

## Article

# Recovery and Resilience of the Inner Areas: Identifying Collective Policy Actions through PROMETHEE II

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**Abstract:** Inner areas are rural areas with low population density, distant from the main hotspots offering essential welfare services and endowed with significant environmental assets and cultural heritage. In Italy, their development is at the core of the national strategy for inner areas. Specific documents and program agreements were issued for each inner area and summarized the intervention themes and projects to implement. However, when the inner areas are considered within a regional territorial ‘matrix’, further collective policy actions have to be identified, through comparison and in-depth analysis of their features and influence on development. Therefore, this research aims to identify and analyse the development needs and potentialities of the inner areas, for strengthening the national strategy and improving their recovery and resilience through collective policy actions. The Multiple Criteria Decision Aiding (MCDA) method PROMETHEE II was applied as research methodology to four inner areas in Puglia region (southern Italy), using 43 indicators organized into seven thematic dimensions and setting specific parameters. The results enabled to delineate the overall development score of the four inner areas, and the profile of each inner area based on every indicator and dimension. By analysing this profile, key thematic dimensions where to direct collective policy actions were identified, related mainly to contrast with the depopulation by improving specific essential services (e.g., digitalization, health, education) and to foster the development of agriculture, tourism, and cultural heritage. This research can be considered a first step for future broader studies, to guide the process of policy making for the recovery and resilience of European and Italian inner areas with a multi-perspective approach.

**Keywords:** rural areas; peripheral areas; marginal areas; rural development; territorial planning; decision making; policy making; MCDA



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## 1. Introduction

Inner areas are rural areas with low population density, distant from the main hotspots offering essential welfare services (education, healthcare, and mobility), and endowed with significant environmental assets and cultural heritage [1]. Therefore, in these areas, demographic decline and population ageing are very high, farm and land abandonment strongly affect economic productivity, and the quality of essential services is influenced by the digital divide. On the other hand, the inner areas are rich in important environmental resources, such as water, high-quality agricultural products, forests, natural and human landscapes, as well as in cultural assets, such as archaeological and historic settlements, small museums, and skills centres [2–5].

According to [6], the European inner areas are tackling new challenges linked to their role in a more globalized and interconnected world, including socio-demographic and economic decline, environmental fragility, opportunities related to greater mobility and the role of technologies for information and communication, which have led to different perceptions on development policies. Therefore, the development strategies of the inner areas in Europe focus on the social, political, and cultural priorities, trying to reverse depopulation

and marginalization phenomena through actions aimed at improving essential services and triggering local development processes. In this respect, it is fundamental to identify and implement development policies fostering the resilience of inner areas. This resilience is generally intended as the capacity of social, economic, and environmental systems to cope with changes, both foreseeable trends and unexpected events or disturbances, by responding and reorganising themselves in ways that maintain their essential functions and identity [7].

From a national standpoint, the Italian inner areas have remarkable and extensive development potential: they contain unused environmental, economic, and social capital that could be matched with employment opportunities [8]. Indeed, recent scientific and political debate focuses on the development issues of these inner areas [9], so that they are at the core of the National Strategy for Inner Areas (SNAI) [10]. The SNAI is one of the most comprehensive policies in the European Union launched by the Italian government in 2012, and represents a laboratory for integrated rural development and institutional innovation [11]. The overall aim of the SNAI is to contrast the decline of these areas, triggering a trend reversal of those processes that had led to their socio-economic and structural fragility [9,11]. More specifically, the SNAI has the following five interdependent objectives: (i) increasing the well-being of local populations; (ii) increasing local labour demand (and employment); (iii) increasing the use of territorial capital; (iv) lowering the social costs of de-anthropisation; (v) strengthening local development factors [8]. In order to achieve these objectives, the SNAI is based on improvement of essential services for providing inner areas with the 'prerequisites' for development (health, education, mobility and digitalization), and on triggering local development processes by supporting projects focused on the promotion of local cultural and natural capital, innovative agro-food systems, business diversification, craftsmanship, and traditional know-how [9,12]. In this regard, the SNAI is supported by national and European funds (ERDF, ESF, EAFRD, EMFF) [6], and the new National Recovery and Resilience Plan (PNRR) launched in 2021 is dedicating funding to improve the resilience of inner areas through its missions and components under the Next Generation EU [13].

In Italy, there are 72 inner areas that include 1060 municipalities and cover a surface of about 51,000 km<sup>2</sup> and with a population of about 2 million inhabitants. These areas represent 13.4% of all Italian municipalities, 3.3% of the national population and 17% of national surface [10]. According to [1], the selection of these areas was carried out by the technical committee of SNAI with the collaboration of regional and local administrations, and followed a public investigation process based on a desk phase and an on-field phase. At the end of this process, the technical committee issued a strategy document for each inner area, summarising the key intervention themes, and a framework program agreement reporting the specific interventions and projects to implement, their scheduling, and the financial resources allocated.

However, when the inner areas are considered within a regional territorial 'matrix', further collective policy actions have to be identified. In this specific scenario, the inner areas are part of a complex system rather than isolated territorial entities [14]. Moreover, the inner areas are squeezed by a spiral of marginalization, which has multiple concomitant causes that need to be addressed in an integrated manner. The population decline can cause a weakening of the structure of population and a series of negative feedback, ranging from the high-income resident population escape, to the weakening of the productive structure and the collapse of the system of local services. These effects in turn generate additional pressures to depopulate, producing a vicious spiral and a structural obstacle to recovery and resilience [11].

As a consequence, suitable decision support approaches built on indicator evaluations are necessary to compare and analyse in-depth the features of the inner areas and their influence on development. Based on this process, it will be possible to support the SNAI with further policy actions to improve the recovery and resilience of inner areas. It is thus evident that robust and scientifically sound decision support approaches are important

to aid the policy makers in the identification of such policy actions. Indeed, in defining priorities for actions, the multi-dimensional nature of the SNAI well fits its integration with a Multiple Criteria Decision Aiding (MCDA) approach, aimed at drawing out a ranking of territories according to common needs or potentialities [1,15,16].

In the light of the above considerations, the aim of this research is to identify and analyse the development needs and potentialities of the inner areas, for strengthening the existing SNAI. This goal will serve to establish if collective policy actions can be found for improving the recovery and resilience of the inner areas. The novelty of this research is: (1) to examine the inner areas within a regional territorial 'matrix' rather than as isolated entities; (2) to identify common needs in a multi-perspective manner, taking into account the features of the inner areas (i.e., the evaluation indicators), embracing several key thematic dimensions simultaneously; (3) to identify further collective policy actions by analysing the overall development ranking and profiles of the inner areas, according to the performances of the indicators.

To cope with the research aim, the MCDA method PROMETHEE II is applied to the following inner areas of Puglia region (southern Italy): Gargano, Monti Dauni, Alta Murgia, Sud Salento. This territory is chosen as case study because its development is considered crucial within the SNAI. Indeed, Puglia is the third region in Italy for the amount of European funding allocation (EUR 16.7 million) and Monti Dauni is the first inner area for the overall funding allocation (about EUR 77 million) [10]. Moreover, the inner areas of Puglia region mirror the specific structural development issues occurring both at the European and Italian levels, such as heavy depopulation in the last twenty years; lack and/or inefficiency of essential services (health, education, accessibility, digitization); agricultural land abandonment; and underdevelopment of key economic sectors [8,10,17]. Puglia region also reflects the structural development problems from being part of southern Italy. Indeed, the socio-economic dualism between southern and northern Italy (the so called "Southern Italy's Question") is still the biggest unresolved problem in the history of Italy and has existed since 1861, when the Kingdom of Italy was born. Since then and despite the great development of the national economy as a whole, the economic and social disparities between southern and northern Italy have progressively increased. Therefore, the weak performance of southern Italy represents a strong limiting factor to its current development [18]. Alongside the fracture between southern and northern Italy, the divergences between centres and peripheries, de-industrialized cities, and countryside, urban areas, and inner areas, have increased throughout the country. These phenomena confer a further national connotation to the debate on territorial cohesion, which is traditionally associated with "Southern Italy's Question" [19].

The paper is organized as follows: after a brief presentation of the case study, the methodology for data collection is described and PROMETHEE II is illustrated both from the theoretical and the empirical perspectives (Section 2). Then, Section 3 shows the results about the overall ranking of inner areas and the profile of each inner area based on the indicators and thematic dimensions, which identifies the collective policy actions. Section 4 provides the discussion of the policy actions identified, and concluding remarks are reported in Section 5.

## 2. Materials and Methods

### 2.1. Case Study

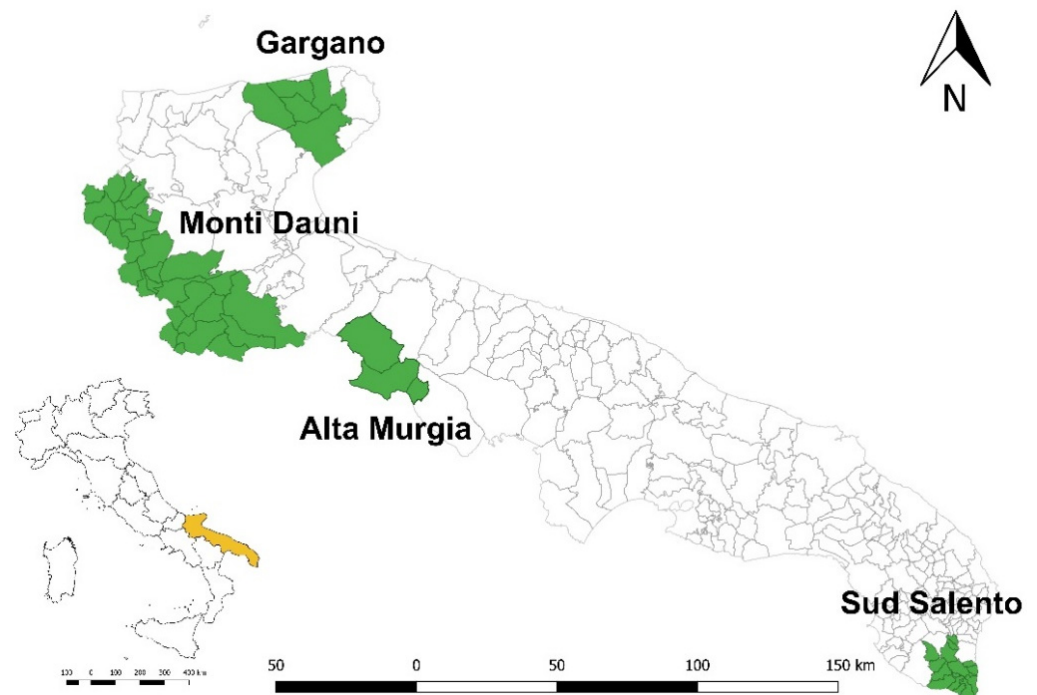
Puglia is considered historically a rural region of southern Italy. According to the European Commission [20], Puglia is a region classified as "less developed". It covers an area of 19,541 km<sup>2</sup> and has a population of about 4.09 million inhabitants, out of which 85.1% live in rural areas. A total of 17.2% of rural areas have development issues, the overall employment rate is 45% (below the national average), the overall unemployment rate is 15.7%, but rising to 41.5% for young people (above the national average). This region is characterized mainly by flatland and some smaller hills, having almost no mountainous areas. Its territory consists of 7.5% of forest land and 83.2% of agricultural land (representing

10% of the Italian Utilized Agricultural Area, UAA). The UAA is 1285.290 ha, of which 51% are arable crops, 8% permanent grassland and 41% permanent crops (mainly vines and olive). The animal husbandry sector is rather insignificant, accounting only for 1.4% of regional farms. There are 272,000 farms mainly run by families and 94% of these farms are specialised, particularly in olive production (54%). Other key sectors are vine, fruit, and vegetables. The average size of farms is around 4.7 ha. The small size of the farms and the resulting land fragmentation have been identified as a major challenge for regional rural development, along with the problem of generational renewal. In terms of competitiveness, a major challenge is represented by the pursuit of a higher degree of farm efficiency and innovation. Puglia region also faces a series of environmental problems, such as desertification, droughts, decrease in biodiversity, soil erosion, extensive water use in agriculture, and a dramatic reduction of the number of local species. As for renewable energies, only 10% of regional energy production comes from such sources.

The case study consists of four Apulian inner areas: Gargano, Monti Dauni, Alta Murgia, and Sud Salento. The Gargano inner area is located in the province of Foggia, it includes 5 municipalities covering a surface of 688.6 km<sup>2</sup> with a total population of 34,068 inhabitants. The population variation in the period 2011–2017 is −2.5%, with a higher decrease in the period 2017–2020 (−5.7%). The funding allocation from the SNAI is EUR 6.75 million. The Monti Dauni inner area is also located in the province of Foggia, and it includes the highest number of municipalities (29). It covers a surface of 1946.8 km<sup>2</sup> with a total population of 54,593 inhabitants. In this area, the population variation is higher than the Gargano inner area, as it is −4.3% in the period 2011–2017 and −6% between 2017 and 2020. Regarding the SNAI funding allocation, the Monti Dauni is the first Italian inner area with a total funding of EUR 76.54 million. The Alta Murgia inner area is located in the province of Bari, it is the smallest area in terms of municipalities (3) and population (15,883 inhabitants). This area covers a surface of 484.9 km<sup>2</sup>, and the population variation in the period 2017–2020 is the highest among the other inner areas (−6.4%), while the variation between 2011 and 2017 was −3.1%. The funding allocation from the SNAI is almost the same as the Gargano inner area (EUR 6.76 million). The Sud Salento inner area is located in the province of Lecce, it includes 13 municipalities, with the highest population (65,185 inhabitants) and the lowest surface (246.4 km<sup>2</sup>) among the regional inner areas. In this area, the population variation is the lowest for the period 2017–2020 (−3.8%) and it did not increase very much compared to the previous period (−3.1%). Concerning the SNAI funding allocation, the Sud Salento received EUR 6.74 million, which is almost the same share assigned to the Gargano and Alta Murgia inner areas. Figure 1 shows the location of these inner areas in Puglia region, whereas the territorial features of the inner areas can be deduced from Table A1.

## 2.2. Data Collection

In the frame of the investigation process carried out by the SNAI technical committee, a database covering all the Italian inner areas was produced and enabled the identification of the social, demographic, and economic situation, as well as of the essential services (i.e., open diagnosis). This database consists of 161 indicators, it is open and can be reused by researchers, companies, civil society, and public/private administrations to obtain additional information capable of exploiting the value of public information assets. However, several studies highlighted that a high number of indicators may present various drawbacks when they are used in an analysis framework, such as MCDA, including difficulties for data collection and updating, redundancy, incomplete and/or ambiguous description, and complex and/or misleading interpretation of the results and policy implications. Therefore, in order to overcome these drawbacks, a selection process is required [1,21,22].



**Figure 1.** The case study areas.

In this research, the selection process was carried out taking into account the data availability for the four inner areas and by discarding the indicators with incomplete description and similar information (i.e., overlapping indicators). Furthermore, the following criteria for selecting the indicators were also applied [23,24]:

- Appropriateness to the main goal and outcome-oriented;
- Reflect the well-being of people residing in the province/area;
- Measure the effects of policy interventions;
- Sensitiveness to policy change;
- Reflect the distinctions and comparability between provinces/areas;
- Contribution direction (positive/negative) can be clearly identified;
- Comprehensible, robust and accurate;
- Accessible and updated periodically.

The final set consists of 43 indicators organized into 7 thematic dimensions: demography (A); agriculture and sectoral specialization (B); digital divide (C); cultural heritage and tourism (D); health (E); accessibility (F); education (G). The complete list of indicators and the data for each inner area are shown in Appendix A (Table A1), and they are used as evaluation criteria in PROMETHEE II (see Section 2.3).

### 2.3. PROMETHEE II

PROMETHEE is a family of MCDA outranking methods first developed by [25] and enables to rank a set of alternatives by performing their pairwise comparisons on each evaluation criterion [26]. PROMETHEE II [27] is applied in this research, because it enables the organisation of indicators into thematic dimensions; in this way, the inner areas are ranked according to an overall development score (net outranking flow) and are also evaluated with respect to each indicator and dimension separately (unicriterion net flow) [28,29]. PROMETHEE II is also very clear and simple in its structure based on users (e.g., researchers, decision-makers, opinion leaders, etc.), it enables to re-evaluate the results if new information becomes available (e.g., indicators and/or areas), it deals with uncertainty by the use of thresholds, and there is software available to implement the method, manage the information, and show the results in a clear and multi-perspective manner [30].

The application of PROMETHEE II is carried out by using the software “Visual PROMETHEE” Academic Edition [29]. PROMETHEE II starts from the following multiple criteria problem:

$$\max \{g_1(a), g_2(a), \dots, g_j(a), \dots, g_k(a) | a \in A\}$$

where  $A$  is a finite set of  $n$  alternatives  $\{a_1, a_2, \dots, a_i, \dots, a_n\}$  and  $\{g_1(\cdot), g_2(\cdot), \dots, g_j(\cdot), \dots, g_k(\cdot)\}$  is a set of  $k$  evaluation criteria. In this research, the alternatives are the four inner areas, while the evaluation criteria are the indicators. There are no objections to consider for some criteria to be maximized (i.e., benefit criteria) and other criteria to be minimized (i.e., cost criteria) [27]. When a criterion is minimized, it means that the higher its value, the worse the result in terms of development. On the contrary, if the criterion is maximized it means that the higher its value, the better the development [22]. In this research, the benefit and cost criteria were identified by consulting a document produced by the technical committee of the SNAI that describes the indicators in detail.

The data related to this multiple criteria problem can be reported in a table containing  $n \times k$  evaluations. Each row is an alternative and each column is a criterion. According to [31], the implementation of PROMETHEE II requires two types of additional information: the criteria weights (information between the criteria) and the preference function (information within the criteria). A criterion weight is a score reflecting the criterion relative importance, so the higher the weight, the more important the criterion. The weights are defined independently from the unit of measurement of the criteria and are normalized in such a way that their sum is equal to 1 (i.e., 100%) [27,29]. Nevertheless, the dataset used in this research includes a different number of indicators for each thematic dimension, posing the risk of attaching a higher or lower importance to certain thematic dimensions within the decisional framework. To avoid this drawback, equal weights are assigned (14.3%), so that the thematic dimensions have the same influence on the development of inner areas. Once the weights are assigned, the preference function must be established. This is associated to each criterion, and translates the deviations between the evaluation of two alternatives into degrees of preferences [26]. A degree of preference is a score ranging from 0 to 1 and defines how an alternative is preferred over another alternative according to the point of view of a researcher or decision-maker [28]. There are different preference functions according to the types of criteria [32]. Basically, the Usual and Level preference functions are suitable for qualitative criteria, while the Linear and the V-shape functions are suitable for quantitative criteria. In this research, the Linear preference function is chosen, and this requires the setting of  $p$  and  $q$  threshold values. The  $p$  threshold is the smallest deviation considered as sufficient in eliciting a full preference for a certain alternative, while the  $q$  threshold is the largest deviation considered as negligible in preferring a certain alternative on each criterion [33]. The values of these thresholds are strictly related to the preferences, level of knowledge, and information on the criteria by the researcher or the decision-maker [34]. It is very important to understand the meaning of the preference function and the corresponding threshold value of a given criterion in order to assess these parameters in the right way. This assessment is performed by using the tool “Preference function Assistant” implemented in the software “Visual PROMETHEE”, which indicates the most suitable threshold value for each indicator according to the statistical analysis and a few simple questions about the pairwise comparisons on a specific indicator.

Once all the above information was obtained, PROMETHEE II is applied according to the following stepwise procedure described by [27,31]:

- (1) Determination of the deviation between alternatives based on pairwise comparisons:

$$d_j(a, b) = g_j(a) - g_j(b)$$

where  $d_j(a, b)$  is the deviation between alternatives  $a$  and  $b$  on each criterion.

- (2) Application of the preference function:

$$P_j(a, b) = F_j[d_j(a, b)]$$

with  $j = 1, \dots, k$ ; where  $P_j(a, b)$  is the preference of alternative  $a$  with respect to alternative  $b$  on each criterion as a function of  $d_j(a, b)$ , and  $0 \leq P_j(a, b) \leq 1$ .

(3) Calculation of the aggregated preference index:

Let  $a, b \in A$ , and let:

$$\begin{cases} \pi(a, b) = \sum_{j=1}^k P_j(a, b) w_j \\ \pi(b, a) = \sum_{j=1}^k P_j(b, a) w_j \end{cases}$$

where  $w_j$  is the weight associated to the  $j$ th criterion;  $\pi(a, b)$  indicates with which degree the alternative  $a$  is preferred to alternative  $b$  over all criteria, and  $\pi(b, a)$  indicates how  $b$  is preferred to  $a$ . In most of the cases, there are criteria for which  $a$  is better than  $b$  and criteria for which  $b$  is better than  $a$ ; thus,  $\pi(a, b)$  and  $\pi(b, a)$  are usually positive. The following property holds for all  $a, b \in A$ :

$$\begin{cases} \pi(a, a) = 0, \\ 0 \leq \pi(a, b) \leq 1, \\ 0 \leq \pi(b, a) \leq 1, \\ 0 \leq \pi(a, b) + \pi(b, a) \leq 1. \end{cases}$$

Consequently:

$$\begin{cases} \pi(a, b) \sim 0 \text{ implies } a \text{ weak global preference of } a \text{ over } b, \\ \pi(b, a) \sim 1 \text{ implies } a \text{ strong global preference of } a \text{ over } b. \end{cases}$$

$P_j(a, b)$ ,  $P_j(b, a)$ ,  $\pi(a, b)$  and  $\pi(b, a)$  are real numbers (without units) completely independent of the scales of the criteria  $g_j(\cdot)$ .

(4) Calculation of the positive and negative outranking flows:

$$\begin{aligned} \phi^+(a) &= \frac{1}{n-1} \sum_{x \in A} \pi(a, x) \\ \phi^-(a) &= \frac{1}{n-1} \sum_{x \in A} \pi(x, a) \end{aligned}$$

where  $\phi^+(a)$  is the positive outranking flow and measures how much the alternative  $a$  is outranking all the other  $n-1$  alternatives.  $\phi^+(a)$  is a global measure of the strength of alternative  $a$ , so the higher  $\phi^+(a)$ , the better the alternative.  $\phi^-(a)$  is the negative outranking flow and measures how much the alternative  $a$  is outranked by all other  $n-1$  alternatives.  $\phi^-(a)$  is a global measure of the weakness of the alternative  $a$ , so the lower  $\phi^-(a)$ , the better the alternative.

(5) Calculation of the net outranking flow:

$$\phi(a) = \phi^+(a) - \phi^-(a)$$

where  $\phi(a)$  is the net outranking flow of alternative  $a$ , as the balance between the positive and the negative outranking flows. Therefore, the higher  $\phi(a)$ , the better the alternative.

The following properties hold:

$$\begin{cases} -1 \leq \phi(a) \leq 1, \\ \sum_{x \in A} \phi(a) = 0 \end{cases}$$

when  $\phi(a) > 0$ ,  $a$  is more outranking all alternatives on all the criteria; when  $\phi(a) < 0$ ,  $a$  is more outranked. The net outranking flow is computed to determine both the overall development ranking of the inner areas, and the ranking based on the single thematic dimensions.

The net outranking flow is also computed for each criterion separately. According to the definitions of the aggregated preference index and of the positive and the negative outranking flows, the following formula is obtained [27]:

$$\phi(a) = \phi^+(a) - \phi^-(a) = \frac{1}{n-1} \sum_{j=1}^k \sum_{x \in A} [P_j(a, x) - P_j(x, a)] w_j$$

Consequently:

$$\phi(a) = \sum_{j=1}^k \phi_j(a) w_j$$

If:

$$\phi_j(a) = \frac{1}{n-1} \sum_{x \in A} [P_j(a, x) - P_j(x, a)]$$

$\phi_j(a)$  is the unicriterion net flow obtained when only the criterion  $g_j(\cdot)$  is considered. This flow indicates how an alternative  $a$  is outranking ( $\phi_j(a) > 0$ ) or outranked ( $\phi_j(a) < 0$ ) by all the other alternatives on only the criterion  $g_j(\cdot)$ . The unicriterion net flow value range between  $-1$  (worst possible value) and  $+1$  (best possible value). This disaggregated view of the strengths and weaknesses of an alternative is very useful to define its profile, which consists of the set of all the single criterion net flows as follows:  $\phi_j(a), j = 1, 2, \dots, k$  [27]. The profile of an alternative enables the researcher to investigate the performance of the inner areas on any indicator and each thematic dimension, where to direct collective policy actions for improving the recovery and resilience of Apulian inner areas.

### 3. Results

The overall development score of the inner areas and their score for each thematic dimension (i.e., net outranking flow,  $\phi$ ) are shown in Table 1. Specifically, the Alta Murgia inner area achieved the best score (0.13), while the Sud Salento inner area achieved the worst score ( $-0.09$ ). However, the analysis of the score of every thematic dimension highlights the different development performances of the areas.

**Table 1.** The overall development score of the inner areas and the score for each thematic dimension (net outranking flow,  $\phi$ ). The best and the worst scores for each thematic dimension are highlighted in green and red, respectively.

Rank	Inner Area	Overall Score	Thematic Dimensions Score						
			A	B	C	D	E	F	G
1	ALTA MURGIA	0.13	-0.16	0.23	0.13	-0.23	0.32	0.53	0.13
2	GARGANO	0.03	0.14	-0.03	0.17	0.42	-0.11	-0.64	0.29
3	MONTI DAUNI	-0.08	-0.04	-0.01	-0.42	-0.23	-0.16	0.31	0.02
4	SUD SALENTO	-0.09	0.06	-0.18	0.12	0.04	-0.05	-0.20	-0.44

The Alta Murgia inner area obtained the highest development score for “agriculture and sectoral specialization” (B), “health” (E) and “accessibility” (F). On the contrary, this area showed the worst development score in terms of “demography” (A) and “cultural heritage and tourism” (D).

Although the Gargano inner area gained the second-best development score, it achieved the best development score on four thematic dimensions out of seven: “demography” (A), “digital divide” (C), “cultural heritage and tourism” (D) and “education” (G). On the other hand, this area was the worst for “accessibility” (F).



The Monti Dauni inner area did not achieve the best scores in any thematic dimension, while it obtained the worst performances in three thematic dimensions, namely “digital divide” (C), “cultural heritage and tourism” (D) and “health” (E).

Even though the Sud Salento inner area was the worst in terms of overall score because of very low positive scores and no best scores, it achieved the worst performances only for “agriculture and sectoral specialization” (B) and “education” (G).

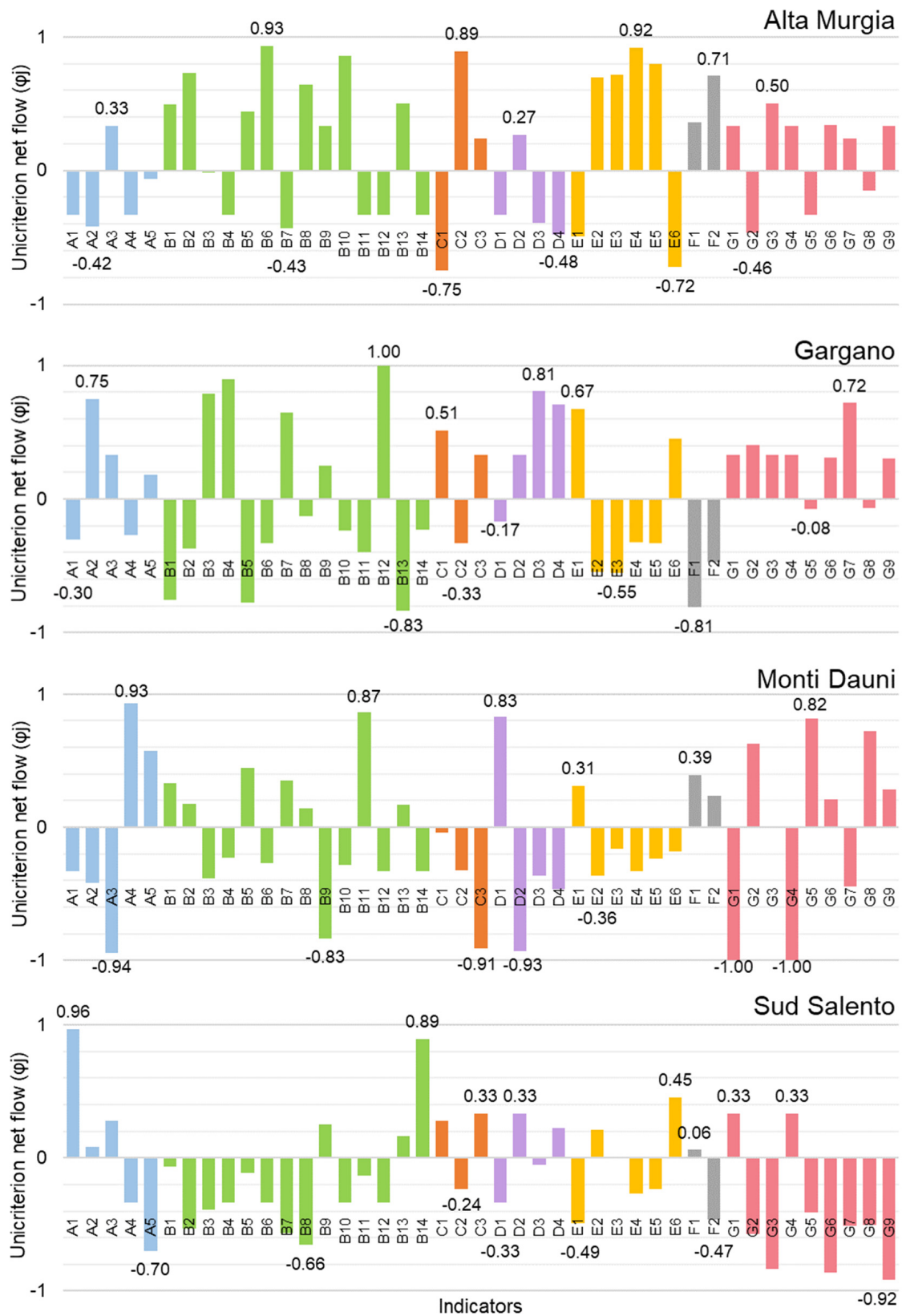
PROMETHEE II also provided the development profile (unicriterion net flow,  $\varphi_j$ ) showing the performances of the inner areas related to the indicators and thematic dimensions separately (Figure 2 and Table A2).

The profile of the Alta Murgia inner area shows that four indicators out of five had a negative performance within the thematic area “demography” (A), although the values are below 0.5. Only the indicator expressing the share of inhabitants between 17 and 34 years old (A3) has a positive performance. Concerning the dimension “agriculture and sectoral specialization” (B), the profile shows positive performances for eight indicators out of fourteen; among these, the highest values are related to indicators measuring the farmers’ share up to 39 years old (B2), the share of farms producing PDO and/or PGI products (B6), and the specialization of the energy, gas, and water sector (B10). On the other hand, there are negative performances for further indicators linked to agriculture (B3, B4, B7) and other economic activities (B11, B12, B14). Within the dimension “digital divide” (C), the indicator C2 (ADSL connection at 20 mbps) has the highest positive performance, highlighting the possibility to access to telehealth services. On the contrary, the negative performance of indicator C1 points out that part of the population has no access to adequate internet connection for other kinds of services. Regarding the dimension “cultural heritage and tourism” (D), it is to be noted that three indicators out of four have a negative performance, meaning that the current cultural resources (museums, archaeological sites, historical buildings, and monuments, etc.) are not very attractive (D1). This influences the tourism presence and the offer of accommodation facilities (D3 and D4). The performance of the dimension “health” (E) is very positive for four indicators related to the efficiency of hospital services (E2, E3, E4) and integrated home care services (E5). However, negative performances are linked to the efficiency of public and private specialist outpatient services (E1) and emergency services (E6). The dimension “accessibility” (F) does not show negative performances for both the indicators, thus there are no critical issues around inner area accessibility by car from the nearest municipalities, as well as the road accessibility for goods transportation. Finally, the dimension “education” (G) includes six indicators out of seven with positive performances, although their values do not exceed 0.50. In this regard, it is interesting to note that all the indicators with negative performances (G2, G5 and G8) are related to the share of foreign students attending primary, secondary, and high schools.

The profile of the Gargano inner area shows that the dimension “demography” (A) includes three indicators out of five with positive performances, with respect to the Italian population share 0–16 years old and 17–34 years old (A2 and A3), and also regarding the share of resident foreigners (A5). Nevertheless, the overall population density (A1) has a negative performance together with the Italian population share over 65 years old (A4). The profile of the “agriculture and sectoral specialization” (B) is mainly negative. Indeed, only 5 indicators out of 14 show positive performances, even though with very high values (except for the indicator B9 having a value of 0.25). Among the negative indicators, the most critical are those related to the territorial share of the Utilized Agricultural Area (UAA) (B1), the importance of the agri-food sector (B5) and the growth rate of the stock of firms (B13). Regarding the “digital divide” (dimension C), in this inner area there is a not adequate ADSL connection at 20 mbps (C2), so that telehealth services cannot be accessed by the entire population. However, the internet connection for other types of services is guaranteed (C1 and C3). The profile of “cultural heritage and tourism” dimension (D) is positive for three indicators out of four, and particularly around accommodation rate (D3) and tourist presence (D4). The dimension “health” (E) has many weaknesses because there are four indicators with negative performances (E2, E3, E4 and E5), highlighting

inefficiencies regarding the hospital and integrated home care services. The other two indicators have positive values, especially the one about outpatient specialization services (E1). The “accessibility” (dimension F) represents a further weakness, since both the indicators have negative values, pointing out issues of road accessibility for people and goods. On the contrary, the dimension “education” (G) shows a good profile since seven indicators out of nine have positive performances, although most of them do not reach a value of 0.5. A very good performance is registered by the indicator expressing the percentage of municipalities with high schools (G7), and the negative performances are quite low for the indicators measuring the share of non-Italian students attending secondary and high schools (G5 and G8).

The profile of the Monti Dauni inner area has three indicators with negative performances within the dimension “demography” (A), particularly those regarding the population share of inhabitants 0–16 and 17–34 years old (A2 and A3). These negative performances are compensated by the positive performances linked to the indicators measuring the population share over 65 years old and the share of resident foreigners (A4 and A5). The dimension “agriculture and sectoral specialization” (B) has many weaknesses because there are seven indicators with negative performances, while most of the indicators with positive performances do not reach a value of 0.5. Specifically, three indicators with negative performances are related to agriculture, namely those measuring the share of protected and forest areas (B3 and B4) and share of farms producing PDO and/or PGI products (B6). The further indicators with negative performances are connected to the other economic sectors, except for construction (B9, B10 and B12), as well as to the establishment of foreign firms (B14). The positive performances regard mainly the indicators of agriculture sector, with the highest performances obtained by those measuring the importance of the agri-food sector (B5) and the share of livestock farms (B7), although their values are quite low. The dimension “digital divide” (C) reports negative performances for all the indicators, with the worst values related to the indicator C3 measuring the population not reached by a fixed ADSL connection. In the same way, the profile of the dimension “cultural heritage and tourism” (D) is very weak, since there are negative performances linked to the indicators measuring the cultural sites that cannot be visited (D2), the accommodation rate (D3) and tourist presence (D4). The performances of these indicators are partially compensated by the positive performance of the indicator that measures the cultural sites that can be visited (D1). Moreover, the dimension “health” (E) shows various fragilities, because five indicators out of six have negative performances with respect to the efficiency of hospital, home care, and emergency services (E2, E3, E4, E5 and E6), although the worst value is  $-0.36$ . The only positive performance is obtained by the indicator measuring the outpatient specialist services (E1). The dimension “accessibility” (F) has positive performances for both the indicators (F1 and F2) even though their values are not high. Finally, the “education” dimension (G) shows very negative performances with respect to the education facilities, particularly for the indicators expressing the share of municipalities with primary, secondary, and high schools (G1, G4 and G7). The positive performances are related to the indicators assessing the share of students with non-Italian citizenship (G2, G5 and G8) and the share of students living in the same municipality as the school location (G6 and G9, while the performance of G3 is equal to 0).



**Figure 2.** The development profiles (unicriterion net flow,  $\phi_j$ ) of the inner areas showing the indicators' performances for each thematic dimension. The best and worst performances are pointed out with the specific values of  $\phi_j$ .

The profile of the Sud Salento inner area shows many weaknesses in almost all the thematic dimensions. Although the dimension “demography” (A) includes positive performances for the indicators measuring the overall population density (A1) and the population share of 0–16 and 17–34 years old (A2 and A3), there is a compensation by the negative performances of indicators A4 and A5. In addition, the dimension “agriculture and sectoral specialization” (B) shows negative performances for 11 indicators out of 14. All the indicators measuring the development of agriculture sector have negative performances, particularly those related to the share of farmers up to 39 years old (B2), as well as the share of livestock farms (B7) and farms with standard production of EUR 25,000 (B8). Concerning the other economic sectors, positive performances are related only to the indicators measuring the specialization of the manufacturing sector (B9), the growth rate of the stock of firms (B13) and the share of foreign firms (B14). The dimension “digital divide” (C) reports a negative performance only for the indicator related to the ADSL connection at 20 mbps (C2), but the other indicators have positive performances not exceeding a value of 0.33 (C1 and C3). The “cultural heritage and tourism” dimension (D) shows negative performance in relation to the number of cultural sites that can be visited (D1) and the accommodation rate (D3), but they are counterbalanced by the positive performances of indicators D2 and D4. Moreover, the “health” dimension (E) is weak because of the negative performances of the indicators related to the outpatient specialist services (E1), the avoidable hospitalization rate (E4) and the integrated home care services (E5). This negative trend is partially compensated by the positive performances of the indicators E2 and E6, while the performance of E3 is equal to 0. Furthermore, the last two dimensions show a negative trend; the “accessibility” dimension (F) is critical for the road accessibility for goods transportation (F2), while the “education” one presents positive performances only for the share of municipalities with primary and secondary schools (G1 and G4).

Since the PROMETHEE methods rely on weights, preference functions and thresholds, these parameters may have a strong impact on the results. Therefore, it is important to check that slight variations of these parameters do not have too large influence on the alternatives’ ranking [16]. This is achieved by applying the sensitivity analysis, and in particular the tool “walking weights” implemented in the software “Visual PROMETHEE”. Although a slight variation of the thematic dimensions’ weights has been performed, this did not have a large influence on the ranking, so the results can be considered valid.

#### 4. Discussion

The obtained results highlighted several development issues in accordance with the negative performances of the indicators, which can be translated into collective policy actions to strengthen the SNAI.

Concerning the Alta Murgia inner area, it is necessary to implement interventions to avoid the depopulation of youth, elderly, and their families. Thus, policy measures should focus on the design of ‘safety nets’ regardless of citizenship, by implementing certain essential services (digitalization, health, education) and developing different economic sectors for job creation [35]. In this respect, digitalization plays a central role for the recovery and resilience of this inner area, particularly for accessing to basic services. Regarding the use of digital technologies by youth, digital inclusion means access to training opportunities, development of self-confidence, and contribution to community development [36]. Digital inclusion is also important for elderly people, because it allows active ageing, sustainable independent living in later life, lifelong learning opportunities, and access to telehealth services [37]. In this inner area, the reinforcement of health services for elderly people should be at the core of tailored policy actions. Strengthening both the emergency care and models that integrate public and private specialist healthcare, can bring a place-based approach improving the performance of the health system, which can adapt itself to the higher and increasing demand for healthcare by older rural communities [38]. Moving the focus on education, the negative performances of the indicators measuring the share of students with non-Italian citizenship poses the need to implement policies for attracting

and including migrants and foreigners in this inner area. Indeed, they can contribute significantly to the agricultural and rural development, playing a crucial role in the survival, expansion, and modernisation of farms. Moreover, migrants and foreigners support the marginal, elderly rural households, and they can also supply vital inputs to other economic sectors, such as manufacturing, construction, tourism, and personal/domestic services. The general positive view of their contribution to the local economy is further strengthened with the significant support that they provide for the social and economic cohesion of rural life [39]. Regarding the economic development of this inner area in terms of agriculture and sectoral specialization, policy measures should be addressed to enhance the agriculture sector, with the specific aim to increase the number of livestock farms and the protected and/or forest areas. Livestock profitability, efficiency, and sustainability can be achieved by implementing smart digital technologies that combine tools and methods based on more precise and resource-efficient approaches for production management. These technologies support farmers' decisions and contribute to the wider goal of meeting the increasing demand of food whilst ensuring the sustainability of livestock [40]. Protected and forest areas can contribute maintaining and enhancing agro-biodiversity, developing sustainable agricultural practices, mitigating the effects of climate change, and contrasting flood vulnerability and soil degradation. Concurrently, the increase in these areas can also enhance rural tourism and improve the well-being of inhabitants [41–44]. The results also highlighted the need to plan policy measures to foster the development of economic sectors different from agriculture, such as construction and trade. Moreover, specific economic and social measures should be implemented to encourage the establishment of new firms in all key economic sectors, in order to improve the 'business vitality' of this inner area. Economic diversity needs to be achieved in rural and remote areas in order to reach competitiveness, welfare, and resilience. Entrepreneurs that trigger the economic development in these areas should not be ignored in such environments [45]. Finally, policy actions should be put in place to enhance and promote the cultural heritage, which represents a lever for the development of sustainable rural tourism and connected services [46].

Also in the Gargano inner area, it is necessary to implement actions to contrast depopulation, especially for people over 65 years old. In this sense, as seen for the Alta Murgia inner area, it is important to ensure certain essential services. Regarding the digital divide, measures should foster the development of broadband internet access to allow telehealth services. Since people living in rural areas are at increased risk of premature deaths due to non-prompt assistance for chronic illness, stroke, and unintentional injury, telehealth is a fundamental service for maintaining continuity of care while avoiding the negative consequences of delayed preventive, chronic, or routine care [47]. Additionally, the results showed inefficiencies of the healthcare services, thus dedicated interventions are required to improve the network of hospital care services (e.g., primary care, specialist assistance, home care) for reducing hospitalizations and providing basic emergency care [48]. Accessibility is a further challenge that policy makers should address, since a lack of road accessibility in remote rural areas undermines the liveability of rural communities and limits their social and economic well-being [49]. Although this inner area does not show particular issues regarding the education system, the negative performances of the indicators measuring the share of non-Italian students poses the necessity to plan specific social measures, because rural schools can act as pole of attraction for young couples with a high degree of cultural diversity [50]. Concerning the development of agriculture and other economic sectors, there are several aspects that policy makers should take into proper account. For instance, the negative performance of the indicator measuring the share of Utilized Agricultural Area (UAA) may indicate a substantial land abandonment for agriculture, and thus the need to implement tailored measures. These could be aimed at reducing the gap in land rent between settlement areas and agricultural areas, and at increasing the productivity and competitiveness of farms through social innovation (e.g., short supply chains, alternative food networks, local farming systems and direct sales) and investments in technologies for smart agriculture [51–53]. In this respect, innovative and sustainable production systems

based on smart agriculture technologies could have a key role to increase the production of marginal lands in an ecologically and profitably sustainable way and secure farmers' economic interests [54]. Further interventions are essential to encourage the presence of young farmers, because the renewal generation of farm managers is becoming a necessity to increase the importance and economic development of the agri-food sector, resulting in improved competitiveness and social life of rural communities. Younger generations of farmers can more easily meet the demands that society requires from the profession of farming, and those required by the regulations of the Common Agricultural Policy. They also promote a wide range of activities, such as rural tourism, preservation of traditions and cultural heritage, and participate in local associations [55]. Moreover, the Protected Designation of Origin (PDO) and Protected Geographical Indications (PGI) products play a key role in rural reterritorialization and agri-food governance. Indeed, especially in remote rural areas, PDO and PGI labels trigger a local development model that fosters cooperative working, develops new food markets, creates jobs and maintains traditions [56]. In this regard, this model may be achieved through policy actions fostering digital technologies, which allow to collect and exploit the large amount of farm data for increasing the profitability and quality of agro-food production [57]. The results also stressed the need to plan measures for the socio-economic growth of other sectoral specialization, including energy, gas, water, and construction. It also appears important to implement actions to increase the growth rate of the stock of firms as well as the share of foreign firms in all the sectors, which can contribute to enhancing the economic diversification of this area [45]. Even though the tourism sector in this inner area does not show concerns to address, policy actions should be devoted to enhancing the actual cultural heritage. In fact, linking rural tourism with cultural resources can lead to the integration and diversification of tourism opportunities, and translates the tourist destination as a whole into a competitive destination [58].

Referring to the Monti Dauni inner area, depopulation is still a critical phenomenon to contrast through the improvement of essential services, mainly for people over 65 years old. Unlike the previous inner areas, here the digital divide is stronger in such a way that policy measures should ensure internet access to both basic services (communication, information retrieval, file transfer, internet banking, etc.) and advanced services (telehealth). Generally, a very limited access to essential digital services and infrastructure and the lack of fast broadband are included among the main features of rural and remote areas and risk exacerbating issues related to depopulation, out-migration, ageing, education, general and digital lack of skills, and the gender employment gap [59]. The results also showed that policy makers should pay great attention to healthcare, in order to improve the network of hospital care services (i.e., emergency, primary, and home care) and reduce unnecessary hospitalizations [48]. A further critical aspect deserving suitable measures is the lack of education facilities. Access to education in remote rural areas can be one of the contributing factors to local economic development and help rural communities adapt to a fast-changing environment, while a lack of access risks widening the rural–urban divide. In addition, school closures and restrictions of movement in response to the COVID-19 pandemic highlighted how fundamental education services are not only for students' development, but also to allow parents to pursue their own employment. The school closures also brought to the fore the need to embrace comprehensive and digital approaches to introduce flexibility to school provision in rural and remote areas [38]. In addition, in this inner area, the development of agriculture is of paramount importance. As pointed out for the Gargano inner area, policy measures should aim to foster a local development model based on the valorisation of PDO and PGI products starting from farm production, also with the aid of smart agriculture technologies [56,57]. Moreover, as seen for the Alta Murgia inner area, ensuring an adequate surface of forest and protected areas may contribute to contrast flood vulnerability and soil degradation, maintain and boost agro-biodiversity, develop sustainable agricultural practices, and mitigate the effects of climate change, in line with the European Green Deal [41–44,60]. Policy measures should also support business diversification in this inner area, with specific reference to the sectoral specialization of

manufacturing, energy, gas, water, and trade. It also emerges the need to implement measures to increase the growth rate of the stock of firms. Great attention should be put toward the development of tourism and cultural heritage, making accessible cultural heritage that cannot be visited. Indeed, ignoring the social and economic value of rural cultural resources, as well as their conservation and valorisation, can lead to the degradation of cultural capital and to failure to exploit opportunities for rural development [61]. A diversified offer in terms of number and types of tourism accommodations and related services may also contribute to the development of a model of sustainable tourism and to the growth of touristic flows [62].

In the Sud Salento inner area, the depopulation mainly affects people over 65 years old and non-Italian residents, who should be the main beneficiaries of the policy actions implementing the essential services. Regarding the digital divide, residents can access basic internet services, but broadband at 20 mbps needs to be implemented to ensure telehealth [37]. As seen for the previous inner areas, policy measures should also be put in place to ensure the quality of healthcare, but with a specific focus on improving outpatient specialist services and integrated home care services, which can prevent unnecessary hospitalizations [48]. Road accessibility, particularly for goods transportation, is also a critical development point to be dealt with proper policy attention. As part of a supply chain network, a company competing on the market must mostly show short lead times and deliver at the right time [63]. Attention should also be put on the weaknesses of the education system. Specifically, there is lack of high schools and students from all school levels show a commuting aptitude, which could mean a non-adequate offer of education facilities. Students who attend rural schools located far from their home town participate in curricular and co-curricular activities at lower rates than students whose schools are nearby, having a negative impact on achievement and graduation. Moreover, distance also constrains the participation of families and communities in schools; this is particularly true for families whose time is limited because of work or travelling costs [64]. An adequate education offer at all levels may also contribute to cultural diversity, because rural schools can act as pole of attraction for migrants and foreigners [50]. In this inner area, agriculture is the most fragile economic sector, since all the related indicators showed negative performances. However, policy measures could give priority to the most critical aspects. For instance, generational renewal in a rural development context can empower highly qualified young farmers, who are most likely to embrace the smart farming technologies and exploit the consequent benefits for sustainable farming practices development [65]. Young farmers can also make a relevant contribution in promoting rural prosperity, strengthening rural value chains, and investing in rural viability and vitality [66]. In this respect, it is important also to increase farms' standard production, since this parameter is used to grant funds for the young farmers under the national Rural Development Programme (RDP). Moreover, the increase in livestock farms and their efficient management through smart agriculture technologies, can keep the multidimensional benefits of the livestock sector while decreasing its negative externalities, thus contributing to the sustainability of food systems [40]. In addition, in this area, policies should be aimed at the development of the economic sectors different from agriculture, except for the manufacturing activity. Finally, measures should be devoted to valorise the cultural heritage that can be visited, as well as to increase and diversify the tourism accommodations [62].

## 5. Conclusions

In this research, PROMETHEE II was applied to analyse the development issues of the inner areas in Puglia region (southern Italy), and to identify key thematic dimensions to direct collective policy actions for boosting the recovery and resilience of these areas. The policy actions can be used by policy makers to strengthen the existing strategies set up for each inner area under the SNAI and to identify specific interventions, taking into account the regional territorial 'matrix' where the inner areas are included. Indeed,

this research considered the inner areas as part of a complex system rather than isolated territorial entities.

In this regard, PROMETHEE II highlighted clearly the ranking of the inner areas in accordance with every thematic dimension, and subsequent precise issues to address through collective policy actions. These actions should relate mainly to contrast the depopulation by improving specific essential services (e.g., digitalization, health, education) and to foster the development of agriculture, tourism, and cultural heritage. It also emerged that these actions are coherent and well framed both with the territorial context and the existing literature. PROMETHEE II proved to be a flexible method that provided clear and detailed results; thus, it can be replicable and scalable on other European and Italian inner areas, serving as a comprehensive policy making tool to identify their development issues and related tailored policy actions.

However, it is to be noted that the feasibility and implementation of the identified policy actions should be further discussed with the policy makers and relevant territorial stakeholders by means of dedicated meetings. Some thematic dimensions, such as accessibility, digital divide, and tourism, are underrepresented in terms of the number of indicators, because of the missing data and the selection criteria adopted. This can be considered a limitation of the research, and for this reason the SNAI indicators should be used together with indicators collected from surveys or other databases. Additionally, the objectivity of the indicators selection process should be improved; thus, it may be based on statistical methods (but information on certain territorial features can be lost).

In light of the above considerations and despite some limitations, this research can be considered a first step for future research. This will focus on the inclusion of opinion leaders and/or relevant territorial stakeholders within the decision-making process, particularly in the attribution of the weights to the thematic dimensions and/or indicators. Moreover, the implementation of the set of indicators will be carried out, serving for new research that will investigate further the development issues of European and Italian inner areas, with the final aim of guiding the process of evidence-based policy making.

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## Appendix A

Table A1. The list of indicators with collected data and PROMETHEE II parameters.

CODE	THEMATIC DIMENSION	INDICATORS	MIN MAX	THRESHOLDS		INNER AREAS			
				q	p	GARGANO	MONTI DAUNI	ALTA MURGIA	SUD SALENTO
A1	Demography (A)	Population density (in./km <sup>2</sup> )	MAX	107	228	49.5	28	32.8	264.5
A2		Population 0–16 years old of the total population (%)	MAX	0.5	1.3	15.6	14.2	14.2	14.9
A3		Population 17–34 years old of the total population (%)	MAX	0.5	1.1	20.8	19.7	21.0	20.7
A4		Population > 65 years old of the total population (%)	MAX	0.8	1.8	23.9	25.5	23.5	23.6
A5		Resident foreigners of the total population (%)	MAX	0.6	1.7	3.4	4.2	3.0	2.0
B1	Agriculture and sectoral specialization (B)	Utilized Agricultural Area (UAA) of the total area (%)	MAX	8.4	25.8	46.2	70.5	77.9	60.9
B2		Farmers up to 39 years old of the total farmers (%)	MAX	1.3	4	7.2	9.0	11.0	6.1
B3		Protected area of the total area (%)	MAX	21.2	56.1	64.4	3.6	30.2	3.3
B4		Forest area of the total area (%)	MAX	15.7	38.7	45.8	14.2	6.3	2.4
B5		Importance of the agri-food sector (index)	MAX	0.1	0.4	2.3	2.7	2.7	1.5
B6		Farms with PDO and/or PGI products of the total farms (%)	MAX	1.6	3.6	0.6	1.0	4.2	0.3
B7		Livestock farms of the total farms (%)	MAX	1.6	4.9	8.0	6.3	3.4	2.4
B8		Farms with standard production of EUR 25,000 of the total farms (%)	MAX	4.3	13.6	8.5	12.3	19.0	1.6
B9		Specialization of the manufacturing sector (index)	MAX	0.2	0.6	1.1	0.6	1.3	1.1
B10		Specialization of the energy, gas and water sector (index)	MAX	0.5	1.2	1.2	1.1	2.2	0.7
B11		Specialization of the construction sector (index)	MAX	0.3	0.8	1.1	2.1	1.3	1.5
B12		Specialization of the trade sector (index)	MAX	0.1	0.2	1.4	1.2	1.1	1.2
B13		Growth rate of the stock of firms	MAX	0.2	0.6	−1.5	−1	−0.7	−1
B14		Foreign firms of the total firms (%)	MAX	3.5	8.8	4	2.2	1.2	11.1
C1	Digital divide (C)	Population reached by fixed network broadband (ADSL) between 2 and 20 mbps (%)	MAX	13.6	42.1	76.7	48.8	24.1	62.2
C2		Population reached by fixed network broadband (ADSL) not less than 20 mbps (%)	MAX	16.4	41.2	19.7	26.8	67.2	32.3
C3		Population not reached by fixed network broadband (ADSL) (%)	MIN	7.8	18.8	3.6	24.5	8.7	5.4

Table A1. Cont.

CODE	THEMATIC DIMENSION	INDICATORS	MIN MAX	THRESHOLDS		INNER AREAS			
				q	p	GARGANO	MONTI DAUNI	ALTA MURGIA	SUD SALENTO
D1	Cultural heritage and tourism (D)	State and non-state cultural sites that can be visited (no.)	MAX	4	10	5	12	1	1
D2		State and non-state cultural sites that cannot be visited (no.)	MIN	4	9	1	10	2	1
D3		Beds per 1000 inhabitants (accommodation rate)	MAX	92.1	248	285.2	20.5	9.3	128.0
D4		Tourists presence per 1000 inhabitants (tourist rate)	MAX	2865	7961	8660	289	79	5121
E1	Health (E)	Outpatient specialist services provided per 1000 inhabitants (no.)	MAX	310	848	890	569	5	2
E2		Hospitalization rate per 1000 inhabitants	MIN	17.3	54.8	189.8	173.4	123	148.4
E3		Hospitalization rate of the population > 75 years old	MIN	39.8	118.2	454.5	397.9	304.0	379.4
E4		Avoidable hospitalization rate	MIN	67.3	157.8	648.1	669.7	493.7	633.1
E5		Residents $\geq$ 65 years old treated with integrated home care services of the total population $\geq$ 65 years old (%)	MAX	0.7	1.7	1.5	2.2	3.6	2.2
E6		Time between the telephone call and the arrival of the ambulance (minutes)	MIN	3	8	22	27	31	22
F1	Accessi-bility (F)	Average distance of the inner municipalities from the nearest "pole" municipality weighted by the population (minutes)	MIN	11	31	75	40	42	55
F2		Road accessibility for goods transportation within the inner municipalities (index)	MAX	7	19.4	36.2	48.5	57.0	36.5
G1	Education (G)	Municipalities with primary schools of the total municipalities (%)	MAX	4	7	100	93	100	100
G2		Primary school students with non-Italian citizenship of the total students (%)	MAX	1	2.8	3.9	4.6	2.0	1.6
G3		Primary school students living in the same municipality as the school location of the total students (%)	MAX	1	3	96	95	97	93
G4		Municipalities with secondary schools of the total municipalities (%)	MAX	4	7	100	93	100	100
G5		Secondary school students with non-Italian citizenship of the total students (%)	MAX	1.3	3.5	3.7	6.0	2.4	1.9
G6		Secondary school students living in the same municipality as the school location of the total students (%)	MAX	2.7	7.1	96.8	95.6	98.4	90.0
G7		Municipalities with high schools of the total municipalities (%)	MAX	25.5	75.4	100.0	24.1	66.7	14.3
G8		High school students with non-Italian citizenship of the total students (%)	MAX	0.9	2.5	2.5	4.2	2.3	1.1
G9		High school students living in the same municipality as the school location of the total students (%)	MAX	23.1	52.7	73.3	71.7	82.2	23.4

**Table A2.** The unicriterion net flow ( $\varphi_j$ ) showing the performances of the inner areas for each indicator and thematic dimension.

	Demography (A)					Agriculture and Sectoral Specialization (B)													
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14
ALTA MURGIA	−0.30	−0.42	0.33	−0.33	−0.06	0.50	0.73	−0.02	−0.33	0.44	0.93	−0.43	0.64	0.33	0.86	−0.33	−0.33	0.50	−0.33
GARGANO	−0.33	0.75	0.33	−0.27	0.18	−0.76	−0.37	0.79	0.90	−0.78	−0.33	0.65	−0.13	0.25	−0.24	−0.40	1.00	−0.83	−0.23
MONTI DAUNI	−0.33	−0.42	−0.94	0.93	0.58	0.33	0.17	−0.38	−0.23	0.44	−0.27	0.35	0.14	−0.83	−0.29	0.87	−0.33	0.17	−0.33
SUD SALENTO	0.96	0.08	0.28	−0.33	−0.70	−0.07	−0.53	−0.39	−0.33	−0.11	−0.33	−0.57	−0.66	0.25	−0.33	−0.13	−0.33	0.17	0.89
	Digital divide (C)			Cultural heritage and tourism (D)				Health (E)											
	C1	C2	C3	D1	D2	D3	D4	E1	E2	E3	E4	E5	E6						
ALTA MURGIA	−0.75	0.89	0.24	−0.33	0.27	−0.39	−0.48	−0.49	0.70	0.71	0.92	0.80	−0.72						
GARGANO	0.51	−0.33	0.33	−0.17	0.33	0.81	0.71	0.67	−0.55	−0.55	−0.32	−0.33	0.45						
MONTI DAUNI	−0.04	−0.32	−0.91	0.83	−0.93	−0.37	−0.46	0.31	−0.36	−0.16	−0.33	−0.23	−0.18						
SUD SALENTO	0.28	−0.24	0.33	−0.33	0.33	−0.05	0.23	−0.49	0.21	0.00	−0.27	−0.23	0.45						
	Accessibility (F)			Education (G)															
	F1	F2	G1	G2	G3	G4	G5	G6	G7	G8	G9								
ALTA MURGIA	0.36	0.71	0.33	−0.46	0.50	0.33	−0.33	0.34	0.24	−0.15	0.33								
GARGANO	−0.81	−0.48	0.33	0.41	0.33	0.33	−0.08	0.31	0.72	−0.06	0.30								
MONTI DAUNI	0.39	0.24	−1.00	0.63	0.00	−1.00	0.82	0.21	−0.45	0.72	0.28								
SUD SALENTO	0.06	−0.47	0.33	−0.57	−0.83	0.33	−0.41	−0.86	−0.51	−0.51	−0.92								

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