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Enhancing Cultural Heritage and Slow Tourism via Heterogeneous Data Integration: The Case of Italy.

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Abstract

This study investigates the role of cultural heritage and slow tourism in the recovery and sustainable development of destinations in Italy. The research aims to assess regional performance in terms of tourism capacity, based on the generated employment impact, while considering cultural endowments and tourist itineraries. The adopted methodology employs a quantitative framework grounded on PCA on data from ISTAT's well-being reports. These are integrated with data on UNESCO sites and walking paths catalogued by web-derived specialized reports. Results highlight that tourism capacity is strongly influenced by accommodation variables, while the general endowment of cultural attractors does not uniformly ensure efficiency or occupational benefits across regions. The proposed interpretative model contributes to the understanding of the connections between heterogenous data and can be adapted to other national or regional contexts.

Keywords: *Composite indicators; Principal Component Analysis; Tourism capacity; Equitable and sustainable well-being; Walking paths.*

1. Introduction

Following the unfortunate pandemic crisis, various measures were taken to restore the status quo and gradually restart all affected activities. Although tourism was one of the sectors hit hardest, the strong desire to travel has given the sector's recovery a major boost. Among the many initiatives tailored to the tourism sector, domestic tourism was particularly popular, i.e. travelling within one's own region and then the nation. The idea of rediscovering or getting to know Italian territory, which is rich in culture, history and natural features, was proved to be a winning proposal (Corbisiero & Monaco, 2023). One successful form of this service is slow tourism (Albanese, 2013). This type of tourism satisfies the new travel needs of a public eager to enjoy intense life experiences immersed in nature, discovering places off the beaten track.

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The defining feature of this form of travel is undoubtedly the journey itself. This involves itinerary of cultural, social, religious, artistic and historical interest, which can be travelled on foot or by other non-motorized means. However, when we focus on walking as a concept rather than a physical activity, it takes on greater significance as a symbol of the rebirth of the Italian tourism sector (Cavuta & Di Giovanni, 2024).

Our work aims to face the challenge posed by the increasing availability of digital data–about walking paths, tourist destinations, World Heritage sites visit, and related well-being measures–to transform the several inputs into meaningful synthetic outputs. Retrieving these data from various sources–from institutional to web-based specialized reports–we perform a quantitative approach, using composite indicators and descriptive maps to establish an analytical framework in support of local and national policies.

2. Literature background

Italy is renowned for its well-established historical and cultural tourism. Cultural heritage management requires a multi-scale approach that can integrate the micro-level relating to individual assets or institutions with the meso-level referring to a culturally and geographically homogeneous area (Donato & Gilli, 2011). The broader cultural governance promoted by the Italian Ministry of Cultural Heritage and Activities and Tourism (MiBACT) reform is also moving in this direction. This model aims to integrate cultural institutions more deeply into the local area and encourage collaboration between various public and private stakeholders. It fosters recognition of and pride in local identity, facilitates positive interactions between visitors and residents, empowers communities to make autonomous decisions regarding tourism development strategies, and creates entrepreneurial and employment opportunities.

Italy stands out on a global level both for the number of cultural sites open to visitors, which is among the highest in the world, and for its position in the top five countries for tourist numbers (Goffi et al., 2023). However, the relationship between cultural heritage and tourism is still evolving. Studies showing visitors' strong interest in historical and artistic heritage seems to derive more from the Country's natural appeal and the richness of its heritage than from any real planning or targeted promotion of this tourism segment (Papa, 2007). This is paradoxical, given that Italy has long been a popular destination for travelers, who are attracted not only by individual cultural assets but also by landscapes, architecture, traditions, and history. This has led to Italy being defined as an open-air museum.

While the presence of such resources undoubtedly increases a country's visibility as a tourist destination, the efficiency of Italian tourist destinations, particularly those linked to UNESCO sites, is often uneven or even negative.

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Our study focus is to assess regional tourism performance, using ISTAT data, and to compare it with cultural heritage — as represented by UNESCO sites — to the extent of tourist itineraries, and to employment levels in the sector. To do so, we rely on the widespread use of composite indicators to evaluate Italian local strategies (Bonanno et al., 2025). The main advantage of using these types of measures is their interpretability thanks to their multivariate nature, which captures different aspects of a topic (Cherchye et al., 2007). Principal component analysis (PCA) is of particular interest in this context, especially regarding territorial data applications (Demšar et al., 2013). The results obtained from PCA will be compared with the public value generated by the regions (Kelly et al., 2002).

3. Methodology

Data relating to the tourism sector is available from a variety of sources. For this analysis, however, we rely exclusively on official statistics from ISTAT databases. We use data collected by ISTAT for the Equitable and Sustainable Well-being in Italy (Bes) project, which Italian institutions use as a reference for well-being studies (ISTAT, 2022).

Five tourism-related indicators were selected from two Bes domains: Landscape and Cultural Heritage, and Environment. Additionally, we retrieved data from the ISTAT database on the number of beds available in accommodation facilities and the number of tourists from Italy and other countries. Finally, we selected data on the number of people employed in the tourism related sectors. All indicators refer to 2023, which was the latest year of complete data available at the time of the research, and a description of the variables can be found in Table 1. All the variables, except the employment indicator, were included in PCA.

Table 1. Description of variables. Source: own elaboration.

Variable	Description
Consecutive Dry Days (CDD)	Maximum number of consecutive dry days per time period with daily precipitation amount of less than 1 mm.
Protected natural areas (Protected areas)	Percentage share of terrestrial protected natural areas included in Italian Official List of Protected Areas (Euap) and Natura 2000 Network.
Spread of rural tourism facilities (Rural facilities)	Number of farmhouses per 100 sq.km.
Presence of Historic Parks/Gardens and other Urban Parks recognised of significant public (Historic green)	Percentage ratio of the area of parks and gardens classified as “historic” and/or “of a significant public interest” by the Legislative Decree no. 42/2004 to the total area of the provincial capital Municipalities.

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Density and importance of museums' heritage (Museums)	Number of permanent exhibition facilities per 100 sq.km (museums, archaeological sites, and monuments open to public), weighed by the number of visitors.
Italians arrivals	Number of incoming tourists from Italy.
Foreigners arrivals	Number of incoming tourists from foreign countries.
Bed availability	Number of beds available in accommodation facilities.
Employment	Number of employed in the tourism related sectors (55 ATECO; 79 ATECO).

PCA aims to reduce the number of variables, from p to $m < p$, with the minimum loss of variance. Starting from the standardized data matrix X, with n observations and p variables, the variance-covariance matrix Σ can be defined. This matrix may be decomposed in its eigen structure (Joliffe, 2002):

$$\Sigma = A\Lambda A^t \quad (1)$$

where Λ is the diagonal matrix of eigenvalues and A is the corresponding matrix of eigenvectors and A^t is its transpose. The eigenvalues in Λ, ordered from the higher to the lower, represent the variance of each principal component Y_v. Component scores are obtained by a linear combination of the data and the A_v eigenvectors as:

$$Y_v = XA_v \quad (2)$$

where A_v is the $v-th$ column matrix from A. Its values, named loadings, represents the contribution of each variable in X to the $v-th$ principal component. Only the components that account for the largest part of the variance are considered in the analysis, since the idea is to use less indicators.

A composite indicator can be determined by PCA using eigenvectors of the variance-covariance matrix Σ. Thus, composite indicators are given by the Y_v and first component scores are often used to retrieve a synthetic measure that embed the largest part of the variance.

4. Results

The first principal component accounts for over 40% of the variability in the dataset. Therefore, it is an ideal candidate for constructing a composite indicator. The loadings of this first component are shown in Table 2.

Table 2. Loadings of the first principal component. Source: own elaboration.

Variables	Loadings
Bed availability	0.4818

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Protected areas	-0.0108
Italians arrivals	0.4853
Foreigners arrivals	0.4655
Historic green	0.0146
Museums	0.2285
Rural facilities	0.2210
CDD	-0.1164

Based on these values, the composite indicator can be defined as an indicator of tourism capacity. Figure 1 shows a quantile map of the scores for the first component. Regions with major art cities are clearly well positioned in terms of composite scores.

To verify whether places are attractive due to the creation of public value through job creation (Lu et al., 2020), Figure 2a shows a map of Italy's provinces using the values of employment.



Figure 1. Quantile map of composite indicator scores. Source: own elaboration with software GeoDa.

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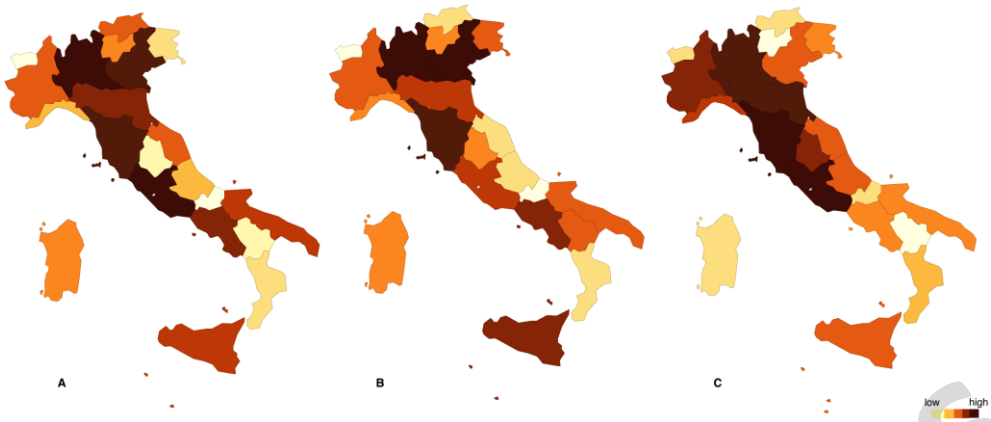


Figure 2. Quantile map of employment values (Panel A), of UNESCO sites distribution (Panel B), and of walking paths surveyed (Panel C). Source: own elaboration with software GeoDa.

We then analyze the correspondence between tourist capacity and employment with the territorial distribution of tourism products. These are represented in this research by Italian UNESCO sites (Figure 2b) and tourist walking paths surveyed (Figure 2c). Including religious, nature, and lesser-known routes — according to official figures from the Ministry of Tourism for 2024 — there are approximately 101 trails. However, integrating these data with web-available specialized reports, over 160 active trails are found and utilized in our analysis (Nanetti, 2024).

4.1. Discussion

Through the loadings in Table 2, it is possible to verify their contribution to the composite indicator. The table contains two types of indicators: those that are directly used to quantify tourism (e.g. bed availability, Italian arrivals and foreign arrivals), which allow tourist flows to be quantified; and those that are not directly used to quantify tourism, but which explain the type of tourist offering (e.g. museums, cultural heritage and historic green spaces, and natural heritage). Of these latter indicators, the museums variable is the most consistent, which is why it has a particular impact on the region's tourism ranking in the composite indicator.

In terms of cartographic analysis, one would theoretically expect to see a correspondence between the map of regional tourism capacity (Figure 1) and the map of employment in the tourism sector by region (Figure 2a) (Crouch & Ritchie, 1999). A comparison of the two maps shows that this is often the case. However, significant differences emerge about insular Italy. Insular regions generally have homogeneous tourism capacity, but not employment levels, with some territories achieving higher employment rates than their neighbors. This enables them to convert tourism attractiveness into employment more effectively than the surrounding territories. Regions with a strong maritime vocation probably find it easier to create jobs due to

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the structure of employment in the tourism sector (Bramwell, 2004). Furthermore, cultural heritage elements such as museums, churches and monuments, as well as walking trails, can also lead to employment opportunities, as they attract tourists who require accommodation and facilities to support their activities.

There is also a high degree of correspondence between the map showing UNESCO sites (Figure 2b) and the composite indicator map (Figure 1). This confirms that, in Italy, the cultural aspect of tourism dynamics largely overlaps with the tourism capacity of the territory. However, this is not always the case. This occurs in island regions where the availability of facilities or places representative of the local cultural heritage is linked to employment, but not to tourism capacity. The presence of cultural representatives does not impact the capacity of the tourism sector, so they do not perform as well as expected. This is consistent with the literature, which states that such resources increase visibility, but not the efficiency, of tourist destinations (Cuccia et al., 2016; Bertacchini et al., 2024).

Instead, when comparing composite indicator results and Italian trails map (Figure 2c), the presence of trails is not particularly relevant to a region's tourist capacity if it is already popular for other types of tourism, such as cultural, seaside or holiday resorts. Regions such as islands base their tourism capacity more on seaside tourism than on the number of trails. However, when a region performs poorly and the trails attract a significant number of tourists, the number of trails can impact the regional ranking (e.g. Umbria and Friuli), improving it.

5. Conclusions

Our analysis based on the integration of several data sources and composite indicators to describe Italian tourism sector it is proved as insightful. In some cases, the presence of sites on the World Heritage List (WHL) is negatively correlated with the regions' technical efficiency. One possible explanation is that, acting as a powerful territorial marketing tool, UNESCO recognition generates excessive expectations among private operators, who tend to overestimate the benefits and expand accommodation capacity and hospitality services disproportionately, resulting in inefficiencies. While a general correspondence was found between high tourism capacity and employment, the research highlighted significant disparities, particularly in insular Italy, where homogeneous tourism capacity does not translate into equal employment levels. The study also emphasized the importance of an integrated methodological approach combining quantitative indicators with territorial and socio-economic factors. According to this approach, the distribution of tourism capacity in Italy is highly polarized, reflecting both the historical significance of well-established cultural destinations and the untapped potential of inland areas and walking routes.

The interdisciplinary study contributes to our understanding of the connections between heritage, sustainability and employment by proposing an interpretative model that can be

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adapted to other national or regional contexts. Indeed, the study informs the ongoing scientific debate by proposing that the abundance of Italian cultural heritage is a necessary, yet insufficient, condition for the success of sustainable tourism.

The practical value of this work lies in its potential to inform enhancement strategies that promote greater territorial equity and the responsible use of cultural resources, while encouraging the diversification of supply. Future research should focus on longitudinal analysis of post-pandemic dynamics, measuring the socio-economic impact of trails, and developing quantitative indicators capable of capturing the contribution of communities to the sustainability of cultural tourism.

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