
Academic Research Paper

Mapping Italy's Tourism Economy: Integrating a Modified Gravity Model and Social Network Analysis

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Abstract:

Purpose - This study maps the spatial structure of Italy's tourism economy across the 20 regional capitals. It identifies central hubs, peripheral nodes and territorial disparities, and considers how the resulting network evidence can inform more coordinated tourism development.

Design/methodology/approach - A DP2 composite tourism economic quality index (Q_i) is combined with a modified gravity model based on multimodal time-distance. The resulting directed city-to-city connection matrix is examined through Social Network Analysis, including in-degree, out-degree, degree, closeness, betweenness, density, global efficiency and total connection strength. **Findings:** Venice records the highest tourism economic quality score ($Q_i = 9.42$) and total connection strength ($T_i = 2,786.65$). Florence, Rome, Milan and Naples also occupy prominent positions, whereas Potenza, Bari, Catanzaro and Campobasso remain peripheral on several centrality measures. Global network efficiency is 0.78, but the distribution of strength is highly concentrated: Venice's T_i is approximately

146 times Campobasso's. **Originality/value:** The contribution is primarily contextual and applied. The study transfers an integrated gravity-model and network-analysis framework to a polycentric national tourism system characterised by strong territorial and transport discontinuities, showing how tourism economic quality and multimodal separation jointly shape hub-and-periphery relations. **Practical implications:** The results support geographically differentiated policies for transport connectivity, interregional destination cooperation, integrated marketing, digital services, workforce development and public-private partnerships, with priority attention to structurally peripheral capitals.

Keywords: Tourism economy; Modified gravity model; Social Network Analysis; DP2 composite indicator; Regional capitals; Italy

JEL Codes: L83; R11; Z32

1. Introduction

Understanding the spatial network structure of the tourism economy in popular destinations necessitates exploring its complex system of geographic elements. These elements encompass cities of differing sizes and hierarchies, channels such as information technologies and transportation networks, and various economic activities related to tourism that function as intermediaries. Through spillover and irradiation effects, the spatial network structure can facilitate the flow of numerous economic variables, such as money, technology, skills, and information, within tourist destinations. Moreover, by strengthening economic ties, this structure may promote spatial integration and coordinated growth among tourist sites (Zhou et al., 2021). As such, to leverage these opportunities and fully grasp their implications, it is crucial to analyse the spatial network structure of the tourism economy.

In recent decades, studies have explored diverse network structures in popular tourist destinations, analysing them from both supply- and demand-oriented perspectives. On the supply side, research has primarily focused on the connections and collaborations among tourism organisations within these areas. Conversely, from the demand side, studies have mainly focused on the movement of tourists and the dynamics of tourism flows. Despite these efforts, a notable gap remains in the literature for evaluating the spatial network structure of tourism activities, particularly in urban agglomerations, as noted by Gan et al. (2021).

Addressing this gap is particularly pertinent in Italy, a geographically dispersed and culturally rich territory that remains underexplored in the literature. The interconnections and relationships among Italy's various urban tourist destinations are vital for facilitating coordinated development of urban clusters to boost tourism.

Italy's captivating appeal, which attracts tens of millions of tourists each year, is rooted in its diverse attractions, including sprawling coastal regions, rich historical and cultural landmarks, world-renowned cuisine, and a pleasant climate. This allure firmly establishes Italy as a cornerstone within the global tourism industry. Despite significant efforts over the past few decades to enhance economic cooperation between cities, there is still substantial room for improvement. Thus, this study focuses on the geographical network structure of the Italian tourism industry to delineate the current situation and foster economic development, which is critical for the global tourism industry's expansion.

The study addresses three questions: how tourism economic quality is distributed among Italy's regional capitals; which capitals occupy central, bridging or peripheral positions in the resulting spatial network; and which policy priorities follow from the observed structure. To answer them, the analysis combines a DP2 composite index, a modified tourism gravity model and Social Network Analysis. The study does not propose a new network metric; its contribution lies in applying and adapting an integrated framework to a geographically discontinuous, polycentric national tourism system.

This design makes it possible to distinguish tourism economic quality from relational position. A city may possess substantial tourism resources yet remain weakly embedded in the wider system, while a well-connected city may act as a broker between otherwise separated destinations. This distinction provides a more precise basis for policies aimed at strengthening regional cooperation and reducing territorial imbalances.

The remainder of the paper is organised as follows. Section 2 reviews the relevant literature and develops the study's positioning. Section 3 describes the case, data and analytical procedure. Section 4 reports the results, Section 5 interprets them and develops policy implications, and Section 6 concludes with the contribution, limitations and future research directions.

2. Literature review and theoretical framework

The increasing significance of networks has sparked extensive academic research that probes the phenomenon from both supply and demand perspectives (Giambona & Grassini, 2020; Pompili et al., 2019). On the supply side, studies have predominantly focused on the network structures of both profit and non-profit tourist organisations (Peeters et al., 2018). From this perspective, research has primarily investigated the relationships and networks among tourism organisations within these destinations (Kumar & Dhir, 2020; Pavlovich, 2014; Valeri & Baggio, 2021). Examples include the cooperative network of travel agencies (Leite et al., 2023; Rusco, 2024), inter-organisational knowledge networks (Raisi et al., 2020), collaborative networks for environmental governance (Farsari, 2023; Roxas et al., 2020), and tourism marketing networks (Wang et al., 2023).

Networks remain crucial for achieving the coordinated development of urban agglomerations for tourism purposes (Hua & Wondirad, 2020; Mariani & Baggio, 2022). These networks have been bolstered by rapid advancements in information technologies, such as mobile phone networks and hyperlinked networks (Herasimovich et al., 2024; Kubo et al., 2020). Innovations in transport and communication technologies have significantly reduced costs, facilitating regional sharing and cooperation by overcoming geographical constraints (Yin et al., 2019). From a demand-side perspective, understanding travellers' mobility behaviour is crucial for examining network structures (Paulino et al., 2021). From this perspective, research has predominantly centred on the patterns of tourism flow (Gidebo, 2021; Kádár & Gede, 2021) and the mobility of tourists (Chen et al., 2022; Paulino & Prats, 2023).

The proliferation of new information technologies, such as social media platforms and online sites, has enabled researchers to gather extensive data on tourists' mobility (Mou et al., 2020). For instance, Asero et al. (2016) argued that digital footprints left by travellers could be used to glean significant behavioural insights and to assess the homogeneity or heterogeneity of trip-related characteristics. The development of information and communication technologies (ICTs) has enriched the data available on tourists' behaviours (Girardin et al., 2008; Mou et al., 2020).

The popularity of travelogues among tourists further allows the capture of comprehensive information about visitor flows (Mou et al., 2020), providing essential big data for tourism research (Kubo et al., 2020; Li et al., 2018). Urban agglomerations have become central to discussions due to the ongoing expansion of cities and metropolitan areas (Leiper, 1979; Liu et al., 2023), which blur boundaries and better connect productive and economic activities through extensive transport and information networks (Liu et al., 2020).

Fang et al. (2020) argue that urban agglomerations should be considered new regional entities fostering spatial integration and industrial growth. Consequently, academic discussions have increasingly examined the spatial network structures within urban agglomerations (Cao & Liu, 2022; Evans-Cowley, 2010). Special attention has been paid to the "tourist spillover effect," where tourism-related economic activities in one area can bolster industrial and economic agglomeration in adjacent cities, thereby enhancing tourism productivity (Bo et al., 2016; Kim et al., 2021).

Additionally, the "tourism radiation effect" has been analysed, highlighting how cities with

considerable development advantages can significantly contribute to the economic growth of other cities through tourism (Wang et al., 2020).

International tourism statistics confirm Italy's continuing prominence as a global destination (World Tourism Organization, 2019). Research on the Italian case has examined regional attractiveness (Giambona & Grassini, 2020), provincial tourism demand and spatial effects (Pompili et al., 2019), tourism's economic impact (Figini & Patuelli, 2022; De Siano & Canale, 2022) and the network position of tourism intermediaries (Valeri & Baggio, 2021). These studies establish that tourism outcomes are spatially uneven and relationally conditioned.

Less attention has been paid to the 20 regional capitals as a single directed national system in which a composite measure of tourism economic quality is combined with multimodal time-distance and node-level network measures. Examining that configuration extends the existing Italian evidence from separate regional or provincial outcomes to the structure of intercity tourism-economic relations.

3. Materials and methods

3.1 Case selection and data

Italy was selected because its tourism economy combines internationally prominent destinations with marked north-south, coastal-inland and mainland-island discontinuities (Musolino, 2018). The capitals of the 20 Italian regions were used as spatial units because they concentrate administrative functions, visitor services and major transport gateways while providing complete national coverage. Figure 1 identifies the cities included in the analysis.

All variables refer to the 2023 observation year. Tourism and accommodation indicators were obtained from ISTAT and harmonised at city level; Eurostat, Banca d'Italia and sectoral publications released or accessed in 2024 were used only where they report or validate 2023 observations. Thus, "2024" in a source label denotes the publication or access year rather than a mixture of observation periods. Scheduled road, rail, high-speed rail, air and maritime travel times were assembled for the same analytical cut-off. No values from a later tourism year were combined with the 2023 city indicators.

Figure 1. Italian regional capitals (Authors' elaboration)



3.2 Modified gravity model and composite tourism economic quality index

Following the spatial-interaction logic of the gravity model (Archer & Shea, 1973; Sen & Smith, 2012), the connection from city i to city j is modelled as directly proportional to the tourism economic quality of the two cities and inversely proportional to their effective separation (Proost & Thisse, 2019):

$$T_{ij} = C_{ij} \frac{Q_i Q_j}{D_{ij}^2} \quad (1)$$

In Equation (1), T_{ij} is the directed tourism-economic connection from city i to city j ; Q_i and Q_j are the corresponding tourism economic quality scores; D_{ij} is multimodal time-distance; and C_{ij} is a directional allocation coefficient. Because a purely Euclidean distance does not represent the accessibility of island and mainland cities in a comparable way, D_{ij} is calculated from observed travel times across the modes available for each pair:

$$D_{ij} = \left(\prod_{m \in M_{ij}} t_{ij}^{(m)} \right)^{1/k_{ij}} \quad (2)$$

In Equation (2), M_{ij} is the set of feasible transport modes between cities i and j ; $t_{ij}(m)$ is the scheduled city-to-city travel time in hours for mode m ; and $k_{ij}=|M_{ij}|$ is the number of available modes. Road, conventional rail, high-speed rail, air and maritime connections were included where feasible. An unavailable mode was omitted from both the product and k_{ij} ; it was not assigned a value of zero. The geometric mean prevents any single mode from determining the effective separation.

For example, Rome-Milan has feasible road, conventional-rail and high-speed-rail connections. For this pair, $k_{ij}=3$ and D_{ij} is the cube root of $t_{ij}(\text{road}) \times t_{ij}(\text{rail}) \times t_{ij}(\text{HSR})$. The same calculation was applied to every city pair using the recorded travel times.

Tourism economic quality Q_i summarises the scale and use of the tourism economy in city i . Following the DP2 approach developed by Pena (1977) and applied in tourism and territorial assessment (Martín et al., 2019; Rossi et al., 2024), the index combines variables expressed in different units while limiting the duplication of information. Table 1 groups the underlying indicators and identifies their sources.

Table 1. Input indicators and data sources (Authors' elaboration)

Simple index	References
Expenditure on tourism trips in rented accommodations	- Pina & Delfa, 2005. - ISTAT: Expenditure on tourism trips in rented accommodations: Type of accommodation, 2023. - Eurostat: Tourism statistics – expenditure, 2024.
Capacity of collective accommodation - municipality data	- Nyns & Schmitz, 2022. - Machado et al., 2020.
Occupancy in collective tourist accommodation - monthly data	- Baldigara & Koic, 2015. - Oses et al., 2016. - ISTAT: Accommodation establishments: Movement of guests in collective accommodation establishments by Occupancy in collective tourist accommodation by type of accommodation—monthly data, 2023.

Simple index	References
Occupancy in collective tourist accommodation - yearly data	- Cavallo et al., 2014. - Tang et al., 2015. - ISTAT: Accommodation establishments: Movement of guests in collective accommodation establishments by Occupancy in collective tourist accommodation by type of accommodation—annual data, 2023. - Banca d'Italia: Indagine sul turismo internazionale, 2024.
Gross and Net rate of bed-places in hotels	- PWC: Hotel market snapshot, 2023. - Eurostat: Net occupancy rate of bed-places and bedrooms in hotels and similar accommodation, 2024.
Tourism indicators - monthly data	- ISTAT: Arrivals, nights spent, average length of stay - Monthly data, 2023. - ETIS: The European Tourism Indicator System, 2016.

The twelve input variables were entered into the DP2 calculation in the following fixed order: (1) tourism expenditure in rented accommodation; (2) collective accommodation establishments; (3) rooms; (4) bed places; (5) monthly arrivals; (6) monthly nights spent; (7) monthly average length of stay; (8) annual arrivals; (9) annual nights spent; (10) annual average length of stay; (11) gross bed-place occupancy rate; and (12) net bed-place occupancy rate. This order, moving from scale to utilisation and intensity, was fixed before the calculation and applied identically to all 20 cities.

For $n=12$ input variables, the tourism economic quality score is calculated as follows:

$$Q_i = \sum_{j=1}^n \frac{d_{ij}}{\sigma_j} (1 - R_{j,j-1,\dots,1}^2), \quad i = 1, \dots, 20 \quad (3)$$

In Equation (3), $d_{ij}=|x_{ij}-\min_i(x_{ij})|$ is city i 's distance from the minimum observed value of variable j , σ_j is the standard deviation of variable j , and $R_{j,j-1,\dots,1}^2$ is the coefficient of determination obtained by regressing variable j on the variables that precede it in the stated order. For $j=1$, R^2 is set to zero, so the first correction factor equals one. Each subsequent factor $(1-R^2)$ discounts information already represented by earlier variables.

The allocation coefficient in Equation (4) makes the matrix directional: $C_{ij}=Q_i/(Q_i+Q_j)$, $C_{ji}=Q_j/(Q_i+Q_j)$, and $C_{ij}+C_{ji}=1$. It therefore assigns the pairwise gravity term between the two directions according to their relative tourism economic quality; it is not a non-directional constant.

$$C_{ij} = \frac{Q_i}{Q_i + Q_j} \quad (4)$$

The total outgoing connection strength of city i is the sum of its directed links to all other cities:

$$T_i = \sum_{j=1, j \neq i}^{20} T_{ij} \quad (5)$$

3.3 Social Network Analysis

The directed T_{ij} matrix was analysed in Gephi using Social Network Analysis (Borgatti et al., 2018). Nodes represent regional capitals and weighted directed edges represent T_{ij} . Centrality values were normalised to the interval $[0,1]$ to support comparison across cities (Gan et al., 2021; Valeri & Baggio, 2021).

- In-degree and out-degree centrality measure, respectively, the incoming and outgoing connections of a node; overall degree centrality summarises its direct connectedness.

- Closeness centrality is the inverse of a node's average directed shortest-path distance to all reachable nodes.
- Betweenness centrality is the proportion of directed shortest paths between other pairs that pass through the focal node.
- Network density is the ratio of observed directed connections to the $n(n-1)$ connections possible without self-loops. Local density reports the corresponding connectedness around a focal node.

Global network efficiency is $E(G)=[1/n(n-1)]\sum_{i \neq j}(1/\ell_{ij})$, where ℓ_{ij} is the directed shortest-path length from i to j ; unreachable pairs contribute zero. The measure ranges from 0 to 1, with higher values indicating that nodes can reach one another through shorter paths. It describes structural reachability, not managerial performance.

For visualisation only, non-zero T_{ij} values were divided at the empirical quartiles of their distribution. The resulting classes were weak [17.32, 36.75], moderate (36.75, 96.82], strong (96.82, 175.95] and very strong (175.95, 463.74]. Quartile cut points were used to avoid imposing external thresholds on a study-specific gravity scale.

4. Results

This section reports the DP2 scores, edge-weight distribution, network-level measures and city-level centralities. Interpretation and policy implications are reserved for Section 5.

4.1 Tourism economic quality

The mean tourism economic quality score was $Q_i=3.87$ (Table 2). The five highest values were recorded for Venice (9.42), Florence (8.86), Milan (8.46), Rome (7.97) and Naples (7.01). Campobasso (0.54), Potenza (0.85) and Aosta (0.97) recorded the three lowest values.

Table 2. Tourism Economic Quality (Q_i) (Authors' elaboration)

City	Q_i	Rank	City	Q_i	Rank
Rome - Lazio	7.97	4	Venice - Veneto	9.42	1
Milan - Lombardia	8.46	3	Trento – Trentino Alto Adige	1.65	15
Naples - Campania	7.01	5	Trieste – Friuli Venezia Giulia	2.52	11
Turin- Piemonte	1.87	14	Cagliari - Sardegna	2.98	10
Palermo - Sicilia	4.76	7	Ancona - Marche	2.43	12
Genoa - Liguria	3.21	9	Perugia - Umbria	1.53	16
Bologna -Emilia-Romagna	5.02	6	Aosta - Valle d'Aosta	0.97	18
Florence -Toscana	8.86	2	Potenza - Basilicata	0.85	19

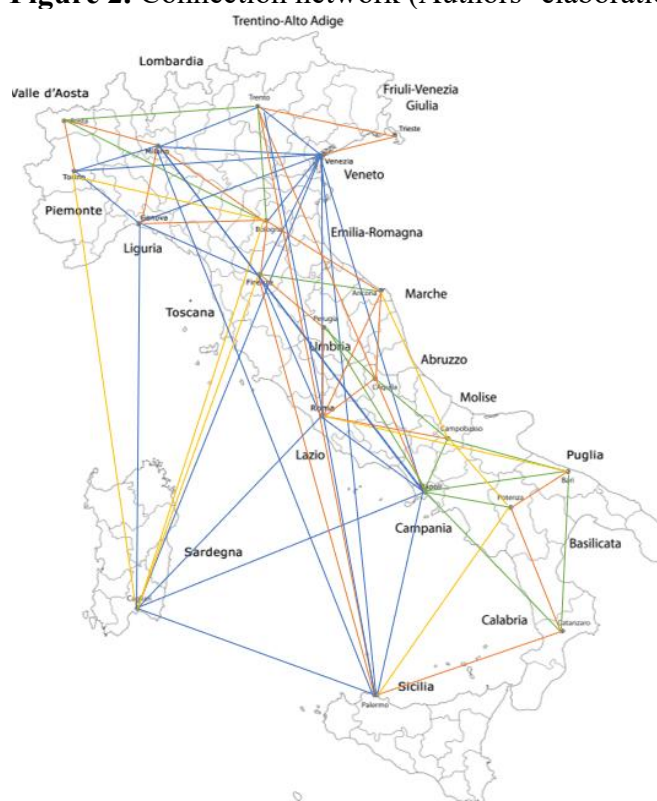
City	Q_i	Rank	City	Q_i	Rank
Bari - Puglia	3.78	8	Campobasso - Molise	0.54	20
Catanzaro - Calabria	1.42	16	L'Aquila - Abruzzo	2.13	13

The northern capitals had an average Q_i of 4.14, above the corresponding averages for the Centre, South and Islands. Table 2 reports the city-level values and ranks; no transport-performance interpretation is attached to Q_i because the index is constructed from tourism expenditure, accommodation capacity, occupancy and visitor-flow variables.

4.2 Spatial connections and network-level measures

Figure 2 displays the directed network generated from the T_{ij} matrix. Nodes are cities and edges are city-pair connection strengths. Edge colours reproduce the quartile classes defined in Section 3.3: weak, moderate, strong and very strong.

Figure 2. Connection network (Authors' elaboration)



Venice, Florence, Rome and Palermo had the largest numbers of displayed connections. The three highest edge weights were observed for Venice-Rome, Rome-Palermo and Milan-Naples. Connections were also present between several geographically adjacent cities.

The local density values for Bari and Potenza were 0.093 and 0.141, respectively.

Global network efficiency was 0.78.

The northern subnetwork containing Venice and Bologna had a density of 0.46, the highest of the geographical groupings examined.

4.3 Node centrality and total strength

Table 3 reports the normalised city-level centralities. Venice recorded the maximum in-degree, degree, closeness and betweenness values (1.00). Florence and Rome had the next-highest in-degree values (0.98 and 0.85), while their out-degree values were 0.71 and 0.74.

Table 3. Network analysis (Authors' Elaboration)

City	In-degree	Out-degree	Degree	Closeness	Betweenness
Rome - Lazio	0.85	0.74	0.94	0.84	0.31
Milan - Lombardia	0.74	0.57	0.36	0.54	0.13
Naples - Campania	0.63	0.59	0.57	0.35	0.09
Turin- Piemonte	0.52	0.42	0.23	0.25	0.08
Palermo - Sicilia	0.57	0.41	0.23	0.28	0.03
Genoa - Liguria	0.61	0.63	0.14	0.41	0.02
Bologna -Emilia-Romagna	0.47	0.36	0.43	0.57	0.05
Florence -Toscana	0.98	0.71	0.44	0.63	0.23
Bari - Puglia	0.00	0.07	0.00	0.24	0.00
Catanzaro - Calabria	0.00	0.05	0.00	0.16	0.00
Venice - Veneto	1.00	0.85	1.00	1.00	1.00
Trento – Trentino Alto Adige	0.37	0.25	0.14	0.27	0.00
Trieste – Friuli Venezia Giulia	0.29	0.19	0.08	0.26	0.00

City	In-degree	Out-degree	Degree	Closeness	Betweenness
Cagliari - Sardegna	0.51	0.45	0.18	0.31	0.00
Ancona - Marche	0.39	0.25	0.08	0.17	0.00
Perugia - Umbria	0.37	0.28	0.04	0.28	0.02
Aosta - Valle d'Aosta	0.18	0.21	0.03	0.14	0.00
Potenza - Basilicata	0.00	0.09	0.00	0.09	0.00
Campobasso - Molise	0.00	0.00	0.00	0.07	0.00
L'Aquila - Abruzzo	0.24	0.17	0.02	0.11	0.00

Potenza, Bari, Catanzaro and Campobasso had an in-degree value of 0. The mean overall degree centrality was 0.25; six cities exceeded it: Venice, Rome, Naples, Milan, Florence and Bologna.

Mean closeness centrality was 0.35. Seven cities were above that mean: Venice, Rome, Florence, Bologna, Milan, Genoa and Naples.

Mean betweenness centrality was 0.10. Venice (1.00), Rome (0.31), Florence (0.23) and Milan (0.13) were the only cities above the mean.

Total outgoing connection strength T_i ranged from 19.04 for Campobasso to 2,786.65 for Venice (Table 4). Venice's value was approximately 146 times Campobasso's. Rome (1,984.28), Milan (1,432.98), Florence (1,401.09) and Naples (1,087.45) completed the top five.

Table 4. Total outgoing connection strength (T_i) (Authors' elaboration)

City	T_i
Rome - Lazio	1984.28
Milan - Lombardia	1432.98
Naples - Campania	1087.45
Turin- Piemonte	452.12

City	T_i
Palermo - Sicilia	785.33
Genoa - Liguria	326.24
Bologna-Emilia Romagna	664.38
Florence -Toscana	1401.09
Bari - Puglia	95.93
Catanzaro - Calabria	42.04
Venice - Veneto	2786.65
Trento - Trentino Alto Adige	75.09
Trieste - Friuli Venezia Giulia	64.86
Cagliari - Sardegna	152.96
Ancona - Marche	86.95
Perugia - Umbria	64.86
Aosta - Valle d'Aosta	31.57
Potenza - Basilicata	25.97
Campobasso - Molise	19.04
L'Aquila - Abruzzo	20.06

5. Discussion

5.1 Interpretation and comparison with prior research

The results show a hub-and-periphery structure rather than an evenly integrated national tourism network. Venice, Florence, Rome and Milan combine high Q_i values with strong centrality, whereas several southern and inland capitals occupy weak positions on both direct connectivity and brokerage. This pattern is consistent with evidence of persistent territorial disparities in Italian tourism (Giambona & Grassini, 2020; Musolino, 2018) and with De Siano and Canale's (2022) finding that tourism's growth effects vary across Italian provinces.

The findings also refine the comparison with Gan et al. (2021). Both studies identify concentrated tourism-economic networks in which a small group of cities organise flows for a wider territory. In the Italian case, however, the concentration is particularly visible in the 146:1 ratio between Venice and Campobasso in T_i and in the zero in-degree values of four capitals. The national scale, island-mainland discontinuities and pronounced variation in multimodal accessibility produce a more fragmented structure than a contiguous urban-agglomeration setting.

Global efficiency of 0.78 should therefore be read alongside, rather than instead of, the unequal node-level results. The network provides relatively short paths among reachable cities, but those paths depend disproportionately on a few hubs. High efficiency does not imply that connections are “managed efficiently”; it indicates structural reachability. Likewise, Q_i measures tourism expenditure, capacity, occupancy and visitor use, not satisfaction or environmental sustainability.

The theoretical contribution is to distinguish three related but non-equivalent properties of a destination system: tourism economic quality, direct relational strength and brokerage position. Applying the gravity-SNA framework to a polycentric national setting shows that resource endowment does not automatically translate into network integration and that multimodal separation can reinforce peripheral lock-in. The contribution is an applied extension and contextual test of an established framework rather than a claim to a new analytical method.

5.2 Practical and policy implications

Policy priorities should follow the type of disadvantage revealed by the network. For capitals with low Q_i and low centrality, including Potenza, Catanzaro and Campobasso, the first priority is to strengthen the local tourism base and access to major gateways. Competitive grants, coordinated rail and coach timetables, last-mile services and joint itineraries with nearby hubs are more directly connected to the evidence than undifferentiated national promotion. Bari requires a more nuanced approach: its tourism base is stronger than those of the lowest-ranked cities, but its low local density indicates a need for intercity route and product integration.

A second priority is coordinated destination management. National and interregional campaigns can distribute attention beyond the most established cities when they market bookable multi-city routes rather than isolated attractions. Shared digital platforms, interoperable visitor information and data exchange among destination management organisations can reduce search and coordination costs. Training in hospitality, languages and digital service delivery, together with public-private-university partnerships, can support implementation in destinations where organisational capacity is limited.

Finally, redistribution should not be pursued by reproducing congestion elsewhere. Infrastructure and marketing interventions should be linked to carrying-capacity monitoring, resident consultation and environmental standards for accommodation and mobility. These measures connect the network evidence to a practical objective: increasing peripheral participation while protecting the natural and cultural assets on which Italy's tourism economy depends.

6. Conclusions

This study combined a DP2 tourism economic quality index, a multimodal gravity model and Social Network Analysis to examine connections among Italy's 20 regional capitals. The results identify a concentrated structure led by Venice, Florence, Rome, Milan and Naples and a group of weakly embedded capitals, especially Potenza, Bari, Catanzaro and Campobasso. The contrast between global efficiency and unequal city-level strength shows that national reachability can coexist with substantial territorial imbalance.

6.1 Theoretical and practical implications

Theoretically, the study shows why destination quality, direct connectivity and brokerage should be analysed separately: they capture different mechanisms through which cities participate in a tourism system. Practically, the evidence supports targeted investment in connectivity, interregional products,

shared digital services, workforce capabilities and collaborative governance. Section 5.2 sets out these measures and links each to the type of network disadvantage observed.

6.2 Limitations and future research

The analysis has three main limitations. First, it relies on aggregate quantitative indicators and therefore does not capture resident attitudes, visitor motivations or the quality of interorganisational collaboration. Second, the 20 regional capitals provide consistent national coverage but do not represent every tourism district or non-capital destination. Third, the cross-sectional 2023 design identifies structure rather than causal effects or changes over time.

Future research could combine the network measures with interviews involving destination managers and operators, extend the nodes to provincial or functional tourism areas, and use longitudinal data to test how infrastructure and policy interventions alter centrality. Comparative applications in other polycentric countries would help assess transferability. Artificial intelligence, mobility data and augmented-reality services may also be examined as mechanisms that change intercity information flows, but their effects should be evaluated rather than assumed (Sotiriadis & Gursoy, 2023).

Despite these limitations, the integrated framework offers a replicable way to locate hubs, brokers and peripheral nodes within a national tourism economy. It thereby provides a more differentiated basis for destination policy than rankings of tourism performance alone (Casanueva et al., 2014).

Conflict of interest

The authors declare no conflicts of interest.

Funding

This research received no external funding.

Ethics statement

Ethical approval and informed consent were not required because the study uses publicly available, aggregate secondary data and involves no human participants or personal data.

Data availability statement

The public data sources used in the study are identified in Table 1 and the reference list. The derived city-level matrices and calculation details are available from the authors upon reasonable request.

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Figures 1 and 2 are the authors' own elaborations; no third-party permissions are required.

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