Benchmarking in Tourism Destination, Keeping in Mind the Sustainable Paradigm

Valentina Bosetti, Mariaester Cassinelli
and Alessandro Lanza

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Valentina Bosetti and Mariaester Cassinelli, *Fondazione Eni Enrico Mattei*
Alessandro Lanza, *Fondazione Eni Enrico Mattei and CRENoS, Facoltà di Scienze Politiche*

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Summary

Tourism destination benchmarking and the assessment of tourism management performances are a crucial and challenging task in the direction of evaluating tourism sustainability and reshaping tourism activities. However, assessing tourism management efficiency per se may not provide enough information concerning long-term performances, which is what sustainability is about. Natural resources management should therefore be included in the analysis to provide a more exhaustive picture of long-run sustainable efficiency and tourism performances. Indeed, while the environmental endowment of a site is a key feature in tourism destination comparison, what really matters is its effective management. Therefore, in this paper we assess and compare tourism destinations, not only in terms of tourism services supply, but also in terms of the performance of environmental management. The proposed efficiency assessment procedure is based on Data Envelopment Analysis (DEA). DEA is a methodology for evaluating the relative efficiency when facing multiple input and output. Although the methodology is extremely versatile, for the sake of exemplification, in this paper it is applied to the valuation of sustainable tourism management of the twenty Italian regions.

Keywords: Data envelopment analysis, Sustainable tourism indicators

JEL Classification: L83, Q26

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Address for correspondence:

Valentina Bosetti
Fondazione Eni Enrico Mattei
Corso Magenta 63
20123 Milano
Italy
Phone: +39 02 520 36983
Fax: +39 02 520 36946
E-mail: valentina.bosetti@feem.it

1. INTRODUCTION

Decisions taken within the framework of tourism management may have important impacts on the environment that may have in turn feedback effects on the tourism responses. Tourism management practices that are environmentally conscious may be reactive, e.g. responding to environmental regulations, or proactive, e.g. effective in order to be competitive with other tourist locations and to satisfy consumers' preferences. This is however just one side of the coin. Indeed, two are the main effects the tourism industry exerts on the management of environmental resources, and they work in opposite directions. In addition to the positive impact due to the increased demand for high environmental standards, a negative impact derives from the anthropization of natural areas, increased pollution on the air compartment (mainly due to increased traffic) and on the water compartment, abnormal production of waste, increased number of arsons in the woods, etc.

Although the relationship between tourism management and environmental quality is a topic still needing further investigation (and will not be the focus of our purposes)★, it is however undeniable that a good notion of the performance in the management of both provides a better understanding of the sustainable efficiency of tourism locations. Developing tools enabling to evaluate the performance of tourism activities not only in economic terms, but also from an environmental perspective, is of critical importance. In particular, in order to provide policy makers guidelines, to correct inefficient management directions and to promote positive effects from competition between destinations, it will prove fundamental the use of performance indicators. Finding ways to produce simple indicators summarizing different features, which characterize a management strategy, is crucial to the policy mechanisms. Indeed, as

Hart emphasizes, an indicator is “something that helps you to understand where you are, which way you are going and how far you are from where you want to be” (Hart, 1997).

Though indicators have a growing resonance in politics, it is often easier to discuss them in theoretical terms than it is in practice. Difficulties arise in choosing good indicators for each feature we want to emphasize in the analysis, in aggregating them in a wrap-up index, and more importantly, in finding data, which in the case of tourism activities are often scarce and incomplete and available only for more recent years. Similarly, data concerning natural resources management have started to be collected only lately; this is even more true for data concerning environmental impacts of/on tourism activities, see for example (Cammarota *et al.*, 2001) and (Miller, 2001).

The present paper discusses a methodology developed to perform tourism destination benchmarking with the broader perspective of sustainability in mind and in order to overcome the discussed difficulties, Data Envelopment Analysis (DEA) is applied. Indeed, DEA is a methodology, which has been developed and successfully applied in order to deal with multiple and non-commensurable input and output problems.

The developed methodology is applied to the assessment of relative efficiency of Italian Regions, from a sustainable perspective. The tourism industry is a sector of fundamental importance for the Italian economy (12.1 % of GDP in 2003 according to the World Travel & Tourism Council) and its relevance is undoubtedly growing considering that the tourism flow has increased of the 18.6% during the period 1990-1997[▲]. Further the 33.8% of tourism visits the coastal areas of Italy, with a resulting intense pressure on local ecosystems. The dataset is composed of 20 Regions. These have been chosen as the basic decision unit to be compared, because they represent the main decision authority in managing tourism destination in terms of land use planning, business permits allocation, environmental, other regulations and tourism advertising, nationally and internationally. One should also bear in mind that tourism in Italy is a matter of exclusive Regional competence since 2001 (art 117, Title V, of the Italian Constitution, modified by the law 3/2001). For each Region, the analysis takes into consideration a set of indicators (inputs and outputs) which are considered relevant when valuing the performance of a management strategy, from an economic as well as environmental perspective.

The paper is organised as follows. In Section 1 a brief description of DEA methodology is given, while in Section 2 the data set, the model developed and the performed analysis are described. Section 3 provides a description of main results and Section 4 concludes.

2. METHODOLOGY

Data Envelopment Analysis is an approach first proposed in (Charnes *et al*., 1997) in order to measure relative efficiency of generally defined decision making units transforming multiple inputs in multiple outputs. DEA has been applied to evaluate the relative performance not only of public organizations, as the study on medical services in (Nyman and Bricker, 1989) and the one on educational institutions in (Charnes *et al*., 1981), but also of private organizations as banks, see for example (Charnes *et al*. 1990). A thorough review of DEA theory and applications can be found in (Charnes *et al*. 1993). In 1986 DEA has been first applied to the hospitality industry (see (Banker and Morey, 1986)), specifically to the restaurant section. Corporate travel management have been analysed in (Bell and Morey, 1995), while the hotel sector has been analysed in several works, see for example (Morey and Dittman, 1997), (Anderson *et al.*, 2000) and (Wober, 2000). An overview of DEA applied to tourism and hospitality industries can be found in (Wober, 2002). Relative performance of tourism advertising programs in the United States has been analysed by Wober (Wober and Fesenmaier, 2004)

The DEA is a multivariate technique for monitoring productivity and providing some insights on possible directions of improvements of the status quo, when inefficient. In particular, DEA is a non-parametric technique, i.e. it can compare input/output data making no prior assumptions about the probability distribution under study. Although DEA is based on efficiency, which is close has a concept to that of a classical production function, the latter is typically determined by a specific equation, while DEA is generated from the data set of observed operative units. The DEA efficiency scored of any decision unit is derived from the comparison with the others included in the analysis; considering the maximum score of unity (or 100%) as a benchmark. The score is independent of the units in which outputs and inputs are measured, and this allows for a greater flexibility in the choice of inputs and outputs to be included in the study.

A commonly accepted measure of efficiency is given by the ratio of the weighted sum of outputs over the weighted sum of inputs. It is however necessary to assess a common set of weights and this may rise some problems. With DEA for each unit whose efficiency has to be assessed, the set of weights is computed through the process of maximizing efficiency. Given a set of N decision units, each producing J outputs from a set of I inputs, let us denote by y_{jn} and x_{in} the vectors representing the quantities of outputs and inputs relative to the m-th unit, respectively. The efficiency of the m-th unit can thus be calculated as:

$$e_m = \frac{\sum_{j=1}^{J} u_j y_{jm}}{\sum_{i=1}^{I} v_i x_{im}}, \qquad \begin{bmatrix} j = 1,..,J \\ i = 1,..,I \end{bmatrix} \tag{1}$$

where u_j and v_i are two vectors of weights that unit m uses in order to measure the relative importance of the multiple consumed and the produced factors. As mentioned, the set of weights, in DEA, is not given, but is calculated through the maximization problem, faced by each decision unit. Let us consider as an example the maximization problem to the m-th unit.

$$\begin{aligned} & \max e_m \\ & s.t. \\ & \frac{\sum_{j=1}^{J} u_j y_{jn}}{\sum_{i=1}^{I} v_i x_{in}} \leq 1 \quad \forall n = 1,.,m,.,N \\ & 0 \leq u_j \leq 1 \\ & 0 \leq v_i \leq 1 \end{aligned} \tag{2}$$

To simplify computations it is possible to scale the input prices so that the cost of the unit m's inputs equals 1, thus transforming problem set in (2) in the ordinary linear programming problem stated below:

$$\begin{aligned} & \max h_m = \sum_{j=1}^{J} u_j y_{jm} \\ & s.t. \\ & \sum_{i=1}^{I} v_i x_{im} = 1 \\ & \sum_{j=1}^{J} u_j y_{jn} - \sum_{i=1}^{I} v_i x_{in} \leq 0 \quad \forall n = 1,.,m,.,N \\ & \varepsilon \leq u_j \leq 1,\ \varepsilon \leq v_i \leq 1,\ \varepsilon \in \Re^{+} \end{aligned} \tag{3}$$

A further constraint is imposed on weights that have to be strictly positive, in order to avoid the possibility that some inputs or outputs may be ignored in the process of determination of the efficiency of each unit.

If the solution to the maximization problem gives a value of efficiency equal to 1, the corresponding unit is considered to be efficient or non-dominated, if the efficiency value if inferior to 1 then the corresponding unit is dominated, therefore does not lays on the efficiency frontier, which is defined by efficient units.

As for every linear programming problem, there exists a dual formulation of the primal one outlined in (3), which has identical solution. While the primal problem can be interpreted as an output-oriented formulation (for a given level of input, units maximizing output are preferred), the dual problem can be interpreted as an input-oriented formulation (for a given level of output, units minimizing input are preferred).

Let us now consider for the sake of clarity a simple numerical example of five Regions, denoted in Figure 1 as A, B, C, D and E, and each using different combinations of two inputs, say labour and number of beds, required to produce a given output quantity, say, number of tourists (data are summarized in Table 1). In order to facilitate comparisons, input levels are converted to those needed by each Region to “produce” one tourist.

Data plotted in Figure 1 refer to the solution of the input minimisation problem. A kinked frontier is drawn from A to C to D and the frontier envelopes all the data points and approximates a smooth efficiency frontier using information available from the data only. Regions on the efficient frontier of our simple example, are assumed to be operating at best practice (i.e. efficiency score equal to one). While, Regions B and D are considered to be less efficient. DEA compares B with the artificially constructed Region B’, which is a linear combination of A and C. municipalities A and C are said to be the “peer group members” of B and the distance BB’ is a measure of the efficiency of B. Compared with its benchmark B’, Region B is inefficient because it produces the same level of output but at higher costs.

Finally, in order to perform dynamic analysis, thus producing not only a static pictures of efficiency, but considering the evolution of efficiency of each Region, the window approach first put forward by Charnes and others (Charnes *et al.*, 1978) has been used. The DEA is performed over time using a moving average similar procedure, where a municipality in each different period is treated as if it were a ‘different’ Region. In other words, a Region’s performance in a particular period is contrasted with its performance in other periods in addition to performance of the other Regions.

One last analysis has been conducted in order to calculate the Malmquist productivity index (Total Factor Productivity), thus getting more information on the dynamics of efficiency. This index measures management efficiency changes for each region between two different time periods.

Fare and others (Fare *et al.*, 1984) specifies the output based Malmquist productivity change index as:

$$Mo_{t,t+1}(y_{t+1}, x_{t+1}, y_t, x_t) = \left[\frac{D_o^t(x_{t+1}, y_{t+1})}{D_o^t(x_t, y_t)} \times \frac{D_o^{t+1}(x_{t+1}, y_{t+1})}{D_o^{t+1}(x_t, y_t)} \right] \tag{4}$$

where the notation *D* represent the distance function and the value of *M* is the Malmquist productivity index. This index represents the efficiency of the activity at time t+1 (x_{t+1}, y_{t+1}) relative to the activity at time t (x_t, y_t). A value of M greater than one will indicate positive TFP growth from period t to period t+1, while a value less than one indicates efficiency decline, and a value equal to 1 corresponds to stagnation.

Fare and others (Fare et al., 1989) showed that the Malmquist productivity index can be decomposed into two component technical efficiency change (eff) and technological change (tech):

$$Mo_{t,t+1}(y_{t+1},x_{t+1},y_t,x_t)=\underbrace{\frac{D_o^{t+1}(x_{t+1},y_{t+1})}{D_o^t(x_t,y_t)}}_{eff}\underbrace{\left[\frac{D_o^t(x_t,y_t)}{D_o^{t+1}(x_t,y_t)}\times\frac{D_o^t(x_{t+1},y_{t+1})}{D_o^{t+1}(x_{t+1},y_{t+1})}\right]^{\frac{1}{2}}}_{tech} \quad (5)$$

We apply this index in order to obtain greater insight in the dynamic valuation of regional tourism and environmental management.

3. DATA AND INDICATORS

In order to represent the sustainable efficiency of tourism management, for each of the 20 regions we consider a set of eight indicators, four inputs, of which one uncontrollable, and four outputs (indicators are summarised in Table 2, 4 and 6, while values are given in Table 10 and 11a, 11b, 11c, 11d). In particular, inputs are tourism development, public expenditures in tourism management and advertising, public expenditures in environmental protection and market size. As a measure for the level of tourism development in each destination one of the most commonly used indicators is applied; namely, the indicator is given by the number of beds in hotels, camping, registered holiday houses and other receptive structures per 100 inhabitants (ISTAT[◊]). Public expenditures in tourism management and advertising embody all regional expenses devoted to tourism support and development which are enrolled in regional budget plans (XIII Italian Tourism Report). Public expenditures in environmental protection (ISTAT[◊]) represent quite intuitively a good proxy for public effort in environmental quality management at regional level. Currently, these are the only available data, while in the forthcoming years the EPEA -Environmental Protection Expenditure Account- standards will be applied. The implied definition of environmental protection of current data include expenses in environmental protection as defined in the EPEA, but also expenses in use and management of natural resources.

The forth input indicator, market size, is incorporated in the analysis in order to measure the reachability and size of each regional market and is included in order to make different region more comparable one with the other. The model used to measure market size is a gravity model also adopted in Wober (2003) ♠.

The outputs used to control for tourism performances *per se* are total presences of tourists and homogeneity of tourism flows during the year. Total presences measure the absolute dimension of the market which is assumed to be proportional to economic benefit deriving from tourism (ISTAT). The degree of homogeneity of tourism flows during the year (ISTAT), measured as a distance from a completely uniform distribution, represents an important indicator of quality of tourism services and quality of tourism management in general. A high seasonality, thus a high concentration of tourists during short periods, has a substantial impact on environmental quality and on the quality of tourism services. As an example think of a water supply system or of waste disposal programs and depurative systems which are extremely sensitive to tourism pressure because generally designed on the necessity of the resident population and not on peak periods population.

The outputs controlling for environmental quality are the percentage of protected areas and an index of efficiency in waste treatment. The percentage of protected area is measured as the percentage of the regional territorial area occupied by natural protected areas. This is a fundamental indicator of environmental protection, because the presence of a protected area implies the existence of regulations, norms and limitations, affecting also the reshaping of the territory due to tourism development. Waste treatment efficiency is measured as the urban waste incinerated over the urban waste produced. The reader should bear in mind that this does not represent the absolute production of solid waste, but the characteristics of the waste management system which is a fundamental measures of environmental policy efficiency.

The values of the input and output factors for the 20 Italian regions are presented in Table 10.

4. MODELS AND RESULTS

Three different analyses have been undertaken for the year 2003, each based on a different idea of efficiency. Indeed, the models have been designed in order to investigate each region's relative efficiency when both tourism activity and environmental management performances are considered (model 1); when only the performance of tourism related activities is considered (model 2); and, finally, when only environmental management is considered (model 3). All three models are necessary to the complete picture. Indeed, although some regions may show relatively high efficiency scores in the overall analysis (model 1), this may depend on high performances in one of the two policy objectives, say tourism management, and may be covering a low performance in the other objective, say environmental quality management.

In Table 2 model 1 is described. What happens if we consider policy makers as having both tourism-oriented and environmental goals (as it should be) in their policy agenda and we include them both in the DEA analysis? The model which accounts for both tourism and environmental objectives produces a ranking which is described in Table 3. Note that, the way DEA works, the set of weights for each region, computed through the maximization problem, are chosen to hide as much as possible that regions' weaknesses and to magnify its strengths. Thus, the ranking should always be read having in mind complementary information provided by the other two models, which consider each goal separately thus making it impossible to hide potential shortages in one of the two objectives.

In particular, model 2, described in Table 4, assumes that each region, given some expenditure on tourism advertising, management and strategic planning, and given a certain level of tourism development, aims at maximizing the number of total visitors as well as their homogenous distribution in time. Each region is then ranked on the basis of how well it fulfils its tourism management objective. The deriving ranking is depicted in Table 5; it defines who is operating at maximum efficiency, given these purely tourism-oriented objectives, and, conversely, who is dominated. As an example, and as one would expect given the national and international recognized fame, Toscana and Liguria appear to be operating at full efficiency, both following model 1 and 2.

However, low performances in environmental management, accompanied by a very high performance in attracting tourism may raise some doubts on the long term sustainability of a fully efficient score obtained in the tourism-oriented or in the comprehensive analysis. Table 6 describes model 3 which is build to detect environmental management solely. In particular, given their level of public expenditures in environmental protection and the level of tourism development (considered having a negative impact on environmental protection), regions are assumed to maximize the percentage of protected area and the efficiency in waste treatment. From Table 7 we can see that the ranking of Italian region is extremely different if this new perspective is adopted. When the objective at stake is designed to reflect the efficiency of environmental quality management, regions as Liguria and Toscana appear less virtuous as they did before.

It is in the dynamic behaviour of efficiency that we expect to detect the interplay of tourism oriented and environmental factors. Furthermore, environmental costs have a multi-period dimension since they generate effects, which are generally visible in future periods. Consequentially, it appears more interesting to get an idea of how the efficiency of such regions is performing over time, rather than giving just a static picture. A dynamic analysis of efficiency for the 20 regions has been performed using both a moving window and a Malmquist DEA approaches and considering indicators' values relative to a previous period (three years). Results are given in Table 8 and 9. In particular, in Table 8, regions above the bisectrix present a relative efficiency score that appears to be improving over time, while the opposite is true for regions below. While in Table 9, the inferred total factor productivity of each region is given. Even though the analysis would deeply benefit form a dataset covering a larger number of samples in time, still the comparison of computed efficiency to a previous period gives an idea of management directions. Going back to our example, it is interesting to notice how Toscana, for example, considered in a dynamic setting, appears to be in a descendent phase in terms of tourism and environmental quality management performances. This may partly depend on identified poor performances in environmental quality preservation and management.

5. FINAL REMARKS

There are several phases characterising a management decision process. First, it is necessary to identify problematic and crucial issues. This status quo analysis is normally followed by the formulation of reacting strategies, which in turn are implemented. In the final phase, effectiveness of results is evaluated. The use of synthetic efficiency indicators may be crucial, particularly at earlier and latter stages of the management process.

Data Envelopment Analysis can be effectively applied in assessing and comparing economic and environmental performances of tourism management units. As discussed, DEA analysis produces relative efficiency indices for each considered unit and also gives useful information concerning which lever would play a more effective role in improving management efficiency. The methodology can handle input and output of multiple natures, as for example economic factors and environmental quality indicators, and this can prove to be of crucial importance when taking into account incommensurable issues.

The present study discusses a methodology that can provide insights on the issue of sustainable tourism management, however there are some important further steps that ought to be considered. First, a survey investigating stakeholders' opinions will be soon carried out in order to better understand what input and output indicators should be considered in order to provide the most relevant information to the decision process. Subsequently, the data set could be extended both spatially, in order to include other European tourist resorts, and temporally, in order to obtain a better understanding of the dynamics of the system. Indeed, changes in time of management efficiency are the most relevant element in addressing the issue of sustainable tourism management.

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TABLES

Table 1. Example Data

DMUs	Labour	Beds	Tourists	Labour per tourist	Beds per tourists
A	200	600	200	1	3
B	600	1200	300	2	4
C	200	200	100	2	2
D	600	300	200	3	1.5
E	500	200	100	5	2

Table 2. List of Input and Output in Tourism and Environment Management Analysis – Model 1

INPUT	Market Size Public expenditures in environmental protection (thousands of Euro) (2003, ISTAT) Tourism Development Index (2003, ISTAT) Public expenditures in tourism management and advertising (2003, XIII Italian Tourism Report)
OUTPUT	Total presences of tourists (2003, ISTAT) Homogeneity of tourism flows during the year (2003, ISTAT) Percentage of protected areas (2001, ISTAT)

Table 3. Ranking from Model 1

Region	Score
Emilia Romagna	100,00
Molise	100,00
Lombardia	100,00
Liguria	100,00
Sicilia	100,00
Umbria	100,00
Toscana	100,00
Abruzzo	100,00
Campania	100,00
Lazio	100,00
Piemonte	100,00
Veneto	100,00
Valle d'Aosta	100,00
Trentino Alto Adige	100,00
Basilicata	93,86
Marche	92,38

Puglia	66,06
Sardegna	63,04
Calabria	54,65
Friuli Venezia Giulia	53,15

Table 4. List of Input and Output in Tourism Management Analysis – Model 2

INPUT	Market Size Tourism Development Index (2003, ISTAT) Public expenditures in tourism management and advertising (2003, XIII Italian Tourism Report)
OUTPUT	Total presences of tourists (2003, ISTAT) Homogeneity of tourism flows during the year (2003, ISTAT)

Table 5. Ranking from Model 2

Region	Score
Campania	100,00
Emilia Romagna	100,00
Lazio	100,00
Liguria	100,00
Lombardia	100,00
Molise	100,00
Piemonte	100,00
Sicilia	100,00
Toscana	100,00
Trentino Alto Adige	100,00
Umbria	100,00
Valle d'Aosta	100,00
Veneto	100,00
Sardegna	85,48
Marche	81,84
Puglia	78,51
Friuli Venezia Giulia	78,26
Basilicata	78,22
Abruzzo	73,10
Calabria	70,79

Table 6. List of Input and Output in Environmental Management Analysis – Model 3

INPUT	Market Size Public expenditures in environmental protection (thousands of Euro) (2003, ISTAT) Tourism Development Index (2003, ISTAT)
OUTPUT	Percentage of protected areas (2001, ISTAT) Index of efficiency in solid waste treatment (2003)

Table 7. Ranking from Model 3

Region	Score
Basilicata	100,00
Campania	100,00
Emilia Romagna	100,00
Friuli Venezia Giulia	100,00
Sardegna	100,00
Trentino Alto Adige	100,00
Valle d'Aosta	100,00
Lombardia	100,00
Abruzzo	100,00
Sicilia	80,06
Calabria	70,01
Lazio	67,52
Umbria	60,27
Piemonte	52,58
Toscana	43,28
Puglia	43,17
Marche	35,06
Veneto	34,44
Liguria	18,78
Molise	18,11

Table 8. Results from Model 1 in a Dynamic Analysis

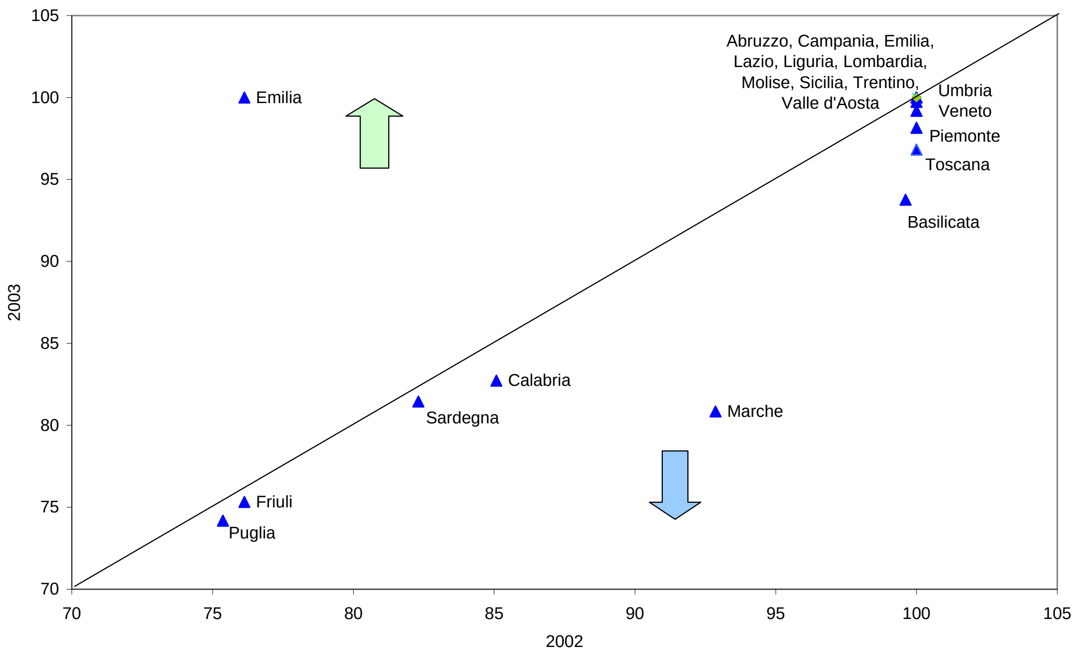


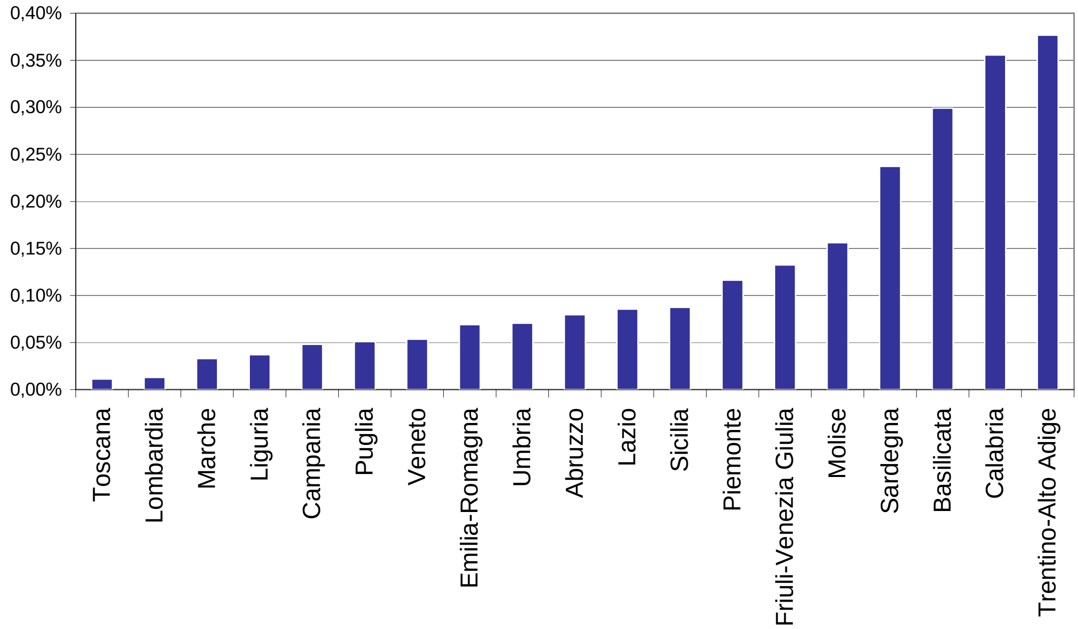
Table 9. Malmquist DEA (model 1) results. Ranking TFP.

Region	TFP
Campania	2,159
Emilia Romagna	1,946
Marche	1,401
Lombardia	1,143
Piemonte	1,04
Puglia	1,013
Lazio	1,003
Trentino Alto Adige	0,994
Friuli Venezia Giulia	0,993
Valle d'Aosta	0,902
Abruzzo	0,863
Toscana	0,851
Sicilia	0,809
Basilicata	0,746
Veneto	0,724
Sardegna	0,708
Calabria	0,686
Liguria	0,663
Molise	0,612
Umbria	0,427

	INPUT				OUTPUT			
REGIONS	market size	tourism development index (2003, ISTAT)	Public expenditures in tourism management and advertising (thousands of Euro) (2003, XIII Italian Tourism Report)	Public expenditures in environmental protection (thousands of Euro) (2002, ISTAT)	Total presences of tourists (2003, ISTAT)	Homogeneity of tourism flows during the year (2003, ISTAT)	Index of efficiency in solid waste treatment (2003)	Percentage of protected areas (2001, ISTAT)
Abruzzo	171020,90	3,77	16323	91,41	7115155	135,61	0,01	28,10
Basilicata	145988,12	2,44	32926	66,11	1761639	130,75	5,26	12,50
Calabria	106168,14	5,75	136059	160,62	7333813	121,28	0,01	12,40
Campania	198565,81	1,31	38839	337,25	19708952	162,05	0,01	24,10
Emilia Romagna	195843,12	3,10	62296	210,20	36621302	138,23	22,35	4,00
Friuli Venezia Giulia	124936,51	9,46	39434	99,68	8863178	136,43	19,95	6,80
Lazio	194358,57	1,84	134225	144,09	24054701	227,61	0,01	12,40
Liguria	151786,52	4,40	14032	110,52	14769598	169,00	0,01	4,70
Lombardia	236853,15	1,07	58608	451,90	25972014	220,70	28,85	2,90
Marche	156481,76	10,23	14654	113,62	13449366	135,19	2,52	9,20
Molise	146930,27	2,04	9036	24,27	769334	151,47	0,01	1,40
Piemonte	132314,07	1,82	124378	250,48	8943998	205,39	3,80	6,60
Puglia	144907,85	3,10	28453	174,05	10702634	125,47	3,61	6,60
Sardegna	93224,61	4,65	68547	140,99	10383975	119,36	14,29	3,80
Sicilia	107673,44	1,03	286053	348,09	13152348	165,82	0,80	10,50
Toscana	186421,63	6,11	23933	227,76	36837331	157,77	7,71	6,90
Trentino Alto Adige	121634,58	13,09	107647	80,57	39570587	191,43	17,13	20,80
Umbria	171219,78	4,61	23007	67,66	5795242	197,07	4,95	7,50
Valle d'Aosta	108661,79	23,99	35242	19,63	3496219	210,56	0,01	12,50
Veneto	174300,07	99,42	65907	299,03	55111931	143,34	9,29	5,10

Table 10. Values of indicators

Table 11.a Public expenditures in Tourism Management (millions of Euros) as a ratio of GDP (millions of Euros) (2002)



Valle d'Aosta	1,26%

Table 11.b Public expenditures in Environmental Management (millions of Euros) as a ratio of GDP (millions of Euros) (2002)

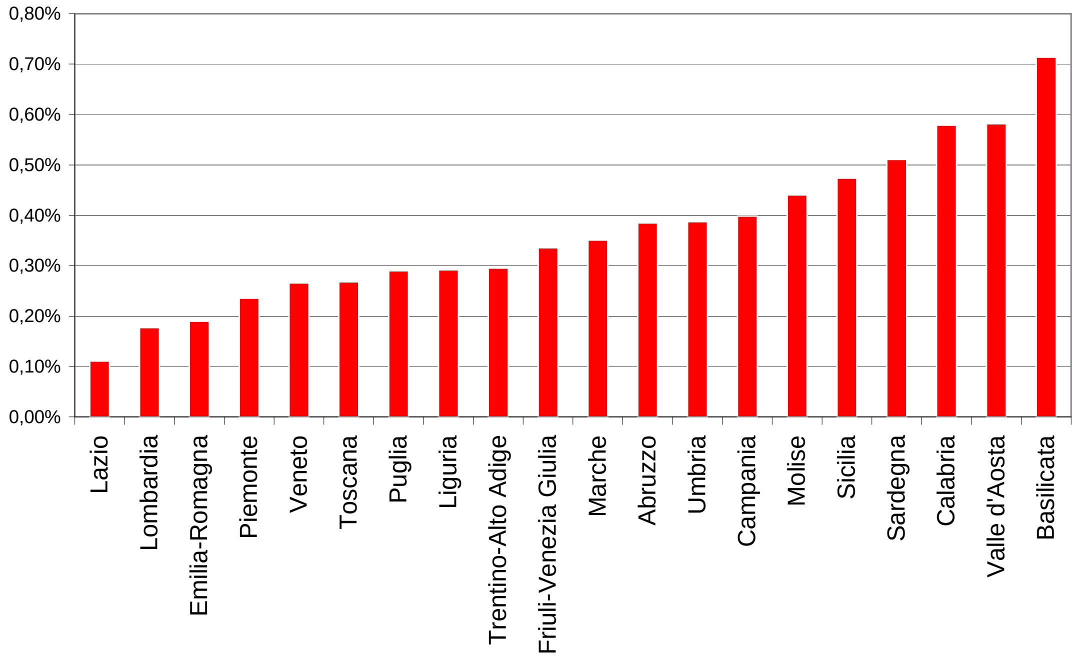


Table 11.c Public expenditures in Tourism Management (millions of Euros) as a ratio of total public expenditures (millions of Euros) (2002)

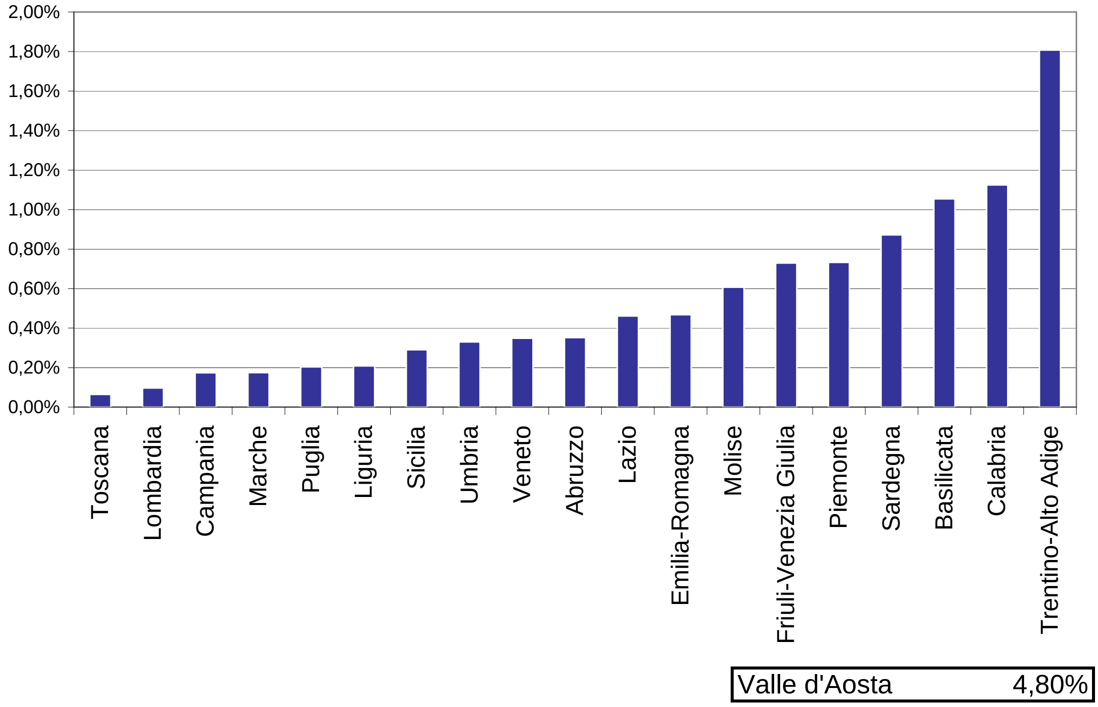
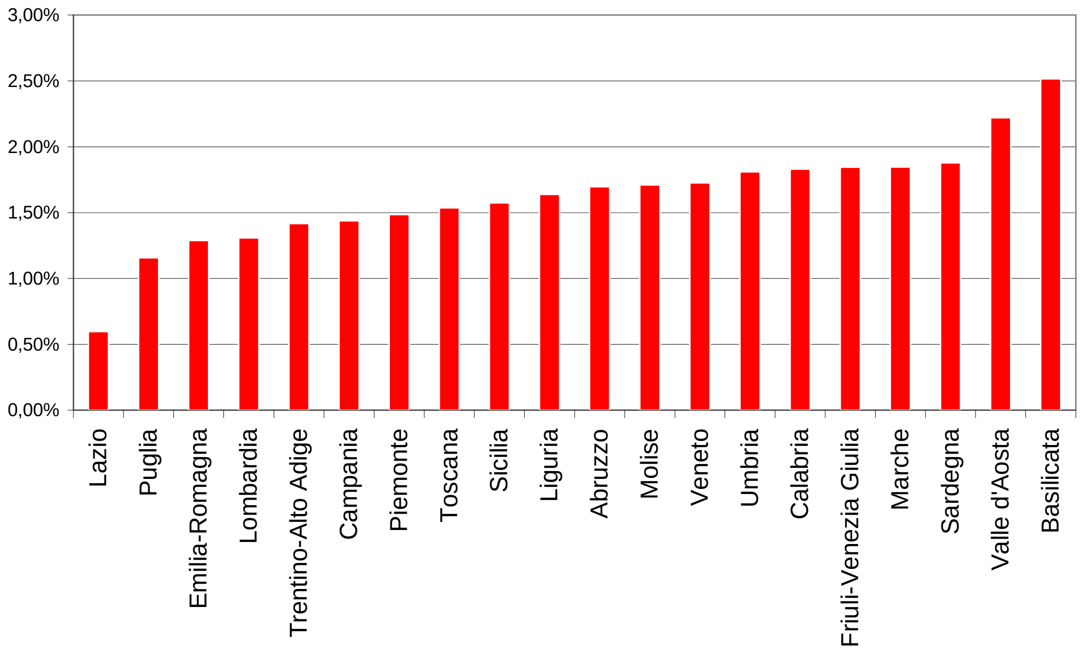


Table 11.d Public expenditures in Environmental Management (millions of Euros) as a ratio of total public expenditures (millions of Euros) (2002)



FOOTNOTES

* Corresponding author. E-mail: Valentina.Bosetti@feem.it, Ph: + 39 02520 36938, Fax:+39 0252036946, www.feem.it.

^ For general information and statistics on tourism in Italy see ISTAT publications (ISTAT, 1997).

◊ ISTAT - National Institute of Statistics. Tourism Statistics for year 2000-2001.

♣ Ancitel S.p.A. society of services of the National Association of Italian Municipalities.

♥ ARPA, Italian Regional agencies for the Environment

★ The theme of integration between economy and environment is faced also by ISTAT through the elaboration of a system of "Environmental and Economic Integrated Accounting" ("Contabilità integrata ambientale ed economica"), a part of which structured on satellite accounts (**Namea**, which considers the pressures exercised on environment by the economic system, and **Epea**, which considers the environmental expenses faced by economic operators to mitigate environmental pressures or to restore deteriorated environmental situations). Here the economic system is seen as an organism that transforms the matter taken from its environment (nature) in residuals and discards of various kind, with the aim to use energy and materials for the operation and the increase of the system itself.

♠ MARKET SIZE has been incorporated into the analysis in order to consider the difference between different Italian Regions and make possible the comparison.

The proposed model for market size, m_i, consists of two components:

DENSITY (which measures the “density” if the population within the Region and is used as a surrogate for the attractiveness of the “domestic” market due to the absence of information regarding travel attractions in the respective Italian Regions) and REACHABILITY (which is measured in terms of the average distance a visitor has to travel during a domestic trip assuming a uniform topological shape of Italian Regions and evenly distributed population density):

$$m_i = \left(\frac{\sqrt{s_i}}{2} \right)^{-1} * p_i + \sum_{j=1}^{20} d_{ij}^{-1} * p_j$$

m_i : market size of region i;
s_i : square miles of region i;
p_j : population of region j;
d_{ij} : distance in miles between region i and region j (regional capitals)

The principle idea is that an Italian Region located close to other Regions with high populations has a competitive advantage as compared to more spatially “exposed” Regions with lesser populated neighbouring Regions (Wober and Fesenmaier, 2004).

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(lxxviii) This paper was presented at the Second International Conference on "Tourism and Sustainable Economic Development - Macro and Micro Economic Issues" jointly organised by CRENoS (Università di Cagliari and Sassari, Italy) and Fondazione Eni Enrico Mattei, Italy, and supported by the World Bank, Chia, Italy, 16-17 September 2005.

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