TI 2006-096/3
Tinbergen Institute Discussion Paper

Efficiency and Productivity of Italian Tourist Destinations: A Quantitative Estimation based on Data Envelopment Analysis and the Malmquist Method

Maria Francesca Cracolici[a,b]
Peter Nijkamp[b,c]
Miranda Cuffaro[a]

a University of Palermo;
[b] Vrije Universiteit Amsterdam;
[c] Tinbergen Institute.

Tinbergen Institute
The Tinbergen Institute is the institute for economic research of the Erasmus Universiteit Rotterdam, Universiteit van Amsterdam, and Vrije Universiteit Amsterdam.

Tinbergen Institute Amsterdam
Roetersstraat 31
1018 WB Amsterdam
The Netherlands
Tel.: +31(0)20 551 3500
Fax: +31(0)20 551 3555

Tinbergen Institute Rotterdam
Burg. Oudlaan 50
3062 PA Rotterdam
The Netherlands
Tel.: +31(0)10 408 8900
Fax: +31(0)10 408 9031

EFFICIENCY AND PRODUCTIVITY OF ITALIAN TOURIST DESTINATIONS: A QUANTITATIVE ESTIMATION BASED ON DATA ENVELOPMENT ANALYSIS AND THE MALMQUIST METHOD

Maria Francesca Cracolici[a,b], Peter Nijkamp[b] and Miranda Cuffaro[a]

[a]*Department of National Accounting and Analysis of Social Processes University of Palermo*
V.le delle Scienze Ed. 2; 90133 Palermo, Italy
E-mail: cracolici@unipa.it, cuffaro@unipa.it

[b]*Department of Spatial Economics, Free University Amsterdam,*
De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands
E-mail: pnijkamp@feweb.vu.nl

PN229mfcmc

Abstract

This paper aims to provide a statistical analysis of the relative economic performance of Italian tourist areas. It uses two modelling approaches to estimate the competitiveness of these regions, viz. data envelopment analysis (DEA) and the Malmquist method. Our results show that the competitiveness position of several Italian regions has not improved over the years under consideration.

1 Introduction

The rising importance of tourism and its expected positive impacts on economic growth have put tourist policy in the center of development strategies of many countries and regions. With more international openness, more geographical mobility, cheap air fares and rising income levels in many countries, tourism is expected to become an important growth engine. The permanent rise in tourism has prompted innovative ideas on growth and marketing strategies of tourist destinations (niche marketing, e-tourism, etc.) with the aim to attract a maximum share of relevant tourist flows to a particular region (see e.g., Giaoutzi and Nijkamp, 2006; and Wall and Mathieson, 2006). Consequently, tourism policy tends to become a fierce competition effort between alternative tourist destinations.

Which tourist sites have been very successful in attracting a significant – increasing – flow of tourists? And why? These questions call for solid theoretical and applied work to identify the critical success factors for regional or national tourist policy. Tourist research should of course, provide insights into the determining factors of tourist behaviour, on both the demand and the supply side. An optimal matching of demand and supply attractiveness will guarantee an optimal use of tourist capacities, both quantitative and qualitative, in destination areas. An important element here is the great heterogeneity in terms of tourist needs on the demand side and tourist attraction profiles on the supply side (see also Poon, 2002; Swarbrooke and Honner, 2001; and Uysel, 1998). Furthermore, an optimal use of a tourist destinations' capacity should also respect the social, ecological, cultural or artistic carrying capacity of a destination area, as violation of a carrying capacity may erode the future growth potential of the area concerned (see e.g., Butler, 1999; Fayos-Solà, 1996; Giaoutzi and Nijkamp, 1995; and Poon, 2003).

In assessing a proper usage of existing tourist capacity or infrastructure, it would ideally be important to look into different socio-economic categories of tourists, into the attractiveness features of tourist sites as well as into the transport and communication characteristics between origin and destination. The overall economic estimation of benefits accruing from tourism to a certain area requires the use of consistent tourist statistics. In recent years, the Tourism Satellite Accounts – incorporating a systematic collection of numerical data on tourism supply and demand – have played a pivotal role in properly assessing the economic importance of the tourist industry for given region.

Tourism tends to become a competitive activity among regions who are forced to enhance their performance in order to attract more tourists and to increase their revenues (see e.g., Crouch and Ritchie, 1999; Dwyer et al., 2000; Enright and Newton, 2004; Pearce, 1997; and Ritchie and Crouch, 2000, 2001). A tourist destination (e.g., city, region or site) is often no longer seen as a set of distinct natural, cultural, artistic or environmental resources, but as an overall appealing product available in a certain area: a complex and integrated portfolio of services offered by a destination that supplies a holiday experience which meets the needs of the tourist. A tourist destination thus produces a compound package of tourist services based on its indigenous supply potential (see Buhalis, 2000; and Murphy et al. 2000). In this context Dwyer et al. (2000) claimed that "it is useful for the industry and government to understand where a country's competitive position is weakest and strongest..." (p.10), while Enright and Newton (2004, p.777) reinforced this view, stating that "…it is important to know how and why competitiveness is changing" (p.777).

The previous observations call for solid applied research, but unfortunately there is a serious limitation in statistical data and empirical modelling work, at both a micro and macro level (e.g. Alavi and Yasin, 2000; Enright and Newton, 2004; Kozak and Rimmington, 1999; and Kozak, 2002).

The present study intends to enrich the tourism literature in this specific aspect by focussing on destination competitiveness and by providing a measure of competitiveness at regional level in terms of technical efficiency and total factor productivity (TFP). Our aim is to investigate whether tourist destinations operate efficiently, i.e., are able to deploy the inputs at their disposal in an efficient manner in order to attract a maximum share of tourist demand and to be competitive against key competitors. Most literature on tourism efficiency considers as statistical units hotels and restaurants, but we will perform our analysis on territorial areas (or tourist destinations). In other words, we hypothesize that tourist destinations are heterogeneous multi-product, multi-client business organisations. In the light of the competitive behaviour on the tourism market, they have to maximize their market share, given the available resources. Consequently, industry-oriented models (such as frontier analysis) may be applied at territorial level as well[1]. A concise illustrative summary of industry-oriented models used in tourism economics is offered.

In the tourism literature, the analysis of efficiency is limited to a small number of studies, which focus the analysis on micro-units (e.g., hotels, corporate travel departments, etc.). Among the earliest, Morey and Dittman (1995) – using data envelopment analysis with 7 inputs and 4 outputs – evaluated the general-manager performance of 54 hotels of an American tourism chain – geographically dispersed over continental United States – for the year 1993. Hwang and Chang (2003), using data envelopment analysis and the Malmquist productivity index, measured the managerial performance of 45 hotels in 1998 and the efficiency change of 45 hotels from 1994 to 1998. They found there was a significant difference in efficiency change due to a difference in sources of customers and management styles. Barros and Mascarenhas (2005), again using data envelopment analysis with 3 inputs and outputs, analysed the technical and allocative efficiency of 43 hotels in Portugal for the

[1] In recent years, several regional applications of frontier analysis in other economic sectors have emerged; see Macmillan (1986); Charnes et al. (1989); Susiluoto and Loikaanen (2001); Martić and Savić (2001); and Cuffaro and Vassallo (2002).

year 2001. Anderson et al. (1999a) proposed an evaluation of managerial efficiency levels in the hotel industry by using the stochastic frontier technique. An overview of efficiency analysis on the restaurant industry can be found in Reynolds (2003). For other applications on efficiency measures at micro level in the tourism field, we refer to Baker and Riley (1994); Bell and Morey (1995); Anderson et al. (1999b); Barros (2004); and Barros (2005).

Using a non-parametric (d*ata envelopment analysis*, DEA) method, the present paper aims to assess production frontiers and efficiency coefficients of alternative tourist destinations. The analysis concerns 103 Italian regions for the year 2001. Moreover, we will also use the Malmquist productivity approach (see Färe et al. 1992) to measure the efficiency change of Italian regions between 1998 and 2001.

The chapter is structured as follows. Section 2 introduces the DEA model foundations by offering, synthetically, a description of production frontier analysis. Then, Section 3 contains a description of the study area and the characteristic of the variables used in our study. In Section 4, the empirical findings are presented and discussed, while Section 6 offers concluding remarks.

2 Analytical Framework for Assessing the Performance of Tourist Destinations

The analysis of the economic performance of tourist areas has already a long history. Using Porter's model (1990), Crouch and Ritchie (1999) have developed a conceptual model of tourist competitiveness that allowed to extend the previous studies that focussed on destination image or attractiveness (see Chon et al., 1991; and Hu and Ritchie, 1993). Crouch and Ritchie argue that tourist destination competitiveness fits into the national industry competition level. They provide a detailed framework in which the different perspectives on competitiveness are coherently organized, by making a distinction into two interrelated environments: micro and macro. The micro-environment incorporates the details of the tourist destination and travel to it which have to be compared with the competitors. The macro-environment includes elements outside the micro-environment which nevertheless influence it, such as the increasing attention for the natural environment; the economic restructuring of economies occurring worldwide; the shifting demographics of the marketplace; the increasingly complex technology-human resource interface, etc. We will use their framework for an empirical work. In particular, we will provide an evaluation of tourist site competitiveness in terms of efficiency.

For our aim we use a non-parametric method (a DEA and a Malmquist approach) of production analysis – generally used to evaluate the efficiency of firms or non-profit organizations – in order to assess empirically the production frontiers and efficiency coefficients for tourist destinations (and their change in efficiency). We will now concisely present the DEA and the Malmquist method.

In order to estimate the efficiency and the productivity change, we assume that the tourist site's production technology can be characterised by a production function, which provides the maximum possible output (i.e., output target), given the proper inputs (see also, Cracolici, 2004, 2005; and Cracolici and Nijkamp, 2006). For our aim, the following 'visitor production function' for tourism is deployed:

Tourist output = f (material capital, cultural heritage, human capital, labour) (1)

As the functional form of the production function is not known, while we have to manage multiple inputs and outputs, a non-parametric method (i.e., DEA) is used. The main advantage of the DEA over a parametric approach is that it does not require any assumption concerning the production technology, while DEA can also easily accommodate multiple outputs[2]. DEA is a non-parametric linear programming method of measuring efficiency to assess a production frontier. The efficiency of each tourist destination is evaluated against this frontier. In other words, the efficiency of a destination is evaluated in comparison with the performance of other destinations.

DEA is based on Farrell's (1957) original work, further elaborated by Charnes et al.'s (1978) CCR model, and Banker et al.'s (1984) BCC Model. Generally, DEA can be applied to efficiency problems in public sector agencies (e.g., schools, hospitals, airports, courts, etc.) and private sector agencies (banks, hotels, etc). Here, we apply DEA to tourist sites considering them as a generic private tourist unit (e.g., hotels and restaurant), which use proper inputs to reach multiple outputs. For this purpose, we adopt an output-oriented DEA model, because we want to explore how well the regions in Italy deploy their input resources for tourism. In other words, given a stock of tourist resources, the aim of a tourist area is to maximize tourist flows.

DEA models assess efficiency by using the actual economic distance to the production frontier giving the highest possible efficiency. The efficiency measure proposed by Charnes et al. (1978) maximizes efficiency in terms of the ratio of total weighted output to total weighted input, subject to the condition that, for every destination, this efficiency measure is smaller than or equal to 1. Given J destinations with I inputs and R outputs, the measure of efficiency of a destination k can then be specified as:

[2] For details on frontier techniques and their strength and weakness, we refer to Coelli (1995), Førsund and Lovell (1980); Bauer (1990); Bjurek et al. (1990); Seiford and Thrall (1990); Battese (1992); Bravo-Ureta and Pinheiro (1993); and Fried et al. (1993).

$$\underset{u,v}{\text{Max}} \quad \frac{\sum_{r=1}^{R} u_r y_{rk}}{\sum_{i=1}^{I} v_i x_{ik}}$$

$$\text{s.t.} \quad \frac{\sum_{r=1}^{R} u_r y_{rj}}{\sum_{i=1}^{I} v_i x_{ij}} \leq 1; \quad \text{for j } = 1,...,\text{J} \tag{2}$$

$$v_i, u_r \geq 0,$$

where x_{ij} is the amount of input *i* to destination *j*; y_{rj} the amount of output *r* from destination *j*; u_r the weight given to output *r*; and v_i the weight given to input *i*.

The maximization problem in (2) can, in principle, have an infinite number of solutions. Charnes et al. (1978) show that the above fractional programming problem has the following equivalent linear programming formulation, which avoids this problem:

$$\underset{u,v}{\text{Max}} \quad \sum_{r=1}^{R} u_r y_{rk}$$

$$\text{s.t.} \quad \sum_{i=1}^{I} v_i x_{ij} - \sum_{r=1}^{R} u_r y_{rj} \geq 0; \quad \text{for j = 1,...,J,}$$

$$\sum_{i=1}^{I} v_i x_{ik} = 1; \tag{3}$$

$$u_r \geq 0; \quad \text{for r } = 1,...,\text{R,}$$

$$v_i \geq 0; \quad \text{for i } = 1,...,\text{I.}$$

The dual specification of this linear programming model can be written as follows:

$$\underset{\theta,\,\lambda}{\text{Min}} \quad \theta_k$$

$$\text{s.t.} \quad \sum_{j=1}^{J} \lambda_j y_{rj} \geq y_{rk}; \quad \text{for r } = 1,...,\text{R,}$$

$$\theta_k x_{ik} - \sum_{j=1}^{J} \lambda_j x_{ij} \geq 0; \quad \text{for i } = 1,...,\text{I,} \tag{4}$$

$$\lambda_j \geq 0; \quad \text{for j } = 1,...,\text{J.}$$

The destination, *j*, is efficient, if $\theta^* = 1$, where an asterisk to a variable denotes its optimal solution. If this condition is not satisfied, the destination *j* is inefficient ($\theta^* > 1$).

The efficiency coefficient can be either output-oriented (as in (4)) or input-oriented. If the output-oriented coefficient is greater than 1 in (4), it is possible to increase all outputs keeping the inputs constant. Likewise, if the input coefficient is smaller than 1, it is possible to reduce the inputs keeping the outputs constant. Besides, the DEA model can be different in the assumption on returns to scale (constant or variable). The above DEA model (2)-(4) assumes a constant returns to scale (CRS) technology; a VRS technology (variable returns to scale) can be obtained adding to (2)-(4) the constraint: $\sum_{j=1}^{J} \lambda_j = 1$ (Banker et al., 1984). The estimate of technical efficiency of each unit (in our case, tourist destination) in the output-oriented VRS DEA model (θ_j^{VRS}) will be higher than or equal to that in an output-oriented CRS DEA model (θ_j^{CRS}), as the VRS DEA is more flexible than the CRS DEA. The scale efficiency measure for the *j*th tourist destination, denoted by, θ_j^{SE}, can be derived from this relationship:

$$\theta_j^{SE} = \frac{\theta_j^{CRS}}{\theta_j^{VRS}}. \qquad (5)$$

If the sum of weights $\sum_{j=1}^{J} \lambda_j > 1$, decreasing returns to scale are prevailing; if $\sum_{j=1}^{J} \lambda_j < 1$, increasing returns to scale are prevailing (see Banker, 1984).

DEA can be used to evaluate the distant functions for measuring the Malmquist productivity index (MPI) introduced by Caves et al. (1982). The Malmquist productivity is a normative measure in the sense that it is measured by the ratio of distance functions pertaining to some benchmark technology. This index can be interpreted as follows.

Given a set of units for different times, the MPI allows to measure total productivity change over time. As shown in Fig.1, f^t represents the efficiency frontier in period t, and f^{t+1} the efficiency frontier in period $t+1$. $J^t(x^t, y^t)$ and $J^{t+1}(x^{t+1}, y^{t+1})$ represent the inputs-outputs vector of a destination j at time t and $t+1$, respectively.

<<Figure 1 about here>>

To deploy this method for measuring the efficiency change from time t to $t+1$, the efficiency distance function $D^{t+1}(x^t, y^t)$ is defined as the following linear programming problem:

$$\begin{aligned} & D^{t+1}(x^t, y^t) = \min_{\theta,\lambda} \quad \theta_k \\ & \text{s.t.} \sum_{j=1}^{J} \lambda_j^{t+1} y_{rj}^{t+1} \geq y_{rk}^t; \quad \text{for r } = 1,\ldots,\text{R}, \\ & \quad \theta_k x_{ik}^t - \sum_{j=1}^{J} \lambda_j^{t+1} x_{ij}^{t+1} \geq 0; \quad \text{for i } = 1,\ldots,\text{I}, \\ & \quad \lambda_j^{t+1} \geq 0; \quad \text{for j } = 1,\ldots,\text{J}. \end{aligned} \qquad (6)$$

$D^{t+1}(x^t, y^t)$ measures the efficiency of a destination j at the period $t+1$ with respect to the efficiency frontier at period t. Similarly, $D^t(x^{t+1}, y^{t+1})$ measures the efficiency of a destination j at time t using the efficiency frontier at time $t+1$ as a reference set; it may be defined in the following way:

$$\begin{aligned} & D^t(x^{t+1}, y^{t+1}) = \underset{\theta,\lambda}{\text{Min}} \quad \theta_k \\ & \text{s.t.} \sum_{j=1}^{J} \lambda_j^t y_{rj}^t \geq y_{rk}^{t+1}; \quad \text{for r } = 1,...,\text{R}, \\ & \quad \theta_k x_{ik}^{t+1} - \sum_{j=1}^{J} \lambda_j^t x_{ij}^t \geq 0; \quad \text{for i } = 1,...,\text{I}, \\ & \quad \lambda_j^t \geq 0; \quad \text{for j } = 1,...,\text{J}. \end{aligned} \tag{7}$$

Both $D^t(x^{t+1}, y^{t+1})$ and $D^{t+1}(x^t, y^t)$ are an output-oriented model with constant returns to scale (i.e. , a CCR model) as (2)-(4).

From the geometric meaning of a distance function (see Fig.1), we know that:

$$\begin{aligned} & D^t(x^t, y^t) = AB / AJ^t \\ & D^{t+1}(x^{t+1}, y^{t+1}) = CD / CJ^{t+1} \\ & D^t(x^{t+1}, y^{t+1}) = CE / CJ^{t+1} \\ & D^{t+1}(x^t, y^t) = AJ^t / AF \end{aligned} \tag{8}$$

The MPI allows us to compare, for each observed unit, the real production at period t (or $t+1$) with the potential production in period $t+1$ (or t). In other words, we can evaluate two Malmquist indices, because we have two different technologies; viz. the technology in period t and in $t+1$. So, the MPIs are calculated in the following way:

$$MPI^t = D^t(x^{t+1}, y^{t+1}) / D^t(x^t, y^t) = (CJ^{t+1} / CE) \big/ (AJ^t / AB) \tag{9}$$

and:

$$MPI^{t+1} = D^{t+1}(x^{t+1}, y^{t+1}) / D^{t+1}(x^t, y^t) = (CJ^{t+1} / CD) \big/ (AJ^t / CJ^{t+1}) \tag{10}$$

Using the geometric mean of the alternative expression of MPI^t and MPI^{t+1}, we obtain:

$$MPI^{t,t+1} = \frac{D^{t+1}(x^{t+1}, y^{t+1})}{D^t(x^t, y^t)} \left[\frac{D^t(x^{t+1}, y^{t+1})}{D^{t+1}(x^{t+1}, y^{t+1})} \frac{D^t(x^t, y^t)}{D^{t+1}(x^t, y^t)} \right]^{1/2} \tag{11}$$

$MPI^{t,t+1}$ is now the Malmquist productivity index; it is used to measure the total efficiency change. According to the Malmquist productivity index developed by Färe et al. (1992), the first term in (11) is merely the ratio of technical efficiencies of the observed input-output set in the two periods considered. It shows the contribution of technical efficiency change. The second term represents the contribution of technical change (for details, see Ray, 2004). An extension of MPI from constant to variable returns to scale was offered by Färe et al. (1994).

In Section 4, the DEA CRS and VRS results and the efficiency change obtained by the Malmquist index will be presented and discussed. But first, we will introduce briefly our study area and the variables used in our empirical analysis.

3 The Study Area and Summary Characteristics of Variables

For our application, we have used data for two tourist outputs and five inputs, evaluated on the basis of non-financial measures. The analysis concerns 103 Italian regions for the years 1998 and 2001.

Tourist output is evaluated here by two non-financial measures: international and national bed-nights. According to the destination concept, the empirical findings and the availability of data, the following inputs were chosen: number of beds in hotels as well as in complementary accommodations divided by population (BH and BCC); the regional state-owned cultural patrimony and heritage (CPH) (number of museums, monuments and archaeological sites) standardized for population; tourist school graduates divided by working age population (TSG); and the labour units (ULAs) employed in the tourism sector divided by the total regional ULA[3].

Table 1 gives a summary description of input and output variables and highlights that there are no strong disparities in each of the inputs considered, whereas the output shows a greater variability. These results indicate that the mean value of CPH is 1.6 monuments per 1000 inhabitant in Italian regions; the mean TSG is about 0.9% as a share of working population, while ULA is about 27%. The mean value for national tourist bed-nights over time has increased from 425.07 to 475.67, while the mean of international tourist bed-nights increases from 222.28 to 266.32. All these data have been deployed in our DEA and Malmquist approach. The findings will now be presented in Section 4.

<<Table 1 about here>>

[3] Data on output has been obtained from ISTAT (National Statistics Institute) (1998a, 2001a), while the data on inputs has been obtained from different sources: number of beds in the hotels and in complementary accommodation from ISTAT (1998a, 2001a); provincial state-owned cultural patrimony and heritage (number of museums, monuments and archaeological areas) from the Ministry of Cultural Heritage; tourist school graduates from the Ministry of Education; and labour units (ULA) employed in the tourism sector from ISTAT (1998 b, 2001b). Because the statistics from the Ministry of Cultural Heritage do not provide the data of regions and provinces with special statute status (Sicily, Aosta, Trento and Bolzano), for these data we have used as a proxy for cultural heritage the region and province-owned cultural heritage (museums, monuments and archaeological areas) supplied by the Regional and Provincial Bureaus of Cultural Heritage. Finally, ULA includes the following economic sectors: commerce, repairs, hotels, restaurants, transport and communication. If the indirect impact of tourism on commerce and repairs is considered, any error with this variable may be neglected.

4 Results and Discussion

Both our CRS and VRS models are estimated for the same Italian regions using the same output and input variables. The frequency distribution of efficiency scores and their summary statistics are presented in Tables 2 and 3.

<<Tables 2 and 3 about here>>

In the year 1998, the means of technical efficiency scores estimated by the CRS and VRS approaches appear to be 0.77 and 0.84, respectively. In the year 2001, the mean technical scores are lower than or equal to 0.76 and 0.84, respectively. For both years, the high values of the coefficient of variation highlight a great variability of efficiency among regions. In fact, in 1998, the efficiency scores range from 0.32 to 1, for both the CRS and VRS technology. In 2001, the efficiency varies between 0.24 and 1 (see Table 3).

In the years 1998 and 2001, the scale efficiency index, estimated using (5), presents a mean value equal to 0.93 and 0.91, respectively. The share of regions with a full scale efficiency (equal to 100) decreases from 33.98 to 31.07.

With regard to the CRS model, the comparison between the two years shows that the percentage of full efficient destinations decreases from 31.07% to 28.16%; the same observation can be made with respect to the VRS model (53.40% and 49.51% for 1998 and 2001, respectively).

These results are confirmed by the Malmquist analysis. We computed the Malmquist index based on the CRS technology, because by using this model the estimation problem has always a feasible solution (Ray, 2004). The Malmquist results are presented in Table 4.

The frequency distribution of the Malmquist model shows there were only 10 regions (9.7%) with an efficiency change greater than 1. This means that over the 5 years, the tourism strategies in these tourist sites have been effective in order to improve their attractiveness or competitiveness against their competitors. The cluster of areas that improved their productivity is mainly composed by regions with a business orientation (i.e., Milan, Pordenone, Prato).

<<Table 4 about here>>

It is noteworthy that the greater part of regions (93) – with a prevalent coastal and cultural image – possesses a Malmquist index less than 1. This means that the productivity of these tourist areas has been decreasing over the time. Regarding the inefficiency of numerous regions, several hypotheses can be envisaged for the inefficient use of the inputs with a view to enhancing the production potential for a maximum possible output.

A more thorough analysis showed that the inefficiency of many Italian provinces may be caused by an imbalance between inputs and outputs. In particular, for many traditional tourist destinations this striking result can be interpreted as an under-utilisation of their productive capability in relation to their tourist resources due to an inability to manage resources (or as an expression of the phase of maturity of the tourist life cycle of the Italian product). This may be caused by various deficiencies. Destination management organizations (DMOs) do perhaps not know which is the phase of their tourist destination life-cycle (e.g., growth, maturity and etc.) and may thus be unable to adopt the correct strategy. Moreover, uncontrollable factors or unexpected events can be causes of technical inefficiency (e.g., the Twin Towers dramatic event on September 11, 2001).

5 Conclusions

The aim of this paper has been to explore the tourist competitiveness of Italian regions for the years 1998 and 2001 and their change over these years. The performance of these regions has been evaluated through the assessment of their efficiency. Tourist sites are considered like traditional tourist profit units (e.g., hotels, restaurants, etc.). That is, they manage the proper inputs (e.g., artistic and cultural, labour units) in order to reach more outputs (i.e., national and international tourist bed-nights). In particular, we have analyzed one of the five elements that characterize the competitive advantage of tourist destinations, i.e., their efficient resource management.

For our purpose, DEA models were applied in order to evaluate the tourist efficiency or competitiveness of different regions in Italy. For both years, 1998 and 2001, with respectively constant and variable returns to scale models (CRS and VRS models), the empirical analysis showed that the number of fully efficient regions has decreased, even though slightly.

In summary, a cluster of efficient regions is able to maintain its position over the years. This result is supported by the Malmquist index which showed that only 10 regions have improved their productivity. In other words, the Italian regions do not show a significant change in efficiency over the years considered. This means that, because the tourist inputs vary slowly over time, regional tourist managers should increase the production of tourist output (bed-nights) in order to improve the territorial efficiency. This has not occurred in the period analyzed, and we may thus hypothesize that there has been the lack of strategic and planning action from public agencies in Italy to improve the attractiveness of tourist sites.

The general conclusion following from the inefficiency of the majority of Italian regions is that local destination management organizations must work hard in order to improve the tourist performance of Italian destinations by focusing more attention on the balance inputs/outputs. They must also give due attention to promoting the territorial (or regional) tourist brands, to supporting the development of "local tourist districts", and to addressing financial resources in tourist infrastructures.

References

Alavi, J., Yasin, M.M. (2000) A Systematic Approach to Tourism Policy, *Journal of Business Research* 48(2), 147–156.

Anderson, R.I., Fish, M., Xia, Y., Michello, F. (1999a) Measuring Efficiency in the Hotel Industry: A Stochastic Frontier Approach, *International Journal of Hospitality Management*, 18(1), 45–57.

Anderson, R.I., Lewis, D., Parker, M.E. (1999b) Another Look at the Efficiency of Corporate Travel Management Departments, *Journal of Travel Reasearch*, 37(3), 267–272.

Baker, M., Riley, M. (1994) New Perspectives on Productivity in Hotels: some Advances and New Directions, *International Journal of Hospitality Management*, 13(4), 297–311.

Banker, R.D., Charnes, A., Cooper, W.W. (1984) Some Models of Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis, *Management Science* 9(9), 1078–1092.

Barros, C.P. (2004) A Sthocastic Cost Frontier in the Portuguese Hotel Industry, *Tourism Economics*, 10, 177–192.

Barros, C.P. (2005) Measuring Efficiency in the Hotel Sector, *Annals of Tourism Research*, 32(2), 456–477.

Barros, C.P., Mascarenhas, M.J. (2005) Technical and Allocative Efficiency in Chain of Small Hotels, *International Journal of Hospitality Management*, 24, 415–436.

Battese, G.E. (1992) Frontier Production Functions and Technical Efficiency: A Survey of Empirical Applications in Agricultural Economics, *Agricultural Economics*, 7, 185–208.

Bauer, P.W. (1990) Recent Developments in the Econometrics estimation of Frontiers, *Journal of Econometrics*, 46, 39–56.

Bell, J., Morey, R.C. (1995) Increasing the Efficiency of Corporate Travel Management through Macro-benchmarking, *Journal of Travel Research*, 33(3), 11–20.

Bjurek, H., Hjalmarsson, L., Førsund, F.R. (1990) Deterministic Parametric and Nonparametric estimation in Service Production, *Journal of Econometrics*, 46, 213–227.

Bravo-Ureta, B.E., Pinheiro, A.E. (1993) Efficiency Analysis of Developing Country Agriculture: A Review of Frontier Function, *Agricultural and Resource Economics Review*, 22, 88–101.

Buhalis, D. (2000) Marketing the Competitive Destination of the Future, *Tourism Management*, 21, 97–116.

Butler, R.W. (1999) The Concept of Tourism Capacity, in Cooper, C.P. and Wanhill, S. (eds.) *Tourism Development*, Wiley, New York, pp.11-21.

Caves, D.W., Christensen, L.R., Diewert, W.E. (1982) The Economic Theory of Index Numbers and the Measurement of Input, Output and Productivity, *Econometrica*, 50(6), 1393–1414.

Charnes, A., Cooper, W.W., Rhodes, E. (1978) Measuring the Efficiency of Decision Making Units, *European Journal of Operational Research*, 2(6), 429–444.

Charnes, A., Cooper, W.W., Li S. (1989), Using Data Envelopment Analysis to Evaluate Efficiency in the Economic Performance of Chinese Cities, *Socio–Economic Planning Sciences*, 23(6), 325–344.

Coelli, T.J. (1995) Recent Developments in Frontier Modeling and Efficiency Measurement, *Australian Journal of Agricultural Economics*, 39, 219–245.

Chon, K.S., Weaver, P.A., Kim, C.Y. (1991) Marketing your Community: Image Analysis in Norfolk, *The Cornell Hotel and Restaurant Administration Quarterly*, 31(4), 24–27.

Cracolici, M.F. (2004) Tourist Performance Evaluation: a Novel Approach, *Atti XLII Riunione Scientifica della Società Italiana di Statistica*, June 2004, Bari.

Cracolici, M.F. (2005) *La Competitività tra Destinazioni Turistiche. Un'Analisi di Destination Benchmarking*, PhD Dissertation, Faculty of Economics, University of Palermo, Italy.

Cracolici, M.F., Nijkamp, P. (2006) Competition among Tourist Destination. An Application of Data Envelopment Analysis to Italian Provinces, in Giaoutzi M. and Nijkamp P. (eds.), *Tourism and Regional Development: New Pathways*, Ashgate, Aldershot, UK.

Crouch, G.I., Ritchie, J.R.B. (1999) Tourism, Competitiveness, and Societal Prosperity, *Journal of Business Research*, 44, 137–152.

Cuffaro, M., Vassallo, E. (2002) Sviluppo Economico e Sviluppo Umano: una Nota sulla Classificazione ONU di Alcuni Paesi, *Scritti di Statistica Economica*, 10.

Dwyer, L., Forsyth, P., Rao, P. (2000) The Price Competitiveness of Travel and Tourism: A Comparison of 19 Destinations, *Tourism Management*, 21(1), 9–22.

Enright, M.J., Newton, J. (2004) Tourism Destination Competitiveness: A Quantitative Approach, *Tourism Management*, 25(XX), 777–788.

Färe, R., Grosskopf, S., Lindgren, B., Roos, P. (1992) Productivity Changes in Swedish Pharmacies 1980–1989: A Non-prametric Malmquist Approach, *The Journal of Productivity Analysis*, 3(1), 85–101.

Färe, R., Grosskopf, M.N., Zhang, Z. (1994) Productivity Growth, Technical Progress and Efficiency Change in Industrialized Countries: Reply, *American Economic Review*, 84, 66–83.

Farrell, M. J. (1957) The Measurement of Productive Efficiency, *Journal of the Royal Statistical Society*, 120, 211–281.

Fayos–Sola, E. (1996) Tourism Policy: A Midsummer Night's Dream?, *Tourism Management*, 17(6), 405–12.

Førsund, F.R., Lovell, C.A.K., Schmidt, P. (1980) A Survey of Frontier Production Functions and of Their relationship to Efficiency Measurement, *Journal of Econometrics*, 13, 5–25.

Fried, H.O., Lovell, C.A.K., Schmidt, S.S. (eds.) (1993) *The Measurement of Productive Efficiency: Techniques and Applications*, Oxford University Press, New York.

Giaoutzi M. and Nijkamp P. (eds.) (2006) *Tourism and regional Development*, Ashgate, Aldershot, UK.

Giaoutzi M. and Nijkamp P. (eds.) (1993) *Decision Support Models for Regional Sustainable Development*, Ashgate, Aldershot, UK.

Hu, Y.Z., Ritchie, J.R.B. (1993) Measuring Destination Attractiveness: A Contextual Approach, *Journal of Travel Research*, 32(2), 25–35.

Hwang S., Chang, T. (2003) Using Data Envelopment Analysis to Measure Hotel Managerial Efficiency Change in Taiwan, *Tourism Management*, 24, 357–369.

ISTAT (1998a) *Statistiche del Turismo*, ISTAT, Roma.

ISTAT (1998b) *Dati di Contabilità Nazionale*, ISTAT, Roma.

ISTAT (2001a) *Statistiche del Turismo*, ISTAT, Roma.

ISTAT (2001b) *Dati di Contabilità Nazionale*, ISTAT, Roma.

Kozak, M., Rimmington, M. (1999) Measuring Tourist Destination Competitiveness: Conceptual Considerations and Empirical Findings, *Hospitality Management*, 18(3), 273–283.

Kozak, M. (2002) Destination Benchmarking, *Annals of Tourism Research*, 29(2), 497–519.

Macmillan, W.D. (1986) The Estimation and Applications of Multi–regional Economic Planning Models Using Data Envelopment Analysis, *Papers of the Regional Science Association*, 60, 41–57.

Martić, M., Savić, G. (2001) An Application of DEA for Comparative Analysis and Ranking of Regions in Serbia with Regard to Social–Economic Development, *European Journal of Operational Research*, 132, 343–356.

Morey, R.C., Dittman, D.A. (1995) Evaluating a Hotel GM's Performance: A case Study in Benchmarking, *Cornell Hotel Restaurant and Administration Quarterly*, 36(5), 30–35.

Murphy, P., Pritchard, M. P., Smith B. (2000) The Destination Product and its Impact on Traveller Perceptions, *Tourism Management*, 21, 43-52.

Pearce, D.G. (1997) Competitiveness Destination Analysis in Southeast Asia, *Journal of Travel Research*, 35(4), 16–25.

Poon, A. (1993) *Tourism, Technology and Competitive Strategies*, CAB, Oxford.

Poon, A. (2002) Competitive Strategies for a "New Tourism", in Cooper C. (eds.), *Aspect of Tourism*, Channell View Publ., Clenadon, pp. 130–142.

Porter, M.E. (1990) *The Competitive Advantage of Nations*, The Free Press, New York.

Ray, S.C. (2004) *Data Envelopment Analysis. Theory and Techniques for Economics and Operations Research*, Cambridge University Press, Cambridge, UK.

Reynolds, D. (2003) Hospitality-productivity Assessment: Using Data-envelopment Analysis, *Cornell Hotel Restaurant and Administration Quarterly*, 44(2), 130–137.

Ritchie, J.R.B., Crouch, G.I. (2000) The Competitive Destination: A Sustainability Perspective, *Tourism Management*, 21, 1–7.

Ritchie, J.R.B., Crouch, G.I. (2001) Developing Operational Measures for the Components of a Destination Competitiveness/Sustainability Model: Consumer versus Managerial Perspectives, in Mazanec, J.A. (eds), *Consumer Psychology of Tourism Hospitality and Leisure*, CABI, Wallingford, 1–17.

Seiford, L.M., Thrall, R.M. (1990) Recent Developments in DEA: The Mathematical Programming Approach to Frontier Analysis, *Journal of Econometrics*, 46, 7–38.

Susiluoto, I., Loikaanen, H. (2001) The Economic Efficiency of Finnish Regions 1988–1999: An Application of the DEA Method, *41st Congress of the European Regional Science Association*, 29 August-1 September 2001, Zagreb, Croatia.

Swarbrooke, J., Honner, S. (2001) *Consumer Behaviour in Tourism*, Butterworth-Heinemann, Oxford.

Uysel, M. (1998) The Determinants of Tourism Demand, in Ioannides, D. and Debbage, K.G. eds.), *The Geography of the Tourist Industry*, Rutledge, London, pp.75–97.

Wall, G., Mathieson, A. (2006) *Tourism Change, Impacts and Opportunities*, Pearson/Prentice & Hall, Harlow, UK.

Table 1 Characteristics of the input and output variables (1998 and 2001)

Variables	Mean	S.D.
	1998	
Input		
BH	4.0373	6.2397
BCC	4.4470	5.1810
CPH	0.0016	0.0052
TSG	0.0950	0.0513
ULA	26.6058	4.8435
Output		
BN	425.0783	584.8067
BI	222.2886	435.2840
	2001	
Input		
BH	4.2951	6.5181
BCC	5.2469	6.8086
CPH	0.0016	0.0052
TSG	0.0949	0.0509
ULA	26.9824	4.7095
Output		
BN	475.6755	633.7207
BI	266.3281	473.7531

Table 2 Frequency distribution of technical and scale efficiency estimates from the DEA models (1998 and 2001)

Efficiency Score	CRS				VRS				SE			
	1998		2001		1998		2001		1998		2001	
	No. of Regions	% of Regions	No. of Regions	% of Regions	No. of Regions	% of Regions	No. of Regions	% of Regions	No. of Regions	% of Regions	No. of Regions	% of Regions
1-48	11	10.68	13	12.62	5	4.85	8	7.77	1	0.97	0	0.00
48-50	0	0.00	3	2.91	2	1.94	1	0.97	0	0.00	1	0.97
50-52	2	1.94	1	0.97	0	0.00	1	0.97	1	0.97	0	0.00
52-54	2	1.94	1	0.97	0	0.00	2	1.94	0	0.00	0	0.00
54-56	1	0.97	0	0.00	2	1.94	1	0.97	0	0.00	0	0.00
56-58	1	0.97	4	3.88	0	0.00	0	0.00	0	0.00	1	0.97
58-60	1	0.97	5	4.85	2	1.94	1	0.97	0	0.00	2	1.94
60-62	7	6.80	2	1.94	3	2.91	1	0.97	2	1.94	2	1.94
62-64	3	2.91	3	2.91	1	0.97	4	3.88	0	0.00	0	0.00
64-66	5	4.85	4	3.88	2	1.94	4	3.88	2	1.94	1	0.97
66-68	4	3.88	2	1.94	1	0.97	3	2.91	2	1.94	3	2.91
68-70	3	2.91	4	3.88	3	2.91	2	1.94	0	0.00	4	3.88
70-72	3	2.91	2	1.94	4	3.88	2	1.94	3	2.91	0	0.00
72-74	4	3.88	2	1.94	1	0.97	2	1.94	1	0.97	0	0.00
74-76	3	2.91	3	2.91	2	1.94	2	1.94	2	1.94	1	0.97
76-78	2	1.94	2	1.94	3	2.91	0	0.00	0	0.00	0	0.00
78-80	1	0.97	1	0.97	3	2.91	1	0.97	2	1.94	3	2.91
80-82	2	1.94	2	1.94	2	1.94	2	1.94	2	1.94	2	1.94
82-84	2	1.94	4	3.88	3	2.91	2	1.94	0	0.00	2	1.94
84-86	2	1.94	1	0.97	0	0.00	1	0.97	2	1.94	0	0.00
86-88	3	2.91	3	2.91	0	0.00	1	0.97	0	0.00	2	1.94
88-90	2	1.94	2	1.94	1	0.97	3	2.91	2	1.94	2	1.94
90-92	1	0.97	2	1.94	2	1.94	3	2.91	4	3.88	6	5.83
92-94	3	2.91	4	3.88	0	0.00	1	0.97	4	3.88	8	7.77
94-96	1	0.97	1	0.97	0	0.00	1	0.97	5	4.85	7	6.80
96-98	1	0.97	2	1.94	3	2.91	1	0.97	11	10.68	7	6.80
98-100	33	32.04	30	29.13	58	56.31	53	51.46	57	55.34	49	47.57
	103	100.00	103	100.00	103	100.00	103	100.00	103	100.00	103	100.00
100	32	31.07	29	28.16	55	53.40	51	49.51	35	33.98	32	31.07

Table 3 Summary statistics of efficiency estimates from DEA models

Efficiency Score	CRS		VRS		SE	
	1998	2001	1998	2001	1998	2001
Mean	0.777	0.762	0.845	0.837	0.927	0.914
Minimun	0.319	0.237	0.323	0.237	0.419	0.486
Maximun	1.000	1.000	1.000	1.000	1.000	1.000
Variance	0.041	0.049	0.040	0.045	0.015	0.016
Coefficient of Variation	16.412	15.717	16.784	17.063	38.492	32.412

Table 4 Frequency distribution of efficiency change from 1998 to 2001

Efficiency distance value	D^{1998} (1998)		D^{2001} (2001)		D^{1998} (2001)		D^{2001} (1998)		Malmquist Index	No. of Regions	% of Regions
	No. of Regions	% of Regions	No. of Regions	% of Regions	No. of Regions	% of Regions	No. of Regions	% of Regions			
1-1.10	39	37.86	38	36.89	41	39.81	28	27.18	0.68.0.75	2	1.94
1.10-1.20	7	6.80	9	8.74	11	10.68	12	11.65	0.75-0.78	1	0.97
1.20-1.30	7	6.80	7	6.80	7	6.80	4	3.88	0.78.0.80	1	0.97
1.30-1.40	9	8.74	5	4.85	8	7.77	8	7.77	0.80-0.82	2	1.94
1-40-1.50	6	5.83	8	7.77	10	9.71	6	5.83	0.82-0.84	1	0.97
1.50-1.60	10	9.71	6	5.83	5	4.85	7	6.80	0.84-0.86	6	5.83
1.60-1.70	8	7.77	7	6.80	3	2.91	9	8.74	0.86-0.88	2	1.94
1.70-1.80	1	0.97	5	4.85	5	4.85	7	6.80	0.88-0.90	7	6.80
1.80-1.90	2	1.94	1	0.97	2	1.94	3	2.91	0.90-0.92	13	12.62
1.90-2.00	3	2.91	1	0.97	1	0.97	2	1.94	0.92-0.94	8	7.77
2.00-2.10	2	1.94	6	5.83	3	2.91	5	4.85	0.94-0.96	13	12.62
2.10-2.20	3	2.91	1	0.97	0	0.00	0	0.00	0.96-0.98	17	16.50
2.20-2.30	1	0.97	1	0.97	0	0.00	3	2.91	0.98-1.00	20	19.42
2.30-2.40	0	0.00	0	0.00	1	0.97	2	1.94	1.00-1.02	5	4.85
2.40-2.50	0	0.00	2	1.94	0	0.00	0	0.00	1.02-1.04	5	4.85
2.50-2.60	0	0.00	0	0.00	1	0.97	1	0.97			
2.60-2.70	3	2.91	0	0.00	0	0.00	1	0.97			
2.70-2.80	1	0.97	0	0.00	1	0.97	1	0.97			
2.80-2.90	0	0.00	2	1.94	0	0.00	1	0.97			
2.90-3.00	0	0.00	0	0.00	1	0.97	1	0.97			
3.00-3.10	1	0.97	0	0.00	0	0.00	0	0.00			
3.10-3.20	0	0.00	4	3.88	3	2.91	2	1.94			
>3.20	0	0.00	0	0.00	0	0.00	0	0.00			
	103	100.00	103	100.00	103	100.00	103	100.00		103	100.00
1	37	35.92	29	28.16	28	27.18	37	35.92	>1	10	0.097

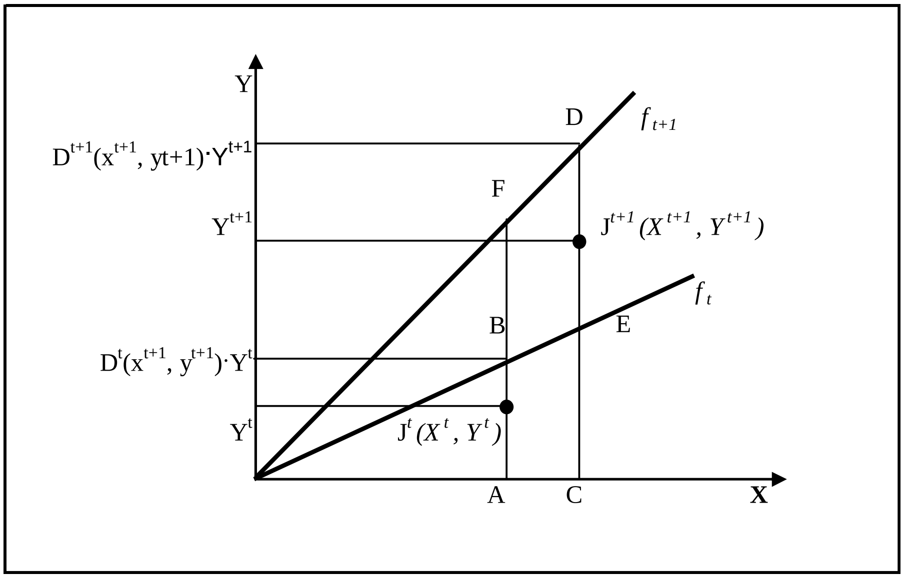

Fig. 1 The output based measurement of efficiency change