TURISTICA
Italian Journal of Tourism

TIJT, Volume 32(3): 61-78
ISSN (print): 1974-2207
ISSN (online): 3034-9842
Received: 11.01.2024
Revised: 31.01.2024
Accepted: 25.02.2024
Published: 27.02.2024

Academic Research Paper

Mapping the Tourism Industry: Insights and Implications

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Abstract: This research offers a holistic view of the tourism industry by addressing data scarcity and classification complexities. Central to this framework is the ATECO 2007 classification, spotlighting core sectors like: accommodation, food and beverage services, travel agencies but also agritourism that are often, wrongly, categorized under the agricultural sector. Methodologically, the study consolidates data from diverse sources and collaborates with regional entities to rectify classification discrepancies and fill informational gaps. We propose effective solutions, introducing imputation methods able to rectify cases where data on employed individuals is absent for specific local units. By applying our integration and imputation procedure to the provinces of Emilia-Romagna, we obtain a more accurate description of the tourism industry that better aligns with the theoretical framework of a sector at the intersection of core and extra-core sectors. The higher employment and the different spatial distribution we found may serves as a foundation for informed policy decisions and targeted policy formulation to promote economic growth, job creation, and sustainable tourism practices.

Keywords: *Tourism employment; Missing data imputation; Statistical archives' integration; Agritourism; Emilia-Romagna region*.

JEL Codes: Z32; C38; J21; M21; O18

1. Introduction

Tourism is one of the most important and dynamic sectors in modern economies. By taking as reference 2019, the last year before the global economy was disrupted by the pandemic crisis, tourism

globally counted for more than 1.4 billion international arrivals, receipts from international tourism surpassed $1,400 billion (€1,323 billion), and the sector was estimated to be the third most significant contributor to the aggregate world exports, right after energy, and chemical products (UNWTO, 2020). In addition, tourism is estimated to contribute more than 10% of the global GDP (of which around 5% is its direct contribution) and 10% (333 million jobs) to world employment (WTTC, 2022). In Italy, tourism directly accounted for almost 6% of the GDP before the COVID-19 pandemic (ISTAT, 2022) This percentage increases to 8.7% when considering the indirect contribution as well (Figini & Patuelli, 2022).

The significance of the social and economic impact of tourism relies on the prior identification of the tourism sector and its businesses. In this regards it is essential to map out tourism firms. This mapping process primarily focuses on hotels, accommodation structures, restaurants, and travel agencies. However, there are other sectors and dimensions related to tourism that are equally important when evaluating the development and improvement of regional tourism ecosystems.

Identifying and integrating these additional dimensions in a comprehensive manner is not a simple task, mainly because official statistics collect information in different databases with varying definitions and purposes (Antolini & Grassini, 2020). The difficulty in integrating information from different archives, can lead to biases when mapping the consistency of the tourism industry and employment at the provincial (NUTS3) and municipal (LAU2) levels. The territorial detail is particularly important in a country like Italy where tourism governance is largely devolved to regions (NUTS2), with sub-regional public bodies playing a crucial role in implementing the policies. In other words, policymakers and practitioners require detailed spatial information on the main characteristics of the tourism supply chain, which is not always guaranteed by the official databases of enterprise statistics at the local unit level (LU).

Our purpose is to develop a theoretical framework that highlights the importance of tailor-made policies. According to us, these policies should possess three key attributes: firstly, they must be specific to different tourism products; secondly, they should involve clustering tourist destinations, and finally, they should enable the integration of tourism enterprises within the supply chain. We are convinced that this approach is crucial for effectively handling the intricate relationships among businesses, market players, and public institutions across all levels.

The primary goal of this paper is to map the tourism industry. Firstly, we propose theoretical guidelines to address the problem of missing data on employment and ATECO (economic activity classification) in the LUs-statistics at municipal level, as well as the lack of integration with archives on the rural tourism industry. Then, we apply the suggested methodology to the case study of the provinces of the Emilia-Romagna region, an Italian area globally recognized for its tourism supply. The proposed imputation procedure results in a significant increase in the numerical importance of the regional tourism ecosystem.

Mapping this ecosystem using quantitative tools is challenging, yet it's an indispensable step in supporting socio-economic policies capable of achieving a wide range of goals, not least the pursuit of UN Agenda 2030 objectives and the SDGs. Especially regarding sustainability, a focal point in economic, social, and political discourse, achieving the six environmental objectives of the European Taxonomy prompts a need to streamline the theoretical framework. This can be effectively accomplished considering that pivotal sectors like hospitality and catering play a significant role in activities such as mitigation, adaptation, and restoration.

2. Theoretical framework for mapping the tourism industry.

Tourism product appears as a heterogeneous bundle composed of many services belonging to different

economic sectors. Therefore, tourism industry can be identified at the intersection of enterprises operating in traditional industries, where the intersection occurs based on the share of their output demanded by tourists. That is, the focus to define a tourism enterprise is not on production technology or substitutability of goods but rather on the consumption patterns of tourists.

In line with this "official" assumption, we see the tourism industry as the sum of "core" enterprises whose main output aligns with the UNWTO definition of tourism (i.e, accommodation, food and beverage service activities and travel agencies, tour operators and other reservation services) and "extra-core" enterprises, associated with specific activities that are only relevant to certain tourism segments; e.g., medical and orthopedic shops in case of the medical tourism segment. From now on we formally identify the "core" part of the tourism industry by considering all the enterprises associated to the different sub-categories of the two-digit ATECO sectors: "55" Accommodation; "56" Food and beverage service activities and "79" Travel agencies, tour operators and other reservation services. The ATECO code serves as a key identifier used by various institutions, including the national office of statistics (ISTAT), the tax authorities (AdE) for tax reference, and the social security agency (INPS) for social security contributions. Therefore, we will utilize this code as the basis for mapping the tourism industry. However, we propose integrating agritourisms into the core sectors, considering them as integral parts of both the food and accommodation industries. These establishments heavily rely on selling products to tourists, aligning with the concept introduced by Smith (1988), which fully associates them with the core of the tourism industry, even if they are classified with ATECO codes related to the agricultural sector in official statistics.

The proposed mapping of tourism enterprises aligns with a broader framework (e.g., UNWTO, 2014) and contributes to the discourse on measuring tourism supply and employment at the provincial (NUTS3) and municipal (LAU2) levels. However, the scarcity of archives with sufficient spatial detail adds complexity to the mapping process, particularly in a country like Italy, where local administrations play a crucial role in defining and implementing tourism policies. To gain a comprehensive understanding of the main structural features of the tourism industry at a disaggregated spatial level, valuable insights can be obtained by consulting and integrating three types of data: administrative data, survey data, and big data from the internet.

Administrative data is information on micro level units based on files from local administrative systems. It may also be called register data. They are data sets collected by government institutions or agencies for tax, benefit or public administration purposes (UNECE, 2011). The data is thus secondary in nature and variables recorded by administrative registry systems are inherently limited to those required for administrative purposes, such as tax payment programs. Moreover, this data might not be specifically tailored for statistical purposes and consequently often requires processing before it can be utilized for statistical analysis. Overall, we need to remember the purpose for which administrative data are collected, which may have a significant impact on their usefulness in term of number of the recorded variables, adopted definitions and coverage of the tourism sector; in a nutshell: data quality issues.

Survey data is collected specifically for statistical purposes. According to Penneck (2007) surveys differ from administrative data. That is, they are specifically designed for analytical purposes, so coverage of population, definitions, methodology and time can be designed to meet these analytic needs. Big data is data that contains greater variety, arriving in increasing volumes and with more velocity (the *three Vs*). The information on micro level units is supplied voluntarily without any sample design and - sometimes - filtered by the internet provider preventing "standard" statistical analysis, particularly with reference to inferential procedures (Lazer et al., 2014).

Survey data are richer but their sample size might be a problem since large-scale surveys are expensive and small-scale surveys have limited use. Samples are also subject to errors and non-response bias. A fortiori the same limit applies to big data from the internet. In addition, as mentioned by Penneck (op.cit), we cannot be sure of the accuracy of business survey responses, compared, for example, with the administrative data collected for tax purposes. However, administrative data is often seen by respondents as a part of the administrative process rather than as an additional statistical burden.

Despite the theoretical advancement there are few existing archives allowing to map the tourism enterprises along with their main characteristics. In Table 1 we briefly introduce these archives distinguishing between official and unofficial archives.

Table 1. Main archives to map the tourism enterprises along their quality dimensions

Source of data	Timeliness	Relevance	Accessibility	Spatial /ATECO reference
Enterprise Censuses	2018	Enterprises censuses inform about Local Units' consistency and employment. Were used to identify tourism local systems (Lazzeretti & Capone, 2008). Nowadays permanent Census offers many qualitative information as actions and strategies pursued by enterprises for sustainability, employee's well-being and to benefit the territory.	ISTAT (2023)	Aggregate data. Regional (NUTS2) detail and 4 digit ATECO. At NUTS3 level few ATECO
ASIA and ASIA-UL national register	2020	A basic census updated year after year through a survey on the local units of large companies. SME and un-respondents' structural variables are updated through statistical models. Local Units' employment (size and information on demographics such as gender, age, place of birth and job title), economic activity and consistency (number).	Aggregate data: ISTAT (2023a) Individual data: only available by agreement	Aggregate and individual data by municipality and ATECO full digits available
Unioncamere's Business Register	2021	Local Units' demography, economic activity, typology (headquarter or branch) and consistency (number)	Only available for a fee or by agreement Unioncamere (2022)	Individual data by municipality and ATECO full digits
INPS's register	2021	Monthly quarterly and annual Local Units and enterprises' employment (detailed by gender, age, place of birth and employment relationship.	Only available for a fee or by agreement	Individual data by municipality and ATECO full digits
ISTAT's surveys/statistics	2022	Official data on consistency for Hotels and similar accommodation (with structural characteristics) Number of apartments and short-stay houses offered by private individuals (registered for tax purposes). Data subject to underestimation: (see Guizzardi et al 2012)	Regione Emilia Romagna (2023)	Aggregate data by municipality Private bodies (without ATECO)
Regione Emilia Romagna	2022	Map of agritourism (accommodations and restaurants) by location, size, services offered, and hospitality quality."	Department of Agriculture (2022). Data only available by agreement	Individual data by municipality
Big data (AIRBNB)	Real time	Apartments and houses for short stays offered by private individuals (number and structural characteristics, stars and offered services). Prices.	Data available for a fee Possible API to download data by making agreements.	Individual data by Municipality (without ATECO)
Ospitalità Religiosa Italiana, non-profit. (private register)	2023	A basic nationwide yearly census of religious facilities that categorizes religious accommodations within 4 categories: lay with commercial purposes, religious-only, religious with lay management, and lay, non-profit (the first two that are facilities without-ATECO).	Only available by agreement	Individual data by Municipality (with and without ATECO)

Source: Author's Elaboration

Overall, administrative data, survey data and big data prove highly valuable in mapping tourist

businesses as they require data from individuals, allowing the respondents to be classified on the basis of their economic activity and spatial location.

Starting from the 2-digits ATECO 2007 classification, in Table 2 we report the sub-categories ATECO codes together with the aggregations suggested to map the tourism industry. These aggregations are intended to consider the trade-off detail and synthesis of the mapping produced at different sub-regional levels (Provinces – NUTS3 between – and municipalities). The combination of sub-categories within ATECO codes and a provincial or municipal territorial reference, as shown in Table 2, represents an essential aspect to ensure that our mapping has the ability to meet the previously highlighted requirements. Specifically, the mapping should enable capturing specific aspects of different tourism products and facilitate both clustering tourist destinations and integrating enterprises into the supply chain.

Table 2. ATECO codes description ("core" industries in tourism) and classification codes suggested for mapping of the tourism industries at NUTS3 and Municipal levels.

Macrosector	Sector	Classification (NUTS 3)	Classific. (Municip.)
55 Accom_ modation	55.10 Hotels and similar accommod.	55.10 Hotels and similar accommod.	55.1 Hotels and sim. acc.
	55.20.1 Resorts	55.20.x Resorts, hostels, refuges	55.x Other accommod. structures and camping grounds
	55.20.2 Hostels		
	55.20.3 Mountain refuges		
	55.20.4 marine camps		
	55.20.5 Holidays apart. and B&B	55.20.5 Holidays apart. and B&B	
	55.20.52 Accommod. in agritourism	55.20.52 Accommod. in agrit.	
	55.3 Camp. grounds, recreat. v, trailer p.	55.3 Camping gr, recr. vehicle and trailer parks	
	55.90 Other accommodation	55.90 Other accommodation	
56 Food and beverage service activities	56.10.1 Restaurants	56.10.1 Restaurants	56.10.1x Restaurants
	56.10.12 Restaurants in agritourism	56.10.12 Restaurants in agritourism	
	56.10.2 Take away restaurants	56.10.2 Take away restaurants	56.x Take away restaurants and event catering activities
	56.21 Event catering activities	56.21 Event catering activities	
	56.10.3 Ice cream and pastry shops	56.10.3 Ice cream and pastry shops	56.10.x Ice cream and pastry shops and Mobile food service activities
	56.10.41 Mobile food service activities	56.10.4x Mobile food service activities	
	56.10.42 Food service on board		
	56.3 Beverage serving activities	56.3 Beverage serving activities	56.3 Beverage serv. act.
	56.29 Other food service activities	56.29 Other food service activities	xx Other food service activities, travel agency, tour oper. and other reservation service
79 Travel ag., tour oper. and other res. serv.	79.1 Travel ag. and tour oper. Activ.	79.x Travel agency, tour oper. and other reservation service	
	79.9 Other reservation service		

Source: Author's Elaboration

Once the boundaries and goals of the mapping are defined, the next aspect that requires particular attention is represented by local units (LU), i.e., a place of work such as a factory, shop, or branch situated in a geographically identified area. These are defined as the smallest combination of legal units (usually based on VAT) that possess a certain degree of autonomy within an enterprise group. It is important to underline that according to the definition of local unit adopted in the European Council regulation No. 696 of 15 March 1993 – annex F, save for certain exceptions, a local unit is manned by at least one person, even part-time (i.e. it should not exist a local unit without staff). It is also worth to note that ATECO codes are also available for local units.

Our mapping of tourism businesses does not stop at identifying the number of enterprises but

extends to a second dimension, that of employment. In this regard, a further complication arises from the fact that, considering the nature of tourism, especially due to its strong seasonality, the count of employed individuals needs to be available with sub-annual granularity. Not all the archives provide such detailed information, hence necessitating to combine different sources.

In the mapping of employees within tourism enterprises, a typical issue encountered in statistical surveys arises—namely, the presence of missing data. Under the label of 'missing data,' there are various types and scenarios, each often requiring distinct solutions. Firstly, we must differentiate between missing data due to unobservability, missing data due to errors, and missing data resulting from survey-related issues.

To ensure the effectiveness of mapping tourism businesses, it's crucial that employment mapping is conducted not at the enterprise level but rather at the level of local units. In this regard, a significantly notable number of local units lack information regarding employed individuals. A typical example of local units with missing data due to survey-related issues refers to the concepts and definitions of the recorded variables, that being driven by legislation, do not necessarily match what we require for social or economic analysis. For example, the INPS administrative dataset record consistency of employed people (on monthly and quarterly base) only at the enterprise and municipality level. A serious consequence of this registration system is that the total enterprise's staff working in a municipality is not specifically allocated to its technologically homogeneous productive units (its local units). This prevents knowing how many personnel units work in each single local unit when an enterprise has several local units in a municipality leaving, in practice, many local units at zero staff. More in general the issue of local units without staff also occurs for local units of enterprises that employs personnel registered in other municipalities or in local units with an ATECO code that it is extra-core for this analysis of the tourism sector. The issue of local units without employees is tackled in the next Section.

3. Methods for mapping tourism enterprises

According to our mapping objectives, we suggest to integrate information on the core sectors (ATECO 55, 56, and 79) with information on agritourisms keeping the analysis disaggregated at sub-categories level (see Table 2) and the provincial and municipal territorial reference.

The operational phase of enterprise mapping encounters certain practical difficulties. Firstly, not all local units have an available ATECO classification, or a detailed ATECO classification as shown in Table 2. In some cases, certain local units are classified under the ATECO 55, 56, or 79, but they should be attributed to other ATECO sectors. When faced with either a too broad (with few digits) or missing ATECO classification, the local units belonging to the same company were assigned the ATECO code of the company. Additionally, it is possible to conduct an internet search to infer the nature of the business, thereby obtaining the necessary information to "fix" or "detail" the ATECO classification of these local units.

Furthermore, there may be local units active in the tourism industry that are classified in sectors different from ATECO 55, 56, or 79. Agritourisms are a typical example. By referring to lists of farmhouses available from industry associations, tourist promotion entities, and public institutions, it is possible to identify these local units classified within the agricultural sector, even though they are significantly and often predominantly engaged in restaurant and/or accommodation activities.

Moving to the second dimension of our mapping, employment, we encounter one of the most critical aspects in mapping tourism enterprises using administrative data: the presence of local units without employees. There are various potential causes for local units without employees in administrative datasets,

and not all of them carry the same weight or consequences. From the perspective of mapping tourism enterprises, we identify two main categories. Firstly, the absence of employees in some local units can be attributed to simplification needs. Reporting an aggregated employment figure (leaving others local units without employees) allows enterprises to meet the reporting obligations in a simpler way respect to multiple declarations for each LU. Secondly, the absence of employees in certain LU may be due to errors or missed communications. It is crucial to differentiate between these two categories to achieve an accurate mapping of the tourism industry.

We observe the following most significant and common situations that should be managed in order to obtain an accurate representation of the industry's employment.

A. an enterprise has multiple local units within a municipality (any ATECO), yet its workforce is assigned to a single unit (or not distributed across all units);
B. an enterprise operates one or multiple local units within a municipality, but no employees are registered in any of these local units. We observe this could happen in case the labour units are associated to a registered office outside the territorial breakdown (state, region, province, etc.) under analysis.

To address the issues posed by local units without employees, we look at all the LUs belonging to any enterprise with at least one local unit operating in the analysed territorial breakdown, even if active outside of it or classified under extra-core ATECO codes. Then we developed an imputation rule divided into several steps.

With respect to situation A, we propose two solutions based on the average number of employees per local unit within the municipality.

A1. If the average number of employees is equal to or greater than 0.5, each LU within the municipality is assigned the average number of employees, considering the percentage of opening days in the year of each LU.
A2. If the average number of employees is less than 0.5, the enterprise is considered to have no employees within the municipality, and we move on to the solutions proposed for situation B.

With respect to situation B, when no employed people are reported for that enterprise in the municipality, then we impute data on employment according to two scenarios:

B1. Staff units are imputed by considering the average size of local units within the province operating in the same ATECO category. This assumes a correction of a registration error or a missed declaration at public offices, resulting in an increase in employees within the municipality.
B2. If there is a LU of the same enterprise in the region with employees, it is assumed that all employees are declared in a single municipality for convenience.

In this case, the imputation is done by distributing these employees among the LUs in the territorial breakdown proportionally to their activity percentage in the year (thus, the total employees per enterprise remain unchanged). If the number of employees allocated to different LUs is less than 0.5 employees (per local unit working 100% of the year), the value is imputed by considering the average size of LUs within the province operating in the same ATECO category. This leads to an increase in

employees, although it is smaller due to the reduced number of local units with zero employees after the data distribution.

The imputation procedure described above helps address issues such as having staff concentrated only in one LU, but it also exposes the risk of two types of errors. On one hand, it may overestimate the employees in the tourism sector when large companies (with thousands of employees) diversify into bars or restaurants, leading to an unrealistic number of employees attributed based on the number of active LUs in the municipality. The same situation also arises for some very large agricultural companies opening agritourism facilities. However, underestimations are also possible; for instance, an agricultural company with one employee opening an agritourism facility sees only half of a personnel unit attributed. On the other hand, it may bias the relative weight of the industries classified under the core ATECO codes. It is the case of bars or restaurants belonging to large companies (typically collective catering, management companies, or nursing homes classified as hotels) resulting in outcomes like bars with more than 20 employees.

These errors are difficult to correct unless each data point is individually considered, making subjective assumptions about the size of the LUs. In the next section, the theoretical framework outlined in Section 2 and the methodological guidelines illustrated in Section 3 are utilized for the analysis of a case study, the mapping of tourism enterprises in the Emilia-Romagna region.

4. Data and Results

The tourism industry plays a vital role in the Emilia-Romagna region, contributing significantly to its economy. However, the significance of the tourism industry in the region extends beyond economic benefits. It plays a crucial role in preserving and promoting the region's cultural identity, supporting local businesses, and creating employment opportunities. The industry also contributes to the sustainable development of the region, as the region maintains a commitment to providing high-quality services while balancing tourism growth and environmental conservation. Being able to leverage public archives to produce a mapping that represents the spatial articulation of the sector as closely as possible is therefore an important objective for policy makers (Antolini & Grassini, op.cit.).

4.1 Mapping tourism enterprises

Our first step to carry out the mapping of tourist businesses is to combine the UNIONCAMERE and INPS business registers with the valuable support of ART-ER, a regional body which already has proven systems for matching these administrative archives. That way we are able to focus on the main pillars dimensions of a tourism enterprise mapping: the spatial distribution of the local units (number) and the occupation. We consider all enterprises active for at least 1 day in the year 2021. In this way, the framework accurately represents the databases provided to us. We opted not to establish a minimum threshold to define an LU as active, given the minimal impact of enterprises active for less than a month (they represent 1.5% of the total, with only 0.9% being active for less than 15 days).

The initial point of mapping addresses the issue of tourism size, and therefore, the first information investigated is the number of tourism businesses. Referring to the breakdown provided in Table 2, Table 3 presents the number of local units operating in various sub-sectors of the tourism industry in Emilia-Romagna. We begin by extracting all LUs of enterprises with codes 55, 56, and 79. The result is 42.507 LUs. However, when the goal is to map the NUTS3 of the tourism industry in detail, several problems arise:

a) Some LUs (507) are classified too generically (using only 2 or 3 digits of the ATECO classification).
b) Another 103 LUs are present without ATECO. They are included in the database because they belong to enterprises classified under ATECO 55, 56, or 79.
c) Some LUs are misclassified, particularly care homes (RSAs), which should fall under ATECO 87.30 but are sometime categorized as ATECO 55.1.
d) The number of accommodations in agritourism (76) and restaurants in agritourism (195) is very low compared to the number of LUs that have requested promotion as agritourism according to the ER region's website (Department of Agriculture, 2022) .

Table 3. Number of local units operating in various sub-sectors of the tourism industry in Emilia-Romagna.

ATECO	Business register's (BR) data	New classification and agritourism inclusion	Diff.	Diff. %
55.1 Hotels and similar accommod.	5052	5063	11	0,2%
55.20.5 Holidays apart. and B&B	2058	2063	5	0,2%
55.20.52 Accommod. in agritourism	76	708	632	831,6%
55.20.x Resorts, hostels, refuges	138	168	30	21,7%
55.3 Camping grounds, recreat. vehicle and trailer parks	141	141	0	0,0%
55.90 Other accommodation	43	43	0	0,0%
56.10.11 Restaurants	11806	12220	414	3,5%
56.10.12 Restaurants in agritourism	195	521	326	167,2%
56.10.2 Take away restaurants	4956	4969	13	0,3%
56.10.3 Ice cream and pastry shops	2026	2033	7	0,3%
56.10.4x Mobile food service activities	284	284	0	0,0%
56.21 Event catering activities	181	186	5	2,8%
56.29 Other food service activities	640	718	78	12,2%
56.3 Beverage serving activities	14863	14910	47	0,3%
79.x Travel agency, tour oper. and other reserv. Serv.	48	48	0	0,0%
Sub total (LUs)	**42507**	**44075**	**1568**	**3,7%**
LUs from the agritourism database (classified as agricultural local units by the BR)	958			
LUs with no ATECO or classified with only 2 or 3 digits in the BR	610			
Total LU's	**44075**			

Source: Author's Elaboration

To address these issues, we have chosen the following solutions:

a) LUs that belong to the same company were assigned the ATECO code of the company. For LUs classified as 552, the most generic code maintaining the first 3 digits (55.20.x Resorts, hostels, refuges) was assigned. In other cases, an internet search was conducted to infer the nature of the business (e.g., if they were take-away restaurants 56.10.2 or restaurants 56.10.1).
b) The main ATECO of the other LUs within the same company was assigned.
c) Keywords in the business name (such as 'sisters,' 'rest,' 'villa') were used, and online verification of the actual nature of the business was conducted. However, conducting a comprehensive analysis would have required checking over 7000 positions, so no changes were made to the ATECO classification, and the original classification was retained.
d) The Department of Agriculture was contacted for a list of agritourisms, and by matching with the agricultural business database, we integrated the tourism business database with 1020 LUs classified as 'agricultural' but sharing tax codes, addresses and business names with those listed on the region's website as "agriturismi".

The LUs were then classified as accommodations, restaurants, or camping sites in agritourism based on the services advertised on the region's website by the respective LUs. This analysis resulted in an

increase in the number of active LUs in the tourism industry in the region to 44,075 (+3.7%) and improved the assignment or detailing of the ATECO for 610 LUs. Table 3 presents the data, highlighting a significant growth in the weight of agritourism offers and alternative forms of accommodation compared to stays in hotels and apartments.

The data indicates that the accommodation sector (ATECO 55) in Emilia-Romagna region is still heavily skewed towards hotels and similar accommodations, which generated more than half of the total units in the sector. In particular, the majority of these unites are in the sub-sector hotels and similar accommodations (5063), followed by holiday apartments and B&Bs (2063). Referring to the total number of tourist enterprises, the subsector with the highest number of local units is *Beverage serving activities*, which accounts for 33.8% of the local units, followed by *Restaurants* at 27.7%.

To ensure the effectiveness of the mapping, it's essential to have granularity at a provincial level and, when possible, at a municipal level, allowing for the disaggregation of the data reported in Table 3. The provincial overview, see Table 4, illustrates how each province is characterized by a distinct productive structure, often intertwined with its environment - both natural and economic - its traditions, history, and local expertise.

Table 4. Provincial overview of LU operating in various sub-sectors of the tourism industry.

NUTS3 / ATECO	BO	FC	FE	MO	PC	PR	RA	RE	RN	Total
55.1 Hotels and similar accommod.	357	655	106	233	74	203	612	140	2683	5063
55.20.5 Holidays apart. and B&B	608	141	183	228	84	180	223	81	335	2063
55.20.52 Accommod. in agritourism	149	117	42	72	89	80	77	64	18	708
55.20.x Resorts, hostels, refuges	18	36	11	16	10	17	9	19	32	168
55.3 Camping, recreat. vehicle and trailer parks	17	27	7	18	7	8	23	9	25	141
55.90 Other accommodation	18	1	13	2	2		2	2	3	43
56.10.11 Restaurants	2580	993	929	1993	848	1207	1040	1183	1447	12220
56.10.12 Restaurants in agritourism	95	78	24	76	63	67	63	28	27	521
56.10.2 Take away restaurants	1152	524	395	702	197	326	592	503	578	4969
56.10.3 Ice cream and pastry shops	435	198	147	246	104	189	203	248	263	2033
56.10.4x Mobile food service activities	60	24	32	35	20	28	27	25	33	284
56.21 Event catering activities	29	14	12	41	17	15	17	27	14	186
56.29 Other food service activities	190	46	37	119	35	103	90	66	32	718
56.3 Beverage serving activities	3379	1290	1277	2024	1182	1474	1257	1471	1556	14910
79.x Travel ag., tour oper. and other reserv. serv.	3	7	8	6	3	5	5	2	9	48
Total (LU)	**9090**	**4151**	**3223**	**5811**	**2735**	**3902**	**4240**	**3868**	**7055**	**44075**

Source: Author's Elaboration

Of the local units in the ATECO 55, 60% are hotels. The majority are located in the provinces along the coast (in Rimini 2683 local units are hotels accounting for more than half the entire region). In the non-coastal provinces, the accommodations segment of holiday apartments and similar has the highest number of local units.

Another important result from the data is the popularity of restaurants and food service activities in the region. This emphasizes the significance of food and dining experiences in the tourism industry, which is not surprising given Emilia-Romagna's rich culinary traditions. The region has a total of 12,220 restaurants, with the city of Bologna having the highest number at 2,580 units, followed by Modena (1,993) and Rimini (1,447). Take-away restaurants are a notable sub-sector within food service activities. For example, Bologna has 1,152 units operating in this sub-sector, making it the most popular in the city. This trend towards take-away restaurants may reflect changing consumer preferences and the growing demand for convenience and speed. Another notable sub-sector is ice cream and pastry shops, with Rimini having 263 units, the second most significant in the city after Bologna with 435 units.

In the beverage sector, the Emilia-Romagna region has a total of 14,910 units. The majority of these units are located in Bologna with 3,379 businesses, followed by Modena (2,024) and Rimini (1,556). This high number of local units in beverage serving activities indicates a strong focus on wine in the region, which is not surprising given its reputation for producing high-quality wines such as Lambrusco, Sangiovese, and Albana.

The data also includes the number of units in other services, such as travel agencies, tour operators, and other reservation services. In the region, there are a total of 48 units in these services, with the majority located in Rimini (9).

Besides the analysis by row of Table 4, pertaining to the study of sub-sectors, the analysis by column of Table 4 allows for the examination of provincial profiles within the region. Bologna is characterized by a concentration of LU in the segments of "Holiday apartments and B&Bs" and "Other accommodation facilities" related to the high numbers of workers and students living in the area. The peak in continuative catering (56.29) and cafeterias and canteens (56.3) for students and workers is thus expected. The province of Forlì-Cesena is well equipped in the hotel segment but it stands out for its high supply of non-hotel accommodation structures ("Resorts, hostels and refuges", Agritourism and Camping) with a clear vocation to develop 360 degrees of leisure tourism (seaside and Apennines). Ferrara (along with Piacenza) is the only province where the number of local units supplying holiday accommodations exceeds the number of hotels. Modena stands out for a highly developed and above all diversified catering industry with the largest number of LUs active in the segment 56.21 Event catering activities. Modena also has the largest market share (1993 local units representing 34.3% of LU) in *Restaurants* sub-category followed by Piacenza and Parma. Piacenza and Parma also are the two provinces with a lesser developed market of "take-away" food compared to the "dine in" options for eating. Parma and Reggio Emilia show a very similar supply and the "Event catering" segment suggests the relevance of short-stay business tourism segment, as suggested by the few local units active in the "other accommodation" segment (i.e., the preferred facilities for long stays). Ravenna, shows an accommodation supply aimed essentially at the outdoor segment with the highest number of local units in the segment "Camping grounds, recreational vehicle and trailer parks" and a high proportion of farmhouses (active both in accommodation and catering) and mobile/take-away catering local units. In Rimini the hotel industry emerges on top, but its strong tourism vocation is also evident in the high number of local units active in all segments of catering. When considering the ratio of supply to population, Rimini generally stands out.

4.2 Mapping LU without staff

While the number of local units per province and by ATECO sub-category is obviously the foundation for mapping the tourism enterprises of the region, in our work, the mapping also refers to the number of employees. Within this second dimension, the main challenge is to 'bring to life' the local units without staff, enabling an effective assessment of the tourism industry's relevance to the regional economy. Regarding tourist enterprises, the number of local units without staff becomes extremely relevant and represents one of the main difficulties to overcome in achieving a satisfactory mapping. In Tables 5 and 6, we illustrate the extent and severity of this phenomenon in absolute and relative terms.

Overall, 7827 local units, equivalent to 17,8% of the total local units, are recorded without employees in 2021, which openly and significantly contradicts the definition of a local unit as a "productive establishment". The distribution of local units without employees is relatively uniform across the provinces of the region, ranging from a minimum of 14,3% in Rimini to a maximum of 20,4% in Modena. However,

not all types of tourism enterprises are equally affected by this issue. In absolute terms, *Beverage serving activities* and *Restaurants* group the highest number of local units without employees, totalling 4767. However, in relative terms, both of these sub-sectors present values (17.3% and 17.9% respectively) close to the average figure of tourism enterprises (17.8%). Still in relative terms, agritourisms (both in terms of accommodations and restaurants) represent the subcategory most affected by this phenomenon, which can be explained by recalling that agritourisms are originally classified as part of agricultural enterprises.

Table 5. LU without staff (by ATECO and NUTS3 area; year 2021, Emilia-Romagna).

NUTS3 / ATECO	BO	FC	FE	MO	PC	PR	RA	RE	RN	Total
55.1 Hotels and similar accommod.	61	113	27	49	18	35	80	21	337	741
55.20.5 Holidays apart. and B&B	139	25	46	59	17	43	48	22	58	457
55.20.52 Accommod. in agritourism	111	89	20	55	74	63	54	44	9	519
55.20.x Resorts, hostels, refuges	4	13	3	3	3	6	4	5	8	49
55.3 Camping grounds, recreat. vehicle and trailer parks	3	9		8	1	4	2	3	6	36
55.90 Other accommodation	1		9	1			2			13
56.10.11 Restaurants	459	174	165	406	127	223	194	177	268	2193
56.10.12 Restaurants in agritourism	52	44	13	44	43	46	30	22	13	307
56.10.2 Take away restaurants	155	39	44	102	25	46	66	51	64	592
56.10.3 Ice cream and pastry shops	58	26	21	34	13	14	22	15	27	230
56.10.4x Mobile food service activities	10	1	3	9		4	5	4	1	37
56.21 Event catering activities	8	4	2	9	3	2	1	7	1	37
56.29 Other food service activities	14	1	1	5	4	5	4	1	1	36
56.3 Beverage serving activities	603	257	213	402	166	276	205	241	211	2574
79.x Travel agency, tour oper. and other reserv. Serv.				1	2		1		2	6
Total (LU)	**1678**	**795**	**567**	**1187**	**496**	**767**	**718**	**613**	**1006**	**7827**

Source: Author's Elaboration

Table 6. Percentage of LU without staff (by ATECO and NUTS3. Year 2021, Emilia-Romagna)

NUTS3 / ATECO	BO	FC	FE	MO	PC	PR	RA	RE	RN	Total
55.1 Hotels and similar accommod.	17,1%	17,3%	25,5%	21,0%	24,3%	17,2%	13,1%	15,0%	12,6%	14,6%
55.20.5 Holidays apart. and B&B	22,9%	17,7%	25,1%	25,9%	20,2%	23,9%	21,5%	27,2%	17,3%	22,2%
55.20.52 Accommod. in agritourism	74,5%	76,1%	47,6%	76,4%	83,1%	78,8%	70,1%	68,8%	50,0%	73,3%
55.20.x Resorts, hostels, refuges	22,2%	36,1%	27,3%	18,8%	30,0%	35,3%	44,4%	26,3%	25,0%	29,2%
55.3 Camping grounds, recreat. vehicle and trailer parks	17,6%	33,3%	0,0%	44,4%	14,3%	50,0%	8,7%	33,3%	24,0%	25,5%
55.90 Other accommodation	5,6%	0,0%	69,2%	50,0%	0,0%	-	100,0%	0,0%	0,0%	30,2%
56.10.1 Restaurants	17,8%	17,5%	17,8%	20,4%	15,0%	18,5%	18,7%	15,0%	18,5%	17,9%
56.10.12 Restaurants in agritourism	54,7%	56,4%	54,2%	57,9%	68,3%	68,7%	47,6%	78,6%	48,1%	58,9%
56.10.2 Take away restaurants	13,5%	7,4%	11,1%	14,5%	12,7%	14,1%	11,1%	10,1%	11,1%	11,9%
56.10.3 Ice cream and pastry shops	13,3%	13,1%	14,3%	13,8%	12,5%	7,4%	10,8%	6,0%	10,3%	11,3%
56.10.4x Mobile food service activities	16,7%	4,2%	9,4%	25,7%	0,0%	14,3%	18,5%	16,0%	3,0%	13,0%
56.21 Event catering activities	27,6%	28,6%	16,7%	22,0%	17,6%	13,3%	5,9%	25,9%	7,1%	19,9%
56.29 Other food service activities	7,4%	2,2%	2,7%	4,2%	11,4%	4,9%	4,4%	1,5%	3,1%	5,0%
56.3 Beverage serving activities	17,8%	19,9%	16,7%	19,9%	14,0%	18,7%	16,3%	16,4%	13,6%	17,3%
79.x Travel agency, tour oper. and other reserv. Serv.	0,0%	0,0%	0,0%	16,7%	66,7%	0,0%	20,0%	0,0%	22,2%	12,5%
Total	**18,5%**	**19,2%**	**17,6%**	**20,4%**	**18,1%**	**19,7%**	**16,9%**	**15,8%**	**14,3%**	**17,8%**

Source: Author's Elaboration

4.3 Mapping employment

In terms of employment, the tourism sector has a significant impact on the economic system. There are 144,666 people directly employed by tourism enterprises in the 44,075 local units located in Emilia-Romagna, as detailed in Table 4. This employement figure considers only the business register's data for the core sectors, without correcting for local units without staff, yet including agritourisms. Even this single piece of information alone provides an idea of the importance of tourism employement in the economic system of the Emilia-Romagna region.

Table 7 reports, in the first column, the business register's data on employment in tourism enterprises in Emilia-Romagna for 2021. It also displays data for two scenarios, B1 and B2, which incorporate the absent data for local units without staff using the imputation method outlined in Section 3. In the first scenario (B1), the number of employees rises to 171,307, while in the second scenario (B2), there are 167,565 employees. The last two columns of the table show the change in the number of employed persons attributable to the two scenarios.

Table 7. Persons Employed in the tourism industry under different scenarios for the imputation of data for the local units without staff; Year 2021, Emilia-Romagna.

ATECO	**Persons employed** *(business register's data, no imputation or reallocation inside municipality)*	**Scenario B1 Persons employed** *reallocation inside municipality and imputation of "0" or unrealistic data*	**Scenario B2 Persons employed** *reallocation inside region and imputation of "0" or unrealistic data*	**Scenario B1** *(% of employed persons imputated)*	**Scenario B2** *(% of employed persons imputated)*
55.1 Hotels and similar accommod.	20.465	24.317	23.554	18,8%	15,1%
55.20.5 Holidays apart. and B&B	2.896	3.576	3.672	23,5%	26,8%
55.20.52 Accommod. in agritourism	1.820	2.170	2.324	19,2%	27,7%
55.20.x Resorts, hostels, refuges	469	602	606	28,2%	29,2%
55.3 Camping gr., recreat. vehicle and trailer parks	496	617	590	24,5%	18,9%
55.90 Other accommodation	144	178	176	23,3%	21,9%
56.10.11 Restaurants	52.632	63.626	61.753	20,9%	17,3%
56.10.12 Restaurants in agritourism	1.386	1.511	1.752	9,0%	26,5%
56.10.2 Take away restaurants	11.475	13.064	12.849	13,9%	12,0%
56.10.3 Ice cream and pastry shops	5.543	6.439	6.138	16,2%	10,7%
56.10.4x Mobile food service activities	510	621	576	21,7%	13,0%
56.21 Event catering activities	849	1.022	1.019	20,3%	20,0%
56.29 Other food service activities	10.913	11.867	11.436	8,7%	4,8%
56.3 Beverage serving activities	34.961	41.571	41.000	18,9%	17,3%
79.x Travel ag., tour oper. and other reserv. Serv.	107	125	120	17,0%	11,9%
Total employement	**144.666**	**171.307**	**167.565**	**18,4%**	**15,8%**

Source: Author's Elaboration

As anticipated in Section 3, our imputation procedure leading to the two scenarios B1 and B2 is not free from the risk of errors, which could only be completely eliminated by individually examining all cases of doubtful classification or anomalies. This is an extremely lengthy task that requires time and resources currently unavailable and, therefore, has not been possible to carry out. However, aiming to address at least the most glaring situations, we focused on specific interventions in the five most striking cases involving major collective catering companies: cooperatives CAMST, CIR and COOP ALLEANZA 3.0, along with two agricultural businesses with over 80 employees in a single LU but listed in the regional database as agritourism. Here, employee data was attributed considering the regional average size of the corresponding ATECO increased by one times the root mean square deviation to account for their large-scale operations. For the three catering cooperatives, the employees in other LUs were increased to balance the totals per municipality (or in the province of Bologna as CAMST's has a bar with 963 employees in the municipality of Castenaso and LU's with no staff in Granarolo). The last correction we introduced pertains to the province of Forlì-Cesena, for which employment data was unavailable, so it was estimated by redistributing it from other provinces.

Overall, from the analysis of the results reported in Table 7, we observe that correcting for local units without staff leads to an increase of 18.4% in the first scenario and 15.8% in the second scenario. Different types of tourism enterprises show significant differences in the correction of the number of employees between the two scenarios. Restaurants consistently have the highest number of employees,

accounting for about 36.4% of the total in official data, and 36.9% and 37.1% in scenarios B1 and B2, respectively. Beverage servicing activities account for about 24% of total employees, followed by hotels at approximately 14%.

Consistent with the guidelines outlined in Section 3 and following the path taken for the mapping of the number of local units, a fundamental step regarding the aggregated information presented in Table 7 is the transition to disaggregated data by province. Looking at the breakdown for NUTS3 area, reported in Table 8, we observe that the largest number of employees in the ATECO 55 is registered in hotels and similar accommodations, with a total of 23,554 employees. The highest number in this sector is in Rimini, with 11,347 employees, followed by Ravenna (3,361) and Bologna (2,275). Ferrara has the lowest number of employees in this sector, with only 399 employees. Another sub-sector within the accommodation industry is resorts, hostels, and refuges. This sub-sector employs only a total of 606 people across the nine provinces, with Forlì-Cesena and Ferrara having the highest numbers at 103 and 94, respectively. Holidays apartments and B&Bs counts a total of 3.672 employees across the nine provinces. Bologna has the highest number of employees in this sub-sector with 1.006 employees, followed by Rimini (668). Accommodation in agritourism is another significant industry in this data, employing a total of 2.324 people across the nine provinces. Bologna has the highest number of employees in this industry with 423 people, followed by Forlì-Cesena with 363.

Table 8. Number of employed persons under scenario B2 by ATECO and NUTS3. Year 2021, Emilia-Romagna.

NUTS3 / ATECO	BO	FC	FE	MO	PC	PR	RA	RE	RN	Total
55.1 Hotels and similar accommod.	2.275	3.084	399	1.084	399	984	3.361	622	11.347	23.554
55.20.5 Holidays apart. and B&B	1.006	252	273	365	119	427	471	92	668	3.672
55.20.52 Accommod. in agritourism	423	363	171	198	234	194	411	252	79	2.324
55.20.x Resorts, hostels, refuges	48	103	94	78	55	19	67	59	83	606
55.3 Camping grounds, recreat. vehicle and trailer parks	29	105	62	31	14	20	186	24	119	590
55.90 Other accommodation	69	5	60	12	15		0	11	4	176
56.10.11 Restaurants	13.486	5.199	4.159	9.377	3.802	6.273	5.327	6.446	7.683	61.753
56.10.12 Restaurants in agritourism	490	175	57	259	184	183	269	65	71	1.752
56.10.2 Take away restaurants	2.781	1.438	1.020	1.748	402	918	1.474	1.367	1.700	12.849
56.10.3 Ice cream and pastry shops	1.406	547	402	807	284	569	680	697	747	6.138
56.10.4x Mobile food service activities	123	63	56	83	38	43	58	54	59	576
56.21 Event catering activities	176	47	16	216	99	79	77	254	56	1.019
56.29 Other food service activities	3.938	496	534	1.703	499	1.856	950	1.261	199	11.436
56.3 Beverage serving activities	9.670	3.831	3.105	5.130	3.013	3.903	3.918	3.816	4.613	41.000
79.x Travel agency, tour oper. and other reserv. Serv.	18	18	15	13	3	7	7	4	35	120
Total employement	**35.937**	**15.725**	**10.423**	**21.102**	**9.158**	**15.474**	**17.255**	**15.025**	**27.465**	**167.565**

Source: Author's Elaboration

Moving on to the food industry, the restaurants industry employs a total of 61.753 people in 12,220 restaurants across the nine provinces. Bologna has the highest number of both local units (2580) and employees in this industry with 13.486, followed by Modena (9.377) and Rimini (7.683). Piacenza has the lowest number of employees in restaurants with only 3.802 employees.

To thoroughly understand the impact of the proposed imputation procedure concerning local units without employees, and thus evaluate the differences between the official employment data and those illustrated in Table 8, in the following Table 9, we present, by ATECO subcategory and province, the percentage variation between scenario B2 and the official data. The overall increase of 15.8% in employment across the region is quite evenly distributed among the provinces, with a minimum value of 13.6% for Reggio Emilia and a maximum of 18.1% for Modena. Notable differences can be observed among the considered ATECO sub-categories, particularly for agritourisms (both accommodations and restaurants) and *Resorts, hostels, and refuges*. The share of employees attributed based on scenario B2 is significant, consistent with the high number of local units without staff observed in these ATECO sub-sectors.

Table 9. Percentage of added employed persons under Scenario B2 by ATECO and NUTS3. Year 2021, Emilia-Romagna.

NUTS3 / ATECO	BO	FC	FE	MO	PC	PR	RA	RE	RN	Total
55.1 Hotels and similar accommod.	18,2%	16,7%	24,3%	19,8%	23,2%	16,4%	13,3%	15,8%	13,5%	15,1%
55.20.5 Holidays apart. and B&B	25,2%	20,3%	27,3%	37,5%	34,5%	35,3%	21,6%	29,0%	23,5%	26,8%
55.20.52 Accommod. in agritourism	34,7%	25,1%	18,9%	25,9%	26,6%	28,4%	22,9%	36,1%	32,5%	27,7%
55.20.x Resorts, hostels, refuges	38,8%	46,0%	27,3%	14,7%	20,6%	26,3%	44,4%	21,4%	25,0%	29,2%
55.3 Camping grounds, recreat. vehicle and trailer parks	11,0%	40,4%	0,0%	39,9%	14,3%	50,0%	12,6%	33,3%	16,5%	18,9%
55.90 Other accommodation	4,3%	0,0%	69,2%	50,0%	0,0%	-	0,0%	0,0%	0,0%	21,9%
56.10.11 Restaurants	17,3%	17,1%	16,9%	19,9%	14,3%	18,0%	17,5%	14,8%	17,7%	17,3%
56.10.12 Restaurants in agritourism	25,1%	24,1%	43,9%	23,0%	23,3%	34,8%	23,5%	28,3%	42,8%	26,5%
56.10.2 Take away restaurants	13,5%	9,3%	11,7%	14,6%	13,7%	14,7%	10,4%	9,8%	10,6%	12,0%
56.10.3 Ice cream and pastry shops	14,0%	12,1%	13,3%	12,1%	11,9%	8,1%	9,1%	5,0%	9,6%	10,7%
56.10.4x Mobile food service activities	15,0%	4,2%	10,6%	24,8%	2,1%	14,3%	15,9%	18,9%	5,6%	13,0%
56.21 Event catering activities	24,1%	28,6%	18,3%	24,2%	17,6%	13,3%	2,8%	23,2%	13,6%	20,0%
56.29 Other food service activities	7,4%	2,2%	2,7%	3,8%	9,9%	3,1%	4,4%	1,5%	3,1%	4,8%
56.3 Beverage serving activities	17,8%	20,4%	16,3%	20,3%	14,4%	18,4%	16,2%	16,1%	14,0%	17,3%
79.x Travel agency, tour oper. and other reserv. Serv.	0,0%	0,0%	0,0%	16,7%	66,7%	0,0%	20,0%	0,0%	32,6%	11,9%
Total	16,4%	16,9%	16,0%	18,1%	15,0%	16,1%	14,9%	13,6%	14,7%	15,8%

Source: Author's Elaboration

The joint analysis of the two dimensions considered in our mapping, the number of local units and the number of employees, ultimately leads to interesting findings and promising developments. For instance, we can obtain the average number of employees per local unit by dividing the data from Table 8 by the data from Table 4. Average staff per local unit is 3,80 with Ravenna at the top (4.07) and Ferrara at the bottom (3.23). It is worth noting that Bologna (3.95) and Rimini (3.89) are above the regional average. In the hotel sub-category, the average number of employees is 4.65, with some variability at the provincial level, with Bologna at the highest level (6.37) and Ferrara at the lowest (3.76). As for restaurants, the average size of employees per local unit is 5.05, with limited variability among provinces, ranging from 4.48 in Ferrara to 5.31 in Rimini. It's interesting to note how such small sized enterprises attract significant attention in light of both the possibility and the willingness to invest the necessary capital to support the green transition for regional businesses.

5. Discussion, conclusions, and future implications

In this paper we map tourism supply in Emilia-Romagna with reference to the number local units

and number employees. The mapping of tourism enterprises is a comprehensive process that involves identifying, locating, and categorizing all the tourism-related businesses in the region. This includes local units active in the “core” sectors: hotels, restaurants, travel agencies, tour operators, and other service but also local units when classified within “extra-core” sectors even though they are significantly and often predominantly engaged in restaurant and/or accommodation activities (e.g. agritourism).

This study leverages the database of tourism-related businesses in the region, which was developed as part of the PNRR Ecosister Project (refer to: Ecosister, 2023) in collaboration with regional organizations: ART-ER, Clust-ER Turismo, and the Department of Agriculture. The research process encompassed multiple stages, beginning with the identification of tourism-related businesses and subsequently gathering information about each business, including its geographical location, provided services, target market, and other pertinent details obtained from official registers.

In this paper we suggest a theoretical framework to contribute to the mapping of the extensive relationships, both between businesses and market operators, and between businesses and public institutions at all levels that design the tourism ecosystem. In our mapping, core and extra-core tourism enterprises “engages” with the 6 environmental objectives of the European Taxonomy. Examples are given, but the main result is that the core sectors of the tourism industry (hospitality and catering) are the sector most involved in the implementation of sustainability, mitigation, adaptation and transition actions. In fact, tourism policies are highly intersected and integrated with urban redevelopment and regeneration policies, mobility policies, etc., playing a crucial role in improving the sustainability.

By integrating different databases, we have identified nearly 1600 active local units in the Emilia Romagna tourism industry, accounting for 3.7% of the total productive establishments. However, we discovered that many of these units were misclassified according to ATECO codes, often being wrongly categorized under other sectors, primarily the agricultural sector, or having incomplete or missing ATECO codes. Additionally, we have identified 7827 local units (17.8% of the total) that are recorded without employees, which clearly contradicts the definition of a local unit as a "productive establishment." Overall, our integration and imputation procedure has led to a significant increase in sectoral employment, ranging from 15.8% to 18.4% under different scenarios, consequently impacting the spatial distribution of employment within the industry.

Our comprehensive mapping of tourism enterprises has several practical implications. Firstly, it enables the identification of the industry's strengths and weaknesses within the region. This valuable information can be utilized to develop targeted policies and strategies, addressing the challenges faced by the industry and leveraging its unique strengths. Secondly, the mapping process uncovers opportunities for the development of new tourism-related businesses, fostering job creation and stimulating economic growth in the region. Thirdly, the mapping of tourism enterprises can serve as a base to improve the quality of tourism services in the region.

We emphasize the crucial role of mapping in tailoring policies to specific products and clustering various tourist destinations and enterprises within the tourism supply chain. A detailed understanding of the spatial distribution of the supply is essential, particularly in marginalized areas such as the mountains and seaside destinations. In these regions, investments in ecological transitions, including initiatives focused on energy, water, and plastic-saving, as well as measures to mitigate the impacts of climate change (such as coastal erosion and landslides), can act as catalysts for transformative urban restructuring choices. These structural interventions, when oriented towards tourism development, can ensure the long-term environmental and economic sustainability of these peripheral areas, thus

averting depopulation.

Furthermore, our mapping aims to highlight the importance of efficient infrastructural networks and continuous support for micro-enterprises distributed throughout the territory. These elements are vital in fostering the growth of "slow tourism," a segment that prioritizes sustainability and values the appreciation of lesser-known assets.

In summary, we believe the mapping of tourism enterprises can serves as an essential component of the region's tourism strategy, striving to promote sustainable and inclusive tourism development in Emilia-Romagna.

Acknowledgments

We would like to thank the Department of Agriculture of the Emilia-Romagna Region and ART-ER for their invaluable support and collaboration, essential for the completion of the work. PNRR project Ecosister's support (Spoke 5 – Circular economy and blue economy, Deliverable D.5.4.3 Map of the characteristics of tourism enterprises) is gratefully acknowledged.

Conflict of interest

All authors declare no conflicts of interest in this paper.

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