



Visualising groups of European destinations

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Abstract

This paper applies a technique called multidimensional scaling (MDS) to illustrate how European destinations are positioned in relation to each other. The basis for doing so is bednight statistics from Eurostat for the period from 1998 to 2009 for 33 European destinations (countries, nations). For each destination bednights are registered in four categories: domestic hotel guests, foreign hotel guests, domestic guests at other types of accommodation, and foreign guests at other types of accommodation. With bednights on a monthly basis, this makes a data matrix with $12 \times 12 \times 4 = 576$ cases. The variables are the destinations, which count up to 28, when combining a few of them. Month or quarter, guest type, and type of accommodation are dummy-variables. A series of MDS diagrams are shown. Two separate factor analyses are used to form groups of destinations, which are also visible in two of the three MDS diagrams. The European destinations for international visitors can be grouped by major language spheres.

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Introduction

Europe, including all of the European Union (EU27), the European Free Trade Area (EFTA4) and other nearby major tourist destinations such as Turkey and Croatia, is probably the largest destination area for commercial bednights in the world, including both domestic and international guest nights. Every year a massive amount of commercial bednights (approximately 2.5 billion in average per year from 2005 to 2010) are registered by the national statistical authorities in Europe and in turn by Eurostat. Two thirds of these bednights are spent in hotels or similar establishments with a relatively high price per

night (per room or per person per night), while the rest are lower priced types of accommodation such as campsites. The accommodation element represents a major component of total tourism spending, the other elements being other forms of spending at the destination and transportation to and from the destination. About 20% of hotel bed nights in Europe are sold as part of packages (own estimate, based on research into the online and total travel, Marcussen, 2009). Spending per hotel night was about 50€ per person (including those sold as part of packages) and the spending was about 20 € for other types of accommodation per person per night (own

estimate based on data relating to Marcussen, 2009). Therefore the 2.5 billion registered person nights per year in recent years in Europe represent 100 billion € per year in accommodation spending only (including the accommodation element of packages), on top of which come the transportation and other spending. Over an 11 year period from 2000 until and including 2010, the one trillion euro mark was surpassed, in commercial accommodation spending only (as mentioned including the accommodation element of packages), in Europe (here: EU27, EFTA4 plus Croatia and Turkey). Thus, the accommodation sector in Europe is large and important by any measure, and it is at the core of tourism. Contributions to further the understanding of this sector are thus important both from a practical and from an academic point of view.

For marketers, including destination marketing organisations at the national level, it is important to know their own position in relation to other destinations in the market place. These other destinations are competitors, but at the same time, some of them may be selected as partners for joint marketing efforts in some source markets. This paper applies a technique called multidimensional scaling (MDS) to illustrate how European destinations are positioned in relation to each other. The data that will form the basis for the MDS analyses are bednight statistics for 33 European destinations, i.e., EU27, EFTA4, Turkey and Croatia. The statistics are from Eurostat and cover the period 1998-2009, with 2010 added in the descriptive part (Figure 1-3). The data are the monthly bednights at all commercial accommodations, including both hotels and other types of collective accommodations. For each of these two main groups of accommodations, the statistics are recorded for residents and for non-residents.

The purpose of this paper is to visualise how European destinations are positioned in relation to each other and how destinations can be grouped based on bednight statistics.

Research questions:

1. Based on time series of bednight statistics, which destinations are somewhat similar, and

how can this be illustrated using a multidimensional scaling technique?

2. Based on bednight statistics, which destinations can be grouped, using factor analyses?

Literature review

Readers are assumed to be familiar with factor analysis. However, the basics about both factor analysis and multidimensional scaling (MDS), sometimes referred to as Principal Component Analysis (PCA), can be read in Green & Tull (1978). Factor analysis forms groups of variables that are correlated with each other, whereas the resulting principal components (factors) are uncorrelated. In statistical programs such as SPSS / PASW (Neulman & Heiser 2009), factor analysis is in the dimension reduction category.

The term multidimensional scaling (MDS) was coined by Torgerson in the early 1950s (Torgerson 1952). The technique started with metric MDS, i.e. based on interval or ratio scaled data. Later on non-metric MDS was developed, based on rank-order scales (Kruskal 1964), which became and remains popular within psychometrics.

Since the late 1970s more than 30 travel and tourism journal articles have used MDS. One of these, Mazanec (1995), used bednight statistics for European cities as a basis for visualising how these presumably competing cities were positioned in relation to each other. This will also be done in this study, although the destinations here will be countries rather than cities.

The incumbent MDS procedure from the late 1970s is called ALSCAL, an Alternating Least Squares approach to Scaling (Young et al. 1978). Later on a more effective MDS algorithm has been implemented in the SPSS / PASW Categories procedure called PROXSCAL (Meulman & Heiser, 2009), short for proximity scaling, from the late 1990s in SPSS Categories 10 and onwards. A few tourism or travel-related journal articles have appeared that explicitly apply PROXSCAL (Ahmed & Miller 2007; Wöber 2007; Wolk & Wöber 2008; Burns 2009).

Methodology and data

MDS is capable of visualising – typically in a two dimensional diagram – how multiple variables are related. The diagram is referred to as the common space. Each variable is represented in the MDS diagram by a dot, referred to as an object point. Closely related variables are placed close together in the MDS diagram and vice versa. Factor analysis is capable of forming groups of variables. Presumably, variables that are grouped together by the factor analysis will be placed close together in the MDS diagram(s).

The data used in this study are bednight statistics for European destinations at the country level according to Eurostat. These are reported for different types of accommodation. Hotel and similar accommodations form the main category. There are three other types of accommodation in Eurostat, and combined, they will here be called “other”. So, there will be two main groups of accommodation. There are only two source markets in the Eurostat data, namely bednights by domestic and non-domestic visitors (foreigners).

The bednight statistics are reported in Eurostat on a monthly and annual basis. The monthly numbers have been used to capture seasonal variations. The 12 year period from 1998-2009 was selected. For some countries, data are missing for some years or months. In place of the missing data the average of the corresponding numbers for the same month of the preceding year or the following year was used, or the average between the preceding and the following year, if both of those were available.

Monthly data for a 12 year period, for hotels and for other commercial accommodations, and for residents and non-residents in both categories produces $12 \times 12 \times 4 = 576$ records in a data matrix. The 33 destinations are variables (columns containing the bednight numbers) in the data matrix. Additional variables (dummy-variables) indicate if the type of accommodation is hotel or not and if the visitors are residents or not. Furthermore dummy variables indicate the month and quarter of visit, and there is a variable for the year.

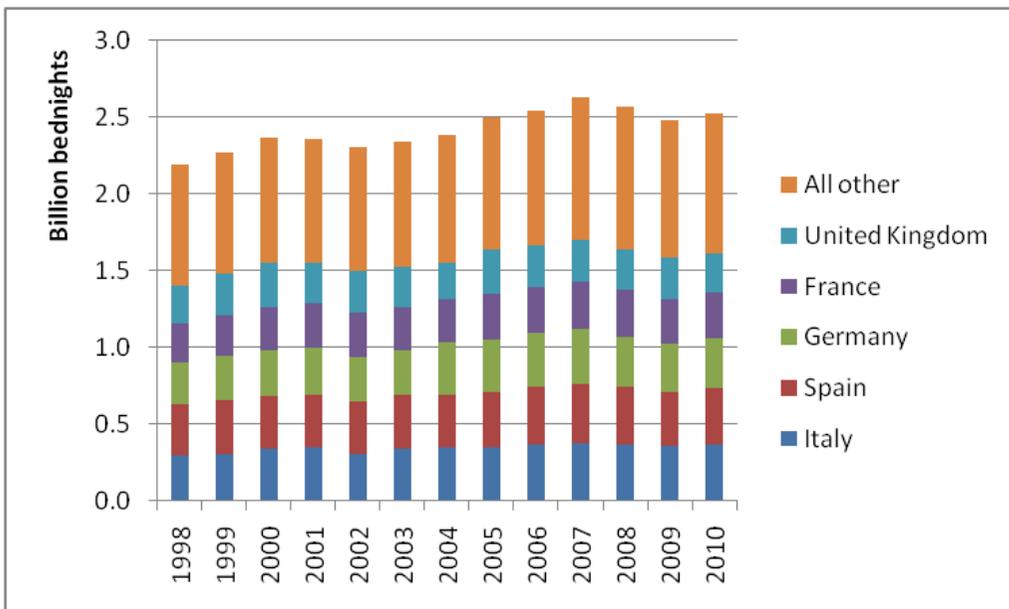


Figure 1. Bednights per destination, Europe 1998-2010

Source: Based on Eurostat data. Own elaboration.

Note: Europe is represented by EU27, EFTA4, Croatia and Turkey.

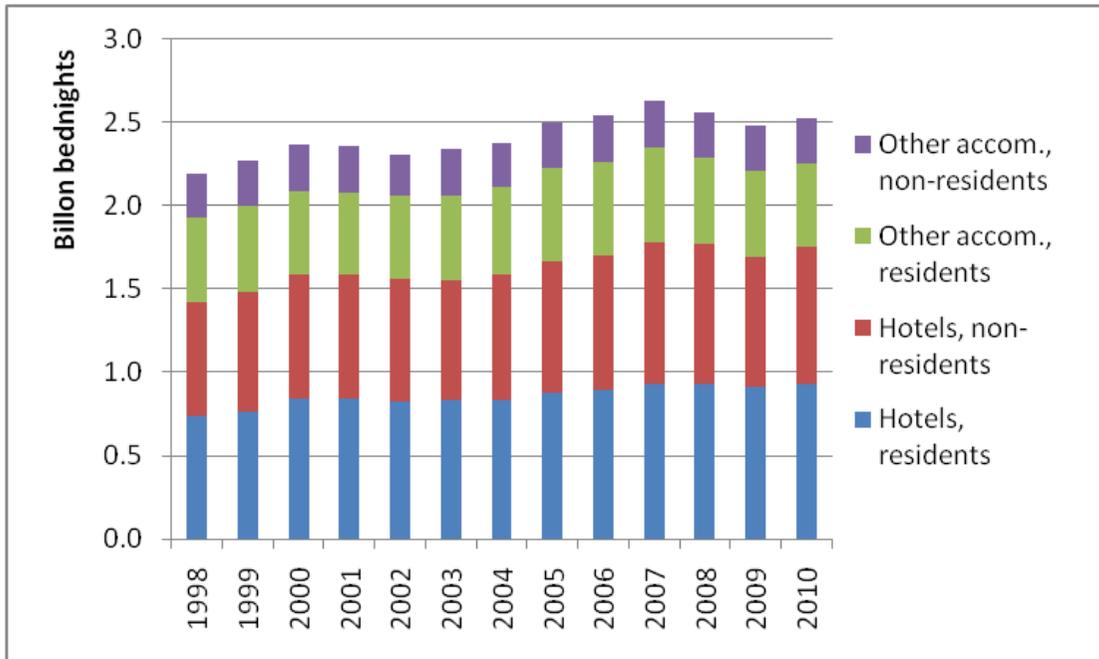


Figure 2. *Bednights per type of accommodation, Europe 1998-2010*

Source: Based on Eurostat. Own elaboration.

Note: Europe is represented by EU27, EFTA4, Croatia and Turkey.

Italy, Spain, Germany, France, and the United Kingdom are the five largest destinations in Europe based on registered commercial bednights (hotels and similar plus other commercial accommodations). Figure 1 shows that the total number of bednights has been around 2.5 billion per year from 2005 to 2010, with a dip in 2009.

In average, for the period 1998-2010, two thirds of the registered commercial bednights were for hotels and similar establishments, and one third were for other types of accommodation. On average, residents accounted for 57% of the bednights and non-residents 43%. The average share during the mentioned period for the four segments was as follows: bednights in hotels by residents, 35%; non-residents in hotels, 32%; residents in other types of accommodations than hotels, 22%; and non-residents in other types of accommodations, 11% (Figure 2).

Figure 3 shows the seasonal pattern for overnight stays at commercial accommodations in Europe, defined here as EU27, EFTA4

(Switzerland, Lichtenstein, Norway, Iceland), Croatia and Turkey. For all types of accommodation, August accounted for the highest percentage of registered bednights during the period 1998-2010, followed by July. Together, August and July accounted for over a third of the bednights. Hotels and similar types of establishments are less seasonal than other types of accommodation (such as camping). Additionally, destinations vary with respect to the degree of seasonality. Some destinations such as Austria and Switzerland have both a summer and a winter season.

Results

In Figure 4 there are 32 object points, i.e., 28 destinations or combinations of destinations plus a pair of object points indicating a domestic-international dimension (the horizontal axis) and another pair indicating seasons (the vertical axis). The relatively few bednights in Lichtenstein have been added to those of Switzerland. The three Baltic states of Estonia, Latvia, and Lithuania have been combined here, as have been Belgium and Luxembourg as well as the two destinations

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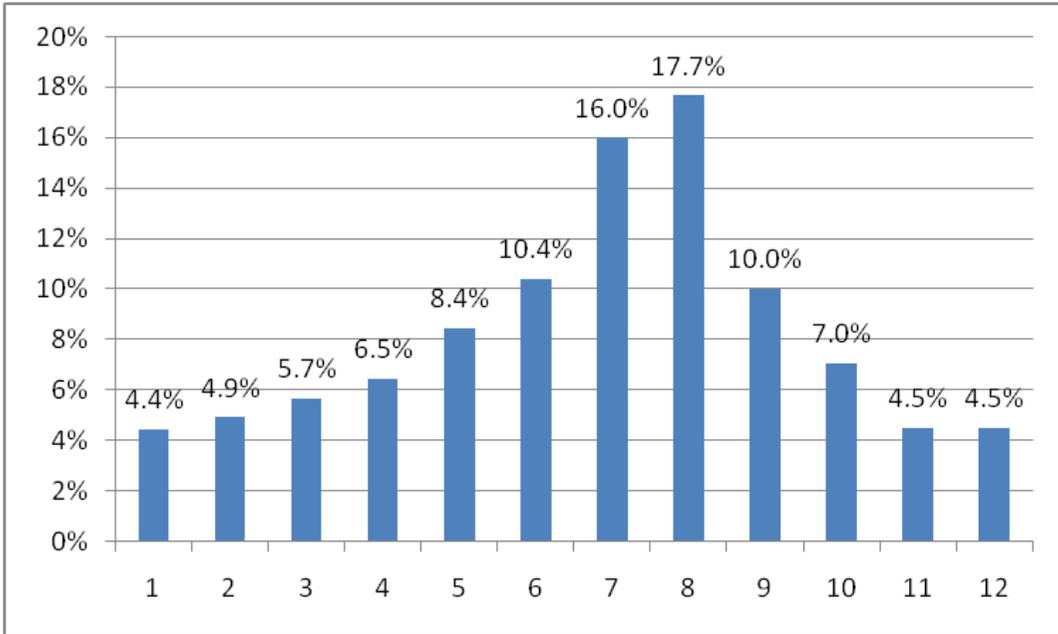


Figure 3. Percent of bednights per month for all of Europe on average for the years 1998-2010
 Source: Based on Eurostat.
 Note: Europe is represented by EU27, EFTA4, Croatia and Turkey.

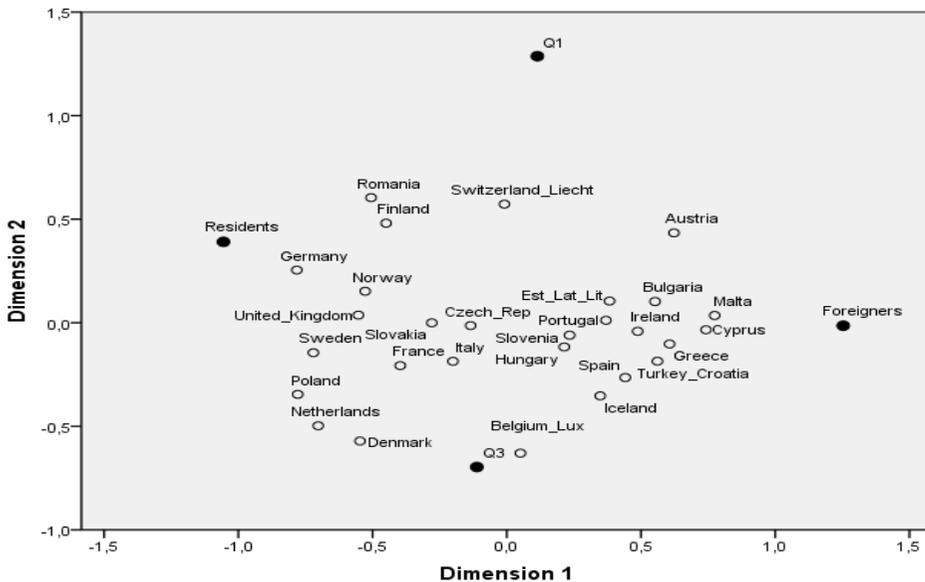


Figure 4. Position of European Destinations – based on all collective accommodations – including origin markets and seasons
 Source: Based on data from Eurostat supplemented by own elaborations.
 Note: Objects: 32. Proximities: 496 $((32*(32-1))/2)$. Normalised Raw Stress: 0.0316. $N=576$. Dispersion Accounted For: $1-0.0316=0.9684$. PROXSCAL has been applied.

outside of the EU/EFTA areas Turkey and Croatia. The reason for the latter two combinations is that Luxembourg and Croatia would appear as a separate factor, if no combining was undertaken, which would not be convenient here.

The horizontal and vertical dimensions of the MDS diagrams in the PROXSCAL programme (Meulman & Heiser, 2009) normally go from -1 to +1. However, the axes can go beyond those intervals in cases of which totally opposite object points are included such as in the cases of “residents / foreigners” or “Q1 and Q3”. In the case of “residents / foreigners”, for each observation in the data matrix the variable “origin market” takes either the value of one or of the other. The vertical axis is dimension 1, the most dominant dimension in the graphical depiction. Therefore the dichotomous variable “origin market” automatically occupies the vertical axis. In this first MDS diagram, the second most dominant dimension is the vertical axis, dimension 2. Here each observation, i.e., each line in the data matrix, can take on one of four different values in the case of season, and not just one of two values as in the case of the object points “residents / foreigners” on the vertical axis. In general, there is no *ex ante* meaning of the axes in MDS diagrams, other than dimension 1 is the primary axis, and dimension 2 the secondary axis. It is up to the researcher to interpret the meaning of the axes, just like it is up to the researcher’s judgement to label the factors in factor analysis. In the case of the first MDS diagram (Figure 4), it was deliberately chosen to include some object points as reference points, namely the “origin market” aspect and the “season” aspect. One object point in the common space, i.e. in the MDS diagram, represents one variable in the data matrix. So, in every line the data matrix the variables residents, foreigners, Q1, and Q3, takes on the values 1 or 0. There are also variables for Q2 and Q4 in the data matrix, but these are not included in any of the MDS diagrams. Not surprisingly, after running the first MDS analysis, it turns out that the object points are positioned in a way that needs no adjustment before interpretation. However, with the use of trigonometry, the object points may be turned around the origin, and either or both

of the axes may be switched. For countries actually located in the North (in the case of Finland) or for those with high mountains (in the cases of Austria and Switzerland), it makes sense to have Q1 in the upper part of the MDS diagram. If it were more intuitively logical to have Q1 down and Q3 up, this could easily have been accomplished by multiplying the X-value of each of the coordinates of the object points by -1 and then re-entering the new position into the graphical part of the MDS program or another program with graphics facilities. This major modification (like the additional possible minor modification mentioned like slightly turning the points around the origin) does not affect the stress values of the MDS analysis.

But what does Figure 4 tell, and does it give a reasonable representation of reality, as represented by the registered bednights? It is fair, for example, that Denmark, with its particularly high concentration of bednights in the 3rd quarter, is positioned next to other northern low-land destinations such as Belgium, Netherlands and Poland, and not far from Sweden. It is fair that Austria and Switzerland, with their winter seasons, are positioned close to each other and oriented towards Q1 at the top of the diagram. It is fair that destinations with small domestic markets such as Malta and Cyprus, with their high proportion of international visitors and bednights are positioned close to each other and close to the “foreigners” reference point to the right in Figure 4. Additionally, it is fair that Germany, with its large domestic market, and several other destinations with predominantly domestic guest nights are positioned to the left in Figure 4, close to the “domestic” reference point. All in all, this first MDS diagram gives confidence that MDS diagrams based on bednight statistics can give realistic depictions of the relative positions of destinations. Direct competitors actually tend to be placed close to each other in the common space. For example Netherlands, Poland and Denmark compete in the northern part of the German market and Austria and Switzerland in the southern part of Germany. Spain, Turkey, Greece, Cyprus, and Malta are all Mediterranean destinations, and air-inclusive charter tourists (buyers of package

tours) may take a plane to any of these destinations. Object points representing the mentioned destinations are placed close to each other.

In Figure 5, the 28 destinations are shown without the supplementary object points. Stress is very low in both Figure 4 and Figure 5, but it is lower in Figure 5 than in Figure 4 because there are fewer object points in Figure 5 than in Figure 4. One minus the “normalised raw stress” is “dispersion accounted for”, which is very high in all of the MDS diagrams shown here. There appears to be some grouping of the destinations. A factor analysis, the result of which is shown in the left part of Table 1, indicates that there are three groups of destinations. The three groups may be labelled as follows:

1. Warm or generally international destinations.
2. Cool destinations.
3. Destinations dominated by domestic visitors.

The three factors account for 85% of the total variation in bednight statistics: factor one, 39%; factor two, 24%; and factor three, 22%. The result of the first factor analysis is shown in the left part of Table 1. Additionally, the three factors are illustrated in the MDS diagram in Figure 5. The demarcation lines between the different destinations in Figure 5 can be drawn as straight lines, which indicate a good overlap between the results of the factor analysis and the results of the MDS analysis.

In Figure 6, the included bednights are those of international visitors only. Under this condition, many neighbouring destinations are positioned

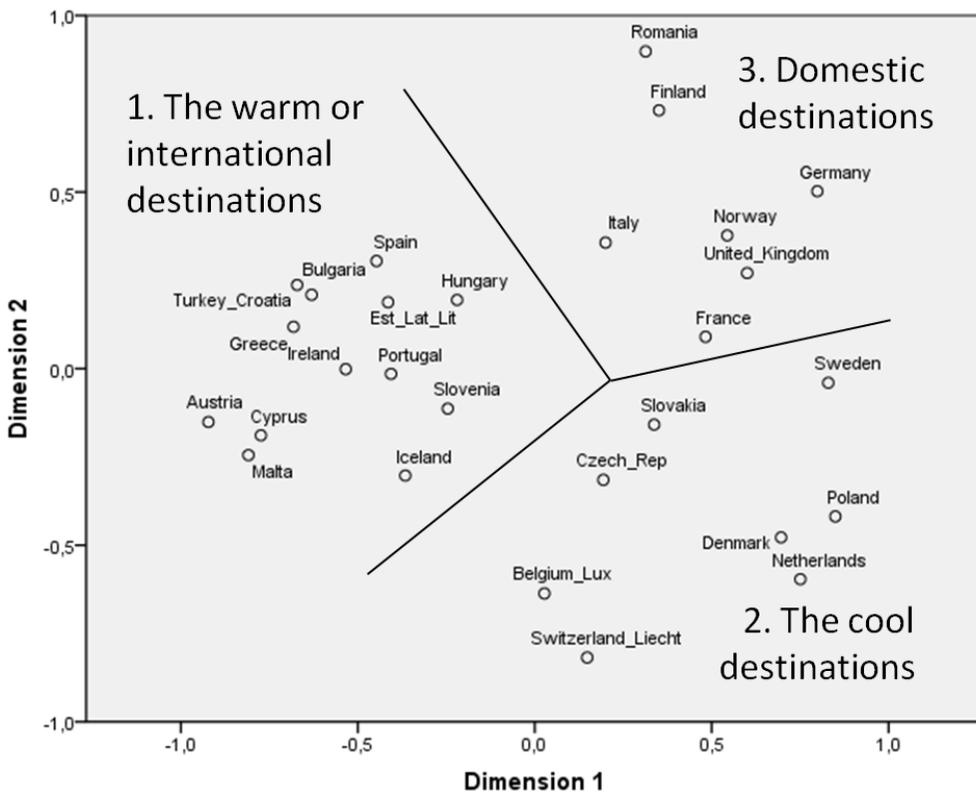


Figure 5. Position of European Destinations – based on bednights of all visitors
 Source: Based on data from Eurostat supplemented by own elaborations.
 Note: Objects: 28. Proximities: 378 ((28*(28-1)/2). Normalised Raw Stress: 0.0141.
 N=576. Dispersion Accounted For: 0.9859. PROXSCAL has been applied.

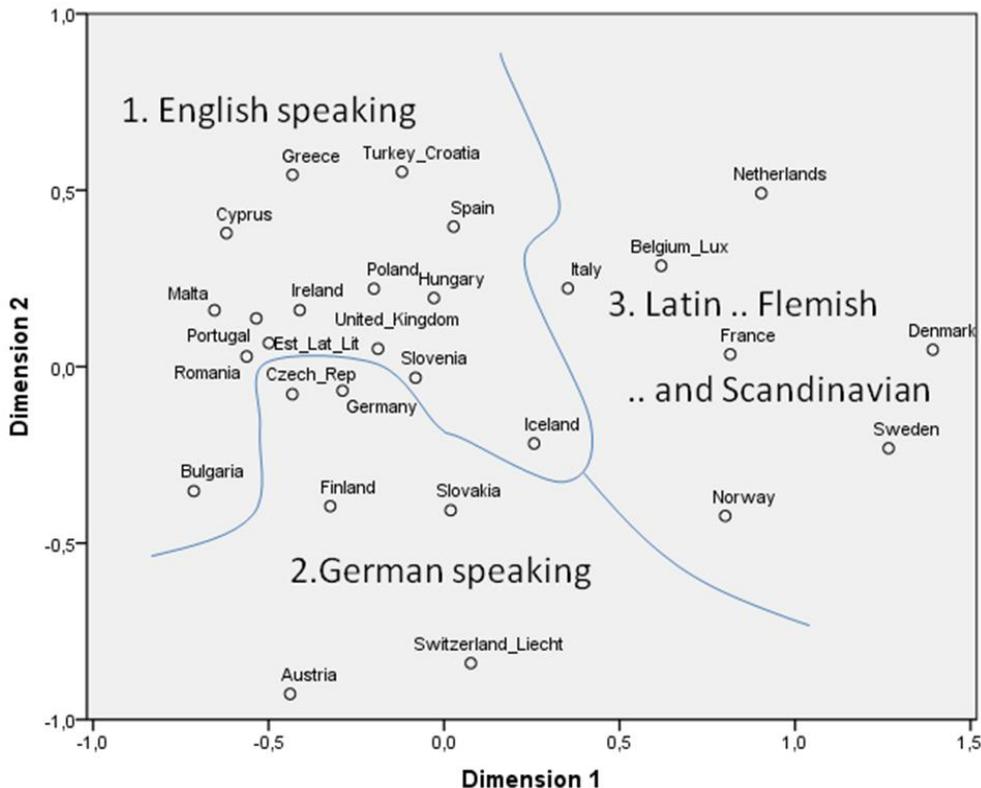


Figure 6. Position of European Destinations – international visitors only, all types of accommodation

Source: Based on data from Eurostat supplemented by own elaborations.

Note: Objects: 28. Proximities: 378 $((28*(28-1)/2)$. Normalised Raw Stress: 0.0232.

$N=288$. Dispersion Accounted For: 0.9768. PROXSCAL has been applied.

next to each other, for example Denmark, Sweden, Norway, and, somewhat to the west, Iceland. The alpine destinations of Austria and Switzerland are positioned next to each other, and so are Netherlands and Belgium, France and Italy, Germany and the Czech Republic, Ireland and the United Kingdom. There is a rim of Mediterranean destinations in the top left corner of Figure 6. Many Polish people work in the British Isles. In recent years additional air links have been established between these destinations.

A second factor analysis was undertaken (see the right part of Table 1) based on international (non-domestic) bednights only. The results indicate that there are also three groups of destinations for international visitors.

These may be labelled as follows:

1. The English language sphere: the British Isles and countries with English as first foreign language;
2. The German language sphere: Germany and (mostly) countries bordering Germany, or business partners; and
3. Other European destinations: Latin (French, Italian), Dutch/Flemish, and Scandinavian.

Group one accounts for 37% of the variation in international (non-domestic) bednights in Europe, group two, 28%, and group three, 26%, i.e., 91% in total, cf. Table 1. With half as many observations (N) in Figure 6 as in Figure 5, stress is a little higher in Figure 6 than in Figure 5.

Table 1. Result of two factor analyses, one with all visitors, and one with non-residents only

All bednights	Component				Component			International bednights only	
	1	2	3		1	2	3		
1. The warm or international destinations	Ireland	,944	,120	,154	Greece	,915	,297	,199	1. English language sphere
	Cyprus	,942	,000	-,156	Bulgaria	,866	,275	,196	
	Malta	,937	-,005	-,223	Turkey_Croatia	,866	,222	,408	
	Greece	,937	-,016	,099	Cyprus	,799	,499	,117	
	Turkey_Croatia	,912	,002	,167	Spain	,766	,328	,507	
	Portugal	,898	,237	,212	Ireland	,765	,567	,246	
	Est_Lat_Lit	,881	,085	,332	Est_Lat_Lit	,753	,601	,179	
	Spain	,867	,084	,284	Romania	,743	,624	,136	
	Bulgaria	,866	,030	,151	Poland	,716	,502	,357	
	Slovenia	,828	,435	,220	Malta	,710	,660	,081	
	Iceland	,809	,395	,071	Portugal	,705	,669	,153	
	Hungary	,802	,237	,444	Iceland	,686	,304	,569	
	Austria	,787	,018	-,054	United_Kingdom	,648	,598	,387	
	2. The cool destinations	Netherlands	-,113	,917	,145	Hungary	,629	,549	
Poland		-,163	,893	,265	Slovenia	,614	,610	,447	
Denmark		-,028	,891	,196	Austria	,232	,872	,152	
Belgium_Lux		,458	,791	-,088	Finland	,493	,771	,281	
Czech_Rep		,470	,748	,267	Czech_Rep	,574	,749	,227	
Slovakia		,373	,720	,451	Germany	,580	,711	,321	
Sweden		-,093	,719	,587	Slovakia	,428	,696	,487	
Switzerland_Liecht		,317	,689	-,012	Switzerland_Liecht	,405	,574	,403	
Romania		,124	-,142	,944	Denmark	,038	-,024	,983	
Finland		,206	,017	,930	Sweden	,092	,056	,952	
3. Domestically dominated destinations	Germany	-,132	,327	,860	France	,263	,335	,885	3. Scandinavian, Dutch/Flemish, Latin
	Norway	,147	,432	,817	Netherlands	,230	,263	,824	
	United_Kingdom	,135	,479	,792	Norway	,330	,235	,822	
	Italy	,435	,357	,706	Belgium_Lux	,298	,483	,753	
	France	,243	,608	,636	Italy	,554	,386	,660	

According to the second factor analysis (right part of Table 1), Slovenia is on the border between the group of destinations labelled “German speaking” and those labelled “English speaking”. According to the factor analysis, Slovenia fits marginally better in the latter than in the former. The groups in both the second and the third MDS diagram have been formed based on the groupings of the two factor analyses. The lines in the second MDS diagram are straight, whereas the lines in the third MDS diagram are not. This indicates that although factor analysis and MDS are somewhat similar, they do not always provide totally identical results. The third MDS diagram is based on only half as many observations as the second MDS diagram, which may explain why the factor analysis results are not quite as clearly visible in the third MDS diagram as in the second MDS diagram.

Conclusion

Three multidimensional scaling (MDS) diagrams have been presented. The first one included 32 dots, object points representing 28 separate destinations plus four additional object points indicating foreign versus domestic guests, and summer versus winter season. Of Europe’s five largest destinations by number of bednights (Italy, Spain Germany, France, and the United Kingdom), Spain is the most oriented towards the international market. Destinations such as Belgium, Denmark, Netherland and Poland are generally summer destinations, while others such as Switzerland and Austria have dual peak seasons.

A second MDS diagram based on all bednights, i.e., both domestic and international visitors, showed (with the help of a first factor analysis) that three main groups of European

destinations can be identified. The first group is the warm or internationally oriented destinations including most of the Mediterranean destinations plus some destinations that are mostly oriented towards the international markets. The second group are the cooler destinations in middle or northern Europe. The third group of European destinations are those with large domestic or predominantly domestic markets.

A third MDS diagram included only the bednights by international (non-domestic) visitors. With the help of a second factor analysis three groups of destinations for international visitors were identified. The first group, with the United Kingdom and Spain as the largest destinations has English either as a first language or as a first foreign language. The second group of destinations for international visitors included Germany, other German speaking destinations, and other destinations familiar with the German language. The third group included the rest of the European destinations, including the three Scandinavian countries, the population of which are able to understand each other's languages, Dutch/Flemish and the Latin languages French (France, Belgium, Luxembourg) and Italian.

MDS has many applications, and the grouping of destinations is one of them. MDS can be supported by factor analysis, which is helpful in the interpretation of the MDS diagrams. Proximity (nearness or distance) between the variables in the original data set and in the resulting diagrams are central in MDS analyses. Neighbouring countries are typically top ranking foreign destinations. Thus, nearness and ease of access (low costs in terms of time and money) play an important role in tourists' choices of destinations. Climate is an important factor as well, be it for a summer or a winter holiday, resulting in relatively short summer seasons in northern Europe and longer seasons in southern Europe, where sunshine is more likely. Additionally, the ability to be understood well at the destination and an element of cultural overlap clearly play a role in tourists' holiday

destination choice and for the choices of countries for business travel.

This paper shows that MDS analyses give meaningful results for countries as destinations based on similarities and differences in internationalisation, seasonality, and types of accommodation, between different countries. Thereby this paper supplements earlier MDS analyses that were based upon many other different units of analysis (variables) such as cities or brands. In terms of the implications of the specific results presented in this paper, it will be up to destinations marketing organisations and others to decide if they will cooperate or compete with destinations positioned close to their own. In distant markets, such as in Japan or China, it may be a good idea for groups of neighbouring destinations (for example Scandinavia with Denmark, Sweden and Norway, or BeNeLux with Belgium, Netherlands and Luxembourg) to jointly target such markets because tourists who travel long distances may want to visit several countries during one journey. Additionally, it may be too expensive to maintain one local marketing office for each destination in distant or small origin markets, while a joint office would be more appropriate for neighbouring destinations, preferably ones that have the same or very similar languages. Likewise, at trade fairs some cooperation and coordination between destinations that seem to be positioned close to each other in the minds of potential visitors, which are typically neighbouring countries, may be feasible.

References

- Ahmed, N., Miller, H. J. (2007). Time-space transformations of geographic space for exploring, analyzing and visualizing transportation systems. *Journal of Transport Geography*, 15(1), 2-17.
- Burns, M. C., Roca, J., Moix, M. (2008). The spatial implications of the functional proximity deriving from air passenger flows between European metropolitan urban regions, *GeoJournal*, 71 (1), pp. 37-52, available online.
- Green, P. E., Tull, D. S. (1978). *Research for Marketing Decisions*, 4th ed.. New Jersey: Prentice-Hall.

- Kruskal, J. B. (1964). Nonmetric multidimensional scaling: A numerical method. *Psychometrika*, 29, 115–129.
- Marcussen, C. H. (2009). Trends in European Internet Distribution - of Travel and Tourism Services, www.crt.dk/trends.
- Mazanec, J.A. (1995). Competition among European tourist cities: a comparative analysis with multidimensional scaling and self-organizing maps. *Tourism Economics*, 1(3), 283-302.
- Meulman, J. J., Heiser, W. J. (2009). *Multidimensional Scaling (PROXSCAL)*, in PASW Categories 18, chapter seven, pp. 67-81, SPSS, Inc..
- Torgerson, W. S. (1952). Multidimensional scaling: I. Theory and method. *Psychometrika*, 17, 401-419.
- Wolk, A., Wöber, K. (2008). A comprehensive study of info needs of city travellers in Europe. *Journal of Information Technology and Tourism*, 10(2), 119-131.
- Wöber, K. (2007). Similarities in Information Search of City Break Travelers — A Web Usage Mining Exercise, pp. 77-86. In: *Information and Communication Technologies in Tourism 2007*, Proceedings of the International Conference in Ljubljana, Slovenia. Edited by: Marianna Sigala, Luisa Mich, Jamie Murphy. Springer. — Available at books.google.com.
- Young, F. W., Takane, Y., Lewyckj, R. (1978). ALSCAL: A nonmetric multidimensional scaling program with several individual difference options. *Behavior Research Methods and Instrumentation*, 10, 451-453. (Also in *Journal of Marketing Research*, 1978, 15, 612-615 and in *American Statistician*, 1980, 34, 117-118).
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