them and by relying on the factors on which they can base their development.

Finally, it is important to note that when territorial cohesion is understood as a path towards the reduction of disparities within the territory under analysis, a trend and dynamic analysis is required. Therefore, future research is required in which the proposed methodology is applied over a period of time to assess territorial trends (of cohesion or exclusion) in the rural areas of Andalusia.

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Appendix A

Table A1. Results of the factor analyses for type 1 counties.

Indicators	Dimensions of Territorial Cohesion									
	Economic		Social		Environmental		Institutional		Spatial Development	
	Factors									
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
	Loaded Factors									
EMPL	0.538									
INCOME	0.675									
INVEST	0.658									
EAI		0.828								
DIVER		0.665								
UNI			0.664							
INCLU			0.768							
EQUITY				0.871						
COOP				0.518						
INVUL					0.703					
CC					0.717					
WATER					0.832					
FOREST					0.535	0.690				
NATU						0.913				
PART							0.722			
EXPEN							0.859			
PRIV								0.979		
ASSOC								0.674		
DENS									0.579	
FLOW									0.813	
ADSL									0.685	
ROAD										0.919
% variance	28.345	22.578	35.243	22.343	43.921	26.273	42.926	25.217	39.502	25.205
% accumulated variance	28.345	50.923	35.243	57.586	43.921	70.194	42.926	68.143	39.502	64.707
Statistics	KMO: 0.511		KMO: 0.585		KMO: 0.599		KMO: 0.555		KMO: 0.590	
	Bartlett: 3.715		Bartlett: 9.440		Bartlett: 26.844		Bartlett: 9.839		Bartlett: 5.375	
	Sig. 0.059		Sig. 0.049		Sig. 0.003		Sig. 0.013		Sig. 0.049	

Table A2. Results of the factor analyses for type 2 counties.

Indicators	Dimensions of Territorial Cohesion									
	Economic		Social		Environmental		Institutional		Spatial Development	
	Factors									
	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
	Loaded Factors									
EMPL	0.801									
INCOME	0.822									
DIVER	0.734									
EAI	0.525	0.583								
INVEST		0.881								
UNI			0.870							
EQUITY			0.454							
INCLU				0.881						
COOP				0.580						
FOREST					0.880					
NATU					0.870					
INVUL						0.854				
CC						0.346				
WATER						0.776				
PART							0.736			
EXPEN							0.833			
PRIV								0.480		
ASSOC								0.905		
DENS									0.850	
FLOW									0.794	
ADSL										0.682
ROAD										0.856
% variance	43.116	25.327	43.16	25.955	44.072	27.823	43.016	24.213	42.168	24.567
% accumulated variance	43.116	68.443	43.16	69.115	44.072	71.895	43.016	67.229	42.168	66.736
Statistics	KMO: 0.672		KMO: 0.488		KMO: 0.614		KMO: 0.623		KMO: 0.495	
	Bartlett: 21.461		Bartlett: 12.465		Bartlett: 29.613		Bartlett: 7.928		Bartlett: 9.284	
	Sig. 0.018		Sig. 0.052		0.001		Sig. 0.024		Sig. 0.015	

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