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“Territorial Cohesion in Insular Contexts: Assessing External Attractiveness and Internal Strength of Major Mediterranean Islands”

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Abstract: In recent years, the concept of cohesion goes beyond the economic and social concern, focusing also on alleviating territorial imbalances and rendering sectorial policies of countries belonging to the European Union (EU) coherent and unified. Territorial imbalances are particularly evident in island regions which, constrained by their geographical position, are confronted with greater difficulties, compared to mainland ones. This work explores the potential for territorial cohesion derived from the study of both an internal state indicator (I_s), highlighting inner inadequacies of an island; and an attractiveness indicator (I_A), illuminating its external linkages and interactions. Interpretation of these two indicators demonstrates how the internal state of an island forms the ground for implementing integration and cohesion policies that are capable of alleviating territorial cohesion imbalances not only within EU countries but, above all, within other islands' realities. Both indicators are integrated into an index (composite indicator) of territorial cohesion (I_{TC}), experimented in major Mediterranean islands. An analytical approach is proposed in this respect, stressing the originality and value of this research for strengthening territorial cohesion among island regions through the improvement of their internal state as well as the attractiveness these can develop towards the external world.

Keywords: Territorial Cohesion; Smart Island; Attractiveness; Index of Territorial Cohesion; Islands' Structural Problems; Sardinia

1. Introduction

Since 1990, territorial cohesion (with Interreg programme) has been one of the main objectives of the European Union (Treaty of Lisbon, 2007; Davoudi, 2006; Schön, 2009; Zaucha *et al.*, 2019; Medeiros, 2019), aiming to promote homogeneous economic, social and place-based development among the various regions (Interreg, 2020; Territorial cohesion, 2004). In particular, "special attention

is given to [...] regions with serious and permanent natural or demographic handicaps, such as the northernmost regions with very low population density as well as the insular, cross-border and mountainous regions" (Economic, social and territorial cohesion, 2020).

According to the Opinion of the European Economic and Social Committee (Opinion of the European Economic and Social Committee, 2017), cohesion among islands could help insular territories to become more competitive; and could be increased and modulated according to their level of attractiveness. In fact, the analysis of attractiveness, perceived as a composite of an island's internal level of development and its strength to establish external links through cohesion policies, acquires even more value when analyzed from the point of view of the structural problems, common to the island contexts. Such problems are due to the pivotal attributes of islands, such as their geographical position and distance from the mainland – the key features of insularity –, which confine their overall performance as to developmental objectives (Opinion of the European Economic and Social Committee, 2017; Stratigea et al., 2017).

Stratigea et al. (2017) and Koutsi and Stratigea (2020a and b) summarize *insularity consequences* as follows: location of islands in a state's periphery; confined geographical space and related availability of natural resources; a demographic pattern that is characterized by low density and an ageing, of low educational profile and digitally illiterate population, mainly employed in the agricultural or tourist sector (Chatziefstathiou *et al.*; 2005); lack of economies of scale, delimiting the flourishing of local economy; bottlenecks that are due to geographical fragmentation and are mostly associated with the insufficient indoor infrastructure for serving basic population needs (e.g. insufficient health and transport infrastructure; lack of higher education infrastructure, being usually associated with migration of young population groups to the mainland); limited labor market opportunities as a defining factor and one that reinforces migration of youth and productive age groups to the mainland, further weakening an island's population pyramid. In fact, *insularity weaknesses* directly affect the attractiveness of islands (Report on the problems of island regions in the European Union, 1998; European Parliament resolution, 2003; Opinion of the European Economic and Social Committee, 2005); and can be subdivided into *three main categories*, namely the: (i) *population aging*, being more evident in island territories (Analysis of the island regions and outermost regions of the European Union, 2003; Motion for a resolution, 2010; Opinion of the European Economic and Social Committee, 2017; Stratigea *et al.*, 2017; Opinion of the European Economic and Social Committee, 2020; Koutsi *et al.*, 2020a and b); (ii) *territorial imbalances*, mainly associated with accessibility barriers and inefficiencies, limited size of resources and markets as well as the high cost of basic public services' provision (Green Paper on Territorial Cohesion, 2008; The Territorial Agenda and the Leipzig Charter, 2008; Islands of the EU, 2016; Opinion of the European Economic and Social Committee, 2020; Stratigea *et al.*, 2015); and (iii) *administrative governance*, calling for a policy, capable of establishing bonds and interaction with the islands' external decision environment and related bodies (European Parliament resolution, 2016; Opinion of the European Economic and Social Committee, 2017; Garau *et al.*, 2018).

Effectively coping with problems within insular contexts implies improvements of their current socio-economic state and quality of life, coupled with the increase of their attractiveness. In this regard, Gløersen (2012) underlines the need for a territorial cohesion policy that should "support the design of policies targeting the social and economic development of concerned areas" (Gløersen, 2012, p.443). These policies, being modified during the five programming periods of Interreg from 1990 to 2020 (Interreg: European Territorial Co-operation, 2020; Bohme, *et al.*, 2011), have launched an extensive research activity on the: integrated development approaches, intersectoral coordination policies, cooperation among territories and improvement of knowledge stock in order for territorial cohesion to be attained. These development modalities, based on cooperation among territories, are explained in the Territorial Agenda 2020, which encourages integrated development among cities, rural areas and specific regions, including island areas, by "applying an integrated and multilevel

approach in urban development and regeneration policies" (Territorial Agenda of the European Union, 2020, p.7).

However, as explained in the Report "How to strengthen the territorial dimension of Europe 2020 and the EU Cohesion Policy" (Bohme, *et al.*, 2011), a broader territorial approach of the single city is still lacking in cohesion policies; while a clear territorial cooperation policy of insular contexts does not yet exist.

This broader territorial approach should be integrated and cooperative and should be capable of bringing on board certain important changes to policy and related processes (Bohme, *et al.*, 2011). Furthermore, it should have as a starting point an analysis of islands' attractiveness and guarantee that islands can themselves pursue a development trajectory similar to that of non-island territories.

The European Union has examined the featuring attributes of this approach for island contexts in several occasions. However, the relationship between islands, territorial cohesion, and administrative border was analyzed, in its entirety, only during the European observation program for territorial development and cohesion ESPON 2013 (ESPON Euroislands study, 2013). The project EUROISLANDS (Euroislands, 2013; ESPON Euroislands study, 2013; Atlas of the Islands, 2013; The Development of the Islands, 2013; Scientific report, 2013) has highlighted *two fundamental aspects*: the first one concerns the current state of *development* of island contexts and the second refers to the *attractiveness* in relation to insularity (Atlas of the Islands, 2013). This research grasps insularity as a common feature of island regions, where physical (small areal size), structural (small population and small market) and accessibility (isolation and remoteness) inadequacies must be considered. In particular, "insularity expresses 'objective' and measurable characteristics [...] as well as unique natural and cultural environments. However, it also involves a distinctive 'experiential identity', which is a non-measurable quality expressing the various symbols that islands are connected to" (The Development of the Islands, 2013, p.8).

The 2013 EUROISLANDS project remains the main source for the territorial cohesion of island contexts. In fact, this research has led to the evaluation of certain policy axes in relation to island territories. Among these, the policy axes concerning the Cohesion policy illuminate the importance of developing and implementing regional operational programs capable of further strengthening current attractiveness attributes of islands (The Development of the Islands, 2013).

Starting from these assumptions, the authors of this paper attempt to develop a methodology for analyzing potential territorial cohesion of islands, with the aim of assessing territorial cooperation through the joint "reading" of both the internal problems related to islands' development and their attractiveness to the outer world.

This goal is pursued by analyzing the European Territorial Cohesion objectives and identifying an *index* (composite indicator) of territorial cohesion (I_{TC}), perceived as the internal capacity of an island to develop the necessary territory functions and attract the interest of external resources. As study region is considered a number of major Mediterranean islands (Sicily, Sardinia, Crete, Corsica, Cyprus and Malta) (section 2), with particular emphasis on the island of Sardinia (Italy), an insular context with a range of structural problems. Section 3 presents the methodology used for identifying an index of territorial cohesion (I_{TC}), being composed of an indicator of internal state (I_S) and one of attractiveness (I_A). Section 4 applies the methodology to the case study region. Finally, the results obtained are discussed (section 5) and the future directions of this research are illustrated (section 6).

2. Mediterranean Islands and the Case Study of Sardinia Island (Italy)

In Europe, 72 island regions exist (Eurostat Maps, 2020), belonging to six different sea basins (Eurostat, Your key to European statistics, methodology, 2020) and implementing different sectoral policies (integrated maritime policy). Among these, the Mediterranean Basin implements

cooperation policies among maritime regions with the aim to evaluate, manage and promote relationships among the countries that are part of it. Six countries within the Mediterranean Basin (Greece, Spain, France, Cyprus, Malta) have major islands, archipelagos or islands that are part of an archipelago not entirely of the same country, such as the French islands of Guadeloupe and La Réunion (Eurostat Maps, 2020).

The authors therefore decided to study the cohesion potential of a particular category of major Mediterranean islands, namely Sicily, Sardinia (Figure 1), Crete, Corsica, Cyprus and Malta. This choice was mainly due to: (i) their position within the Mediterranean Sea that allows for a geomorphological, economic and social comparison; and (ii) the type of this islands' category that permits for a comparable geographical continuum, which could not be possible in case of an island belonging to an archipelago.

Moreover, in the context of Cohesion Policy for EU regional and urban development (2014), the European Commission highlighted some main investment priorities for both the European island-states such as Cyprus and Malta and the states they belong to big island-regions such as Sicilia, Sardinia, Cyprus and Corsica. Equal priorities can be found in European islands included in this study. Indeed, the main problems correlated and common to the islands can be listed as follows:

- 1) tackling and mitigating the severe effects of the economic, and social crisis with particular focus on high unemployment (especially youth);
- 2) fostering competitiveness through innovation and the creation of a business-friendly environment;
- 3) sustaining an environmentally-friendly and resource-efficient economy (Cohesion Policy, 2014).

These three problems for the islands are selected for the analysis of this research.

Once the islands' sample is defined, the authors attempt to identify a measurable quantity for territorial cohesion that addresses the structural problems of these territorial contexts, through the definition of an *index (composite indicator) of territorial cohesion (ITC)*. Based on this index, authors attempt to identify what could be the relevant fields of policy intervention in order for the structural problems to be alleviated.



Figure 1. Mediterranean Islands and Sardinia island with its morphology and the five administrative territorial divisions.

Sardinia island is an emblematic part of the study region – the six major islands in the Mediterranean –, guiding in a way the research approach of this work. This is due to its geographical position at the center of the Mediterranean Basin, which could favor external attractiveness; its architectural quality of the public spaces, which could favor the attractiveness of the internal areas (Coni *et al.*, 2019); its administrative peculiarities and internal structural problems. Furthermore, Sardinia is among the European island regions with great economic and social difficulties (European Structural and Investment Funds Regulations, 2015) that block its development perspectives and slow down the mechanisms of establishing relationships with other regions (Sardinia Programming, 2016; Autonomous Region of Sardinia, 2015). The authors' thorough knowledge of the regional geography of Sardinia, coupled with their unimpeded access to policy documents for data collection, have largely demarcated the steps and choices made in the methodological part of this work.

More specifically, Sardinia is one of the largest islands in the Mediterranean basin (Italian Regions Classified by Area, 2019), after Sicily. It covers 24,100.02 square kilometers and has a population of 1,639,591 inhabitants (Demographic Statistics, Population Sardinia, 2019). Its morphological, geographical, political and social characteristics have resulted, over time, in an island with strong geographical disparities, not only in the urban realm – between coastal and inland areas –, but also in the administrative and political contexts. In fact, these disparities have led to the formation of main hubs (Garau *et al.*, 2020), with very high capacity for growth and attractiveness, and less developed ones. Additionally, Sardinia has a significant variety of structural and settlement contexts, and the structural problems dictated by the European Union have been consolidated for years. In particular these problems are associated with:

- (i) *Demographic issues*. The island's demographic evolution is marked by factors referring to natural population growth, determined by births and deaths, and migratory movements. In fact, only in 2019 Sardinia counted for 1,639,591 residents, 8,585 fewer than the previous year (Crenos, 2020). Furthermore, the population is concentrated near the coastal areas and in the main Sardinian municipality, Cagliari. This, rather current in Sardinia, population distribution causes serious malfunctions in the local economy, particularly in the case of inland areas; distorts the structure and spatial distribution of labor market and employment; and creates repercussions with regard to relationships of Sardinia with the outer world (Svimez Report, 2019; Cocco *et al.*, 2016).
- (ii) *Territorial balances*. The problem of the "survival" of smaller towns (Desogus, 2016), linked to infrastructures and access to services (Garau, *et al.*, 2019; Crenos, 2018) is certainly the most delicate for Sardinia. In fact, Sardinia participates in the National Strategy for Internal Areas (National strategy for internal areas, 2019) and the Strategy for Urban Areas (Urban area strategy, 2018), in which the aim is "to contrast depopulation phenomena, improve the quality of life of local communities and strengthen the attractiveness of the territories" (Crenos, 2020, p.127). In addition, the Territorial Planning of Sardinia 2014-2020 (Territorial Planning, 2020) aims to "enhance the internal areas and revitalize all areas of Sardinia, focusing on the vocations and potential of each territorial unit" (Territorial Planning, 2020).
- (iii) *Administrative governance*. Sardinia has not yet initiated a social and economic cohesion policy which, while involving the entire regional territory, would allow to enhance the various peculiarities of the coastal areas, generally the most developed ones; and tackle inefficiencies of the inland areas, still remaining the less developed ones. In fact, within the European Union (EU) funding programmes 2014-2020 (European Structural and Investment Funds Regulations, 2015), Sardinia, together with Abruzzo and Molise, belongs to the Italian regions that face great difficulties in promoting economic and social development of inland areas.

The above issues appear to be important constraints since they, among others, prevent the building of territorial leaderships that go beyond the borders of the island. There is therefore a need

to address these problems with a strategic and integrated view, which allows the pursuit of targeted internal development objectives that subsequently can broaden solid relationships with the outer world.

The ascertainments as to the economic, social and territorial cohesion issues, coupled with the experience gained from the study of the structural problems prevailing in Sardinia island, constitute the basic constituents upon which the steps of the proposed methodology of this work is built. More specifically, the proposed methodology for analyzing attractiveness of Sardinia island and the rest five islands falling into the study region of this work – i.e. the major Mediterranean islands –, taking into consideration inherent problems and internal state, is based on the development of an *index of territorial cohesion* (I_{TC}) that and is described in the following and is tested in the major Mediterranean islands previously mentioned.

3. Methods

Territorial cohesion in islands' contexts is in this work captured by two *key factors*, namely the *current state* of the islands and their *attractiveness*. The first key factor is determined by islands' internal characteristics that feature the problems and therefore the possible improvements of their internal environment. The second one represents the potential of islands to establish links to the outer world. Both can be perfectly defined by variables already identified in the literature on territorial cohesion (The Development of the Islands, 2013; Bohme *et al.*, 2011). To compare these two factors, the authors adopt a systematic approach (Abis *et al.*, 2013; Garau *et al.*, 2016; Garau *et al.*, 2018; Garau *et al.*, 2019; Garau *et al.*, 2020), which results in a specific *index of territorial cohesion* for island contexts (I_{TC}).

The index of territorial cohesion (I_{TC}) has been defined by use of a geometric mean (Garau, *et al.*, 2015). Formula 1 shows how the two factors (the current state of the islands and their attractiveness) have been combined, once the parameters identified for each key factor were normalized. I_S represents the indicator of internal state, i.e. the internal peculiarities of the island under study; and I_A identifies the indicator of attractiveness, i.e. possible relationships with the outside world.

$$\text{Formula 1} \quad I_{TC} = (I_S + I_A)$$

Subsequently the authors have split these two indicators (I_S and I_A) into four variables (of state and potential change for I_S ; and of direct and indirect attractiveness for I_A), using the state of the art on the analysis and creation of indicators available in the literature (Garau, *et al.*, 2015; Ciccarelli, 2003; Gismondi *et al.*, 2004; Abis *et al.*, 2013; Mazziotta *et al.*, 2010); and also paying attention to experiences on the topic of territorial cohesion (González *et al.*, 2015; Dao *et al.*, 2017; Prezioso, 2008; Farrugia *et al.*, 2008).

Formula 2 shows the indicator of *internal state* (I_S). I_S is decomposed into two variables, namely I_S for state and I_C for potential change. The first one (I_S) represents the current economic, social and urban situation inside the island. The second (I_C) interprets the potential change that an island can withstand. This describes not only the annual variations but also some educational and employment improvements that define the future potential.

$$\text{Formula 2} \quad I_S = (I_S + I_C) (1/2)$$

Formula 3 shows the indicator of *attractiveness* (I_A), which is split into two variables, namely I_{DA} for direct and I_{IA} for indirect attractiveness. The first one focuses on the potential of an island to attract people; while the second one features a number of services and other islands' attributes that can indirectly support attraction of resources and interest from the outer world.

$$\text{Formula 3} \quad I_A = (I_{DA} + I_{IA}) (1/2)$$

Table 1 shows the four variables identified through the project EUROISLANDS. *The Development of the Islands. European Islands and Cohesion Policy* (2013), which are used for exploring the cohesion concept in the insular spatial contexts.

Subsequently, for each variable, several sub-indicators of territorial cohesion were identified (Table 1 column 3), which are widely described in the literature (Bohme, *et al.*, 2011; The Development of the Islands, 2013). In particular, the two variables (state and change), which form the indicator of internal state (I_{IS}), are represented by the sub-indicators that highlight both the internal well-being in the island and the ability to adapt to changes. The other two variables (direct and indirect attractiveness), which form the indicator of attractiveness, describe the potential for attractiveness that an island can display over the outer world.

Table 1. Variables, Indicators and sub-indicators obtained from the Eurostat Regional Yearbook 2019

Variables	Indicators	Sub-indicators	Sicily	Crete	Corsica	Cyprus	Malta	Sardinia	European average
Indicator of Internal State (I_{IS})									
State	I_S	GDP per person	58.15	57.63	80.93	77.92	85.76	69.25	100
		Income available per inhabitant	12,343	10,673	15,605	15,165	dnt	14,216	15,597
		Labor productivity	83.65	39.85	117.44	39.85	63.4	82.64	100
		Female life expectancy at birth	84	84.4	86.7	84.3	84.4	85.8	83.5
		Male life expectancy at birth	79.8	79.4	80.6	80.2	80.2	80.4	78.1
		Employment rate of recent graduates	27.3	61.9	dnt	78.9	94.8	52.4	81.6
Change	I_C	GDP per capita (average annual variation)	-0.4	-2.5	1.5	-0.9	3.9	0.1	1.6
		GDP per capita, pace of economic recovery	2008	2008	2009	2008	2010	2017	2011
		Labor productivity 2008/2016 variation	0.9	-2.2	1.2	1	4.7	1.2	1.9
		Tertiary education level 2008/2018 variation	2.1	5.6	18.7	9.6	13	4.9	8.1
		Working age population 2008/2018 variation	0.1	-1	-2.8	0.7	-0.7	-2.6	-1.7
		Indicator of Attractiveness (I_A)							
Direct attractiveness	I_{DA}	Nights spent in tourist accommodation / total area	569.2	3,236.1	1,187.4	1,814	30,375.2	590.1	708
		I_{IA}	95.9	86.7	90.6	92	96.5	97.1	95.3

Variables	Indicators	Sub-indicators	Sicily	Crete	Corsica	Cyprus	Malta	Sardinia	European average
Indirect attractiveness		Participation rates in early childhood education							
		Premature abandonment of education and training	22.1	7.2	23.3	7.8	17.5	23	10.6
		Professional satisfaction	48.4	28.8	dnt	43.1	75	48.8	42.8
		Intensity of research and development	0.79	1.53	0.29	0.53	0.57	0.84	2.04
		Research and development researchers	0.38	1.19	0.31	0.25	0.44	0.35	0.86
		Human resources in science and technology	27.8	30.5	40.8	50.4	43.6	28.4	45.6
		Families with broadband access	74	69	76	86	84	86	86
		Daily Internet users	60	60	61	77	77	65	76
		Tertiary education level	20.8	33.5	30.6	57.1	34.2	21.5	40.7
	High growth companies	10.8	7.2	6.7	2.7	16.2	9.5	10.7	

The values of all sub-indicators (Table 1 columns 4 to 11) are obtained from the Eurostat 2019 Regional Yearbook (Eurostat regional yearbook, 2019; Eurostat regional yearbook Maps, 2019).

For comparison purposes between the sample of selected European Islands on the one hand and Europe as a whole on the other, for each sub-indicator relating to the islands, the ratio with the European Union average was calculated by use of Formula 4.

$$\text{Formula 4} \quad \text{Europe data: } 100 = \text{island data: } X \quad 100 * \text{island data} / \text{Europe data}$$

The values of all sub-indicators are obtained by applying formula 4, further classified into 9 classes (Table 2 column 1). Column 2 of Table 2 shows the classes obtained from the EUROISLANDS project (The Development of the Islands, 2013). The nine classes build up the basic assumption that the European average and the values around this average should form the middle class; while four classes should be constructed with higher than the middle-class values and four with lower ones (Atlas of the Islands, 2013). The nine classes were used for all sub-indicators, except for those relating to the one of change (I_c), for which the levels suggested by the Eurostat Regional Yearbook were used (column 3 of Table 2). In case that the indicator expresses a negative problem, as the one of the sub-indicator *premature abandonment of education and training*, the value of the class was inverted, i.e. if the value was 9 it becomes 1, if it was 8 it becomes 2, etc. in this way the index value is always positive (Atlas of the Islands, 2013).

Table 2. Limits of the classes used for the construction of the indices obtained from the Atlas of the Islands, 2013 and Eurostat regional yearbook, 2019

Class ¹	Indicators where EU27 = 100	Classes defined by the Eurostat Yearbook =9
1	< 65	1
2	65-75	2
3	75-85	3
4	85-95	4

Class ¹	Indicators where EU27 = 100	Classes defined by the Eurostat Yearbook =9
5	95-105	5
6	105-115	6
7	115-125	7
8	125-135	8
9	> 135	9

After calculating the classes of each variable, Figure 2a shows an interpretative positioning matrix (Abis *et al.*, 2013; Garau *et al.*, 2015; Garau *et al.*, 2016; Pinna *et al.*, 2017), prepared on the basis of the sub-indicators used. The matrix made possible to identify the territorial cohesion policy of all the islands in relation to the European average (Abis *et al.*, 2013; The Development of the Islands, 2013; Garau, *et al.*, 2015; Abis *et al.*, 2015). The classes obtained were translated into a pair of coordinates, useful for positioning each island within a methodological grid (Figure 2a), in which the internal state indicator (I_{IS}) is measured on the ordinate axis, while on the abscissa axis the value of the attractiveness indicator (I_A) is reflected. In particular, each sub-indicator belonging to the different variables had the same weight during its normalization, thus defining the value of I_S , I_C and I_{DA} , I_{IA} .

Subsequently, the values of the internal state indicator (I_{IS}) and the I_{DA} , I_{IA} values were obtained for achieving the value of the indicator of attractiveness (I_A).

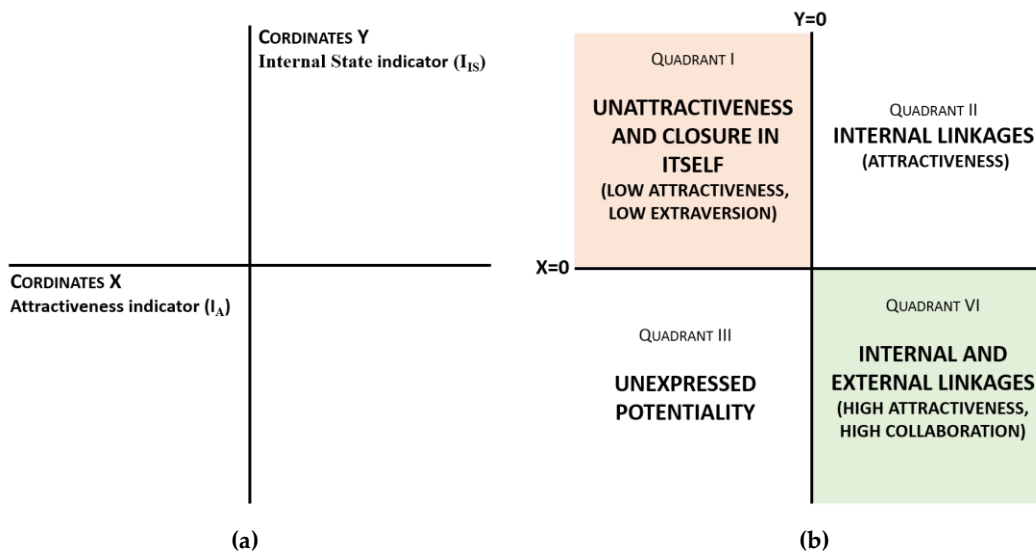


Figure 2. Indicator positioning matrix (a) interpretative matrix; (b) quadrants matrix values.

The intersection between the abscissa and ordinate axes creates four quadrants, each of which briefly describes the position of the European islands with regard to their territorial cohesion policy, as a result of its (meaning the territorial cohesion policy) relationship with the indicator of internal state (I_{IS}) and the indicator of attractiveness (I_A). In particular, the most problematic islands, in terms of territorial cohesion, are located in the first red quadrant (Figure 2b) and therefore have values very low for both indicators, i.e. internal state and attractiveness.

These islands are those where more effective territorial policies should be adopted for the purpose of cooperation and relationships with the external world. In the second quadrant fall islands that, despite having a current policy not in line with EU policy, have an excellent attractiveness

potential. However, internal structural problems of these islands block their development perspectives and therefore limit potential for developing solid relationships with external to them regions of the world. In the third quadrant there are islands performing quite well with respect to internal state indicators, but having poor performance in attractiveness indicators in relation to the European mean.

This quadrant actually features islands that can, based on the strength of their internal parameters, undertake targeted cooperation actions for attaining higher attractiveness levels. Finally, the fourth quadrant (the green one in Figure 2b) is characterized by islands that have a territorial cohesion policy in line with the European Union, displaying good performance in both internal strength and attractiveness to the outer world.

4. Results

The above described operational methodology has outlined an explanatory framework of territorial cohesion policies of the European Islands in relation to their internal policies and their attractiveness to the external world. In fact, the variables and sub-indicators chosen for each indicator (I_{IS} and I_A) were those indicated by the European Union for territorial cooperation. The values obtained for each island are studied in relation to the average of the European Union.

In particular, Table 3 demonstrates the Islands' performance (values) calculated by using Formula 4.

Table 3. Average between islands values and Europe calculated with formula 4

Variables	Indicators	Sub-indicators	Sicily	Crete	Corsica	Cyprus	Malta	Sardinia
Indicator of Internal State (I_{IS})								
State	I _S	GDP per person	58.15	57.63	80.93	77.92	85.76	69.25
		Income available per inhabitant	79.14	68.43	100.05	97.23	0	91.15
		Labor productivity	83.65	39.85	117.44	39.85	63.40	82.64
		Female life expectancy at birth	100.60	101.08	103.83	100.96	101.08	102.75
		Male life expectancy at birth	102.18	101.66	103.20	102.69	102.69	102.94
		Employment rate of recent graduates	33.46	75.86	0	96.69	116.18	64.22
Change	I _C	GDP per capita (average annual variation)	-25.00	-156.25	93.75	-56.25	243.75	6.25
		GDP per capita, pace of economic recovery	99.85	99.85	99.90	99.85	99.95	100.30
		Labor productivity 2008/2016 variation	47.37	-115.79	63.16	52.63	247.37	63.16
		Tertiary education level 2008/2018 variation	25.93	69.14	230.86	118.52	160.49	60.49
		Working age population 2008/2018 variation	-144.83	-141.38	396.55	-89.66	544.83	0

Variables	Indicators	Sub-indicators	Sicily	Crete	Corsica	Cyprus	Malta	Sardinia
Indicator of Attractiveness (IA)								
Direct attractiveness	IDA	Nights spent in tourist accommodation / total area	80.37	457.06	167.66	256.21	4,290.25	83.33
Indirect attractiveness	IIA	Participation rates in early childhood education	100.63	90.98	95.07	96.54	101.26	101.89
		Premature abandonment of education and training	208.49	67.92	219.81	73.58	165.09	216.98
		Professional satisfaction	113.08	67.29	0	100.70	175.23	114.02
		Intensity of research and development	38.73	75.00	14.22	25.98	27.94	41.18
		Research and development researchers	44.19	138.37	36.05	29.07	51.16	40.70
		Human resources in science and technology	60.96	66.89	89.47	110.53	95.61	62.28
		Families with broadband access	86.05	80.23	88.37	100.00	97.67	100.00
		Daily Internet users	78.95	78.95	80.26	101.32	101.32	85.53
		Tertiary education level	51.10	82.31	75.18	140.29	84.03	52.83
		High growth companies	100.93	67.29	62.62	25.23	151.40	88.79

Once the averages are calculated, Table 4 shows the classes for each sub-indicator in relation to the European situation for all islands. The classes are obtained through the values described in Table 2 for the indicator of internal state (I_{IS}) and formula 3 for the indicator of attractiveness (I_A). In this way, Table 5 shows the coordinates obtained for each island studied in this work .

Table 4. Classes and coordinates of the indicators described in Table 2.

Variables	Indicators	Sub-indicators	Sicily	Crete	Corsica	Cyprus	Malta	Sardinia
Indicator of Internal State (I_{IS})								
State	I _S	GDP per person	1	1	3	3	4	2
		Income available per inhabitant	3	2	5	5	0	4
		Labor productivity	3	1	7	1	1	3
		Female life expectancy at birth	5	5	5	5	5	5
		Male life expectancy at birth	5	5	5	5	5	5
		Employment rate of recent graduates	1	3	0	1	7	1
Change	I _C	GDP per capita (average annual variation)	1	1	2	1	3	2

Variables	Indicators	Sub-indicators	Sicily	Crete	Corsica	Cyprus	Malta	Sardinia
		GDP per capita, pace of economic recovery	1	1	9	1	8	2
		Labor productivity 2008/2016 variation	2	1	6	2	4	2
		Tertiary education level 2008/2018 variation	2	3	4	7	4	2
		Working age population 2008/2018 variation	1	1	4	5	7	2

Indicator of Attractiveness (IA)

Direct attractiveness	I _{DA}	Sub-indicators	Sicily	Crete	Corsica	Cyprus	Malta	Sardinia
		Nights spent in tourist accommodation / total area	9	9	9	9	3	9
Indirect attractiveness	I _{IA}	Sub-indicators	Sicily	Crete	Corsica	Cyprus	Malta	Sardinia
		Participation rates in early childhood education	5	4	5	5	5	5
		Premature abandonment of education and training	1	8	1	7	1	1
		Professional satisfaction	6	2	0	5	9	6
		Intensity of research and development	1	3	1	1	1	1
		Research and development researchers	1	9	1	1	1	1
		Human resources in science and technology	1	2	4	6	5	1
		Families with broadband access	4	3	4	5	5	5
		Daily Internet users	3	3	3	5	5	4
		Tertiary education level	1	3	3	9	3	1
		High growth companies	5	2	1	1	9	4

Table 5. Coordinates X and Y for each studied island

	Coordinates (X)	Coordinates (Y)
	Indicator of Attractiveness (I _A)	Indicator of Internal State (I _{IS})
Sardinia	3	2.5
Sicily	3	2
Crete	6.5	2
Corsica	5.5	4.5
Cyprus	7	3.5
Malta	6.5	4.5

Figure 3 positions each one of the Mediterranean islands, studied in this work, in the methodological grid of Figure 2 by use of the *composite indicator of territorial cohesion* (I_{TC}) (coordinates of Table 5).

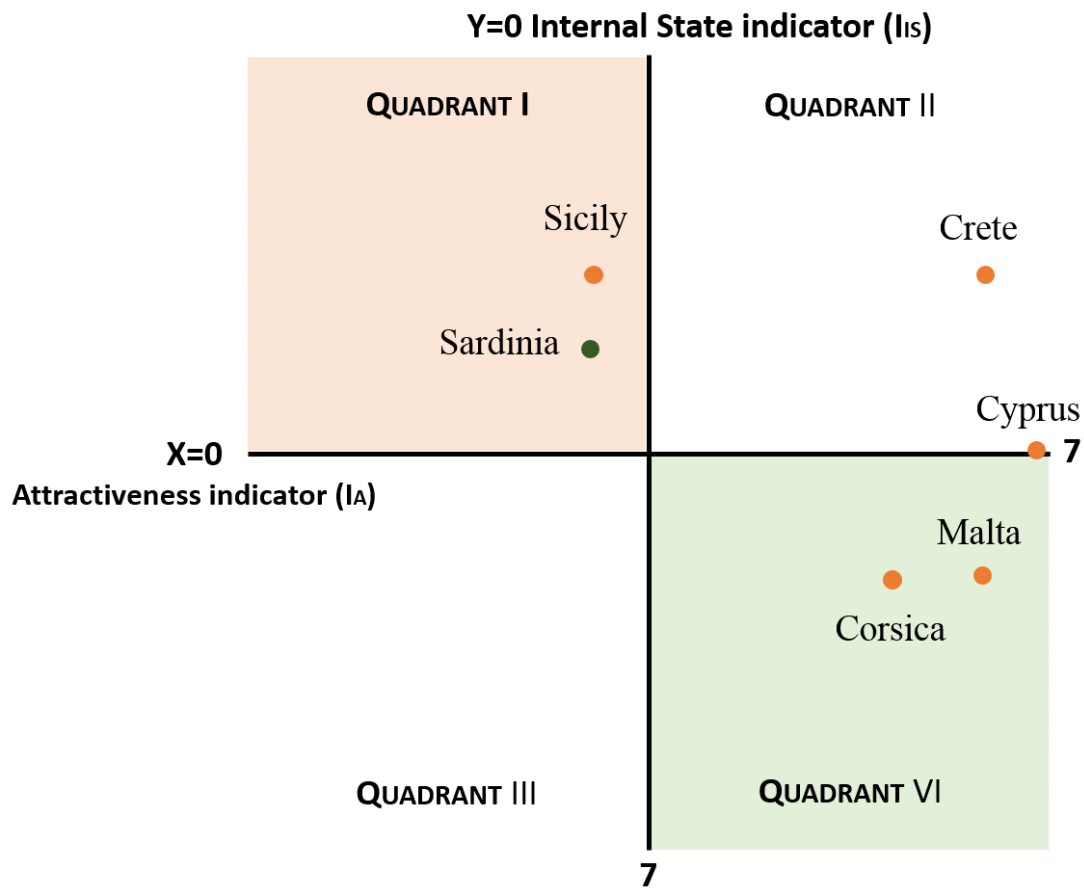


Figure 3. Positioning of islands in the methodological grid - Relationship to Indicator of Internal state (I_{is}) and Indicator of attractiveness (I_A)

The analysis shows that *Sicily and Sardinia* are among the most problematic European islands in relation to territorial cohesion policies. In fact, these, being in the first quadrant, have not only a low performance in terms of attractiveness, but also show various internal uncertainties, related to the structural problems indicated by the European Union. Conversely, *Malta and Corsica* have a good attractiveness performance compared to countries of the European Union and an excellent internal state indicator performance; and are characterized by a territorial cohesion policy in line with the European Union. Finally, *Crete and Cyprus* appear to be very attractive, but with structural problems that need to be solved for achieving internal state improvements. From the islands' sample used in this work, no one seems to fall into the third quadrant.

5. Discussion

In the previous section, the potential for territorial cohesion of the major Mediterranean islands was represented through the analysis of their internal state and attractiveness indicators' performance.

In general, the results obtained reveal a strong criticality linked to their internal state (I_{is}). In particular, visualization of the value of internal state indicator, presented in the methodological grid (Figure 3), unveils that all islands concerned, with the exception of Malta and Corsica, have poor performance compared to the European average. This poor performance, associated with the well-

being of the internal state and the capacity to adapt to changes, affects the potential for cohesion and shows a general state of stativity.

However, the islands respond well to the indicator of attractiveness (I_A). This fact, being especially evident in the cases of Crete and Cyprus but also Malta and Corsica, implies that although internal inefficiencies are present, these islands demonstrate a high capacity for attractiveness to the outer world.

The same does not hold, though, for the islands of Sicily and Sardinia, all falling into the Quadrant I of the methodological grid (Figure 3). Sicily and Sardinia, exhibit serious problems as to their performance in both the internal state and the attractiveness. In particular, by analyzing all indicators (I_S , I_C , I_{DA} , and I_A) it is understood that the major criticalities are linked to economic, productivity and social factors.

However, the methodology adopted allows targeted territorial action to be undertaken by highlighting major fields affecting islands' state and attractiveness performance; and thus, delineating fields of intervention that can lead to the improvement of their positioning as to these indicators. Furthermore, in the case of Sardinia, given the authors' knowledge of geography and politics, these actions could be sketched in a more specific way, by inserting additional indicators for the study of the 4 variables. Nevertheless, such an option is not followed in this paper, since selection of indicators used was mainly driven by reasons of standardization and common approach in the analysis of the major Mediterranean islands concerned.

Conversely, the islands located in Quadrant IV (Malta and Corsica) (Figure 3) demonstrate an optimal state for establishing relations of territorial cohesion. In fact, they display an extremely high level of attractiveness and internal state performance, when compared with the European average.

Finally, the approach of this work, based on the theoretical premises of territorial cooperation, allows an overall understanding of the problems linked to insularity. In fact, in a delicate spatial context such as the insular one, this methodology allows, by improving the values of respective variables with targeted policies, to attain a balance between internal well-being and attractiveness in order to improve cooperation relationships with other insular and main land contexts.

6. Conclusions

In this study, the authors developed a methodology that is capable of monitoring and improving territorial cohesion. Towards this end, an *index of territorial cohesion* (I_{TC}) was developed, a composite of an internal state indicator (I_S) and an indicator of attractiveness (I_A). The analysis was conducted by analyzing variables and sub-indicators that are grounded on regulations of the European Union on territorial cohesion in relation to internal structural problems and external relations.

This allowed to observe how the study of attractiveness within an island system is necessary to implement interrelation policies, and that these policies have to first cope with internal structural problems.

First of all, the concept of territorial cooperation was theoretically presented in relation to the structural problems of island contexts. Subsequently, the potential for territorial cooperation was analyzed in the context of a range of major islands of the Mediterranean by means of a composite index of territorial cohesion (I_{TC}). This initially made it possible to: (i) observe the way the parameters of territorial cohesion of the European Union can be applied to island contexts; (ii) identify the most suitable sub-indicators – indicator of internal state (I_S) and indicator of attractiveness (I_A) – for analyzing territorial cooperation between island contexts, belonging to the Mediterranean Basin; and (iii) develop a methodological approach for analyzing structural problems of the islands' contexts.

Furthermore, the analysis, which can be replicated to other national and international island contexts as well, stressed the importance of internal policies of a single island context for achieving cohesion objectives. In particular, the indicator of internal state (Is) makes even more evident how internal policies are closely related to international ones. In other words, the internal state of an island can push forward or restrain relationships with other islands. It is evident that this report can be read in reverse, namely if some islands show the same problems (for example the demographic issue), an international network can be created that helps the island contexts concerned to develop economic and social policies related to that specific problem.

A future direction of this research should focus on the establishment of a territorial cooperation network among insular spatial contexts which, starting from the methodology presented in this paper, would undertake the task of identifying and resolving structural problems, common to these insular contexts.

Moreover, the same methodological approach could be useful for identifying a set of indicators for other areas that the European Union identifies as areas of economic and social disadvantage, such as mountain regions or rural or inner areas. This would allow to understand how the relationships between attraction and the internal state of a non-island territory would improve the cohesion relationships between different areas.

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