Journal of Destination Marketing & Management 31 (2024) 100856

Contents lists available at ScienceDirect

Journal of Destination Marketing & Management

journal homepage: www.elsevier.com/locate/jdmm

How specialized are coastal tourism destinations in Europe?

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ARTICLE INFO

Keywords:
Coastal management
Covid-19
Data envelopment analysis
Environmental policy
Synthetic index
Tourism development

ABSTRACT

This paper assesses the degree of specialization of tourism destinations along European coasts. It presents a European tourism database and a method based on Data Envelopment Analysis for creating an index of tourism specialization that ranks European basins, countries, and regions at the smallest Eurostat geocoding layer. The set of indicators selected respond to the economic logic of the tourism industry within three vectors: Demand, Supply & employment, and Attractions & amenities. Mediterranean and some Northern European destinations have high levels of tourism specialization while others, mostly in Eastern Europe, rank low in the index. This serves to identify some tourism profiles that provide some insights into the potential for tourism development of the European coasts, which may help in the recovery of the sector and in the management of its transition to a green tourism.

1. Introduction

Tourism is a diverse and complex industry that encompasses activities that fall under various categories such as lodging, catering and beverage services, recreation providers, travel agencies and tour operators and passenger transport. The tourism industry is today a major activity in the worldwide economy due to both its size and its dynamism. It is also considered an engine for regional development given its great potential for job creation and the development of new infrastructures. In terms of size, during 2019 the tourism industry contributed 10.6 % of the workforce and 10.4 % of GDP to the global economy (The World Travel & Tourism Council, 2021), including indirect and induced effects on other sectors. Also, in terms of dynamism, tourism is one of the sectors with the fastest growth rates worldwide. In spite of the 2009 global economic crisis, the tourism industry recovered soon and from 2010 international tourism grew at rates over 4 %, reflecting the industry's status as a dynamic and robust one. More recently, during 2020, tourism growth was expected to continue, but the sector was particularly affected by the Covid-19 pandemic crisis. At present, there are signs that the number of tourists has started to recover as from 2021.

Europe is probably the world's most visited area, being the destination for roughly half of the world's tourists. The relevance of tourism is even greater in coastal areas and small islands, which are very popular destinations. According to Eurostat tourism statistics, more than 47 % of the total overnight stays and 51 % of tourism establishments are located in coastal destinations. Therefore, coastal tourism is an industry with significant development capacity and is one of the main areas of intervention in the Blue Growth strategy of the European Union (EU) (The European Commission, 2012, p. 494). In particular, Spain leads coastal tourism followed by Greece, Italy and France, which together account for 61 % of EU's coastal tourism employment, 64 % of Gross Value Added, and more than 64 % of arrivals (Addamo et al., 2021).

Given all of the above, it is not surprising that a major objective of EU policy is to maintain the position of Europe as a popular travel destination while optimizing the contribution of this sector to regional economic growth and employment.

Tourism policy in the EU is essentially a Member State prerogative, although the Lisbon Treaty gave legal support to complement or coordinate Member States' initiatives in the tourism sector. Within this legal framework, the EU Commission has so far launched two policy strategies on tourism. The first one, in June 2010, established a new political framework setting out the priorities regarding tourism and encouraging a multinational coordinated approach to encourage tourism development (The European Commission, 2010). Besides, a new strategy was presented in 2014 to promote sustainable growth and competitive advantages in maritime and coastal tourism (The European Commission, 2014, p. 86), identifying some actions to help the industry by cooperating with local councils and regional and state governments.

However, the tourism sector is currently facing a number of challenges. With 6 million jobs at stake and a 70 % drop in international tourist arrivals in 2020, the Covid-19 pandemic has severely impacted the tourism industry, particularly coastal tourism (The European

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https://doi.org/10.1016/j.jdmm.2024.100856
Received 19 November 2022; Received in revised form 19 December 2023; Accepted 8 January 2024
Available online 14 February 2024

Commission, 2021, p. 240). Evidence has also been found asserting the vulnerability of coastal tourism associated with the pandemic (Duro et al., 2021). In addition, Europe must cope with both the increasing competition from non-European emerging destinations, whose share of the global tourism market is gradually increasing, and the green and digital transformation of the sector (Margaras, 2017). In this sense, the recent European data strategy points to the need to focus on data "to make better decisions both in business and the public sector" (The European Commission, 2020a). Within this framework, this paper aims to develop a database of comprehensive statistics for coastal tourism, and to provide a quantitative assessment tool to evaluate the degree of tourism specialization of European destinations, which may help in the recovery of the sector and its transition to a green and digital tourism.

Previous research in tourism development, in particular tourism specialization, has mainly focused on its economic impacts. Thus, for example, Croes (2022a, b), Croes et al. (2021) and Croes and Kubickova (2013) conceptualize tourism specialization and discuss links to economic growth, quality of life and human development, while Zhang et al. (2020) and Pérez-Granja and Inchausti-Sintes (2021) analyze the relationship between tourism specialization and efficiency of lodging services. That notwithstanding, there is not a unanimous opinion on the effects of tourism specialization on the economy, and a review of the literature shows that its effect seems to be positive in general (Arezki et al., 2009; Biagi et al., 2016; Croes et al., 2021; Marsiglio, 2018; Paci & Marrocu, 2013; Pérez-Granja & Inchausti-Sintes, 2021; Vita & Kyaw, 2016; Zhang et al., 2020).

With respect to geographic size, most of the work on tourism specialization so far has been done at country level (Algieri, 2006; Biagi et al., 2016; Croes et al., 2021; Nowak & Petit, 2020; Vita & Kyaw, 2016), with some others at regional level (Paci & Marrocu, 2013; Romão, 2020), and for the special cases of islands (Croes, 2013; Croes et al., 2018; Ridderstaat et al., 2014).

Since there is not a unique definition of specialization in tourism, all those studies were based on either indicators of tourism flows or international tourism receipts or some index based solely on demand indicators. However, tourism is a multifaceted phenomenon, which is why Pérez-Dacal et al. (2014) suggest indicators of tourism specialization not only from the demand side but also from the supply and attractiveness sides.

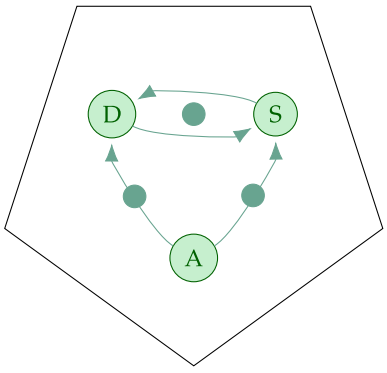
The objective of this work is based, first of all, on the construction of a database of tourism indicators with which to measure tourism specialization on European coastal destinations. Then, with the help of appropriate statistical tools (Fernández-Macho, 2016; Fernández-Macho et al., 2020), this research develops a specialization index, and ranks the European coastal areas at the lowest possible geostatistical level. Following the same approach, partial rankings for each of the specialization vector sub-indices are also obtained. The proposed technique uses Cross-efficiency Data Envelopment Analysis, which has the potential to aggregate all available data for every destination using non-parametric data-driven flexible weights.

The insights from this research could be used to help implement coordinated European management strategies of coastal destinations, as well as in the formulation of governmental strategies to promote sustainable coastal tourism. It should be taken into account that after the global financial crisis of 2007–2008 "sustained growth [of tourism] has been instrumental in supporting the economic recovery of many EU Member States" (Addamo et al., 2021, p. 68), so that the European Commission defined tourism as one of the 14 industrial ecosystems in its industrial policy in 2020 (The European Commission, 2021). Today, there is once again the possibility that the tourism industry may play an important part in the economic recovery of Europe following the Covid-19 pandemic crisis. This need for recovery can be an opportunity to design tourism policies along the lines of the European Green Deal (The European Commission, 2019, 2022; UNWTO, 2020a, 2020b). Furthermore, as stated by the European Commission, the blue economy is indispensable to achieve this transformation, as "a sustainable blue economy will create tangible opportunities for new jobs and businesses" (The European Commission, 2021, p. 240). These objectives are also shared by the recovery plan for Europe launched on May 2020 by the European Commission to aid in repairing the Covid-19 pandemic's negative socioeconomic consequences (The European Commission, 2020b, p. 456, 2020c). In this light, the evaluation of the level of coastal tourism specialization reveals insights about the distinctive qualities of the most well-known European coastal destinations and identifies those areas where tourism is most important to their economy and those that are most adversely affected by it.

The paper is organized as follows. The index's database and indicator system are discussed in Section 2. The statistical procedure for calculating the index scores is described in Section 3. Section 4 examines the results for each of the tourism vectors' scores of the relative specialization of tourism in European coastal destinations, while Section 5 interprets the overall index of specialization. Finally, Section 6 presents theoretical and managerial implications of the study focusing on the coastal tourism specialization profiles obtained, and Section 7 discusses some consequences of these findings.

2. Tourism specialization indicator system

Following official EU publications, a coastal destination is defined hereafter as a NUTS level 3 statistical region with a maritime border. NUTS3 regions are the smallest and most detailed territorial units in the EU NUTS classification, a geographical system used by the European Union for statistical purposes (Eurostat, 2020). The countries included in the analysis are the 22 Member States of the European Union that have a coastline, plus the United Kingdom, the EFTA countries (Iceland and Norway) and the candidate country of Montenegro. Therefore, according to the Eurostat NUTS2016 classification, a total of $n = 398$ coastal regions corresponding to these criteria have been worked with. Non-European overseas territories, London's 'coastal' regions, and, due to lack of data, the candidate countries of Albania and Turkey have not been included.



Tourism is usually viewed as an economic activity with many different aspects. Even though it is primarily a demand-side industry, tourism also has an impact on the supply-side, so it is important to take both perspectives into consideration when measuring tourism. Besides, attractions and amenities have a magnetic pulling power when choosing a tourist destination, and without them tourism probably would not exist. There is an economic logic to this. A typically developed tourist destination is expected to have a high degree of attractiveness, most probably accompanied by a certain number of amenities. Given time, this attractiveness creates tourism demand, supply and employment and, in turn, demand and supply interact with each other to stay in equilibrium in the long run. These relationships are captured schematically in the picture above. Therefore, to capture different aspects of tourism, the three primary groups or vectors that comprise the indicator system created for this study are as follows: Demand, Supply &

employment, and Attractions & amenities. Expanding on the selection proposed in Pérez-Dacal et al. (2014), Table 1 lists the indicators used in this paper to build each of the three vectors that comprise the specialization index. Within the constraints imposed by the availability of data at the NUTS3 level, these indicators were chosen to capture the main characteristics of the tourism sector.

The demand side of tourism is measured by tourist flows, arrivals, and overnight stays at tourist accommodation establishments. Some relevant characteristics of tourist flows may also be considered, such as the weight of international coastal tourism, the density of cruise tourism, and the length of stay. The latter, which reflects the total number of nights a specific number of visitors stayed at a destination, is a key parameter in destination management since it influences tourist spending, service offers and infrastructure and resource patterns (Gössling et al., 2017). Finally, the intensity and density of tourism are both important concepts in tourism studies, since they provide information on the social and territorial pressures imposed by tourism (Pérez-Dacal et al., 2014). Furthermore, whenever relevant, a distinction has been made between domestic and international tourism indicators. The former, more than six times larger than international tourism, is a major driver of the worldwide tourism industry and with a proven resilience in times of crisis. In this respect, during the present initial phases of travel regularization, the somewhat significant limitations for overseas travel as a result of Covid-19 have prompted passengers to choose places closer to home. As a result, destinations with greater proportions of domestic tourism may be expected to recover sooner and quicker (UNWTO, 2020a, 2020b).

Tourism supply indicators collect information on three specific areas: accommodation, tourism employment, and other tourism-related activities, such as food and beverage services and retail trade. First of all, indicators have been included that measure the capacity of the sector, number of accommodation establishments and bed places, and a measure of the average size of its establishments. Secondly, the efficiency of the accommodation sector is included through the occupancy rate, and the pressure exerted at both the social and territorial levels through the number of beds per 1000 inhabitants and the number of beds per km^2. The weight of tourism employment over total employment has also been considered, making the distinction between the accommodation and the food and beverage sectors. These indicators are useful to measure the dependence of the regional economy on tourism. Lastly, indicators on the intensity of some tourist services as hotels, shops and restaurants and bars are also considered.

For the attractions and amenities vector, this research focuses on indicators that can convey the abstract concept of tourism appeal, which may lead to high levels of specialization. These indicators typically include natural and cultural activities among others. Regarding natural attractions and recreational amenities, the database, following well established criteria in tourism research (Gearing et al., 1974; Marcouiller & Prey, 2005), includes indicators of a coastal area's size, the quantity of bathing zones and the quality of their water, and the number of blue flag awards earned, which serve to assess the potential of beach vacations and water sports. In addition, information on the Sites of Community Importance (Natura 2000 network), which include distinctive landscapes with outstanding scenery that promote hiking or relaxation along the coast (Sundseth, 2008), has been considered. The number of UNESCO's World Heritage Sites (natural, cultural and intangible), which may be considered as proxies of cultural destinations, has also been taken into account. Finally, the relative number of shops and restaurants is used to account for two of the most popular visitor activities: shopping and dining out.

Table 1
Main indicators by vector.

V1. Tourism demand:
Total Arrivals.
Total overnight stays.
International arrivals (% of total arrivals).
Cruise tourism (cruise passengers per 1000 inhabitants).
Length of stay (total, domestic and foreign).
Tourism density: overnights per km^2 (domestic and foreign).
Tourism intensity: overnights per 1000 inhabitants (total and domestic).
V2. Tourism supply and employment:
Number of accommodation establishments.
Number of bed places.
Size of hotels and similar accommodation sector: number of beds per establishment.
Occupation rate in hotels and similar accommodations.
Supply intensity: number of beds per 1000 inhabitants.
Supply density: number of beds per km^2.
Employment in the accommodation and food service activities (% of total employment).
Employment in the accommodation sector (% of total employment).
Employment in the food service activities sector (% of total employment).
Hotels per 1000 inhabitants.
Restaurants per 1000 inhabitants.
Retail premises per 1000 inhabitants.
V3. Tourism attractions & amenities:
Coastal area.
Coastal area (% of total area).
Bathing places.
Excellent Bathing places (% of total).
Blue flag beaches.
Sites of Community Importance (SCI) sites (total and marine).
Sites of Community Importance (SCI) area (total and marine).
Forests (% of total land).
World Heritage Sites (natural, cultural and intangible).
Restaurants per 1000 inhabitants.
Retail premises per 1000 inhabitants.

3. Data processing method

3.1. Statistical information

The European tourism database collects key indicators down to the NUTS3 layer of the Eurostat geocoding standard for 2019. This is the base year for the construction of the proposed specialization index using statistical information available for the three aforementioned vectors. Eurostat is the primary data source, although other particular sources have also been used for some indicators such as Blue Flags or World Heritage Sites (see Table A.1 for a detailed description). Where imputation of missing values is required to estimate missing data in the desired geocoding layer and base year, it is assumed that a uniform distribution among close neighbors and/or a negligible annual increase would occur. A detailed example of this imputation method can be followed in the Supplementary material. In summary, for the European tourism database used in this work, a total of 38 tourism specialization indicators have been calculated, distributed among the three tourism vectors, for each of the 398 NUTS3 coastal regions in Europe (see Table B1).

3.2. Specialization scores

For each specialization vector, the proposed statistical method aims to calculate a sort of weighted average of the m specialization indicators of every NUTS3 region in the European coastal tourism database. However, since the selection of weights can have a significant impact on the scores and rankings that are achieved, the proposed method uses Data Envelopment Analysis (DEA) to provide a different optimal set of weights for each of the regional destinations (Charnes et al., 1978; Fernández-Macho, 2016). The DEA method uses linear programming to create a set of case-specific weights that maximize the weighted average of values corresponding to each study case or unit, with the restriction that no case may get a score greater than some given constant c (see Liu et al., 2011; Lovell & Pastor, 1999; Yang et al., 2014, among others). More specifically, this study uses an 'output-based' without-explicit-input DEA formulation that maximizes the relative specialization of each case or destination, that is

$$\max_{w} V_k = \sum_{j=1}^{m} w_j z_{kj}, \text{ subject to } V_k \leq c, \ \forall k, \ w_j \geq 0 \ \forall j, \quad k = 1, \ldots, n, \tag{1}$$

where z_{kj} are the destination's indicator values, w_j are the index weights, and k and j refer to the destination and indicator respectively.

Fig. 1 outlines an example of the specialization scoring model. Note how the most distant cases form a specialization frontier that encompasses the other cases. In the proposed procedure, the cases that make up the frontier receive a score of $c = 10$, while the scores assigned to less specialized destinations are equal to their radial distance from the origin (scaled from zero to ten). Therefore, the specialization score is the consequence of a self-assessment process with respect to the specialization frontier using flexible weights based on the specific specialization profile of the destination. However, in addition to its own auto-evaluation, each region will also be cross-evaluated with the weights obtained by all the other regions in the database (*cf.* Doyle & Green, 1994; Sexton et al., 1986). In other words, following Fernández-Macho et al. (2020), for every region R_k, let $\left\{\widetilde{w}_j(\ell);\ j = 1, \ldots, m,\ \ell \neq k\right\}$ be the resulting set of optimal weights for the remaining $R_{\ell \neq k}$'s regions using eq. (1). Accordingly, at the conclusion of the self- and cross-evaluation procedure each region will have obtained a total of n scores

$$\widetilde{V}_k(\ell) = \sum_{j=1}^{m} \widetilde{w}_j(\ell) z_{kj}. \tag{2}$$

Finally, the arithmetic mean of all the n scores for the k-th destination may then be used as the summary score for that destination.

The interested reader can check a detailed example of the complete statistical procedure in the Supplementary materials.

4. Tourism specialization scores

The results obtained for each destination in the calculation of the synthetic index can be seen in Table B2 of the Supplementary material. The subsequent ranking of the European coastal destinations according to their scores in the sub-indices of the three specialization vectors (demand, supply & employment and attractions & services) will be analyzed in what follows.

4.1. Tourism demand

The specialization index for the demand vector is led by two of the Canary Islands, Lanzarote and Fuerteventura, followed by the island of Rhodes in the Aegean Sea. On the other hand, the least specialized destinations are located in Western Finland (Satakunta and Pohjanmaa, FI195-6) and Central-Eastern Sweden (Sodermanlands, Ostergotlands and Uppsala, SE121-3). More generally, it can be concluded that the 5 % most specialized destinations are found in southern Europe (Spain, Greece, Croatia and Portugal) while the 5 % least specialized destinations are located mostly in the Scandinavian peninsula (see Figure A1.a in the Appendix A).

There are large differences in the level of demand specialization between countries. The most specialized countries are all Mediterranean: Croatia, Montenegro, and the insular countries of Cyprus and Malta (see Table A.2). In addition to these countries, it is worth highlighting the performance of countries such as Bulgaria, Iceland and even Denmark, all of whose regions have a higher level of specialization than the European average. On the contrary, all the regions in the Scandinavian countries (Sweden, Norway and Finland), Romania and the Baltic Republics (Estonia, Latvia and Lithuania) show scores lower than EU average. It is interesting to note the results obtained for such popular destinations as Spain and Greece, which nevertheless occupy the seventh and eighth position, respectively, in the ranking of the countries. Both countries show the highest dispersion in the demand sub-index. Their results reflect a highly differentiated average level of specialization in these countries between islands, the top specialized destinations, and some mainland destinations with quite low scores in these countries. As a consequence, in Greece the average index for the islands is 6.6 and for the mainland 3.8. This difference is even larger in Spain with an average index of 7.6 for the islands and 4.1 for the mainland.

Some European countries have tourist destinations in two different

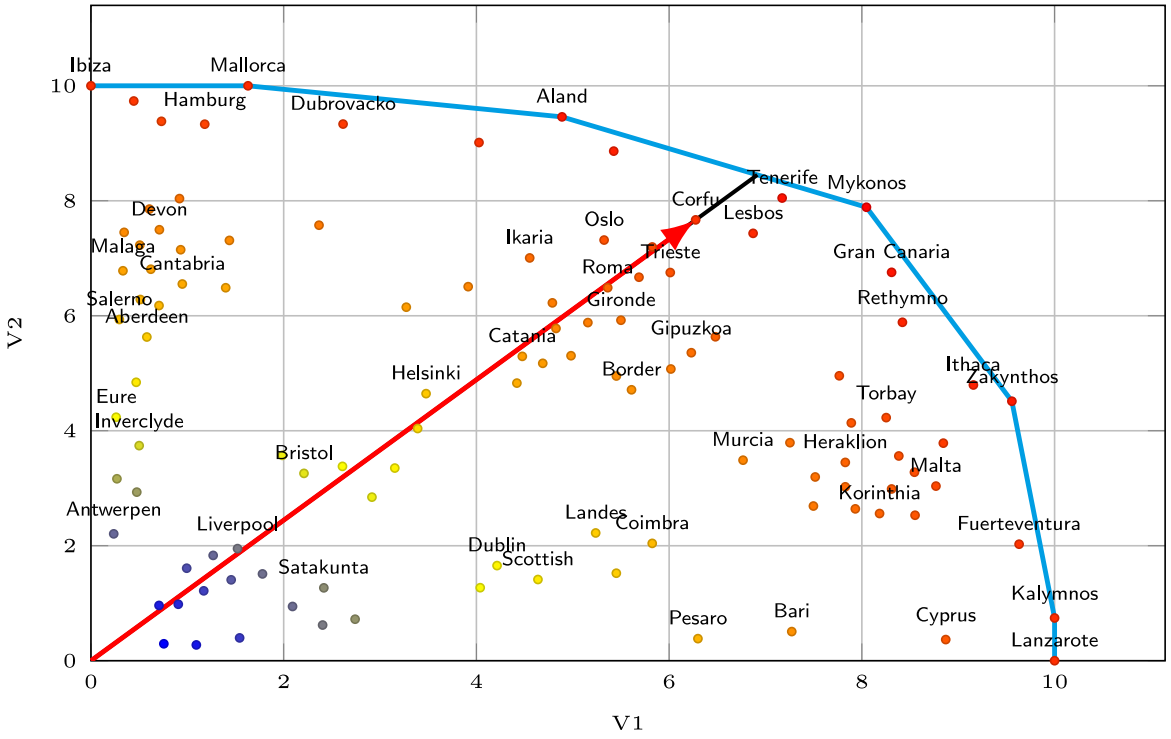


Fig. 1. DEA-based tourism specialization scores.

basins: Spain and France in the Mediterranean and the Atlantic, Denmark and Germany in the Baltic and the North Sea, and the UK in the North Sea and the Atlantic. Some differences in specialization can be observed, either by country or by basin. Thus, in the case of France and Spain, the Mediterranean regions are more specialized than the Atlantic regions: for France, the average Mediterranean index is 4.61 compared to 2.98 for the Atlantic, while in Spain the scores are 5.65 compared to 5.03. The results, however, are quite different for Germany and Denmark: in Germany, the average index for the Baltic regions is 4.05, much higher than the North Sea index of 2.78, while the scores for the two basins are quite similar in the Danish regions (4.75 in the Baltic Sea versus 4.66 in the North Sea). There are also no major differences in the index between the Atlantic (4.23) and North Sea (4.09) regions of the UK.

4.2. Tourism supply & employment

Figure A1.b in the Appendix A shows the 5 % most specialized and 5 % least specialized regions in terms of tourism supply & employment. In this case, the presence of islands among the most specialized destinations is even higher than in the demand vector: in the 5 % most specialized destinations, all are islands, except the Croatian region of Istria and Alicante in Spain. The Balearic Islands (ES531-3) lead this group, which also includes the Spanish Canary Islands (ES703-9), the Greek islands of Zakynthos and Corfu (EL621-2) in the Ionian Sea, Rhodes and Heraklion, Corsica and the insular countries of Cyprus and Malta. On the other hand, the least specialized destinations, with relatively lower accommodation capacity, occupancy rate and dependence on tourism, are found in Central Greece and Macedonia (Western Athens (EL302), Phthiotis (EL644) and Imathia (EL521)) and in North Central England (Merseyside (UKD7), Northumberland and Tyne and Wear (UKC2), Tees Valley and Durham (UKC1), Cheshire (UKD6), Lancashire (UKD4) and Lincolnshire (UKF3)).

The differences in specialization by country and basin are quite small. It is found that the level of supply & employment specialization is very similar in Spain between the Mediterranean (7.5) and the Atlantic (7), in Denmark and Germany between the Baltic (6.3 and 5) and the North Sea (5.8 and 4.8), and in the UK between the Atlantic (4.4) and the North Sea (3.8). Only in France is the difference between the Atlantic (5.4) and the Mediterranean (6.6) more than one point.

Regarding the distribution of the most specialized destinations by country (see Table A.2), the highest average index score (8.3) is obtained by the insular countries of Cyprus and Malta, while the bottom positions are occupied by Montenegro and UK, with scores around 4.1. It should be noted, as well, on the one hand, the results of Croatia, Bulgaria and Denmark, whose regions have a level of specialization above the European average, and on the other hand, those of the Baltic Republics, Romania, Belgium and Finland, whose regions, with the exception of Helsinki, all have scores below the average. Considering again the cases of Spain and Greece, it may be noted that their positioning is quite different from that observed in the case of demand. Spain occupies third place in the ranking with 11 regions in the top 5 % of specialized regions and most of the regions with scores well above the EU average. Consequently, the Spanish index for islands is 9.1, higher than Cyprus or Malta, and the mainland index is also quite high at 6.3. Greece, on the other hand, comes 13th in the ranking. Although four of the Greek islands are among the top 5 % most specialized, more than half of its regions have a below-average score. Thus, the average index for Greek islands is 6.4 and for the territory 4.1. In fact, Greece has the highest range of variability in the regional specialization index: there is an eight-point difference between the most specialized region, Corfu, and the least specialized one, Western Athens (see Table B2 in the Supplementary material).

4.3. Tourism attractions & amenities

The specialization index for the tourism attractions & amenities vector (see Figure A1.c in the Appendix A is led by the Finnish island of Åland, most of the Aegean Islands in Greece (except Lesbos and Lemnos that appear in the twelfth position), the Croatian Dubrovnik-Neretva county with its islands and Riga in Latvia. On the other hand, the least specialized destinations are the Swedish region of Norrbottens, the Romanian region of Tulcea, the northern regions of the Netherlands and a large number of regions in the west of the United Kingdom, mainly Lancashire, the southern part of the Bristol Channel and some Scottish regions.

Finally, considering the distribution of the most specialized destinations by country, it is observed that, among the 5 % most specialized destinations, 9 are Greek and 6 are German. These destinations are characterized by high values for indicators related to beaches and coastal areas. Less specialized destinations tend to have high values for forest indicators and World Heritage Sites. Ten out of the 5 % least specialized destinations are in the UK and 4 in the Netherlands. The most specialized countries are the insular countries Cyprus and Malta (see Table A.2), along with Lithuania (mainly due to the Riga region), Denmark, Croatia and Greece, all with average index values above eight. The bottom positions are occupied by Romania, the Netherlands, Poland, Bulgaria, Estonia and UK with average index values below six. As in the previous sub-indices, the degree of specialization is much higher on the islands than on the mainland for most of the countries (France, Finland, Greece, Portugal, Spain and UK) except Italy and Denmark. There are also important differences by basin. For example, the Mediterranean part of France has an index value of 7.0 compared to a value of 5.5 in the Atlantic basin, and Germany and Denmark have higher index values in their Baltic basin, 7.7 and 8.3 respectively, than in their North Sea basin, 7.2 and 7.9 respectively.

5. Overall synthetic index of specialization

A final synthetic specialization index was obtained by combining the three vector partial sub-indices. The cartogram shown in Fig. 2 illustrates the relative tourism specialization of European coastal destinations, where every NUTS3 region's surface area has been scaled proportionally to its specialization index score. The scores themselves can be seen in Table B2 of the Supplementary material.

As can be seen, except for some isolated and dispersed cases, the main tourist destinations of the Atlantic and Mediterranean islands have the highest values of tourist specialization. In particular, 100 % score in their respective self-evaluations are obtained by Zakynthos (EL621), the Kalymnos and Mykonos archipelagos (EL421-2), Lanzarote (ES708), the Balearic islands of Ibiza and Mallorca (ES531-2), and the Åland archipelago (FI200). The latter, a Finish island in the Baltic sea, is an interesting outlier, which can be explained because it is a popular holiday destination for neighboring Sweden and Finland with excellent attractions and amenities. However, when cross-evaluation is also considered (see the overall ranking in Figure A2 in the Appendix A), Dubrovnik (HR037), Corfu (EL622), the rest of Canary Islands (ES703-7,9), Ikaria-Samos (EL412), Gozo-Comino (MT002), Hamburg (DE600), Åland (FI200), Malta (MT001), and Byen København (DK011), are also among the top 5 % NUTS3 regions, relegating Ibiza to the 36th position. While again most new additions are Mediterranean destinations, Hamburg and København stand out among them. Not too surprisingly since they are two major urban tourist destinations.

By basins, the average scores are 7.03 for the Mediterranean coast, 4.14 for the Black sea regions, 5.9 for the Atlantic coast, 5.82 for destinations in the North sea, and 6.42 for the Baltic sea coast, with an overall European average of 6.3 (see aggregated values in Table A.2). Using "violin plots", a more comprehensive comparison highlighting the heterogeneity of each basin can be visualized more easily (see Fig. 3a). In this respect, the Mediterranean basin shows a much more compact

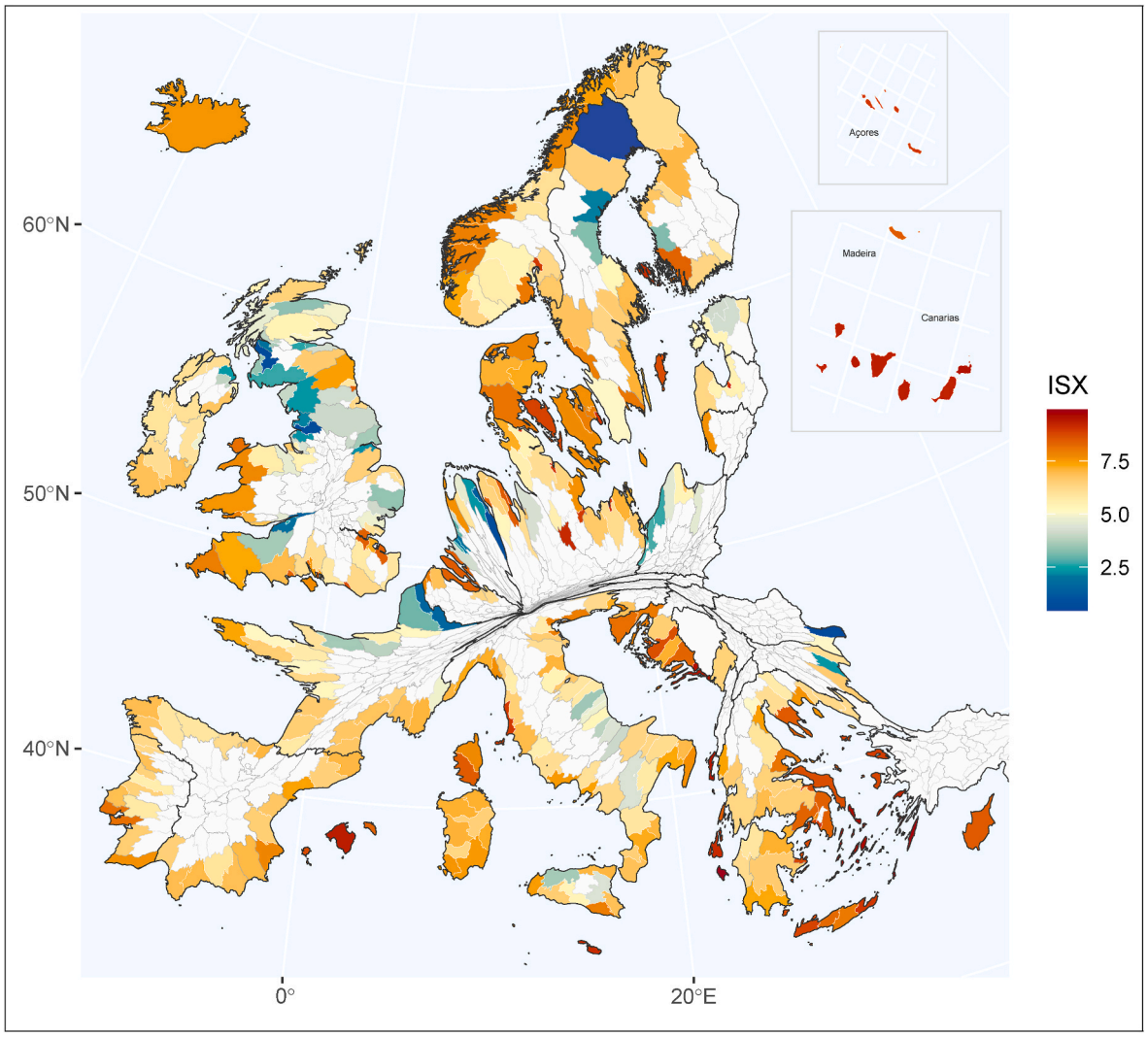


Fig. 2. Tourism specialization index: cartogram.

specialization score distribution than the rest of the European basins, with nearly all of its destinations above the European average. In particular, the five top Mediterranean destinations are Greek islands in the Ionian and South Aegean seas (the aforementioned Zakynthos, Kalymnos, Mikonos, and Corfu) and Dubrovnik, while the bottom five are all in the South-Italian Adriatic coast and Sicily.

With respect to country average scores and heterogeneity, Fig. 3b shows violin plots for every country bathed by European waters. Based on this, Table 2 compares the regional values of the index as per country vs. the European average. Among the most specialized countries with more than one NUTS3 coastal regions, Malta, Croatia, Denmark, Greece, Iceland, and Spain have either all or most of their coastal destinations above the European average. To them, it would also be desirable to include the single coastal regions of Cyprus and Lithuania, respectively. Among the least specialized countries, on the other hand, Bulgaria, Poland and Netherlands have most of their coastal destinations below average, while Estonia and Romania are completely below the average.

6. Discussion and implications

The main goal of this study is to evaluate the specialization of European coastal tourist destinations. To achieve this objective, the first step involves developing a comprehensive database of indicators for coastal tourism in Europe at the most detailed geostatistical level possible, defined by the NUST3 regional classification. Due to data availability constraints at this level of disaggregation, the chosen indicators aim to encapsulate the key aspects of the tourism sector, focusing on demand, supply, and services. This database comprises 38 indicators across 398 European coastal regions, enabling the analysis and comparison of the European tourism economy on a regional scale. The second step is the proposal of a statistical approach to create a synthetic index that consolidates the available data into an overall measure of tourism specialization. This index aids in ranking destinations and identifying regions with similar tourism patterns, offering guidance for policy formulation and sector transition.

6.1. Theoretical implications

This study assess the degree of tourism specialization in European coastal destinations using a synthetic index created through Data Envelopment Analysis.

There is not a consensus regarding the definition of tourism specialization. Tourism is a multifaceted economic activity with both demand-side and supply-side considerations and amenities playing a crucial role creating demand, and driving supply and employment in the long run. Therefore, the paper focuses in these three aspects, Demand, Supply & employment, and Attractions & amenities, to capture the main characteristics of the tourism industry.

The methodological approach involves creating an index for each coastal region, which will summarize the complex system of economic

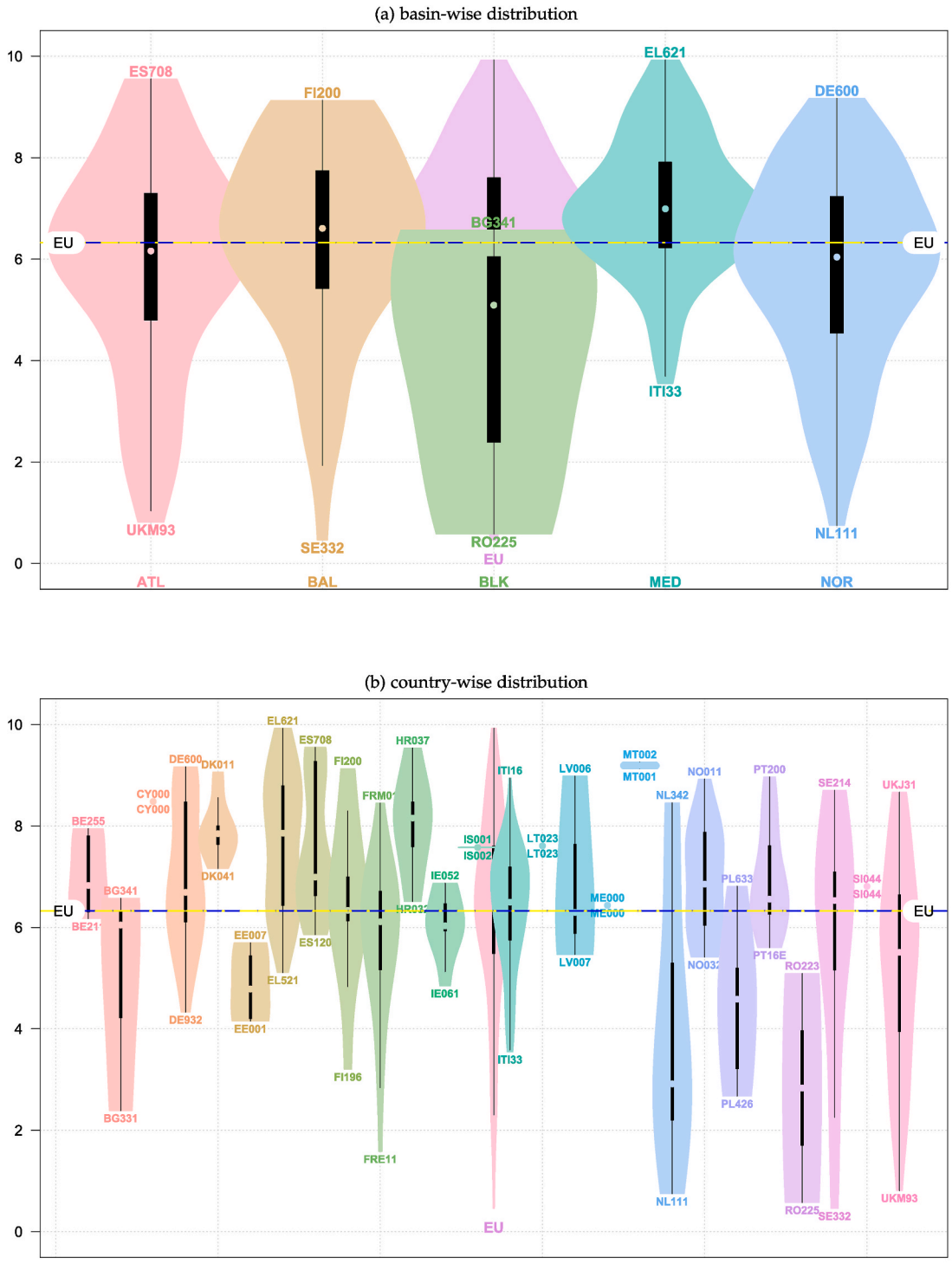


Fig. 3. Tourism specialization index: violin plots. Top: *basin-wise* distribution. Bottom: *country-wise* distribution. The codes refer to the top/bottom five NUTS3 regions. (Note: violin plots are a combination of a box-and-whisker plot showing the median, interquartile range, and 1.5 times that range plus a reflected kernel density plot).

indicators of the European tourism database into a single meaningful value, allowing for a comparison of the level of tourism specialization between different European coastal destinations. In this framework, synthetic indicators are a very useful tool to policymaking and benchmarking at a supranational level because they facilitate the interpretation of the results by reducing the dimension of the number of indicators without losing information (Nardo et al., 2008).

The statistical method employed in this study to create this synthetic index is Cross-efficiency Data Envelopment Analysis (DEA), which calculates a weighted average of specialization indicators for each region in the European coastal tourism database, thereby creating a specialization vector. Furthermore, this technique offers the potential to aggregate all

Table 2
Tourism specialization index: index values *vs.* Eur average.

country		average	NUTS3 regions: all above Eur average	mostly(*) above Eur average	mostly(*) below Eur average	all below Eur average
MT	Malta	9.19	X			
CY	Cyprus	8.48				
HR	Croatia	8.05	X			
DK	Denmark	7.91	X			
EL	Greece	7.68		X		
LT	Lithuania	7.61				
IS	Iceland	7.58	X			
ES	Spain	7.57		X		
DE	Germany	7.06				
BE	Belgium	7.01				
PT	Portugal	6.94				
NO	Norway	6.92				
LV	Latvia	6.91				
SI	Slovenia	6.81				
FI	Finland	6.54				
ME	Montenegro	6.44				
IT	Italy	6.37				
Eur average		6.33				
IE	Ireland	6.08				
FR	France	5.80				
SE	Sweden	5.80				
UK	United Kingdom	5.26				
BG	Bulgaria	5.00			X	
EE	Estonia	4.85				X
PL	Poland	4.47			X	
NL	Netherlands	4.03			X	
RO	Romania	2.83				X

(*) 'mostly above/below' ≡ country's complete interquartile range ≷ Eur average (except for Cyprus and Lithuania since they only have one sigle NUTS3 coastal region).

available data for every destination through non-parametric, data-driven flexible weights. The 'output-based' DEA formulation utilized maximizes the relative specialization of each destination. As a result, the specialization score reflects a self-assessment process aligned with the destination's specialization profile, ensuring a more tailored assessment. Furthermore, the methodology includes both self-evaluation and cross-evaluation processes. Each region not only assesses itself using its unique specialization profile but also undergoes cross-evaluation using weights derived from other regions within the database. This dual evaluation process enhances the objectivity of the assessment. After the self- and cross-evaluation process, each region obtains a score for each region under analysis. To summarize the destination's performance, the arithmetic mean of all the scores is calculated for each destination.

The application of this technique to each of the three vectors of interest makes it possible to reduce the information of all the indicators into a single vector, thus obtaining three different synthetic indexes of Tourism specialization scores: Demand, Supply & employment, and Attractions & amenities. Finally, in order to summarize all the available information in an overall measure of tourism specialization, the proposed method was used to construct a synthetic index based on three vectors related to the main features of Europe's coastal tourist destinations. The index provides a relative score for each Eurostat NUTS3 region that can be useful to assess its degree of tourism specialization in comparison to other regions in the European coast.

6.2. *Practical implications: tourism specialization profiles*

A general review of the results shows the weight of the islands among the most specialized destinations, occupying the top positions in the ranking of destinations in the three vectors. The average value of the index is 30 % higher on islands than on the mainland in the supply & employment and attractions & amenities vectors and up to 50 % higher

in the demand vector. Therefore, it can be concluded that islands are the most tourism-dependent economies.

Table A.2 shows that the Mediterranean basin is the most specialized coastal destination in the EU. For the three vectors considered, more than half of the destinations in the top 5 % are located in this basin, and the value of the indices for most of its destinations is higher than the EU average level of specialization. In contrast, most of the Baltic and North Sea regions present a level of specialization below the EU average in every vector, while the Black Sea coastal regions are below average in the attractions & amenities vector. Finally, the Atlantic shows the largest dispersion in the results, being home to some of the most specialized destinations, such as the Canary Islands, as well as some regions of the UK or France that occupy very low positions in the rankings.

At country level, there are countries, such as Cyprus, Malta, Croatia and Denmark, followed by Spain and Greece, with high levels of tourism specialization, above the European average in the three vectors analyzed. On the other hand, the scores of the coastal regions in Estonia and Romania are well below the European average in all specialization vectors. In addition, it is worth mentioning the cases of France, Italy and Portugal, countries with a world-leading tourism sector but whose coastal regions are just around the European average.

The methodology proposed in this study not only ranks tourist destinations along European coasts in terms of specialization but also helps identify regions with similar tourism specialization patterns. The results show the pattern of specialization is not always homogeneous and, in some countries, significant differences by vector are observed. Thus, the Northern European countries of Belgium, Germany, the Baltic republics of Latvia and Lithuania, and the Scandinavian countries of Finland, Norway and, to a lesser extent, Sweden, show a low level of specialization in demand and supply & employment, but very high scores on the attractions & amenities vector, largely due to their natural assets. On the other hand, tourist destinations that have developed more recently, such as Iceland, Montenegro and Slovenia, show a specialization profile with very high scores in demand and attractions & amenities, which are not yet reflected in the supply & employment vector. The opposite is true for Ireland, Netherlands and Poland with a specialization profile defined by their high supply & employment scores, but their level of both demand and attractions & amenities is rather low.

These differences become even more evident when analyzed at the regional level. Take, for example, the attractions & amenities vector. Åland in Finland leads this vector, followed by some Greek islands in the North Aegean sea and Piraeus (EL411-3, EL307), Riga (LV006), the Azores (PT200), and Wilhelmshaven (DE945), all of which rank rather low in the other two vectors. In what follows, an attempt will be made to explain these relationships and imbalances in terms of the economic logic behind the chosen vectors mentioned above.

Let us start, in very broad terms, with the correlation matrices of the top/bottom 5 % destinations for the three vectors of the tourism specialization index:

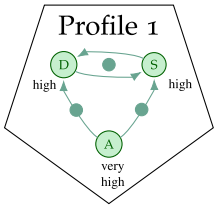
	Correlation matrix: top 5 %:			Correlation matrix: bottom 5 %:		
	Vector 1	*Vector 2*	*Vector 3*	*Vector 1*	*Vector 2*	*Vector 3*
V1: demand	1	0.87	0.86	1	0.42	−0.76
V2: supply	0.87	1	0.89	0.42	1	−0.79
V3: attractions	0.86	0.89	1	−0.76	−0.79	1

For the top 5 % destinations, it is observed, as expected, that the three vectors are highly correlated. However, for the bottom 5 % the correlation between the demand and supply vectors is much weaker, while the correlation between those vectors and the attractions & amenities vector is actually negative, which is synonymous of a weak tourism sector but may also imply, in some circumstances, some potential for tourism development.

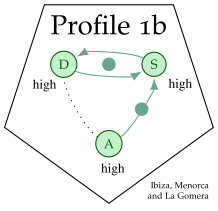
Table A.3 shows a colored comparison of the relative contributions of a selection of destinations to the total correlations between the three vectors of the tourism specialization index and their corresponding values in the vectors of the specialization index. In particular, semaphore colors highlight those destinations in the extremes of the contributions to correlation. To summarize, those relationships between vectors give rise to the following insights according to the perceived profiles:

Tourism specialization profiles.

TOP: developed coastal tourism.

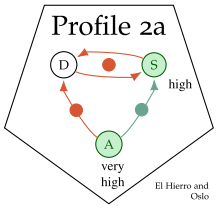


Typical highly developed tourist destination with all vectors highly valued.
High tourist attractiveness creates both high demand and supply & employment in tourist activities.

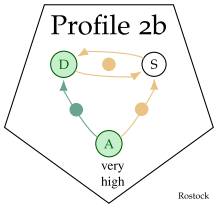


Ibiza, Menorca and La Gomera.
Variation of the above. High attractiveness leads to tourism supply & employment creation, which in turn creates its own demand.

INTERMEDIATE HIGH: attractive special cases.



El Hierro, in the Canaries, and Oslo.
Developed tourism variation of the above. High attractiveness leads to tourism supply & employment creation, but demand appears comparatively low, possibly due to their atypical characteristics and relative isolation, which sets them apart from other typical island and urban tourist destinations, respectively.



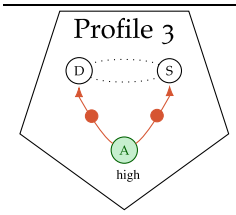
Rostock, in North Germany.
Transit tourism variation of the above. Tourist demand created by its high attractiveness, mostly due to its port facilities with high passenger and freight traffic from Germany to the Scandinavian countries.

INTERMEDIATE LOW: attractive tourism potential.

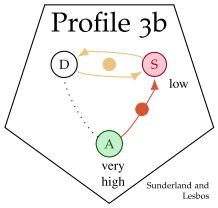
(*continued on next page*)

(*continued*)

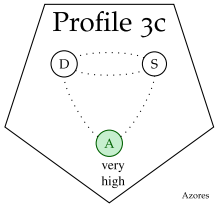
TOP: developed coastal tourism.



Highly attractive destinations but their attractiveness seems negatively related to tourism demand and supply & employment. The tourism sector appears less developed but, in turn, it may have great development potential.

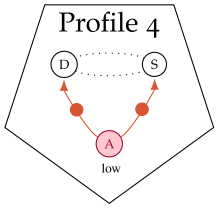


Sunderland, in North-East England, and Lesbos. Demand variation of the above. High attractiveness creates some tourism demand, but supply & employment does not follow. The tourism sector possibly has significant potential for development.

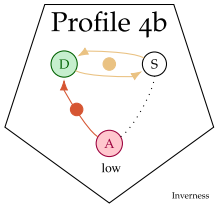


Azores.
Variation of the above. Very attractive but this potential doesn't appear to relate further to tourism demand nor supply & employment. The tourism sector possibly has some potential for further development.

BOTTOM: non-existent or unclear potential.



Typical undeveloped tourist destination with no apparent potential. Low attractiveness, and negatively related to tourism demand and supply & employment. The tourism sector possibly remains undeveloped for a good reason.



Inverness, in North Scotland.
Unclear potential for coastal tourism. Low coastal attractiveness that appears unrelated to its higher tourism demand. It possibly has an atypical attractiveness not measured in this study.

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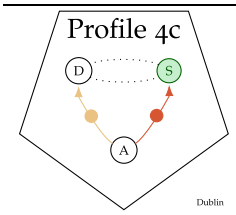
(*continued*)

TOP: developed coastal tourism.



Dublin.
Unclear potential for coastal tourism. Moderate attractiveness that seems not to be related to a higher tourism supply & employment and a moderate demand. This may also be due to a different kind of attractiveness, more related to an urban tourism typology, which is not measured in this study.

Analyzing the different types of tourism profiles can contribute to the evaluation of tourism specialization levels in European coastal tourist destinations, providing valuable insights into the potential for tourism development along European coasts. It also offers guidance in formulating effective policies and actions aimed at aiding sector recovery and managing its transition to green tourism.

6.3. *Limitations and future lines of research*

The index, as it stands now, has some limitations in that it does not cover some other types of specific tourism-related characteristics, *e.g.* more related to an urban tourism typology. In particular, two destinations have been found (4b Inverness and 4c Dublin) whose tourism profiles show an atypical attractiveness that has not been covered by the indicators used in this study. It may also be challenging to incorporate significant influences that are not consistently measured at a regional level below the national scale, such as climate change or qualitative factors like socio-cultural living styles and attitudes. To address these limitations, future analyses could consider integrating statistical proxies. Nonetheless, the overall approach remains valid as long as there is access to statistical information pertaining to the relevant specialization factors.

Regarding further research, the proposed specialization index could be expanded to encompass other geographical areas in the world or to facilitate comparisons across different time periods. In the latter scenario, it could be used to gauge the impact on tourism destinations of shocks caused by a crisis such as the recent Covid-19 pandemic, or to assess how coastal tourism specialization evolves over time, aiding in the evaluation of the effectiveness of coastal strategies in a specific area.

7. Conclusions

This work aims to address the need for an evaluation of the effects of coastal tourism in Europe and outlines a metric to gauge and compare the extent of tourism specialization in European coastal destinations.

The suggested approach was utilized to create a synthetic index based on three vectors related to the economic logic of the tourism industry in order to condense the available data into an overall measure of tourist specialization. Each Eurostat NUTS3 coastal region receives a relative score from the index, which may be used to compare the level of specialization in tourism between each destination and other coastal areas in Europe.

In summary, it may be concluded that the Mediterranean destinations of Malta, Croatia, Greece, and Spain are the most specialized, with either all or most of their coastal destinations above the European average. To them, Denmark and Iceland should be included, which also show high levels of tourism specialization. On the contrary, the least specialized coasts are in Bulgaria, Poland, Netherlands, Estonia and Romania, with the last two having a distribution that is fairly compact and below average.

The paper's findings could provide fresh insights on how tourism affects European coasts. In particular, the case study has confirmed the expected profile of typically developed tourist destinations, where

tourism attractiveness has created high tourism demand and supply. Likewise, the apparent lack of tourism potential of some coastal destinations can be explained by their low attractiveness and unrelated tourism demand and supply. But, more importantly, some destinations have been identified whose tourism profiles show great potential for tourism development (Azores, Lesbos, Riga, Wilhelmshaven, Varsinais, Piraeus, Åland, Sunderland, Chios, and West Athens) due to their high tourism attractiveness combined with a somehow undeveloped tourism sector.

The evaluation provided may serve as a diagnostic tool for policy makers to identify and assess specialization shortcomings in order to develop appropriate solutions according with the integrated European coastal management and tourism policies of European countries.

CRediT authorship contribution statement

Javier Fernández-Macho: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Pilar González:** Writing – review & editing, Validation, Resources, Investigation, Data curation. **Jorge Virto:** Writing – review & editing, Validation, Resources, Investigation, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgments

This work was supported by the EU Interreg Atlantic Area Programme 2014–2020 and European Regional Development Fund (ERDF) under Grant EAPA_224/2016 MOSES. In addition, financial support from UPV/EHU Econometrics Research Group (Basque Government grants IT1359-19, IT1508-22) and Spanish Ministry of Science and Innovation (1st author: grant PID2020-112951 GB-I0, 3rd author: grant PID2019-105183 GB-I00) is also acknowledged. We also thank one anonymous reviewer for his helpful comments on an earlier draft of the manuscript.

Appendix A

Table A.1Tourism specialization data sources.

Source		Variables	Level
Eurostat	Regional Tourism Statistics	Arrivals, Overnights, Beds, Establishments, Occupation rate	NUTS2(*)
	Regional Structural Business Statistics	Premises, Employment	NUTS2(*)
	Regional Business Demography	Enterprises, Employment	NUTS3
	Transport	Cruise passengers	Ports(*)
	Land Use and Cover Area frame Survey	Land use forests	NUTS2(*)
	European database on Natura 2000 sites and the Official Journal of the European Union	Sites of Community Interest	Sites(*)
	Bathing Water Directive: Status of bathing water (European Environment Agency)	Bathing places status	Bathing places(*)
	Regional Demographic Statistics	Area, Population	NUTS3
	Regional Economic Accounts (Branch and Household Accounts)	GVA, Employment	NUTS3
Others	OECD Statistics	GVA, Employment (Iceland)	NUTS3
	FAO statistics	Forests (Iceland and Montenegro)	NUTS3
	Global Forest Watch statistics	Forests (Azores, Madeira, Norway)	NUTS3
	World Heritage website	Sites	Sites(*)
	Country websites on blue flags	Number of flags	NUTS3
	National Statistical Offices	Arrivals, Overnights, Beds, Establishments	NUTS3

(*)Regulation (EU) 692/2011 foresees the collection of regional tourism statistics at the NUTS2 level.
Tourism statistics are therefore no longer collected for regions at the NUTS3 level (from 2012 onwards).
Therefore, it has been necessary to disaggregate the available NUTS2 level indicators in order to construct the database at NUTS3 level for year 2019.
For this, tourism data on overnight stays (demand) and places (supply & employment) from the National Statistical Offices have been used as distributors.
On the other hand, when data were collected at a smaller geographical level (such as data on attractions & amenities), NUTS3 regions' data were calculated by aggregation.

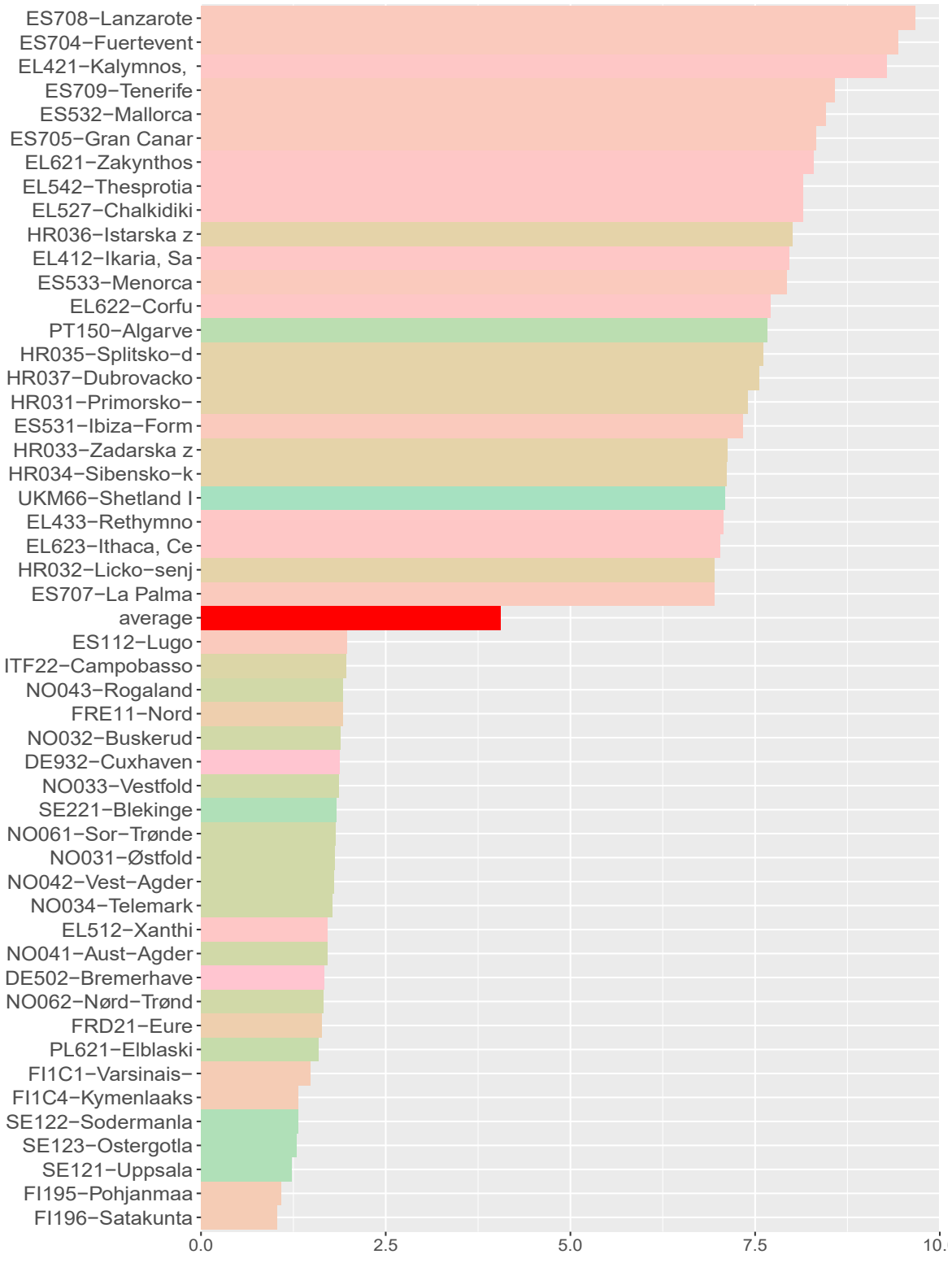


Fig. A1.a. Vector 1 ranking: demand.

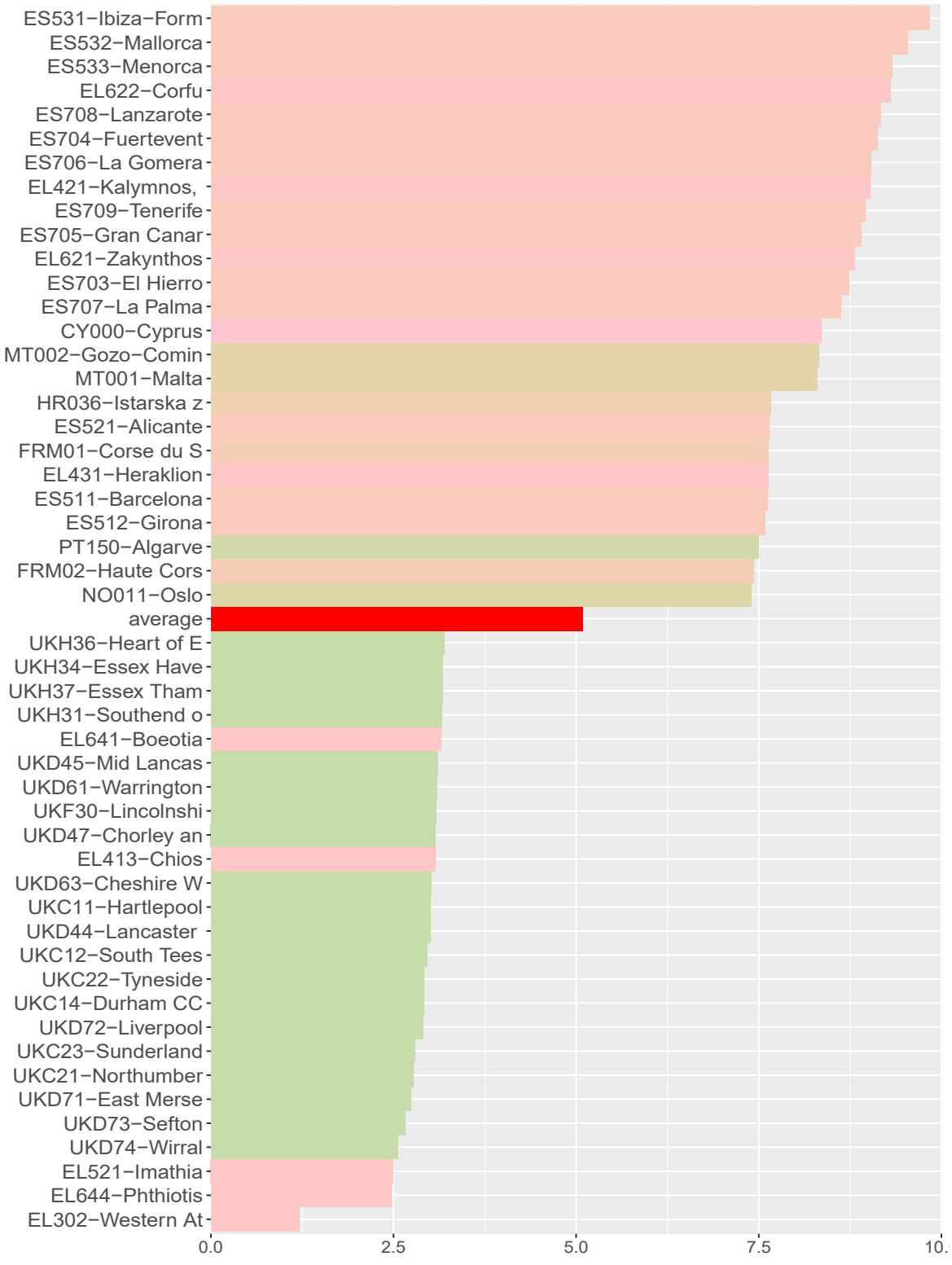


Fig. A1.b. Vector 2 ranking: supply & employment.

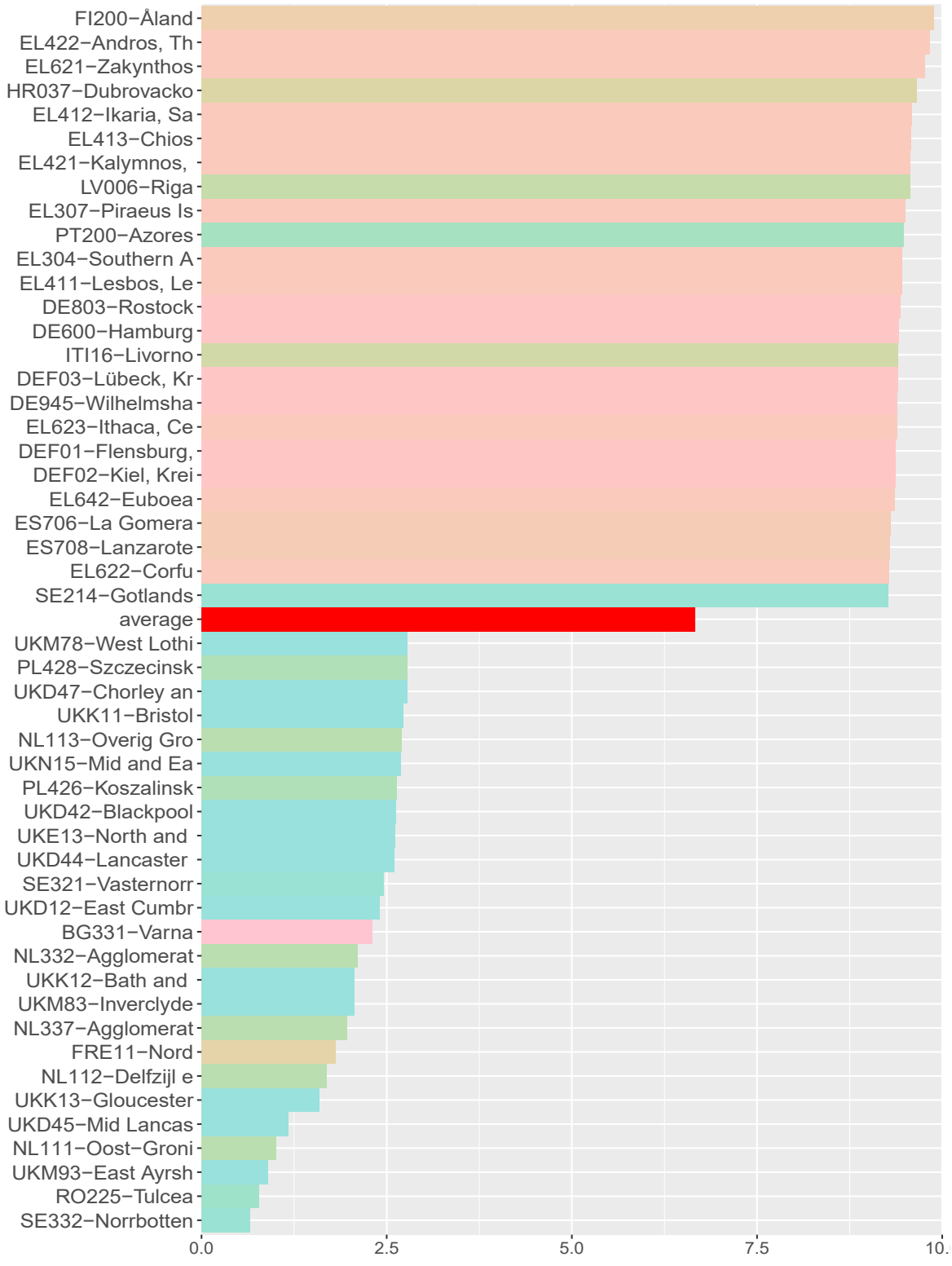


Fig. A1.c. Vector 3 ranking: attractions & amenities.

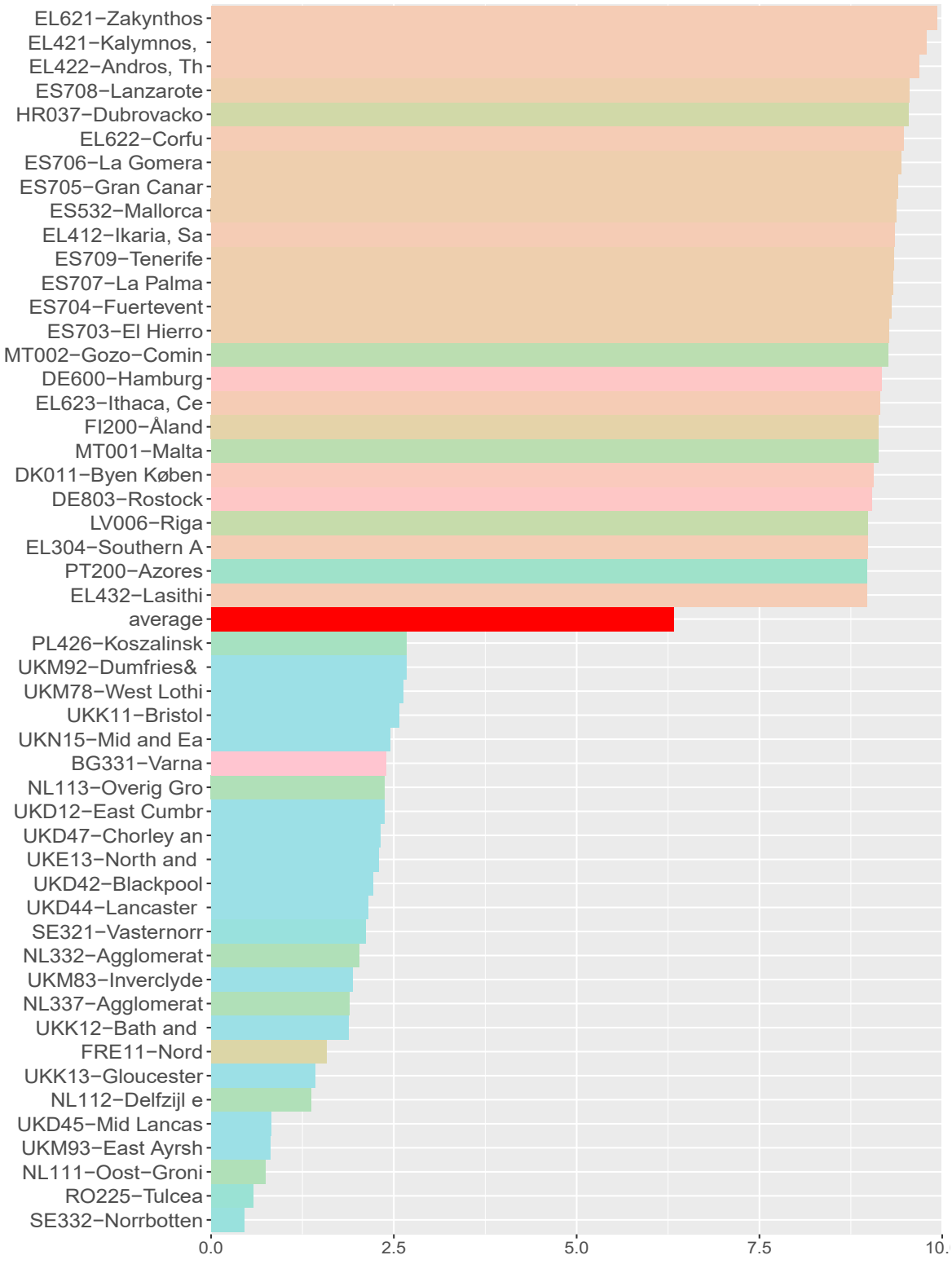


Fig. A2. Overall index ranking.

Table A.2
Basin/country-level average specialization index score.

Basin/Country	Vector 1 demand	Vector 2 supply & employment	Vector 3 attractions & amenities	Overall Index
FR (part Med.)	3.55	5.84	6.01	5.80
	(1.64; 5.68)	(4.62; 7.63)	(1.81; 8.48)	(1.58; 8.45)
IE	3.05	5.54	6.37	6.08
	(2.35; 4.46)	(4.71; 6.86)	(4.86; 7.28)	(4.85; 6.87)
IS	4.41	4.82	8.03	7.58
	(4.10; 4.72)	(4.66; 4.98)	(8.01; 8.06)	(7.57; 7.59)
PT	3.68	5.44	7.28	6.94
	(2.24; 7.66)	(4.44; 7.50)	(6.05; 9.48)	(5.60; 8.97)
UK (part North sea)	4.16	4.15	5.68	5.26
	(2.71; 7.10)	(2.56; 6.09)	(0.90; 9.18)	(0.81; 8.66)
Atlantic	3.99	5.18	6.21	5.90
	(1.64; 9.66)	(3.01; 9.17)	(0.90; 9.48)	(0.81; 9.55)
DK (part North sea)	4.72	6.13	8.17	7.91
	(3.91; 6.32)	(4.98; 7.16)	(7.42; 9.17)	(7.16; 9.06)
EE	3.04	4.53	5.23	4.85
	(2.84; 3.47)	(4.33; 4.89)	(4.43; 6.16)	(4.15; 5.70)
FI	2.01	4.54	7.05	6.54
	(1.03; 3.22)	(3.81; 6.18)	(3.55; 9.89)	(3.20; 9.13)
LT	2.77	4.46	8.17	7.61
	(2.77; 2.77)	(4.46; 4.46)	(8.17; 8.17)	(7.61; 7.61)
LV	3.51	4.27	7.45	6.91
	(3.30; 3.91)	(4.00; 4.72)	(5.94; 9.56)	(5.46; 8.98)
PL	3.58	4.87	4.75	4.47
	(1.59; 5.62)	(3.54; 5.73)	(2.64; 7.23)	(2.67; 6.81)
SE	2.13	4.91	6.20	5.80
	(1.23; 3.25)	(4.03; 6.43)	(0.66; 9.27)	(0.46; 8.70)
Baltic sea	3.16	4.97	6.81	6.42
	(1.03; 6.56)	(3.54; 7.16)	(0.66; 9.89)	(0.46; 9.13)
BG	5.71	6.22	5.04	5.00
	(5.33; 6.31)	(5.63; 7.05)	(2.31; 6.58)	(2.39; 6.58)
RO	2.21	4.82	3.09	2.83
	(2.02; 2.40)	(4.64; 5.00)	(0.78; 5.41)	(0.57; 5.09)
Black sea	4.31	5.66	4.26	4.14
	(2.02; 6.31)	(4.64; 7.05)	(0.78; 6.58)	(0.57; 6.58)
CY	6.20	8.35	8.41	8.48
	(6.20; 6.20)	(8.35; 8.35)	(8.41; 8.41)	(8.48; 8.48)
EL	4.76	4.90	8.10	7.68
	(1.71; 9.28)	(1.21; 9.30)	(5.85; 9.83)	(5.11; 9.93)
ES (part Atlantic)	5.33	7.25	7.62	7.57
	(1.98; 9.66)	(4.51; 9.84)	(6.05; 9.31)	(5.86; 9.55)
HR	7.39	6.86	8.10	8.05
	(6.95; 8.00)	(6.29; 7.66)	(6.58; 9.66)	(6.51; 9.54)
IT	4.33	4.81	6.75	6.37
	(1.97; 6.42)	(3.63; 6.48)	(3.79; 9.40)	(3.54; 8.94)
MT	6.18	8.31	9.14	9.19
	(5.98; 6.39)	(8.30; 8.32)	(9.07; 9.22)	(9.12; 9.26)
ME	6.28	4.10	6.80	6.44
	(6.28; 6.28)	(4.10; 4.10)	(6.80; 6.80)	(6.44; 6.44)
SI	4.93	4.47	7.24	6.81
	(4.93; 4.93)	(4.47; 4.47)	(7.24; 7.24)	(6.81; 6.81)
Mediterranean	4.82	5.40	7.34	7.03
	(1.71; 9.28)	(1.21; 9.84)	(3.79; 9.83)	(3.54; 9.93)
BE	3.80	4.61	7.48	7.01
	(3.00; 4.41)	(4.49; 4.71)	(6.63; 8.48)	(6.17; 7.95)
DE (part Baltic)	3.39	4.90	7.50	7.06
	(1.67; 6.56)	(3.91; 6.78)	(4.80; 9.44)	(4.33; 9.17)
NL	3.79	5.52	4.21	4.03
	(2.15; 6.47)	(4.00; 6.82)	(1.01; 8.70)	(0.75; 8.46)
NO	2.22	5.11	7.35	6.92
	(1.65; 3.05)	(4.65; 7.40)	(5.74; 9.07)	(5.41; 8.92)
North sea	3.53	4.58	6.23	5.82
	(1.65; 7.10)	(2.56; 7.40)	(1.01; 9.41)	(0.75; 9.17)

Countries bathed by two sea water bodies are shown within their main basin for display purposes only. Range of NUTS3 index values within each basin/country is shown in brackets.

Table A.3
Tourism specialization index: top/bottom contributions to correlation.

			vectors			contribution to correlation(*)				
		profile	V1	V2	V3	V1-V2	V1-V3	V2-V3	average	
ES708	Lanzarote	1	9.66	9.17	9.29	4.7%	3.7%	3.9%	4.1%	
EL421	Kalymnos	1	9.28	9.03	9.57	4.2%	3.8%	4.2%	4.1%	TOP 1%
ES704	Fuerteventura	1	9.44	9.12	9.05	4.4%	3.2%	3.6%	3.7%	
EL621	Zakynthos	1	8.29	8.82	9.76	3.2%	3.3%	4.3%	3.6%	
ES532	Mallorca	1	8.45	9.54	9.10	4.0%	2.7%	4.0%	3.6%	
ES709	Tenerife	1	8.57	8.96	9.14	3.6%	2.8%	3.5%	3.3%	TOP 2%
ES705	Gran Canaria	1	8.32	8.90	9.22	3.3%	2.7%	3.6%	3.2%	
EL622	Corfu	1	7.71	9.30	9.28	3.2%	2.4%	4.1%	3.2%	
ES531	Ibiza	1b	7.34	9.84	8.41	3.2%	1.4%	3.0%	2.6%	
ES707	La Palma	1	6.95	8.62	9.23	2.1%	1.9%	3.3%	2.4%	TOP 3%
ES533	Menorca	1b	7.93	9.32	8.09	3.4%	1.4%	2.2%	2.3%	
ES706	La Gomera	1b	6.09	9.04	9.31	1.6%	1.3%	3.8%	2.3%	
			...			...				
ES703	El Hierro	2a	3.67	8.73	9.21	-0.3%	-0.2%	3.4%	1.0%	
DE803	Rostock	2b	6.56	4.97	9.44	-0.1%	1.7%	-0.1%	0.5%	
NO011	Oslo	2a	3.05	7.40	9.07	-0.5%	-0.6%	2.1%	0.3%	
			...			...				
PT200	Azores	3c	4.08	5.11	9.48	0.0%	0.0%	0.0%	0.0%	
EL411	Lesbos	3b	5.53	4.33	9.46	-0.2%	1.0%	-0.8%	0.0%	
	⋮		⋮							⋮
LV006	Riga	3	3.91	4.72	8.98	0.0%	-0.1%	-0.4%	-0.2%	
			...			...				
IE061	Dublin	4c	4.46	6.86	4.86	0.1%	-0.2%	-1.2%	-0.4%	BOTTOM 6%
			...			...				
DE945	Wilhelmshaven	3	2.88	4.23	9.40	0.2%	-0.8%	-0.9%	-0.5%	BOTTOM 4%
			...			...				
FI1C1	Varsinais	3	1.48	4.56	8.99	0.3%	-1.5%	-0.5%	-0.6%	
UKM62	Inverness	4b	6.66	4.59	3.55	-0.3%	-2.0%	0.6%	-0.6%	BOTTOM 3%
EL307	Piraeus	3	3.06	3.82	9.51	0.3%	-0.7%	-1.3%	-0.6%	
PL428	Szczecinski	4	5.15	5.68	2.78	0.1%	-1.1%	-0.9%	-0.6%	
FI200	Åland	3	3.22	3.81	9.89	0.2%	-0.7%	-1.5%	-0.7%	
UKC23	Sunderland	3b	4.21	2.79	9.14	-0.1%	0.1%	-2.1%	-0.7%	BOTTOM 2%
EL413	Chios	3	4.03	3.08	9.58	0.0%	0.0%	-2.2%	-0.7%	
NL323	Ijmond	4	4.20	6.59	2.84	0.0%	-0.1%	-2.1%	-0.7%	
PL426	Koszalinski	4	5.62	5.73	2.64	0.2%	-1.6%	-1.0%	-0.8%	
NL324	Haarlem	4	4.44	6.82	2.84	0.1%	-0.4%	-2.4%	-0.9%	BOTTOM 1%
BG331	Varna	4	5.49	5.99	2.31	0.3%	-1.6%	-1.5%	-0.9%	
EL302	W Athens	3	2.70	1.21	8.91	1.1%	-0.8%	-3.2%	-1.0%	

(*) Region's percent contribution to correlation between vectors, *i.e.* $100 \cdot V_i^*(k)\, V_j^*(k)$, where $V_i^*(k) = \left(V_i(k) - \overline{V_i}\right)/\sigma(V_i)$ is the i-th vector standardized score of region k.
Green cells: vector score $V_i(k) > 1$ std.dev. above average; red cells: $V_i(k) < 1$ std.dev. below average.
Semaphore green: above the 95th percentile of average contribution; yellow: negative above the 5th percentile; red: below the 5th percentile.
Profiles: (see text).

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