# Does Unesco inscription affect the performance of tourism destinations? A regional perspective

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**Abstract**

This paper analyses the role of tourism in the enhancement of local development focusing on the role of UNESCO World Heritage List (WHL) as attractor of tourism demand. It aims at evaluating the performance of the Italian regions as tourism destinations in the period 1995-2010, using the Data Envelopment Analysis (DEA) two-stage approach. In the first stage the efficiency scores are calculated using a smoothed DEA bootstrap procedure to generate unbiased technical efficiency estimates. In the second stage a robust semi-parametric regression is employed to assess the impact of the WHL inscription on the efficiency of tourism destinations in the short and in the long term. The empirical results show that, controlling for several environmental factors, the presence of UNESCO sites is negatively correlated to the technical efficiency of tourist destinations. Our explanation for such a result is that WHL inscription raises expectations which are not met by an equivalent increase of tourism flows: this has to be taken in account by policy-makers in the design of the local strategies to promote tourist destinations and therefore to foster local development.

**Keywords:** Cultural Heritage; Tourism; Non-parametric methods.

**JEL codes:** Z10; L83; O18; D24.

## 1. Introduction

UNESCO World Heritage List (WHL), its growth through time, composition, and effectiveness in ensuring conservation as well as promoting tourism and, therefore, economic local development have recently attracted great attention in the economic literature. In this paper, we explore a specific aspect of the relationship between WHL and tourism, that is, whether the inscription in the WHL affects the technical efficiency of the supply of tourism goods and services and, therefore, the competitiveness of the tourism destinations.

Following Barros et al. (2011) a Tourism Destination (hereafter, TD) can be considered as a geographical area (at different levels of analysis: country, region, city, etc.) where various types of experiences are organized and managed to attract tourists and to be enjoyed by them. According to this approach each TD bases its tourism attractiveness on both the natural and cultural endowment and the tangible and intangible infrastructures supplied by private and public agents (accommodation, transportation, information and communication systems,

cultural services and performing arts). Where the comparative advantage of a TD depends on the resources availability, its competitive advantage in the tourism destinations market depends on its ability to use these resources effectively (Crouch and Ritchie, 1999).

Therefore, it is relevant to evaluate whether TDs, having a comparative advantage based on their outstanding cultural endowment included in the WHL, are able to transform this comparative advantage in a competitive advantage and are able to register better technical efficiency in the whole tourism supply. To estimate the technical efficiency of the TDs in Italy, we apply Data Envelopment Analysis (DEA), on data referring to Italian regions and autonomous provinces in the period 1995-2010. The reason to adopt regions and autonomous provinces as TDs depends on data availability. Moreover, such a choice has also an institutional rationale, since Italian tourism system is decentralised and regions have large competences in the field.

In the second step of the analysis we check for the effects of some non-discretionary inputs on the technical efficiency of TDs, adopting the semi-parametric two-stage technique suggested by Simar and Wilson (2007). This technique overcomes severe limitations imposed by the standard two-stage DEA approach. In particular, in the second stage we assess the impact of the WHL inscription on the efficiency of tourism destinations, investigating whether it is relevant and, if this is the case, whether it generates short or long terms effects. Our results show that the presence of UNESCO sites negatively affects the technical efficiency of TDs. Our explanation for such a result is that WHL inscription raises expectations in the private operators of the tourism industry, particularly in the accommodation suppliers, considered in this study, which are not met by an equivalent increase of tourism flows.

The paper is organised as follows: section 2 explores the main economic issues related to UNESCO sites and their relationship with tourism; section 3 describes the characteristics of the tourism industry in Italy; section 4 introduces the standard and bootstrapped DEA approaches, presents data and DEA results. The second stage results are offered in section 5 and, finally, section 6 provides some concluding remarks.

## 2. WHL and tourism

As it is well known, the *Convention concerning the protection of the world cultural and natural heritage* was adopted by the General Conference of UNESCO in November 1972, came into force in 1977 and, since then, it has been ratified by 187 countries. The WHL has also been growing through time: nowadays, it includes 936 properties (725 cultural, 183 natural and 28 mixed, i.e. combining cultural and natural) in 153 countries. As Table 1 shows, continents and countries are represented in a very unbalanced way in the WHL[1].

Frey, Pamini and Steiner (2011) outline that no objective criterion – e.g., per capita, per area or per income unit – can explain the actual distribution of properties. Notwithstanding the positive attention generated by WHL on the conservation of specific outstanding heritage, Frey and Steiner (2011) claim that the selection of properties is questionable, since it is subject to rent-seeking exerted by national political interests and by the commercial heritage industry. Other scholars (Bertacchini and Sacconi, 2012) provide a political economy explanation of the composition of the WHL, suggesting that the involvement of countries in the World Heritage Committee, which select the properties to be included in the List, influence the inscription of national heritage sites.

Leaving aside the issues related to the composition of the WHL, from our point of view it is worth noting that the growth of the WHL has stimulated the interest of several scholars in investigating the link between cultural tourism and the heritage included in the List. Cultural tourism is a segment of the tourism demand that is worth to investigate, as it shows a positive trend even in the last years of negative business cycle, whatever the definition of cultural tourism adopted by researchers (ICOMOS, 2002, Bonet, 2011): +3 per cent in terms of global visitors of cultural attractions in the period 1995-2007 (OECD, 2009); +2 per cent in the expenditure in the Italian art cities in the period 2001-2010 (Alivernini et al. 2012), just to give some data.

Though the main objective of the WHL is the preservation of the natural and cultural heritage of outstanding relevance for the future generations, the UNESCO assignment is also to promote "an appropriate equitable balance between conservation, sustainability and development" (Budapest Declaration on World

[1] The total reported in the table is higher than the number provided by UNESCO because cross-border sites are counted for each country in which they are located.

Heritage, 2002) in the destinations where the UNESCO heritage is located. UNESCO official documents take somehow for granted the positive effects of the heritage included in the List on tourism and UNESCO heritage is also used as an indicator of variations in the attractiveness of travel destinations, as measured by the Competitive Monitor (Mazanec et al., 2007). However, the real success of this initiative depends on the degree of involvement of the local community and on the degree of awareness of the local community (residents, entrepreneurs of different sectors, etc.) of the relevance of their cultural endowment for the present and future development of their territory (Jimura, 2011).

The procedure for the inscription comprehends two very competitive selections: at the national level, for the inscription in the national Tentative List, and at the international level for the final inscription in the WHL. Therefore, the selective process takes quite a long time, in which the policy-makers of the site under scrutiny should plan and start to implement a strategy of local development, based on the preservation and valorization of the cultural endowment, that involves the whole local community. The compulsory presentation of the Management Plan of the site to participate at the international competition should stimulate local coordinated actions for the tourism valorization of the site.

A recent strand of literature on the economic impact of mega sport events, based on the theory of signalling (Rose and Spiegel, 2011; Fourie and Santana-Gallego, 2011), goes further and discusses if the signals a country sends by hosting or just by be willing to host a mega sport event, e.g. participating at the bidding for the Olympic games, have the same economic impact in terms of tourism flows. If the participation at the bidding for a sport event, as well as the proposal to inscribe the local natural or cultural site of outstanding value in the WHL, can be considered signals of a strategy of local development tourism and cultural oriented, they could both succeed even if they will not win the bid and will not receive the inscription in the WHL for their site. On the opposite, winning the bid and receiving the international recognition for a site could not guarantee success in terms of tourism flows, both in the short time, considering the potential crowding out of tourists' arrivals and in the long-run, if the strategy is just announced but not really implemented.

Indeed, the effectiveness of WHL in promoting tourism is an open and controversial question. In the investigation of the effects on tourism of UNESCO

sites, complementary as well substitution effects have been outlined (Tisdell and Wilson, 2002) and, at the same time, empirically investigated. Aretzky et al. (2009) consider the WHL as an example of tourism specialization and find positive and significant effects on economic growth through specialization in tourism; a recent debate in the journal “Tourism Management” (Yang, et al., 2010 and 2011; and Cellini, 2011) shows that empirical evidence is ambiguous. Looking at regional evidence, Cuccia and Rizzo (2012) show that UNESCO inscription does not seem to be effective in fostering cultural tourism and in overcoming seasonality. In what follows we indirectly enter such a debate investigating whether the presence of heritage included in the List affects the efficiency of the supply of tourism services and therefore contributes to increase the competitiveness of TDs.

**<< *Table 1 around here* >>**

## 3. Italian WHL and the regional tourism industry

Italy is the European country with the largest number of Unesco sites; if we look at the regional distribution (see Table 2 and Figure 1), the highest number of World Heritage Site (WHS) is in Lombardy (9 sites) and in Tuscany (6 sites); then, Veneto, Campania and Sicily follow with 5 sites and Lazio with 4 sites. The other Italian regions have one or two WHL sites and four of them (Valle d’Aosta, Abruzzo, Molise and Calabria) have none. Obviously, this does not mean that these regions do not have any piece of cultural or natural heritage of outstanding importance, but probably the other political economy reasons mentioned above could be at the origin of this distribution. In this study, we overlook the reasons underlying the present regional distribution and we focus our interest in the Italian regional distribution of the WHS to estimate their potential role in orienting tourism flows and investments in the tourism sector.

**<< *Table 2 around here* >>**

**<< *Figure 1 around here* >>**

Tourism is of primary importance in Italy: according to the Tourism Satellite Account (ISTAT, 2012), in 2010, the contribution of the tourism industry to the national value added (82.833 billion euro) is equal to 6 per cent, a percentage similar to the contribution of the building sector in the Italian economy (ISTAT, 2012); the internal tourism consumption, that comprehends both in-bound and domestic tourism, is equal to 114.016 billion of euro and corresponds to the 9.1% of the total national consumption. In 2011, people directly and indirectly employed in the Italian tourism sector are more than two million (2,231,500 according to Eurostat, 2012), corresponding to 9.7% of the whole national employment.

Moreover, Italy is still a destination of primary importance in the worldwide tourism market: in the 2011 international ranking, Italy is fifth in place in both arrivals (46 million) and receipts (US$ 43 billion). In the ranking of the first twenty European regions with the highest overnight stays, there are six Italian regions, as compared to five Spanish and French regions.

In the period 2000-2011, Italy registered a very large increase of about 19 million arrivals (+23.7 in percentage terms), a slightly slower increase in overnight stays (+10.3 in percentage terms) and a decrease in average stays (from 4.23 in 2000 to 3.77 in 2011) (ONT, 2012)). However, long term trends show that the average annual growth of the arrivals in the European destinations will have a slower pace in the next years and by 2015 arrivals to emerging economies are expected to overcome those to advanced economies (UNWTO , 2012). Moreover, in Italy, on the supply side, the rate of growth of the value added of the traditional tourism services – hotels and restaurants – that in the nineties of the last century has increased about 3 per cent per year (twice  than GDP), in the period 2000-2010 substantially stopped (-0.1 per cent). Only the rate of growth of the value added of extra-hotels has increased (+0.5 per cent), slightly more than the rate of growth of the Italian GDP (+0.2 per cent) (Alivernini et al., 2012).

The present slowdown phase on the supply side can be explained by the structural characteristics of the Italian accommodation supply: Italy has a large number of establishments but with a low average number of beds (23.1 beds) (ONT, 2012). Small extra-hotel establishments (21 beds on average) are spread all over the regions: the number of beds in extra-hotels is larger than the number of beds in hotels in some of the most attractive regions (Veneto, Tuscany, Apulia,

Marche and Piedmont, see Figure 2). In the period 1995-2010, the number of beds in extra-hotels more than doubles in Bozen, Friuli-Venezia-Giulia, Umbria and Veneto (see Figure 3).

<< Figure 2 ***around here*** >>

<< Figure 3 ***around here*** >>

These characteristics can affect the performance of the tourism destinations. The structural characteristics of the Italian tourism hospitality, increasingly based on establishments of small scale or bed and breakfast, mainly located in the historical centers, could generate some inefficiencies in TDs. The small size of the establishments could negatively influences the private investments in immaterial infrastructures (i.e. accessibility and visibility on-line); however, this kind of accommodation is particularly requested by couples or small groups of tourists that are used to organize the trip on their own, without the advice of any tour operators. Therefore, more coordinated actions of the public and private agents could be usefully required to promote TDs. The smaller the size of the local tourism operator, the more important the role to be played by the policy-maker in the coordination of a public-private network.

Other determinants of the performance of the Italian tourism industry have been recently investigated. They focus on the role of the policy-makers and the public services supplied: the effectiveness of the regional public spending for tourism in both capital and current accounts (Cellini and Torrisi, 2013) and the bi-univocal relationship between tourism and crime in the Italian provinces (Biagi and Detotto, 2010). These two determinants concern the accessibility and the safety of a destination; they are not the main attractors of a destination but are key elements of attraction . According to the methodological approach suggested by Crouch and Ritchie, 1999, public spending can be considered a supporting factor and the safety from crime a qualifying determinant of the tourism sector but unfortunately both are largely beyond the control of the private tourism operators. Moreover, Cellini and Torrisi (2013, p.22-23) show that the financial effort of public intervention for tourism in the Italian regions is negligible in quantitative terms and not effective on neither the tourist presence nor the endowment of

accommodation. Biagi and Detotto (2012) go over the most common assumption of the negative impact of crime that crowds out the tourism demand and on the basis of the statistics on crime registered in the Italian provinces in 2005, they estimate a "positive" impact of tourism on specific forms of crime (street crime, pick-pocketing, etc.).

These studies are based on parametric methods of analysis. Other studies (Cracolici et al., 2008; Suzuki et al., 2011) adopt non-parametric methods (respectively, the DEA and the Euclidean Distance Minimization model in the context of DEA) to estimate the efficiency of the Italian tourism destinations located in 103 provinces in the year 2001. Cracolici et al. (2008) consider the overnight stays as output of the tourism production function, and the cultural endowment and the human capital (i.e., the normalized number of employees in the tourism sector and the normalized number of graduates in tourism studies) as inputs. Suzuky et al. (2011) include as input a fixed factor: the length of the beaches. The findings of these studies show a high level of inefficiency in the Italian provinces; particularly, Cracolici et al. (2008) estimate that only seven provinces are efficient in Italy and many cultural tourism destinations are inefficient just because of an over-endowment of cultural heritage compared to the tourism flows that are able to attract.

Our study follows this line of research based on non-parametric methodologies.

## 4. Measuring the performance of tourism destinations

### 4.1 Methodology for measuring performance

In this study we focus on the technical efficiency of TDs, following the Barros et al., (2011) approach, which involves the comparison of the actual performance of each TD (assumed as Decision Making Unit – DMU) with the optimal performance of the TDs located on the relevant frontier (or best practice frontier). The aim of this approach is the measurement of productive efficiency by defining a frontier envelopment surface for all sample observations using linear programming techniques.

We apply a non-parametric frontier mathematical programming methods for the measurement of the efficiency (Charnes et al., 1978) – namely, DEA – that generalized Farrell (1957) single input/output measure to a multiple-input/multiple-output technique. DEA is a mathematical programming technique designed to evaluate the relative efficiency of a group of comparable (DMUs). The DEA methodology calculates an efficiency frontier for a set of DMUs, as well as the distance to the frontier for each unit. This distance (efficiency score) between observed DMU and the most efficient DMU gives a measure of the radial reduction in inputs that could be achieved for a given measure of output. To describe this point[2], consider $n$ DMUs to be evaluated, a DEA input-oriented efficiency score $\theta_i$ is calculated for each DMU solving the following program, for $i=1, \ldots, n$, in the case of constant returns to scale (CRS):

$$\begin{aligned} & \text{Min}_{\lambda,\theta_i} \quad \theta_i \\ & \text{subject to} \quad Y\lambda - y_i \geq 0 \\ & \qquad \theta_i x_i - X\lambda \geq 0 \\ & \qquad \lambda \geq 0 \end{aligned} \qquad [1]$$

where $x_i$ and $y_i$ are respectively the input and output of *i-th* DMU; $X$ is the matrix of input and $Y$ is the matrix of output of the sample, $\lambda$ is a $n\times1$ vector of variables. The model [1] can be modified to account for variable return to scale (VRS) by adding the convexity constraint: $e\lambda=1$, where $e$ is a row vector with all elements unity, which allows to distinguish between Technical Efficiency (TE) and Scale Efficiency (SE).[3]

DEA is a well-established and useful technique for measuring efficiency in public sector activities[4]: it is capable of handling multiple inputs and outputs without a priori assumptions of a specific functional form on production technologies; it does not require a priori a relative weighting scheme for the input and output variables; it returns a simple summary measure for the efficiency of

[2] For further details see Fried et al. (2008).

[3] The acronyms CRS (Constant Returns to Scale) and VRS (Variable Returns to Scale) are often used with reference to CCR and BCC models that come from the initial of the authors Charnes et al. (1978) and Banker et al. (1984).

[4] DEA technique has been applied to several fields, such as public library (De Witte and Benny Geys, 2011) regulation of water companies (Thanassoulis, 2000) and gas distribution industry (Erbetta and Rappuoli, 2008), judicial districts (Finocchiaro Castro and Guccio, 2012), higher education (Johnes, 2006), health (Hollingsworth et al., 1999) and care for the elderly sector (Borge and Haraldsvik, 2009), heritage Authorities (Finocchiaro Castro et al., 2011).

each DMU, and it identifies the sources and amounts of relative inefficiency for each DMU.

In this paper we apply DEA to investigate the efficiency of the tourism sector in the Italian regions.[5] The efficiency is explored in two steps.

In the first step, we measure the technical efficiency of the Italian TDs. For this purpose, we apply DEA approach to investigate data referring to 21 Italian regions and autonomous provinces in the period 1995-2010. To provide a robustness check of our findings, we employ the smoothed homogeneous bootstrap procedure to investigate bias, variance, and confidence intervals of the attained efficiency scores and to get unbiased efficiency rankings (Simar and Wilson, 1998 and 2000).

In the second step we investigate the impact of environmental variables (or non-discretionary input) on the TD technical efficiency and, in particular, we try to assess the impact of the WHL inscription. We perform the second-stage analysis running a regression with the efficiency scores as dependent variable and the environmental variables as the independent ones.[6]

Thus, we assume that the efficiency scores can be regressed – in a cross-section framework – on a vector of environmental variables along the following general specification:

$$\theta_i = f(z_i)+\varepsilon_i \qquad [2]$$

where $\theta_i$ represents the efficient score that resulted from previous stage, $z_i$ is a set of possible non-discretionary inputs and $\varepsilon_i$ is a vector of error terms.

When running the two-stage approach, researchers usually adopt censored regression techniques (Tobit) or, in a few cases, OLS estimates to take into account the censored nature of dependent variable. Simar and Wilson (2007) show that in these case the estimates [2] are biased because of serial correlation of efficiency scores and suggests to apply semi-parametric two-stage techniques. More specifically estimating [2] with Tobit or OLS regression leads to the violation of the assumption of the independence between $\varepsilon_i$ and $z_i$. Thus, in the

[5] The analysis of efficiency in the tourism and hospitality industry has shown a growing interest in the literature (see among the other: Barros, 2005; Wang et al. 2006; Pulina, Detotto and Paba, 2010; Barros et al., 2011; Fuentes, 2011).

[6] An alternative approach would be to include environmental variables as inputs when estimating the efficiency frontier. (Cordero-Ferrera et al., 2008).

following section 4, we apply the two-step biased-corrected efficiency method proposed by Simar and Wilson (2007).

### 4.2 Data

Data under consideration come from the Italian Statistic Office (ISTAT). They cover the 21 Italian regions and autonomous provinces over the period 1995-2010[7] so that our dataset is a balanced panel data with 336 observations.

In the DEA frontier estimation tourist arrivals and the accommodation capacity (hotels and other accommodation) are considered as inputs and bed-nights as output of each TD. Specification of these inputs and output is consistent with earlier studies on France regions by Botti et al., (2009) and Barros et al. (2011). The supply of beds in hotels and other establishments across regions is highly differentiated[8]. To take into account the specialization of supply across regions and its effects on the performance we estimate two models: model 1 uses the above inputs as a whole without differentiating among them; model 2 takes into account the differences between hotels and other establishments (see Table 3).

***<< Table 3 around here >>***

Table 4 provides a concise description of the variables used in the first and second stage whereas Table 5 provides the descriptive statistics.

The variables used in the first and second stage are mainly provided by ISTAT. Our key variable, the number of WHS in each region, is obtained directly from UNESCO website (http://whc.unesco.org/), which provides a list of all WHS by country, year of inclusion and type of the site. For a better evaluation of the effects of inscription in the WHL, our analysis is focused on the cultural sites which have been included in the list by 2010.

***<< Table 4 around here >>***

***<< Table 5 around here >>***

[7] One region, Trentino Alto Adige, has two fully autonomous provinces.

[8] See table A.1 in the Appendix

In the next section, we will discuss the efficiency scores of Italian TDs, obtained using the models described above, whereas in section 4 we check which variables, among those reported in Table 4, affect the technical efficiency of Italian TDs.

### 4.3 DEA efficiency results

We estimate an output-oriented, Technically Efficient (TE) DEA model, assuming that TDs aim to maximize their output, given the inputs. The output-oriented DEA score gives a measure of how much TDs outputs can be proportionately increased given the observed levels of its inputs. A common shortcoming in DEA application is the consistency of the results from the DEA model with respect to the dimensionality space (*i.e.,* the number of input and output variables employed). In fact, the number of free dimensions decreases as new variables are included and, consequently, it is more likely that each unit may be considered efficient because of the flexibility of DEA estimator. From the consistency of DEA estimate this implies that small dimensionality space tend to produce better estimates frontier than large dimensionality space.[9] Thus, due the slow convergence rates of DEA estimator, we pool the data to obtain meaningful estimates[10].

For both models described above, we use pooled cross-section, time-series data on all Italian regions and Table 6 shows the descriptive statistics from the technical efficiency analysis of TD with the CRS and VRS assumptions.

<< ***Table 6 around here*** >>

Our results, reported in Table 6, show, as expected, that a reduced number of inputs or outputs influences the observations near the frontier, and lowers the average efficiency. In particular, model 1 shows lower average efficiency and many TDs with high level of inefficiency. In Table 6, our estimation using the CRS hypothesis shows that 3 TDs out of 336 are relatively efficient, whereas the

[9] This is a severe problem for DEA estimations as a point out by Kneip et al. (1998). See also footnote 13.

[10] For a detailed discussion on the asymptotic properties of non-parametric frontier models, see Simar and Wilson (2008).

number of efficient TDs increases to 12 if model 2 is considered. Further, the mean efficiency for the 336 TDs is 73.66% using the model 1 and 83.77% for the model 2. The same effect between model 1 *vs.* model 2 occurs under VRS hypothesis. In Table 7 we also report the average technical efficiency scores for each region from 1995 through 2010[11].

***<< Table 7 around here >>***

The various factors related to the context and scopes of the analysis are crucial to assess whether CRS or VRS is appropriate. Nevertheless, as stated in the previous Section, the main interest of the study is to investigate what are the determinants of TDs efficient management of tourism resources and, in particular, to assess the impact of the WHL inscription on the efficiency of TDs, rather than investigating scale inefficiencies. Thus, in our analysis it seems reasonable to assume the CRS hypothesis[12]. As far as the choice of the most appropriate model is concerned, Table 8 shows that the correlation between efficiency scores for the two models is high, that the relative ranking is strong and that the coefficients are significant using both the CRS and VRS assumptions[13].

These results suggest the use of model 1. In fact, due to the above mentioned slow convergence rate of DEA estimator, the former specification ensures better consistency in the efficiency estimate[14].

***<< Table 8 around here >>***

[11] See table A.2 in the Appendix for details of efficiency scores in model 1 under CRS assumption. All estimates are available upon request from the authors.

[12] This assumption has been usually discussed, since it may not account for differences in the dimension of TDs. However, we observe that this approach is quite widespread in two stage analyses in the literature mainly for two reasons: first, CRS scores exhibit more variability than VRS scores and second, CRS scores identify overall technical inefficiency.

[13] To assess if the efficiency scores obtained by the two models are statistically different, we employ adapted non parametric Li (1996) test, as suggested by Simar and Zelenyuk (2006). The results show that the null hypothesis of equality efficiency scores distributions in two models cannot be rejected. The estimates are available upon request from the authors.

[14] Simar and Wilson (2008) point out that most researchers have largely ignored the statistical properties of DEA estimators obtaining biased DEA estimates and misleading results. A common error is given by the dimensionality space (*i.e.* number of input and output variables included in the efficiency analysis) and by the reliability of the results obtained through the DEA model. Kneip et al. (1998) refer to this problem in the case of non-parametric estimators as the “curse of dimensionality”.

Moreover, the DEA efficiency estimate measures performance relative to an estimation of the true and unobservable production frontier and provides point estimates of performance. Since estimates on the frontier are based on finite samples, DEA measures, based on these estimates, are subject to sampling variation of the frontier. To address this problem, we implement a bootstrap procedure, with 2,000 bootstrap draws as described by Simar and Wilson (1998, 2000), to correct the bias in DEA estimators and obtain their confidence intervals. Table 9 reports the average values of technical efficiency at TD level, estimated with model 1 under CRS assumption; Figure 4 shows the plot of estimated values at DMU level. The reported results show that, from the perspective of sensitivity analysis, estimated efficiency scores are robust with respect to sampling variation.

***<< Table 9 around here >>***

***<< Figure 4 around here >>***

Finally, because we use cross-sectional, time-series data, an indication of how productivity changed in time span could be obtained by aggregating efficiency scores across all TDs. Figure 5 plots the mean and standard deviation of the DEA efficiency scores (CRS) estimates using model 1, for each year of observation. The mean is measured on the left vertical axis, while the standard deviation is measured on the right vertical axis. The patterns of efficiency levels turned out to be clearly decreasing over the time span under consideration.

***<< Figure 5 around here >>***

The above DEA results suggest that there is room for investigating the determinants of the performance of TDs. In the next section a two-step biased-corrected efficiency method proposed by Simar and Wilson (2007)[15] will be used to analyze the relationship between efficiency scores and the WHL inscription, controlling for other regional tourism attraction characteristics.

[15] Estimated efficiency scores have been tested with respect to sampling variation and they turn up to be robust.

## 5. Searching for the impact of the WHL inscription on the performance

As a first step in the analysis of the relation between the efficiency of TDs and the WHL inscription, we show the scatter plot of bias- corrected efficiency scores, the absolute as well as the weighted[16] number of WHL sites, fitted values and the confidence interval (Figure 6 and 7). It is clear that the relationship between efficiency scores and both variables representing WHL inscription is negative.

<< ***Figure 6 around here*** >>

<< ***Figure 7 around here*** >>

To better analyze this relationship, controlling for other regional tourism attraction characteristics, we follow the two-step approach, as suggested by Coelli et al. (1998) so as to regress DEA efficiency scores on a set of explanatory variables. As stated in the previous section, the bias corrected efficiency scores (CRS) in model 1 are chosen as the dependent variable. We follow the approach of Simar and Wilson (2007) that ensures a feasible, consistent inference for the parameters estimated in the second stage of the regression.

As far as independent variables are concerned, we identify some variables which are likely to affect the efficiency of TDs. We estimate two models. The first model is the baseline model, with the set of explanatory variables limited to the main independent variables. The second model includes variables related to WHL.

For this purpose, we employ tourism attractors outside the control of tourism managers in the region as main independent variables. The choice of these variables is based on the mentioned literature and also affected by data availability. The following variables are used in our regression: kilometres of coasts (SEA); number of visitors to state museums and historic buildings per square kilometre (CULTURE); hectare of protected natural areas per 100 hectares (ENVIROMENT); kilometres of motorways at three lanes per 1,000 square kilometres (MOTORWAYS); thefts and robberies per 1,000 inhabitants (THEFT). For all the above variables, but the last one, we would expect a positive sign.

[16] Weights are the number of years of inscription of each site (see Table 4).

Moreover, since some Regions enjoy special autonomy we use a dummy variable (AUTONOMY) to capture such an institutional specificity.

As far as the variables related to the presence of WHL sites, we consider both the number of sites (WHL) and a variable obtained weighting the number of sites with the number of years of inscription of each site in the region (WHL_YEAR).

Finally, for each estimated model we employ a yearly time trend (TREND) to take into account the time effects on the TDs efficiency. The estimates are reported in Table 10.

<< ***Table 10 around here*** >>

The results in Table 10 show that tourism attractors are significant and with the expected signs. As it can be seen in column 1, cultural, natural and environmental factors enhance the efficient management of tourism destinations; (SEA, ENVIROMENT, CULTURE) as well as the availability of transport infrastructures (MOTORWAYS). The degree of autonomy (AUTONOMY) also exerts positive and significant effects and, as expected higher petty crime (THEFT) has a negative impact on the efficiency of TDs. Time trend (TREND) is highly significant and negative, showing that the efficiency of TDs is decreasing through time.

Columns 2 to 4 show the results of the extended models including the variables representing WHL inscription. The presence of UNESCO sites as such (WHL) has a negative effect on TDs efficiency. The same negative effect occurs in the long run (WHL_YEAR). Considering both variables jointly, their effect is reduced, as it could be expected, because of the correlation between them: the inscription (WHL) has a negative impact effect while no further significant effect seems to occur in the long run (WHL_YEAR).

At a first sight this result might seem counterintuitive and deserves some comments. A reasonable explanation is that the WHL inscription procedure contributes to create a positive and creative atmosphere; it could be considered an exogenous positive shock that enhances positive expectations in the local entrepreneurs involved in the supply of tourism services.. We argue that the positive expectations of local entrepreneurs, in some case stimulated by local policies, may be at the origin of the stated inefficiency: for instance, let us think of

the policies supporting the restoration of ancient buildings as bed and breakfast, leading to a spectacular growth of accommodation establishments. It is not a problem of over-endowment of cultural heritage that affects the efficiency of the Italian regions – as TDs – but a problem of the over-endowment of the accommodation capacity that the positive expectations founded on the project of a WHL site can generate. If the project is not included in a general plan of local development, the initiative will represent just an announcement that allow policy-makers gaining local consensus in the period of their office but it will not last in the long-run (Cuccia, 2012; Cuccia and Rizzo, 2012) and causes inefficiency.

Moreover, the presence of a WHS generates positive expectations on both the suppliers and the consumers of tourism services (Biagi and Pulina, 2009). The positive effects of cultural and environmental variables show that the "density" of cultural and natural attractions is relevant and, at the same time, suggest that the UNESCO label is not capable to enhance the efficiency of TDs. This is in line with some evidence on the trend in the demand side estimated in some case studies on Sicily (Cuccia and Rizzo, 2011; Cuccia, 2012); they suggest that WHL inscription as such is not enough to attract visitors, since cultural tourists look for overall 'cultural experience', and that coordinated actions of public as well as private actors are needed. The visitors of a WHS require at least a good management in terms of good accessibility of the site and the area around it; good material and immaterial infrastructures; good planning of temporary events that enrich the cultural experiences that tourists – visitors look for. These positive expectations cannot be frustrated; otherwise in the long-run the occupancy rate could decrease not for the over-supply of the accommodation capacity but for the over reduction in tourism flows (Cuccia and Rizzo, 2011; Cuccia, 2012).

## 6. Concluding remarks

In this paper, we aimed at evaluating the effects of WHL inscription on the performance of Italian TDs at regional level, using a two-stage approach in which the determinants of efficiency scores are investigated. At a first sight, it could be very surprising that, on one side, the cultural and environmental endowment of the Italian regions positively affect the efficiency of TDs, measured by the occupancy rate of their establishments, but, on the other side, the presence of UNESCO sites

is negatively correlated to the technical efficiency of TDs. In our study, unlike Cracolici et al., (2008), it is not the over-endowment of cultural capital that negatively affects the efficiency of TDs, but it is the outstanding worth of this cultural capital, recognised by the inscription in the WHL, that negatively affects their efficiency. It seems that the quality, more than the quantity, of the cultural heritage counts more.

Different possible explanations could be offered for such a result; they concern both the supply and the demand side.

On the supply side, local tourism operators overestimate the effects of the inscription in the WHL and over-supply the accommodation capacity and other hospitality services; on the basis of a political economy approach, the local policy-makers seem to be more interested in the international recognition to gain consensus in the short run, than to give the necessary support to the private tourism operators for a sustainable development in the long run. Moreover, the structural features of the Italian accommodation capacity, increasingly based on small size establishments and bed & breakfast, require more coordinated actions between private and public agents. Only a public-private network, that connects all the different tourism and cultural services locally offered, allows to create those economies of scale that benefit both suppliers involved in the local development policy and potential visitors.

On the demand side, the presence of a WHS attracts visitors expecting for a good management and accessibility of the site and looking for a complete cultural and creative experience (Richards, 2011) that makes them closer to the intangible cultural capital expressed by local community. Their expectations cannot be disappointed; otherwise the inefficiency in the TDs with WHS will be not come from the over- supply in the accommodation capacity but from a sharp decrease in tourism flows.

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## TABLES AND FIGURES

### Table 1 - Countries with a large number (ten or more) of Sites in the World Heritage List, 2011

| Country/Region | Total | Cultural | Natural | Mixed |
|---|---|---|---|---|
| **Americas** | | | | |
| Brazil | 18 | 11 | 7 | 0 |
| Canada | 15 | 6 | 9 | 0 |
| Mexico | 31 | 27 | 4 | 0 |
| Peru | 11 | 7 | 2 | 2 |
| United States | 21 | 8 | 12 | 1 |
| **Asia and Pacific** | | | | |
| Australia | 17 | 3 | 12 | 4 |
| China | 41 | 29 | 8 | 4 |
| Korea | 10 | 9 | 1 | 0 |
| India | 28 | 23 | 5 | 0 |
| Iran | 13 | 13 | 0 | 0 |
| Japan | 16 | 12 | 4 | 0 |
| **Europe** | | | | |
| Belgium | 10 | 10 | 0 | 0 |
| Czech Republic | 12 | 12 | 0 | 0 |
| France | 37 | 33 | 3 | 1 |
| Germany | 37 | 34 | 3 | 0 |
| Greece | 17 | 15 | 0 | 2 |
| Italy | 47 | 44 | 3 | 0 |
| Poland | 13 | 12 | 1 | 0 |
| Portugal | 13 | 12 | 1 | 0 |
| Russia | 24 | 15 | 9 | 0 |
| Spain | 43 | 38 | 3 | 2 |
| Sweden | 14 | 12 | 1 | 1 |
| Switzerland | 11 | 8 | 3 | 0 |
| United Kingdom | 28 | 23 | 4 | 1 |
| Turkey | 10 | 8 | 0 | 2 |
| ***Total selection*** | ***539*** | ***424*** | ***95*** | ***20*** |
| **Total sites in WHL** | **976** | **750** | **197** | **29** |

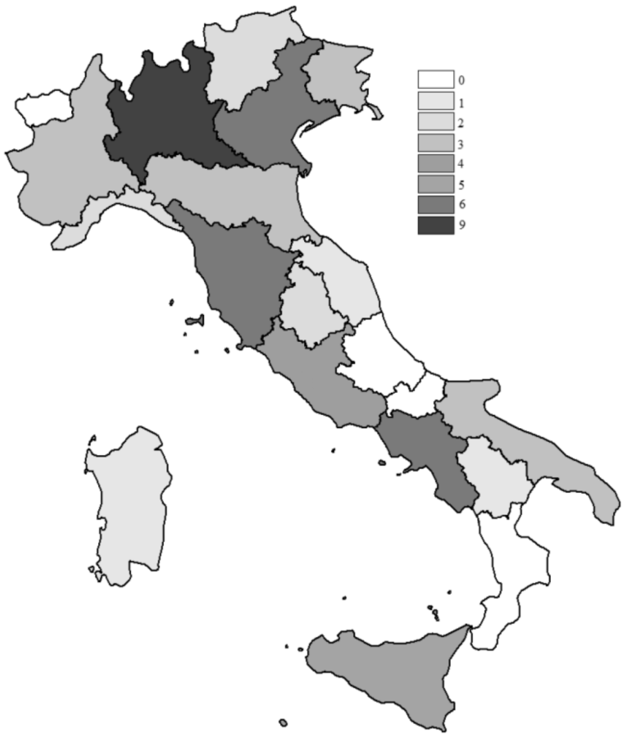
Note. Source: our updating from Frey and Pamini 2011 on data provided by http://whc.unesco.org/en/list, accessed on 30.5.2012. In 2011, 25 WHL sites are located across two or more countries and they are counted for each country. Differently from Frey and Pamini 2010 we do not consider the Socialist Federal Republic of Yugoslavia.

## Table 2 - Italian region with sites in the World Heritage List, 2011.

| Region or autonomous province | WHL sites in 2010 | | | | WHL sites before 1995 | | | |
|---|---|---|---|---|---|---|---|---|
| | Tot. | *Cult.* | *Nat.* | *Mixed* | Tot. | *Cult.* | *Nat.* | *Mixed* |
| Piedmont | 2 [a] | *2* [a] | *0* | *0* | 0 | *0* | *0* | *0* |
| Valle d'Aosta/Vallée d'Aoste | 0 | *0* | *0* | *0* | 0 | *0* | *0* | *0* |
| Lombardy | 9 [a, b] | *8* [a, b] | *1* [b] | *0* | 2 | *2* | *0* | *0* |
| Liguria | 2 | *2* | *0* | *0* | 0 | *0* | *0* | *0* |
| Bolzano/Bozen | 2 [a] | *1* [a, b] | *1* [a] | *0* | 0 | *0* | *0* | *0* |
| Trento | 2 [a] | *1* [a, b] | *1* [a] | *0* | 0 | *0* | *0* | *0* |
| Veneto | 5 [a] | *4* | *1* [a] | *0* | 2 | *2* | *0* | *0* |
| Friuli-Venezia Giulia | 2 [a] | *1* | *1* [a] | *0* | 0 | *0* | *0* | *0* |
| Emilia-Romagna | 3 | *3* | *0* | *0* | 0 | *0* | *0* | *0* |
| Tuscany | 6 | *6* | *0* | *0* | 3 | *3* | *0* | *0* |
| Umbria | 1 | *1* | *0* | *0* | 0 | *0* | *0* | *0* |
| Marche | 1 | *1* | *0* | *0* | 0 | *0* | *0* | *0* |
| Lazio | 4 [b] | *4* [b] | *0* | *0* | 1 | *1* | *0* | *0* |
| Abruzzo | 0 | *0* | *0* | *0* | 0 | *0* | *0* | *0* |
| Molise | 0 | *0* | *0* | *0* | 0 | *0* | *0* | *0* |
| Campania | 5 | *5* | *0* | *0* | 0 | *0* | *0* | *0* |
| Apulia | 2 | *2* | *0* | *0* | 0 | *0* | *0* | *0* |
| Basilicata | 1 | *1* | *0* | *0* | 1 | *1* | *0* | *0* |
| Calabria | 0 | *0* | *0* | *0* | 0 | *0* | *0* | *0* |
| Sicily | 5 | *4* | *1* | *0* | 0 | *0* | *0* | *0* |
| Sardinia | 1 | *1* | *0* | *0* | 0 | *0* | *0* | *0* |
| **Italy** | **47** | ***44*** | ***3*** | ***0*** | **9** | ***9*** | ***0*** | ***0*** |

Note. Source: our elaboration on data provided by http://whc.unesco.org/en/list, accessed on 30.5.2012. [a] include sites pertaining to more than one Region. [b] include cross- border sites.

**Figure 1 – Distribution of WHL sites in Italian regions, 2011.**




Source: our elaboration on data provided by http://whc.unesco.org/en/list

**Figure 2- Number of beds in hotel and extra hotels 2010**

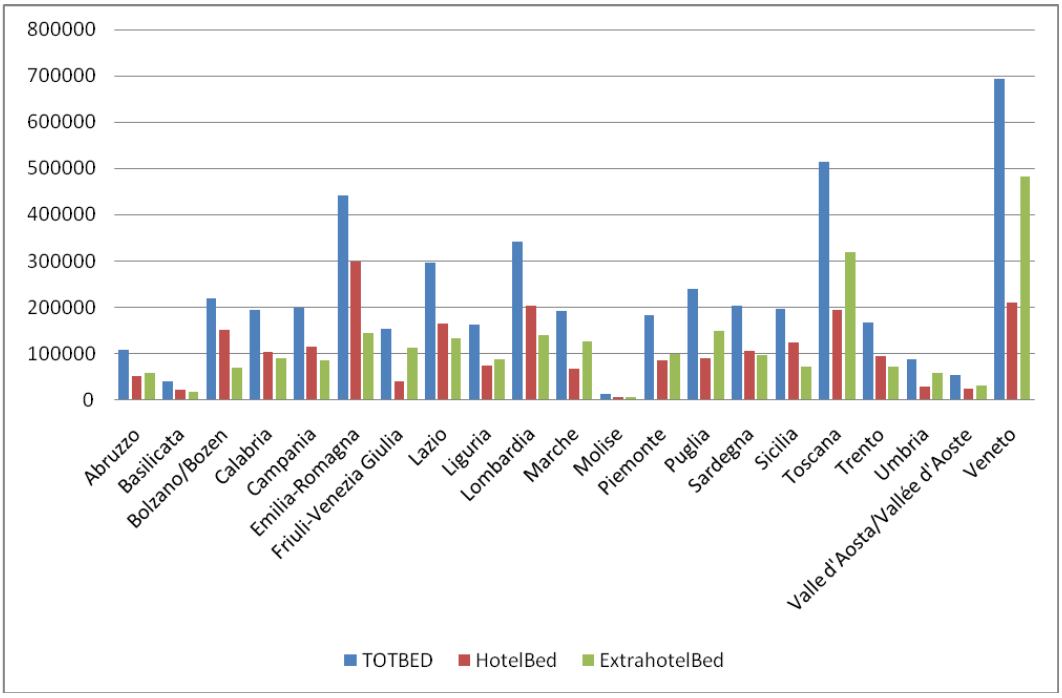
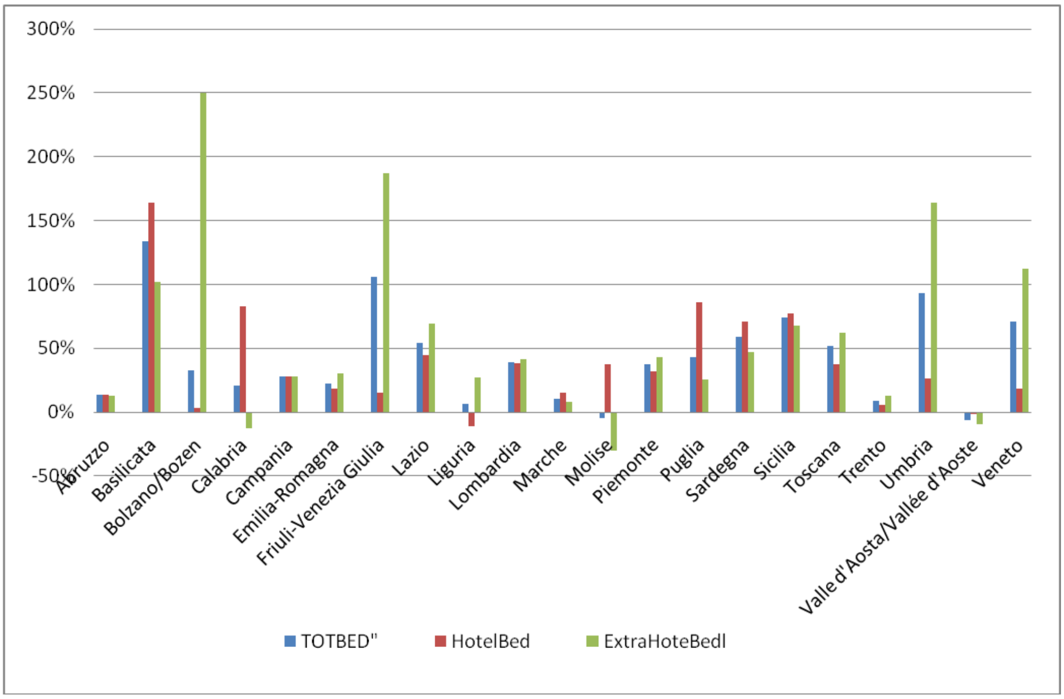


**Figure 3- Number of beds in hotels and extra hotels % variation 1995 -2010**



## Table 3 – Estimated models

| Variables | | Model 1 | Model 2 |
|---|---|---|---|
| *Input* | Total accommodation capacity T_BEDS | X | |
| | Accommodation capacity in hotel H_BEDS | | X |
| | Accommodation capacity in other establishments O_BEDS | | X |
| | Total arrivals T_ ARRIVALS | X | |
| | Arrivals in hotel H_ ARRIVALS | | X |
| | Arrivals in other establishments O_ ARRIVALS | | X |
| *Output* | Total nights slept T_ NIGHTS | X | |
| | Nights slept in hotel H_ NIGHTS | | X |
| | Nights slept in other establishments O_ NIGHTS | | X |

## Table 4 - Variables

| Variables | Meanings | Source |
|---|---|---|
| | *First stage* | |
| T_BEDS | Total accommodation capacity in the region in 1,000s | ISTAT, Statistiche del Turismo, several years. |
| H_ BEDS | Accommodation capacity in hotel in the region in 1,000s | ISTAT, Statistiche del Turismo, several years. |
| O_ BEDS | Accommodation capacity in other establishments in the region 1,000s | ISTAT, Statistiche del Turismo, several years. |
| T_ARRIVALS | Total arrivals in the region in 1,000s | ISTAT, Statistiche del Turismo, several years. |
| H_ ARRIVALS | Arrivals in hotel in the region 1,000s | ISTAT, Statistiche del Turismo, several years. |
| O_ ARRIVALS | Arrivals in other establishments in the region 1,000s | ISTAT, Statistiche del Turismo, several years. |
| T_NIGHTS | Total nights slept in the region 1,000s | ISTAT, Statistiche del Turismo, several years. |
| H_ NIGHTS | Nights slept in hotel in the region 1,000s | ISTAT, Statistiche del Turismo, several years. |
| O_ NIGHTS | Nights slept in other establishments in the region 1,000s | ISTAT, Statistiche del Turismo, several years. |
| | *Second stage* | |
| SEA | Number of kilometres of beaches in the region | ISTAT, Indicatori territoriali per le politiche di sviluppo, several years. |
| CULTURE | Number of visitors to state museums and historic buildings per square kilometres in the region | ISTAT, Indicatori territoriali per le politiche di sviluppo, several years. [a] |
| ENVIROMENT | Hectare of protected natural areas per 100 hectares in the region | ISTAT, Indicatori territoriali per le politiche di sviluppo, several years. |
| MOTORWAYS | Kilometres of motorways per 1,000 square kilometres in the region | ISTAT, Atlante delle infrastrutture. |
| THEFT | Thefts and robberies per 1,000 inhabitants in the region | ISTAT, Statistiche sulla Giustizia, several years. |
| AUTONOMY | Dummy for autonomous regions | Our elaboration |
| WHL | Number of WHL cultural sites in the region | UNESCO http://whc.unesco.org/en/list, accessed on 30.5.2012 |
| WHL_YEAR | Weighted number of WHL cultural sites in the region the weight is the number of years of inscription of each site | Our elaboration on UNESCO |
| TREND | Yearly trend | Our elaboration |
| | | |

Note. [a] For the autonomous Valle d'Aosta region the variable is estimated on data provided by *Soprintendenza per i Beni e le attività culturali della Regione Valle d'Aosta*

## Table 5 - Descriptive statistics

| *First stage variables* | | | | |
|---|---|---|---|---|
| **Variables** | **Mean** | **St. dev.** | **Minimum** | **Max** |
| *Input* | | | | |
| T_BEDS | 194.02 | 138.91 | 10.92 | 705.00 |
| H_ BEDS | 93.59 | 66.74 | 4.65 | 298.70 |
| O_ BEDS | 100.44 | 88.69 | 4.63 | 511.92 |
| T_ARRIVALS | 3,967.93 | 3,465.50 | 136.31 | 14,583.51 |
| H_ ARRIVALS | 3,275.46 | 2,850.94 | 124.21 | 11,186.00 |
| O_ ARRIVALS | 692.47 | 791.90 | 12.09 | 4,495.80 |
| *Output* | | | | |
| T_NIGHTS | 16,132.29 | 13,392.75 | 434.40 | 61,529.57 |
| H_ NIGHTS | 11,063.93 | 8,796.54 | 304.40 | 30,652.69 |
| O_ NIGHTS | 5,068.36 | 5,958.65 | 130.00 | 32,695.85 |
| *Second stage variables* | | | | |
| SEA | 351.20 | 479.19 | 0.00 | 1,731.10 |
| CULTURE | 111.65 | 166.93 | 0.00 | 897.40 |
| ENVIROMENT | 10.81 | 7.21 | 1.40 | 28.20 |
| MOTORWAYS | 13.12 | 19.61 | 0.00 | 61.10 |
| THEFT | 20.78 | 7.83 | 6.08 | 41.94 |
| AUTONOMOUS | 0.29 | 0.45 | 0.00 | 1.00 |
| WHL | 1.64 | 1.75 | 0.00 | 7.00 |
| WHL_YEAR | 15.71 | 21.93 | 0.00 | 111.00 |
| TREND | 8.50 | 4.62 | 1.00 | 16.00 |
| | | | | |

Note. Source: ISTAT and Unesco see Table 4. [a] For the autonomous Valle d'Aosta region the variable is estimated on data provided by *Soprintendenza per i Beni e le attività culturali della Regione Valle d'Aosta*.

## Table 6 - Descriptive statistics of technical efficiency scores for TDs

| **Region TD** | **Model 1** | | **Model 2** | |
|---|---|---|---|---|
| | Technical efficiency, constant returns-to-scale CRS model | Technical efficiency, variable returns-to-scale VRS model | Technical efficiency, constant returns-to-scale CRS model | Technical efficiency, variable returns-to-scale VRS model |
| # Efficient DMUs | 3 | 22 | 12 | 41 |
| # Inefficient DMUs | 333 | 314 | 324 | 295 |
| Mean all sample | 73.66 | 80.46 | 83.77 | 87.97 |
| Median all sample | 73.88 | 81.36 | 85.52 | 89.26 |
| Mean inefficient unit | 73.42 | 82.64 | 79.73 | 86.29 |
| SD | 12.28 | 12.72 | 10.99 | 10.48 |
| *Observations* | *336* | *336* | *336* | *336* |

**Table 7 - DEA technical efficiency for Italian regions average scores for each region in the period 1995–2010.**

| Region | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | TE - CRS mean value | TE – VRS mean value | TE- CRS mean value | TE – VRS mean value |
| Piedmont | 52.25 | 52.64 | 61.07 | 61.79 |
| Valle d'Aosta/Vallée d'Aoste | 62.15 | 66.44 | 75.36 | 81.51 |
| Lombardy | 69.88 | 76.34 | 73.80 | 83.36 |
| Liguria | 72.94 | 73.18 | 90.76 | 91.52 |
| Bolzano/Bozen | 94.19 | 98.68 | 99.22 | 99.29 |
| Trento | 81.59 | 81.78 | 88.35 | 89.13 |
| Veneto | 74.47 | 97.73 | 96.49 | 99.10 |
| Friuli-Venezia Giulia | 78.03 | 78.99 | 91.69 | 92.19 |
| Emilia-Romagna | 77.08 | 92.60 | 82.47 | 98.12 |
| Tuscany | 65.64 | 82.66 | 82.39 | 84.84 |
| Umbria | 61.19 | 65.95 | 75.91 | 82.05 |
| Marche | 93.41 | 94.81 | 97.08 | 97.24 |
| Lazio | 82.53 | 86.39 | 88.42 | 91.33 |
| Abruzzo | 78.10 | 80.16 | 84.63 | 85.82 |
| Molise | 54.63 | 92.65 | 76.23 | 97.59 |
| Campania | 83.56 | 84.34 | 93.38 | 94.47 |
| Apulia | 68.56 | 69.34 | 73.70 | 74.11 |
| Basilicata | 64.50 | 79.10 | 74.50 | 84.46 |
| Calabria | 84.66 | 86.48 | 89.84 | 93.06 |
| Sicily | 65.37 | 66.45 | 74.16 | 74.78 |
| Sardinia | 82.13 | 82.87 | 89.77 | 91.53 |
| **Al sample mean** | **73.66** | **80.46** | **83.77** | **87.97** |
| **S.D.** | **12.28** | **12.72** | **10.99** | **10.48** |
| *Total number of observations* | ***336*** | | ***336*** | |

## Table 8 – Correlation between efficiency scores as well as relative TDs rank

| | Pearson correlation | Spearman's rank correlation |
|---|---|---|
| Eff. Scores Model 1 CRS vs. Eff. Scores Model 2 CRS | 0.8429*** | 0.8291*** |
| Rank order Eff. Scores Model 1 CRS vs. Rank order Eff. Scores Model 2 CRS | 0.8344*** | 0.8442*** |
| Eff. Scores Model 1 VRS vs. Eff. Scores Model 2 VRS | 0.9181*** | 0.9115*** |
| Rank order Eff. Scores Model 1 VRS vs. Rank order Eff. Scores Model 2 VRS | 0.8972*** | 0.9053*** |

Note. * significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 9 - Bias-corrected efficiency scores average value at TD level.**

| Region TD | Eff. Scores CRS | Eff. Scores Bias-Corrected CRS | Lower Bound | Upper Bound |
|---|---|---|---|---|
| Piedmont | 52.25 | 51.31 | 49.95 | 52.12 |
| Valle d'Aosta/Vallée d'Aoste | 62.15 | 61.26 | 60.02 | 61.99 |
| Lombardy | 69.88 | 68.43 | 66.24 | 69.66 |
| Liguria | 72.94 | 70.83 | 68.30 | 72.64 |
| Bolzano/Bozen | 94.19 | 91.30 | 87.62 | 93.75 |
| Trento | 81.59 | 80.32 | 78.30 | 81.43 |
| Veneto | 74.47 | 67.78 | 61.55 | 73.66 |
| Friuli-Venezia Giulia | 78.03 | 76.82 | 75.10 | 77.86 |
| Emilia-Romagna | 77.08 | 74.44 | 70.47 | 76.80 |
| Tuscany | 65.64 | 62.62 | 59.06 | 65.21 |
| Umbria | 61.19 | 58.79 | 57.12 | 60.64 |
| Marche | 93.41 | 90.05 | 87.28 | 92.83 |
| Lazio | 82.53 | 80.44 | 77.58 | 82.10 |
| Abruzzo | 78.10 | 77.00 | 75.44 | 77.93 |
| Molise | 54.63 | 49.74 | 45.50 | 54.00 |
| Campania | 83.56 | 81.85 | 79.36 | 83.28 |
| Apulia | 68.56 | 67.09 | 65.37 | 68.33 |
| Basilicata | 64.50 | 62.93 | 60.63 | 64.25 |
| Calabria | 84.66 | 82.31 | 79.64 | 84.34 |
| Sicily | 65.37 | 64.05 | 62.35 | 65.12 |
| Sardinia | 82.13 | 80.63 | 78.68 | 81.92 |
| All sample mean | 73.66 | 71.43 | 68.84 | 73.33 |

**Figure 4 – Scatter plot of Bias corrected efficiency scores and confidence intervals**

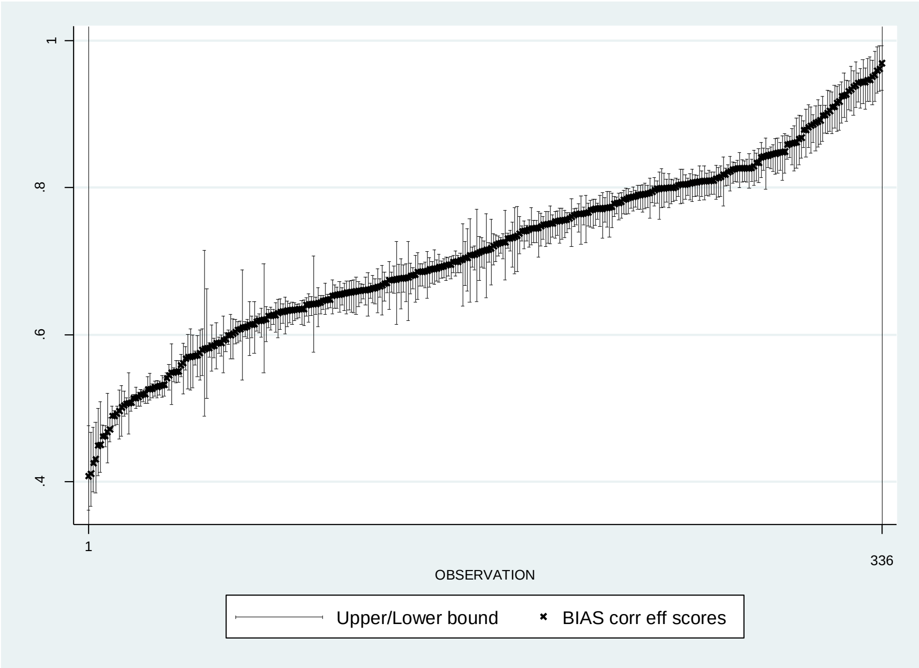


**Figure 5 - Mean and standard deviation of efficiency estimates across TDs by year.**

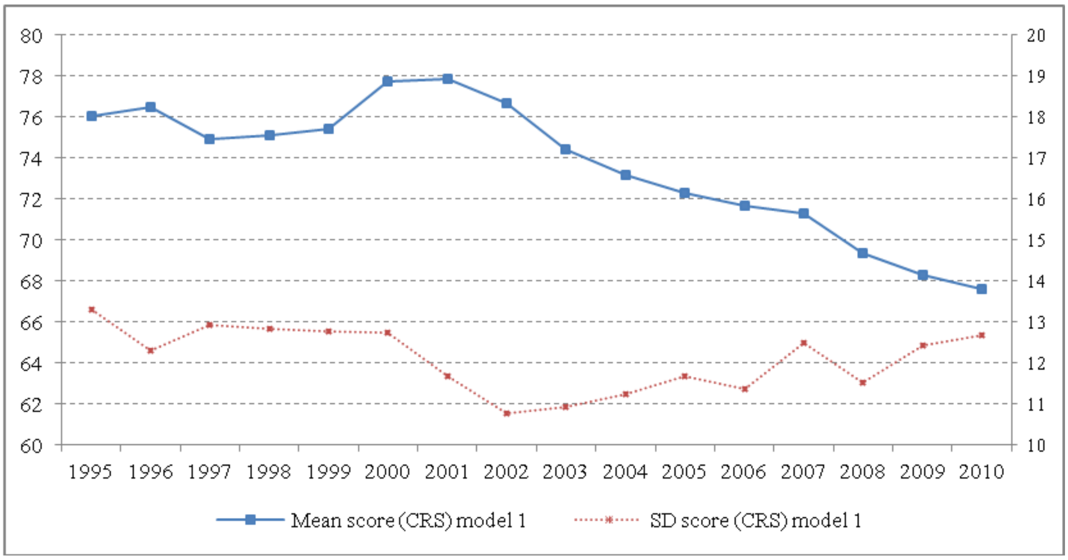


**Figure 6 – Scatter plot of Bias corrected efficiency scores and number of WHL in regions**

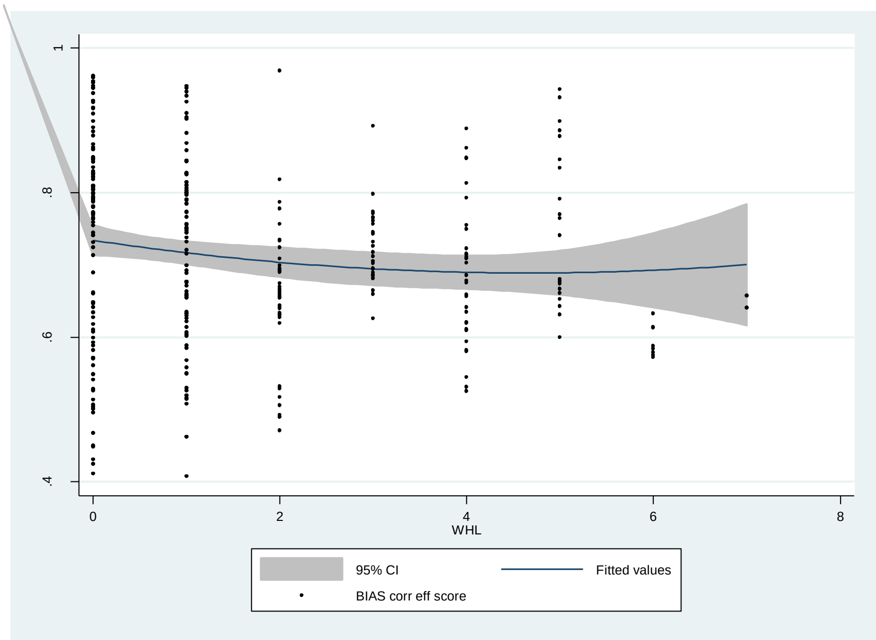
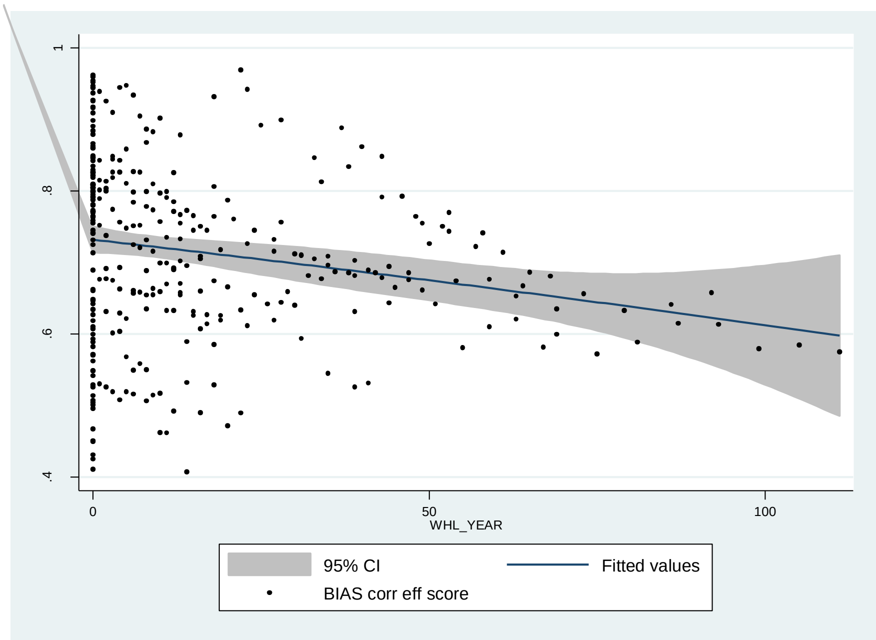


**Figure 7 – Scatter plot of Bias corrected efficiency scores and weighted WHL.**



## Table 10 – Environmental factors influencing TDs technical efficiency

| Variables | Truncate regression [a] | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| | DEA CRS Bias-Corrected | DEA CRS Bias-Corrected | | |
| Constant | 0.6092*** | 0.6947*** | 0.6877*** | 0.6914*** |
| | 0.0252 | 0.0252 | 0.0253 | 0.0254 |
| SEA | 0.0000*** | 0.0000*** | 0.0000*** | 0.0000*** |
| | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| CULTURE | 0.0001** | 0.0002*** | 0.0002*** | 0.0002*** |
| | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| ENVIROMENT | 0.0019*** | 0.0018*** | 0.0018*** | 0.0018*** |
| | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| MOTORWAYS | 0.0008* | 0.0011** | 0.0010** | 0.0011** |
| | 0.0004 | 0.0005 | 0.0005 | 0.0005 |
| THEFT | -0.0024** | -0.0012 | -0.0011 | -0.0008 |
| | 0.0010 | 0.0010 | 0.0011 | 0.0011 |
| AUTONOMY | 0.0448*** | 0.0314** | 0.0353** | 0.0319** |
| | 0.0151 | 0.0153 | 0.0151 | 0.0153 |
| WHL | -- | -0.0174*** | -- | -0.0153** |
| | -- | 0.0051 | -- | 0.0067 |
| WHL_YEAR | -- | -- | -0.0012*** | -0.0005 |
| | -- | -- | 0.0004 | 0.0006 |
| TREND | -0.0089*** | -0.0076*** | -0.0068*** | -0.0071*** |
| | 0.0014 | 0.0014 | 0.0015 | 0.0015 |

Note. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% level, respectively; significance at the 10% level using the bootstrap-estimated confidence intervals.

## Appendix A

## Table A.1 – Accommodation capacity by type

| Regions | T_ACCOMMODATION | | H_ ACCOMMODATION | | O_ ACCOMMODATION | | Average Incidence of hotel accommodation |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | |
| Piedmont | 154.15 | 19.29 | 72.05 | 7.81 | 82.09 | 11.71 | 46.74% |
| Valle d'Aosta/Vallée d'Aoste | 52.44 | 1.60 | 23.26 | 0.34 | 29.18 | 1.69 | 44.36% |
| Lombardy | 276.33 | 37.07 | 165.10 | 19.81 | 111.23 | 17.92 | 59.75% |
| Liguria | 154.32 | 4.86 | 76.14 | 4.31 | 78.18 | 6.96 | 49.34% |
| Bolzano/Bozen | 211.35 | 12.71 | 148.02 | 2.28 | 63.33 | 11.76 | 70.03% |
| Trento | 157.16 | 3.94 | 93.45 | 1.47 | 63.71 | 3.37 | 59.46% |
| Veneto | 587.43 | 121.39 | 192.57 | 13.49 | 394.87 | 111.68 | 32.78% |
| Friuli-Venezia Giulia | 132.59 | 27.15 | 37.32 | 2.07 | 95.26 | 25.56 | 28.15% |
| Emilia-Romagna | 403.19 | 27.88 | 276.45 | 17.23 | 126.74 | 10.94 | 68.56% |
| Tuscany | 427.02 | 60.15 | 171.04 | 16.98 | 255.98 | 43.33 | 40.05% |
| Umbria | 66.82 | 15.49 | 26.37 | 2.43 | 40.45 | 13.08 | 39.46% |
| Marche | 200.55 | 23.64 | 60.64 | 2.71 | 139.91 | 24.50 | 30.24% |
| Lazio | 241.21 | 36.83 | 137.89 | 16.70 | 103.32 | 20.34 | 57.17% |
| Abruzzo | 100.11 | 4.71 | 48.11 | 2.05 | 52.00 | 3.10 | 48.05% |
| Molise | 12.24 | 0.84 | 5.61 | 0.64 | 6.63 | 0.87 | 45.83% |
| Campania | 173.64 | 13.99 | 96.90 | 9.50 | 76.73 | 4.86 | 55.81% |
| Apulia | 194.48 | 22.94 | 64.66 | 14.01 | 129.82 | 9.16 | 33.25% |
| Basilicata | 29.09 | 8.26 | 16.50 | 5.58 | 12.58 | 2.92 | 56.74% |
| Calabria | 189.20 | 9.07 | 78.03 | 16.18 | 111.16 | 11.58 | 41.24% |
| Sicily | 148.96 | 29.61 | 92.75 | 19.15 | 56.21 | 10.52 | 62.27% |
| Sardinia | 162.22 | 26.60 | 82.47 | 14.57 | 79.75 | 12.27 | 50.84% |

Source: our elaboration on ISTAT, *Statistiche del Turismo*, several years.

## Table A.2 – Efficiency scores by region and year, CRS model 1.

| **Region** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **All year** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Abruzzo | 80.87 | 82.56 | 80.35 | 82.32 | 77.56 | 78.13 | 79.68 | 80.44 | 78.89 | 76.75 | 73.36 | 75.04 | 74.99 | 73.98 | 77.32 | 77.37 | **78.10** |
| Basilicata | 62.49 | 65.11 | 64.11 | 67.61 | 67.72 | 64.99 | 67.81 | 67.49 | 64.63 | 64.51 | 66.72 | 60.20 | 64.05 | 62.04 | 62.74 | 59.71 | **64.50** |
| Bolzano/Bozen | 100.00 | 96.45 | 96.54 | 94.63 | 94.82 | 93.29 | 92.88 | 92.69 | 90.80 | 90.19 | 91.13 | 91.35 | 94.11 | 94.30 | 96.23 | 97.69 | **94.19** |
| Calabria | 83.04 | 85.79 | 87.15 | 86.51 | 88.35 | 86.93 | 82.16 | 84.93 | 84.53 | 85.34 | 82.25 | 82.81 | 83.43 | 83.33 | 82.89 | 85.08 | **84.66** |
| Campania | 83.28 | 82.99 | 86.36 | 90.21 | 89.37 | 94.83 | 95.97 | 91.49 | 86.13 | 84.97 | 80.67 | 78.03 | 78.66 | 75.74 | 68.12 | 70.07 | **83.56** |
| Emilia-Romagna | 87.04 | 84.43 | 82.45 | 79.73 | 79.59 | 79.25 | 79.23 | 78.78 | 77.07 | 75.61 | 73.57 | 72.99 | 71.60 | 71.22 | 71.43 | 69.22 | **77.08** |
| Friuli-Venezia Giulia | 87.86 | 82.83 | 81.50 | 79.84 | 81.33 | 85.46 | 83.91 | 82.29 | 79.86 | 76.52 | 74.40 | 72.70 | 70.91 | 70.90 | 70.20 | 67.96 | **78.03** |
| Lazio | 75.89 | 76.43 | 75.91 | 82.36 | 80.35 | 100.00 | 91.63 | 77.15 | 72.28 | 83.41 | 91.68 | 89.14 | 87.72 | 81.78 | 77.60 | 77.13 | **82.53** |
| Liguria | 79.93 | 79.22 | 78.13 | 76.81 | 79.62 | 77.43 | 76.84 | 76.94 | 73.99 | 70.65 | 67.59 | 68.72 | 67.50 | 65.30 | 64.66 | 63.77 | **72.94** |
| Lombardia | 69.36 | 70.82 | 69.82 | 70.19 | 70.80 | 69.86 | 74.00 | 75.88 | 73.77 | 72.99 | 70.11 | 64.89 | 67.22 | 64.81 | 65.80 | 67.75 | **69.88** |
| Marche | 98.03 | 100.00 | 99.72 | 97.70 | 96.42 | 94.46 | 98.00 | 98.40 | 97.16 | 93.57 | 90.65 | 92.18 | 94.31 | 83.11 | 83.64 | 77.13 | **93.41** |
| Molise | 48.95 | 47.98 | 48.62 | 52.82 | 50.81 | 55.17 | 59.19 | 61.15 | 62.80 | 60.33 | 60.21 | 59.08 | 52.83 | 53.40 | 52.21 | 48.54 | **54.63** |
| Piedmont | 51.98 | 55.63 | 53.76 | 53.38 | 52.56 | 51.51 | 52.75 | 52.29 | 51.55 | 52.65 | 50.45 | 54.31 | 49.76 | 53.84 | 48.94 | 50.65 | **52.25** |
| Puglia (Apulia) | 73.61 | 71.26 | 68.42 | 68.18 | 66.97 | 71.64 | 70.39 | 70.66 | 72.15 | 68.73 | 67.74 | 64.48 | 66.59 | 65.29 | 65.53 | 65.26 | **68.56** |
| Sardinia | 82.01 | 80.59 | 81.49 | 81.31 | 83.92 | 85.54 | 87.30 | 84.05 | 84.09 | 81.41 | 82.62 | 81.65 | 80.63 | 80.32 | 78.21 | 78.99 | **82.13** |
| Sicily | 62.15 | 65.47 | 64.44 | 70.62 | 73.73 | 79.15 | 76.93 | 71.37 | 67.14 | 63.63 | 62.24 | 62.99 | 60.43 | 56.13 | 54.84 | 54.60 | **65.37** |
| Tuscany | 68.01 | 69.84 | 65.33 | 66.61 | 68.68 | 70.19 | 70.60 | 69.65 | 63.50 | 60.49 | 62.04 | 64.80 | 64.83 | 62.01 | 62.12 | 61.58 | **65.64** |
| Trento | 87.24 | 85.73 | 83.83 | 83.31 | 83.69 | 81.87 | 82.11 | 81.91 | 80.44 | 81.09 | 81.29 | 79.50 | 79.40 | 78.59 | 78.44 | 76.92 | **81.59** |
| Umbria | 72.30 | 78.07 | 67.74 | 53.58 | 55.58 | 70.03 | 69.89 | 69.66 | 62.40 | 58.72 | 56.87 | 57.62 | 56.77 | 53.23 | 48.39 | 48.17 | **61.19** |
| Valle d'Aosta/Vallée d'Aoste | 65.67 | 67.13 | 62.72 | 63.61 | 64.34 | 65.66 | 65.52 | 66.97 | 64.32 | 61.93 | 59.84 | 60.85 | 59.10 | 57.95 | 55.00 | 53.83 | **62.15** |
| Veneto | 78.04 | 77.94 | 75.00 | 76.33 | 77.72 | 76.93 | 77.93 | 76.39 | 75.60 | 73.27 | 73.36 | 71.52 | 73.15 | 69.80 | 70.45 | 68.01 | **74.47** |
| **Total** | **76.08** | **76.49** | **74.92** | **75.13** | **75.43** | **77.73** | **77.84** | **76.69** | **74.43** | **73.18** | **72.32** | **71.66** | **71.33** | **69.38** | **68.32** | **67.59** | **73.66** |