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Preface

This book is composed by the papers written in English and accepted for presentation and discussion at the 2019 International Conference on Tourism, Technology & Systems (ICOTTS'19). This Conference had the support of the UAI (Universidad Abierta Interamericana) and AISTI (Iberian Association for Information Systems and Technologies). It took place at Buenos Aires, Argentina, December 5th–7th, 2019.

The 2019 International Conference on Tourism, Technology & Systems (ICOTTS'19) is an international forum for researchers and practitioners to present and discuss the most recent innovations, trends, results, experiences and concerns in the several perspectives of Tourism and/or Information Technologies and Systems.

The Program Committee of ICOTTS'19 was composed of a multidisciplinary group of 125 experts and those who are intimately concerned with Information Systems and Technologies. They had the responsibility for evaluating, in a 'double-blind review' process, the papers received for each of the main themes proposed for the Conference: Technology in Tourism and Tourist experience; Generations and Technology in Tourism; Digital Marketing applied to Tourism and Travel; Mobile Technologies applied to sustainable Tourism; Tourism research in providing innovative solutions to social problems; Tourism, Wellness and Hospitality; Information Technologies in Tourism; Digital transformation of Tourism Business; Traveling for health/medical and wellness; Information Technologies in Ecotourism and Agritourism; Information Technologies in Food Tourism; Information Technologies in Education and Educational Tourism; eTourism and Tourism 2.0; Big data and Management for Travel and Tourism; Geo-tagging and Tourist mobility; Health Tourism; Information Systems in Tourism and Hospitality; Smart Destinations; Resilience and Tourism; Dark Tourism; Military Tourism; Tourism Management; Tourism Planning; Strategic Planning in Tourism; Destination Marketing Planning; Destination Partnerships and Team-Building; Destination Governance and Leadership; Destination Product Development; Destination Markets; Accessible Tourism; Cultural Tourism; Destination Quality; Education and Tourism; Human Resources development in Tourism; Robotics in Tourism; Destination Marketing Systems; Computer

Reservations Systems; Global Distribution Systems; Electronic Information Distribution in Tourism and Hospitality; Organizational Models and Information Systems; Information Systems and Technologies.

ICOTTS'19 received about 100 contributions from 20 countries around the world. The papers accepted for presentation and discussion at the Conference are published by Springer (this book) and by AISTI, and will be submitted for indexing by ISI, EI-Compendex, SCOPUS and/or Google Scholar, among others.

We acknowledge all of those that contributed to the staging of ICOTTS'19 (authors, committees, workshop organizers and sponsors). We deeply appreciate their involvement and support that was crucial for the success of ICOTTS'19.

Buenos Aires, Argentina
December 2019

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João Vidal de Carvalho
Dália Liberato
Elisa Alén González
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Administrative Management and Quality of Service: A Diagnosis in the MiPymes of the Hotel Sector of the Salinas Canton	223
Emanuel Bohórquez, Maritza Pérez, William Caiche and Arturo Benavides	
Discovering Tourist Attractions of Cities Using Flickr and OpenStreetMap Data	231
Farzad Vaziri, Mirco Nanni, Stan Matwin and Dino Pedreschi	
Mobile Tourist Recommendation System for Metro do Porto	243
Susana Martins, Milena Carvalho and Juliana Rodrigues	
The Workforce of the Future—Projects and Initiatives to Overcome the Challenges Enacted by the Digital Transformation	253
Anabela Mesquita, Adriana Oliveira, Arminda Sequeira, Luciana Oliveira and Paulino Silva	
Spatial and Temporal Concentration of Tourism Supply and Demand in Northern Portugal. Application of the Herfindahl-Hirschman Index	263
Paula Odete Fernandes, Alcina Maria Nunes, Cláudia Miranda Veloso, Eleonora Santos, Fernanda A. Ferreira and Manuel José Fonseca	
Knowledge Creation and Transfer in Tourism Innovation Networks	275
Filipa Brandão, Carlos Costa, Zélia Breda and Rui Costa	
Price-Setting Hotel Competition Under Uncertain Demand	289
Fernanda A. Ferreira and Flávio Ferreira	
Organizational Model for Public Sector Auditing Bearing in Mind Time Factor	297
Tatiana Antipova	
Machine Learning for Prediction of Business Company Failure in Hospitality Sector.	307
José Henrique Brito, José Manuel Pereira, Amélia Ferreira da Silva, Maria José Angélico, António Abreu and Sandrina Teixeira	
Tourism Planning and Product Management	
The Paradoxes in Development of Silk Way Tourism Product and Overcome of Them	321
Mukhambetov Temirkhan	
Women in Tourism Entrepreneurship in South Africa: Is it a Man's World?	335
Athenkosi Ntanjana and Jacqueline Mangwane	



Spatial and temporal concentration of tourism supply and demand in Northern Portugal. Application of the Herfindahl-Hirschman Index.

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Abstract. The northern region of Portugal, in the last years, has experienced the enhancement of tourism demand, which may induce the emergence of an overtourism phenomenon in some particular subregions of the North of Portugal. This phenomenon may cause significant destruction of the living conditions of residents, landscapes, seascapes, air and water quality, causing economic inequalities and social exclusion. The aim of this research paper is to understand if the phenomena of overtourism is present in the North of Portugal and if it changed overtime. The concentration of tourism activity in different municipality subregions can be measured with the Herfindahl-Hirschman Index a well know economic concentration measure. Using as variables the number guest and their expenditure in accommodation, to measure the demand, and the number of establishments, bedrooms and lodging capacity to measure the supply was possible to follow the concentration of tourism demand and supply in the 8 NUTIII regions located in the North of Portugal. The results showed that a specific subregion –Area Metropolitan do Porto– concentrates both the tourism demand and supply in the years 2014 and 2017, despite the increasing values found for all the variables in the 8 subregions. When it is observed a decrease in the levels of concentration are the subregions near by the most concentrate one that increase the share of tourism demand and supply. More rural and less populated areas need more targeted and specific policies measures to attract even more visitors.

Keywords: Overtourism, Northern Portugal, Spatial measurement, Herfindahl-Hirschman Index, Public policies, Outdoor tourism.

1 Introduction

Attention to the importance of tourism as a particularly efficient way of promoting regional development has increased significantly in recent years, in part due to tourism's ability to generate income and employment as well as synergies within other economic sectors. Portugal has a long tradition in tourism. However, the development of tourism between regions is unbalanced as a result of the country's highly insular and mountainous geomorphology and the unequal distribution of natural, socio-cultural and

environmental resources. Nevertheless, factors such as a rich cultural heritage, a long coastline and a good natural environment encompass significant opportunities for the development and promotion of tourism in the North of Portugal.

While confining green spaces with densely populated urban agglomerations are preferred locations for outdoor recreational activities by many residents, ecotourism participants are attracted to hilly regions endowed with wildlife, attractive landscapes and that offer opportunity for outdoor activities such as hiking, mountain biking, climbing or skiing. In this framework, the North of Portugal is a privileged space since it is a hilly region with a heterogeneous panorama. In fact, this region has several famous mountains like Serra do Gerês, Peneda, Marão and Soajo, as well as several prominent rivers like Minho, Lima, Neiva, Cávado, Ave and Douro, waterfalls and vineyards. Some of these elevations form natural parks, such as Peneda-Gerês, Montesinho and Alvão. In addition, the region incorporates four World Heritage Sites: Porto and Historic Center of Guimarães; Alto Douro Vinhateiro; and the Prehistoric Region and the Rock Art site in the Côa Valley. In this context, the Douro region was considered as a priority tourist attraction within the agenda of the National Strategic Tourism Plan and was also considered by the Regional Tourism Agenda as a priority area for the development of regional tourism.

The aim of this research paper is to understand if the phenomena of overtourism is present in the North of Portugal and if it changed overtime. In a context of tourism globalization, massification may be an inevitability for several hot-spot tourism destinations. Nonetheless, if there is a proper policy of spatial planning, based on well-defined measures and indicators, like the one here proposed by the application of the Herfindahl-Hirschman Index (HHI), there could be adequate management of it and the provision of effective mechanisms for environmental planning and management.

The paper is divided in three main sections: the first after the introduction is devoted a brief literature review on the phenomena of overtourism and the potentialities of outdoor tourism; a section explain the methodology appears before the section where the results are presented; finally the paper closes with some conclusions and final remarks.

2 Literature Review

The term "Overtourism" describes the state in which the effect of tourism, at particular times and in specific locations, surpasses physical, ecological, social, economic, psychological, and/or political capacity thresholds [1]. This phenomenon per se is not a new one, since there are several studies, recent and ancient, that analyse the troublesome modes of tourism agglomeration and their impacts on communities and environment of the touristic destinations. In fact, the investigations examining the strain of tourism on local populations arisen in the seventy decade [2-3], beside debates of the dangers of destination saturation [4]. For example, a main contribution in the impact researches field is Doxey's 'Irritation Index' [5], which proposed four emotional stages citizens can experience with growing visitor numbers. One more contribution is the Tourism Area Life Cycle (TALC) offered by Butler [6], according to which tourism places grieve from their own successes. The term overtourism is not referred in these publications but they evidently examined the possibly negative effects of a quickly developing tourism sector. Growing air and water pollution, higher consumption of resources, increased noise and a more evidenced role of tourism as a reason of climate change are examples a few of the sector's problematic impacts [7]. Nevertheless, the debate on the negative consequences of tourism, that is to say new phenomenon

‘overtourism’, is nowadays of special interest to both academia and general public and political. This rising phenomenon disturbing destinations global has newly and frequently been mentioned to as “overtourism” [8].

An exact definition of overtourism phenomenon is not right away offered. Given its own nature, this term is related with the destination’s carrying capacity, the tourist number and the type and time frame of their visit. According to the study of the McKinsey & Company & World Travel & Tourism Council [9], the challenges associated with overtourism can linked to the laden infrastructure, destruction to nature, estranged residents, a degraded tourist experience, or threats to culture and heritage. Recently, an increasing number of worldwide capital cities, have been described to affect from overtourism [10-12].

In according to definition of the Overtourism proposed by Peeters et al. [1] this term describes the negatives impacts (social, economic, environment, political) of the excess tourism in the local destinations. This concept contains very modes of strain produced by high growth of visitors. It comprises economic (tourism commercial zones), social (hosts, guests, residents), ecological (noise, air quality, water use, water quality, waste, etc.) and physical (infrastructure, space) aspects. Overtourism is an intricate and complex phenomenon that intensely affects the liveability of a location, just as the experiences of citizens, guests and several stakeholders who are implicated with or concerned by tourism [9, 12-14]. Whereas a wide perspective, overtourism may be enclosed inside the area of tourism impact researches. Typically, the tourism studies have discussed this from an only perspective: tourism of the about the social, economic and environment destination [14]. These impacts range from the loss of heritage, of the depopulation of the city centre to the development of protests by the inhabitants or environmental appeal and authenticity of the places.

Thus, the current enormous amount of tourism inbound flows led to the occurrence of new type of tourism, whose economic and socio-cultural importance gave it the status of mass tourism. The analysis of tourism reflects a phenomenon of masses, both in terms of the number of people who practice it (visitors), of the agents associated with it (both public and private sectors) and of the spaces where it grows and develops (tourism destinations). While some countries around the world focus their efforts on tourism promotion campaigns and seek to attract visitors through all possible strategies, others suffer from the overcrowding of some of their spaces and the dissatisfaction of its residents. The overtourism, the phenomenon of mass tourism, is a new concept, which embraces the study of the negative consequences of the tourism mass flows. Nevertheless, the phenomenon already exists as a consequence of tourism crowding and its effects on the local and regional communities. Less careful control of tourism development and the spread of overtourism may lead to the loss of identity and authenticity and generate a significant risk to the future attractiveness and competitiveness of a particular touristic destination.

In a territory such as Portuguese, which combines the diversity of natural resources, with a unique architectural heritage, with a mild climate, with the security of the destination and with the proximity to the main emitting markets, tourism associated with activities practiced in nature and physical activity is an opportunity. These activities can be important catalysts for the social development and recovery of regions weakened from the social, economic, demographic and environmental point of view. The definition of outdoor tourism concept thus assumes particular relevance. The literature presents different studies of the last years that relate the terms Leisure, Recreation and Outdoor with the tourist activity [15-18]. This relationship is based on the different activities that are outdoor developed, during vacations, in natural areas and

that by their characteristics are sometimes considered as Nature Tourism [19-20], or as Adventure Tourism [17, 20-21], or as Outdoor Active Tourism [16, 22], or such as Adventure Tourism in Mountain areas [23].

Outdoor Tourism can be considered as a set of activities that are based on the practice of physical activity and that motivate the trip and visit to certain regions. The activities can be soft or hard, leisure or competition, and can be developed, also, within the scope of events. They have to be practiced outdoor and in contact with nature, whether in rural areas (protected areas and natural areas), or urban. Outdoor Tourism also contemplates cultural interaction/learning, through the offer of different experiences (supply perspective.). On the other hand, Outdoor Tourism also contemplates the demand perspective, since it includes not only the practitioners of the activities, but also the respective companions (e.g., family members, friends). The nature and scope of Outdoor Tourism presents a high potential for the sustainable development of the territories, in their social, economic and environmental components.

3 Research Methodology

The empirical evaluation of regional tourist inequalities is usually performed using well-known regional statistical measures, namely dispersion and concentration measures, such as the location quotient, the tourist density indices, the occupancy rates or the hotel density indices. Some of these measures are derived from descriptive statistics, while others have been specifically designed for regional and tourism analysis purposes. The Herfindahl-Hirschman Index (HHI) is probably the most used indicator to measure the level of concentration/specialization between companies. In addition, The HHI is also one of the most common indicators used to detect anti-competitive practices among companies. An increase in the value of the index is usually interpreted as an indicator of actions that can decrease the competition of the companies.

Due to its enormous potential and versatility, its application has been extended to the tourism literature, to measure the level of concentration/competition between regions and over time [24-27]. Considering the spacial level of subregions (municipalities or their communities, for example) within the North of Portugal, it is possible to use the index to calculate a major uniformity or a higher discrepancy among those subregions bearing in mind, for instance, the number of tourist arrivals, visitors by nationality, the expenditure made tourists or the practitioners of specific types of tourism activities. The HHI is given by the formula $\sum_{i=1}^n t^2$, where n is the number of subregions considered within the North region and the t^2 is the square of the share of each subregion considering the indicator chosen to assess the touristic competition/concentration among subregions. Note that the reason for squaring the regional share under analysis is to emphasize the weight of larger tourist destinations in the market. The index could range between 0, meaning a perfect uniformity among regions, and 1 meaning a perfect concentration which reflects high differences among regions. Lower levels of the HHI indicate a more diverse portfolio of tourism activities offered by the subregions. The higher the HHI the smaller the number of subregions with tourism concentration and the weaker the competition in concurring to the creation of businesses and jobs in the sector and, therefore, the level of income generated. The tourism attraction diversity of a northern subregion destination may be regarded as the inverse of HHI.

In this paper, the HHI addresses the spatial and temporal concentration regarding the market of origin of tourists in the North region of Portugal, considering the number and nationality of visitants, the nights spend and the expenditure made in each

subregion. In more detail, it will analyse the particular case of the number of outdoor activities/tourists in the subregions of the North of Portugal. For this last indicator, the HHI is used as a measure of the size of the particular tourism attraction type in a subregion in relation to the overall northern tourism industry. In this case, an increase in the index could be interpreted as a decrease in the attraction type diversity. The opposite happens if the index decreases.

The current and official data of the National Statistics of Portugal (INE) will be considered for all 8 NUTIII regions (8 subregions) that belong to the North region of Portugal, over the period 2014-2017 (the period for each could be found the most updated statistics according to the last NUT revision, in Portugal).

4 Discussion and Results

As explained in the previous sections the focus of this research work is to understand the concentration of tourism indicators on the 8 subregions of the Northern region of Portugal. The tourism indicators selected in this exploratory work, are identified and presented in Table 1.

Table1. Variables identification, definition and measurement units.

Variable	Definition	Measurement unit	Observations
Number	Tourist accommodations: total	Absolute number	From 2014 (inclusive), the total includes the new local housing units and the housing tourism and rural area tourism establishments.
Bedrooms	Bedrooms in tourist accommodations: total		
Capacity	Lodging capacity in tourist accommodations: total		
Income	Total incomes of tourist accommodations: total	Absolute number in €	No observations
Guests	Guests in tourist accommodations: total	Absolute number	
Guests/100	Guests in tourist accommodations per 100 inhabitants, this is, guests in hotel establishments during the calendar year divided by the average resident population in percentage	%	
Average stay	Average stay in total tourist accommodations, this is, nights spent during the calendar year divided by guests during the calendar year	Average number	

Source: Own elaboration using information from Pordata (www.pordata.pt) accessed on 02.07.2019.

The indicators chosen measure the inflow of guest in each northern subregion, having in consideration the number of guests by 100 inhabitants and their average stay, the places which can lodge such guests as the number of tourism establishments, the available bedrooms and its lodging capacity. Moreover, it is considered the expenditure (in euros) made by the guests in each region. Additionally, and to best understand the evolution of each of the 8 considered subregions, the values for the total of the North region and the overall Portuguese economy (considering Portugal continental and the islands) will also be presented.

Table 2 shows the first set of indicators, regarding the lodging capacity. In the table it is possible to observe the absolute values for 2014 and 2017 and the percentage growth rate between those two moments in time. Furthermore, it is believed is important to show the share of the North Portugal in the overall economy for the set of indicators.

Table 2. Absolute and relative evolution of the total number of tourism establishments, bedrooms and its lodging capacity between 2014 and 2017.

Regions	Bedrooms			Capacity			Number		
	Absolute Values		Growth rate	Absolute Values		Growth rate	Absolute Values		Growth rate
	Number		(2014-2017)	Number		(2014-2017)	Number		(2014-2017)
	2014	2017	%	2014	2017	%	2014	2017	%
Alto Minho	2 500	3 100	24,0	5 247	6 667	27,1	152	233	53,3
Cávado	3 093	3 480	12,5	6 650	7 368	10,8	113	155	37,2
Ave	1 499	1 986	32,5	3 230	4 406	36,4	79	122	54,4
Área Metropolitana do Porto	11 834	13 952	17,9	25 912	30 880	19,2	289	398	37,7
Alto Tâmega	1 145	1 097	-4,2	2 366	2 308	-2,5	55	63	14,5
Tâmega e Sousa	1 137	1 559	37,1	2 289	3 397	48,4	67	105	56,7
Douro	1 743	1 976	13,4	3 547	4 127	16,4	104	137	31,7
Terras de Trás-os-Montes	1 323	1 634	23,5	2 864	3 702	29,3	63	100	58,7
Total North Portugal (Number)	24 274	28 784	18,6	52 105	62 855	20,6	922	1 313	42,4
Total Portugal (Number)	151 896	175 056	15,2	342 497	402 832	17,6	3 578	5 840	63,2
Share of North Portugal (%)	16,0	16,4	2,9	15,2	15,6	2,6	25,8	22,5	-12,8

Source: Own elaboration using information from Pordata (www.pordata.pt) accessed on 02.07.2019.

The results observed in Table 3, show the North of Portugal represents only nearly 16% of the total number of bedrooms and lodging capacity in the Portuguese economy. Furthermore, in the North region, one subregion is dominant in absolute values – the Área Metropolitana do Porto that represents almost a share of 50% for the two indicators. Such values are an evidence of existence of overtourism in the North region. This share is not so notorious for the number of establishments, which may be explained by the period of analysis. From 2014, the total value for the indicators include the new local housing units and the housing tourism and rural area tourism establishments, more spread over the territory of the North region and not so much located in the urban areas.

A more detail analysis of the values shows that over the period the North region increased its Portuguese share in the number of bedrooms and lodging capacity and that is observed for all the subregions, except the subregion of Alto Tâmega. The regions of Tâmega e Sousa and Ave, are the ones that present a bigger grow but are also the ones with lower absolute number of the two indicators in 2014. Regarding the number of establishments, the share of the North region decreased almost 13% even if in all the subregions of the North the number of tourism establishments increased notorious (but at a lower pace than the overall Portuguese economy). Terras de Trás-os-Montes and Alto Tâmega are regions where the increase reached almost 60% in 4 years.

The next set of indicators is a set that includes important indicators, which allow measuring the attraction of tourists for a certain region or subregion. These indicators are the absolute number of guests visiting the region, its relative number regarding each 100 inhabitants of the region and the average time (nights) they stay in such a region.

Table 3. Absolute and relative evolution of the total number of guests, guests per 100 inhabitants and their average stay between 2014 and 2017.

Regions	Guests			Guests by 100 inhabitants			Average stay		
	Absolute Values		Growth rate	Absolute Values		Growth rate	Absolute Values		Growth rate
	Number		(2014-2017)	Number		(2014-2017)	Number		(2014-2017)
	2014	2017	%	2014	2017	%	2014	2017	%
Alto Minho	204 610	351 621	71,8	77,7	132,7	70,8	1,7	1,8	5,9
Cávado	322 049	478 267	48,5	77,2	113,9	47,5	1,7	1,8	5,9
Ave	186 443	267 785	43,6	41,4	58,0	40,1	1,6	1,7	6,3
Área Metropolitana do Porto	2 200 896	3 117 423	41,6	126,3	179,9	42,4	1,8	1,9	5,6
Alto Tâmega	101 264	130 280	28,7	100,3	136,9	36,5	1,7	1,8	5,9
Tâmega e Sousa	93 750	163 802	74,7	18,4	29,2	58,7	1,8	1,7	-5,6
Douro	180 536	250 828	38,9	72,3	89,1	23,2	1,6	1,5	-6,3
Terras de Trás-os-Montes	102 752	132 599	29,0	84,1	105,7	25,7	1,4	1,5	7,1
Total North Portugal (Number)	3 392 300	4 892 605	44,2	90,2	129,4	43,5	1,8	1,8	0,0
Total Portugal (Number) (*)	17 301 622	23 953 765	38,4	155,7	214,1	37,5	2,6	2,6	0,0
Share of North Portugal (%)	19,6	20,4	4,2	57,9	60,4	4,3	69,2	69,2	0,0

Note: (*) The values for the total of Portugal just refer to the continent for the indicators guest by 100 inhabitants and average stay.

Source: Own elaboration using information from Pordata (www.pordata.pt) accessed on 02.07.2019.

It is possible to observe that the North region attracts 20% of the total Portuguese territory (including islands), even if the number of guests, regarding the number of inhabitants, is relatively lower than in the Portuguese mainland. However, it is important to stress that this number increased in a faster pace than what had been observed for Portugal (continent). Additionally, is important to refer that the average stay is also lower for the North region than for the Portuguese mainland (the islands where withdraw from this analysis due to their specificities that increase the average stay for logistics reasons); In the North of Portugal the guests stay, in average, less than 2 nights while in Portugal they stay almost 3 nights.

In detail, and because the main focus are the regions inside the North region one fact is obvious, the guests in the Northern region visit mainly the Área Metropolitana do Porto (around 65% of the total North guests). Even if it is a region with a high density of inhabitants it is also the regions with more guests by 100 inhabitants (in 2017 there were almost more 0.8 guests by inhabitants in this subregion). Furthermore, the guests in this subregion stay, in average, also more time (1.9 nights in 2017, over the average of the North region). Again, this second set of indicator show a presence of overtourism in a specific subregion of the North of Portugal even if the inflow of guest had increased in all the 8 subregions that comprise the North region.

The increase in the number of guests and in the number of guests per 100 inhabitants, over the four years of analysis, is more noticeable in Tâmega e Sousa and Alto Minho. Subregions like Terras de Trás-os-Montes and Alto Tâmega, that also presented positive growth rates, perform not so better as in the rest of the subregions. Regarding the average stay of guests should be noticed the decreases observed in the regions of Douro and Tâmega e Sousa. The other 6 subregions perform equally, concerning this indicator.

Finally, it will be presented, Table 4, the evolution of income generated by the guests visiting the North region and its subregions. The indicator is measured here in thousand euros.

Table 4. Absolute and relative evolution of the expenditures made by guests in tourism establishments between 2014 and 2017.

Regions	Income		
	Absolute Values		Growth rate
	Number		(2014-2017)
	2014	2017	%
Alto Minho	16 878	32 230	91,0
Cávado	23 407	39 267	67,8
Ave	14 266	20 560	44,1
Área Metropolitana do Porto	175 423	322 020	83,6
Alto Tâmega	8 776	12 911	47,1
Tâmega e Sousa	10 150	19 189	89,1
Douro	16 609	34 590	108,3
Terras de Trás-os-Montes	5 608	8 544	52,4
Total North Portugal (Number)	271 117	489 312	80,5
Total Portugal (Number) (*)	2 285 896	3 681 207	61,0
Share of North Portugal (%)	11,9	13,3	12,1

Source: Own elaboration using information from Pordata (www.pordata.pt) accessed on 02.07.2019.

Also for this indicator is the subregion of Área Metropolitana do Porto that gathers the biggest share of expenditures made by guests in the North region of Portugal (around 65% in both years presented). This subregion is not the one with the highest growth rate in 4 years since the region of Douro performed very well on this item – the income generated by guests in accommodation grew more than 100% over 4 years. The region that performs worse on this indicator is the subregion of Terras de Trás-os-Montes, together with Alto Tâmega and Ave.

The three previous set of indicators and the analysis of their evolution show that all the North region of Portugal, included the majority of its subregions were able to attract

more tourists, which was followed by the generation of a higher supply on tourism establishments, bedrooms and lodging capacity. In consequence, more income was generated by guests staying in the available tourism accommodations. However, another phenomena can be observed. North region is very dependent of a specific subregion, Área Metropolitana do Porto, what illustrates some phenomena of overtourism. The growth rates computed show that several North subregions performed better than the previous mention region but this higher growth rates indicated a lower concentration of tourism establishments, guests and income in Área Metropolitana do Porto between 2014 and 2017?

To answer this question the HHI has been calculated for all of the indicators except the guests by 100 inhabitants and their average stay, since the total of the North region is not the sum of the several subregions, which is an assumption to be considered when calculating the HHI. Table 5, presents the results for the first set of indicators related with the number of establishments, bedrooms and lodging capacity. Table 6 presents the found results for the number of guests and the HHI and its variation for the income generated by guests in each subregion.

The previous statistical results show the number of guests and their expenditure grew all over the regions in the years in analysis. A simple glance at the statistical data allows to observe that all the northern region of Portugal became more attractive. That is an undeniable fact. The present tourism public policies are achieving the attraction purpose. However, when analyzing the concentration of guests and the receipts they generate on accommodation, after applying the HHI, it is possible to observe that the levels of concentration of guests and their accommodation expenditure changed just slightly towards specific regions - the ones nearest the places with more guests.

Table 5. HHI for the concentration measurement of the number of establishments, bedrooms and lodging capacity and its variation (delta) between 2014 and 2017, by subregion.

Regions	Bedrooms			Capacity			Number		
	HHI		Δ (Delta) (HHI ₂₀₁₇ - HHI ₂₀₁₄)	HHI		Δ (Delta) (HHI ₂₀₁₇ - HHI ₂₀₁₄)	HHI		Δ (Delta) (HHI ₂₀₁₇ - HHI ₂₀₁₄)
	2014	2017		2014	2017		2014	2017	
Alto Minho	0,011	0,012	0,001	0,010	0,011	0,001	0,027	0,031	0,004
Cávado	0,016	0,015	-0,002	0,016	0,014	-0,003	0,015	0,014	-0,001
Ave	0,004	0,005	0,001	0,004	0,005	0,001	0,007	0,009	0,002
Área Metropolitana do Porto	0,238	0,235	-0,003	0,247	0,241	-0,006	0,098	0,092	-0,006
Alto Tâmega	0,002	0,001	-0,001	0,002	0,001	-0,001	0,004	0,002	-0,002
Tâmega e Sousa	0,002	0,003	0,001	0,002	0,003	0,001	0,005	0,006	0,001
Douro	0,005	0,005	0,000	0,005	0,004	0,000	0,013	0,011	-0,002
Terras de Trás-os-Montes	0,003	0,003	0,000	0,003	0,003	0,000	0,005	0,006	0,001
Total North Portugal	0,281	0,278	-0,003	0,289	0,283	-0,006	0,174	0,171	-0,003

Source: Own elaboration using information from Pordata (www.pordata.pt) accessed on 02.07.2019.

Table 6. HHI for the concentration measurement of the number of guests and income generated by them and its variation (delta) between 2014 and 2017, by subregion.

Regions	Guests			Income		
	HHI		Δ (Delta) (HHI ₂₀₁₇ - HHI ₂₀₁₄)	HHI		Δ (Delta) (HHI ₂₀₁₇ - HHI ₂₀₁₄)
	2014	2017		2014	2017	
Alto Minho	0,004	0,005	0,002	0,004	0,004	0,000
Cávado	0,009	0,010	0,001	0,007	0,006	-0,001
Ave	0,003	0,003	0,000	0,003	0,002	-0,001
Área Metropolitana do Porto	0,421	0,406	-0,015	0,419	0,433	0,014
Alto Tâmega	0,001	0,001	0,000	0,001	0,001	0,000
Tâmega e Sousa	0,001	0,001	0,000	0,001	0,002	0,000
Douro	0,003	0,003	0,000	0,004	0,005	0,001
Terras de Trás-os-Montes	0,001	0,001	0,000	0,000	0,000	0,000
Total North Portugal	0,442	0,429	-0,013	0,439	0,453	0,014

Source: Own elaboration using information from Pordata (www.pordata.pt) accessed on 02.07.2019.

It seems clear, by observing Table 5, that the concentration regarding the total number of tourism establishments, bedrooms and lodging capacity decreased in the

North region of Portugal. A bigger supply in the number of establishments appeared in regions where they existed in a smaller number – that is particularly true for Alto Minho, Ave, Tâmega e Sousa and Terras de Trás-os-Montes. However, with the exception of Terras de Trás-os-Montes, the supply appeared in regions near the Área Metropolitana do Porto that continues to be the subregion with the highest concentration of each one of these three indicators. Accommodation in the North region still concentrates on this subregion.

The less concentration of the supply of accommodation allowed also to observe a reduction in the concentration of guest in the North region – The Área Metropolitana do Porto had been the subregion that had seen its share of guests reduced mostly. Again, in favour of Alto Minho and Cávado, regions very near. Regions far away from Oporto also lost concentration regarding their share of guests. However, when observing the expenditure made by guests, concentration had increased were it was already bigger – the Área Metropolitana do Porto.

More rural, depopulated and elder areas continue to present low relative level of tourism activities when compared with more traditional touristic regions. Such results show the importance of promote more effective and targeted public policies, namely measures to attract nature-oriented tourism as the outdoor tourism.

5 Final Remarks

The HHI allows to gain insights on the level of competition among regions over time and on their interactions, to recommend public policies for the sustainability of the tourism sector in the North of Portugal and to provide tools for the strategic management of private companies in this sector of activity. The North of Portugal offers a set of multiple and very distinct touristic solutions that are not yet well known and explored but which development may be a justifiable bet to diversify experiences and destinations. It is the case of the outdoor tourism that may create competition opportunities among regions and combat the overtourism concentrated in specific hotspot areas for tourists, such as coastal areas, gateway cities or higher hierarchy cities within the northern Portuguese region. The offer of outdoor tourism, regulated by suitable rules and supplied adequately by the specific public and private agents, is a solution not yet extensively study, analysed and scientifically researched.

In a context of tourism globalization, massification may be an inevitability for several hotspot tourism destinations. Nonetheless, if there is a proper policy of spatial planning, based on well-defined measures and indicators, like the one here proposed by the application of the HHI, there could be adequate management of it and the provision of effective mechanisms for environmental planning and management.

Finally, effective policies for tourism in the North of Portugal may allow the generation of spillover effects which generate tourism sustainability avoiding or mitigating the negative impacts of overtourism on the territory and its communities, maintaining the interest in both national and international touristic flows and its long term economic profitability, social positive impact (which include the creation of jobs and the retention of population on rural spaces) and environmental protection.

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