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REGULATION ON HERITAGE CONSERVATION AND DETERMINANTS OF HERITAGE AUTHORITIES' PERFORMANCE: A SEMI-PARAMETRIC ANALYSIS

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Regulation on Heritage Conservation and Determinants of Heritage Authorities' Performance: A Semi-parametric Analysis.

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Abstract.

Government regulation plays a significant role in the field of heritage conservation given that it affects the allocation of resources in a relevant way. Namely, regulation is aimed at restricting or modifying the activities of public as well as private actors - firms and individuals – in order to control the stock of heritage. Surprisingly, the literature has neither extensively investigated the performance of heritage regulation authorities in the field of heritage conservation nor its determinants. In this paper we investigate, from both a theoretical and empirical point of view, the determinants of the differences in the performance employing a panel data of nine Heritage Authorities over the period 1993-2005. We use economic and managerial variables, to distinguish objective from discretionary causes. The results show that the efficiency seems to be only affected by demand and supply factors whereas the managerial variables do not affect the performance.

JEL Classification: D24, C14, Z10

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1. Introduction

In the heritage field, Government uses direct monetary tools, such as expenditure, as well as indirectly monetary tools, e.g. tax-expenditures. At the same time, a major role is played by non monetary instruments such as regulation. Although the size of public cultural spending is small, Government strongly affects heritage conservation activity regulating the allocation of resources in a relevant way. Namely, regulation is aimed at restricting or modifying the activities of public as well as private actors -firms and individuals- in order to control the stock of heritage. A good example of the above mentioned issues raised by regulation is offered by focusing the attention upon the concept of conservation itself. Indeed, different meanings can be assigned to the word 'conservation' with different economic implications (Peacock and Rizzo, 2008). The principles of heritage conservation, internationally recognized, have been established through time among conservation professionals and may be found in a great number of international,[1] regional, national, and thematic documents on a variety of topics, such as historic towns, training and education, popular architecture etc. Thus, heritage authorities, that employ a wide range of different institutional and organizational models among countries, play a central role in heritage conservation activity. Surprisingly, the literature on the economics of heritage has not extensively investigated the performance of heritage authorities.

Among the several regulation models of heritage conservation, we will consider the Sicilian model of heritage authorities (*Soprintendenze*) as a case study. The institutional characteristics of such model have been already discussed in the literature (Rizzo, 2002, 2003).

The present work extends previous literature in various directions. First, we define and test a production function, based on the activities carried out by regulatory authorities. We apply Simar and Wilson (1998, 2000) smoothed bootstrap procedure to correct the bias in DEA estimators and establish their confidence interval. This new procedure sheds some light on the effects of statistical noise on DEA estimates, often ignored by most of the researchers in the field of efficiency analysis.

Second, we investigate, from both a theoretical and empirical point of view, the determinants of efficiency estimates using economic and political variables to distinguish objective from discretionary

[1] See section 2.

causes. Following the most recent literature on statistical inference in nonparametric DEA models (Simar and Wilson, 2007), we apply a two-stage semi-parametric estimate to explain the sources of efficiency variations of Heritage Authorities.

The structure of the paper is the following. Section 2 discusses the features of public intervention for conservation, section 3, illustrates the methodological issues on measuring efficiency of heritage conservation authority employing as a case study the institutional features of conservation in Sicily, whereas section 4 presents the empirical analysis. Section 5 concludes.

2. Main features of government intervention for conservation

2.1. Government tools

In all the industrialized countries the public sector plays an important role in the conservation of cultural heritage, even if with different quantitative and qualitative characteristics. The analysis of the normative rationale for Government intervention is outside the scope of this paper and the related efficiency and equity arguments are taken for granted;[2] in what follows the attention will be concentrated on the features of public action and on its effects. In fact, though market failure provides a rationale for Government intervention, this is not to say that Government action is efficient[3] in providing conservation nor that there is only one way to intervene.

In the heritage field Government uses direct monetary tools – such as expenditure - as well as indirectly monetary tools – e.g. tax-expenditures -. At the same time, a major role is played by a non monetary instrument such as regulation. In what follows, attention will be concentrated on public spending and regulation.[4]

[2] A general overview of the pros and cons of the normative justifications for government intervention in the heritage field is provided by Peacock-Rizzo (2008).

[3] Public intervention does not necessarily ensure efficiency, e.g. the maximization of society's well being, because it is not carried out by a fully informed and far-sighted planner pursuing the public interest. According with the positive analysis, public choices are, in fact, the outcome of a decision-making process involving self-utility maximizer 'agents', e.g. elected representatives and bureaucrats. The theoretical issues of the positive analysis of public choices are explored by Mazza (2003).

[4] Tax expenditures, e.g. tax allowances to incentive private financing are not taken into account because they are not relevant for our case study, since they are outside the influence of Regional government.

Public expenditure can be used for many purposes: to purchase goods and services[5] as well as buildings of artistic interest or to provide subsidies and/or loans to cultural (public, private or non profit institutions) or to private owners of historic buildings.

As Peacock and Rizzo (2008) points out, the size, the composition and the institutional features of public spending vary across countries: for instance, state-driven, bureaucratic systems[6] prevail in France and Italy with a larger role for the public sector and the central government while Anglo-Saxon countries follow an arms-length approach,[7] with lower direct expenditure and larger private support (Ploeg van der, 2006). Cautions is needed when comparing countries since cross-national data are not reliable; differences do exist but, anyway, direct spending for culture is negligible in term of GDP (OECD, 2006). Though the size of public cultural spending is small, Government plays a very relevant role in the cultural heritage field since non monetary tools, such as regulation, which are not accounted for by statistics, affect the allocation of resources in a relevant way.

Regulation is a non monetary tool aimed at restricting or modifying the activities of public as well as private actors -firms and individuals- to control the stock of heritage. Regulation constrains the exercise of property rights in many different ways: for instance, listing historical and archaeological sites, as well as individual buildings, preventing the demolition of a building or a group of buildings; imposing restrictions on the uses to which the building can be put, on its appearance and the way restoration or re-use is carried out; imposing limitations on the use of land affecting heritage buildings. Regulated subjects must comply and penalties are provided for non compliance.[8]

Regulation is a flexible tool, which satisfies the need for quick decisions characterizing the heritage field, and at the same time leaves many degrees of freedom to the decision–maker, since the concept of heritage is not well defined (Rizzo, 2003). Therefore, the features of the decision-making process and of

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[5] For example, the salaries for Government experts and staff involved in heritage conservation, the purchasing of consumption goods, equipment for diagnosis, etc. for the restoration activity.

[6] Such a system is state-driven and top-down; bureaucrats and politicians decide how to distribute public funds.

[7] In the U.K. funds are allocated to Non-Departmental Public Bodies which distribute them among various projects and applicants while in the Netherlands, funds are allocated by the Minister with the recommendations of independent Arts Council.

[8] In addition to these forms of regulation, which Throsby (1997) defines as *hard regulations*, there are also non-enforceable forms of regulation, i.e. *soft regulations*, mainly applied at international level: Charters, Codes of Practice, Guidelines, etc., as well as listing, such as the Unesco World Heritage List, belong to this type of regulation, are implemented by agreement and not involve penalties.

the actors involved are important in determining the stock of cultural heritage, both in quantitative and qualitative terms, and its capability of becoming a 'resource' for local development.

2.2. Focus on conservation

A good example of the above mentioned issues raised by regulation is offered focusing attention upon the concept of conservation itself. Indeed, different meanings can be assigned to the word 'conservation' with different economic implications. The principles of cultural heritage conservation internationally recognized have been established through time among conservation professionals and may be found in a great number of international,[9] regional, national, and thematic documents on a variety of topics, such as historic towns, training and education, popular architecture etc.

Among the various possible definitions, it might be useful to recall here that according to the definition provided by English Heritage (2006), conservation is "*the process of managing change in ways that will best sustain the values of a place in its contexts, and which recognises opportunities to reveal and reinforce those values*". In such a definition the concept of conservation seems to aim not only at keeping heritage safe from harm but also at enhancing it through a positive change. Somehow different emphasis is placed by the Icomos 1999 Burra Charter,[10] since "*conservation is based on a respect for the existing fabric, use, associations and meanings. It requires a cautious approach of changing as much as necessary but as little as possible*". Going into more operational details, the World Bank (1994) outlines that conservation "*encompasses all aspects of protecting a site or remains so as to retain its cultural significance. It includes maintenance and may, depending on the importance of the cultural artefact and related circumstances, involve preservation, restoration, reconstruction or adaptation, or any combination of these*".

[9] The list of international documents is almost endless ranging from Icomos documents, such as the Venice Chart (1964) or the Nara Document on Authenticity (1999) to the Unesco Vienna Memorandum on Historic Urban Landscapes (2005) or to the 2000 Charter of Krakow (produced by the cooperation of six European countries).

[10] The Burra Charter was adopted by Australia Icomos on 19 August 1979 at Burra, South Australia. Revisions were adopted on 23 February 1981, 23 April 1988 and 26 November 1999.

Different types of conservation may have relevant impact on the economic benefits stemming from conservation: for instance, *preservation* is an intervention which does not allow for compatible uses[11] while *adaptation* implies that an historical place is modified for compatible uses, to meet modern standards of comfort and safety without harming its physical structure or its architectural character. Also in such a controversial choice the decision maker enjoys a high degree of freedom.

Moreover, even if the terms *preservation* or *adaptation* are apparently straightforward, in practice their content varies according with the ways conservation is put in practice and, therefore, this choice cannot be considered 'neutral', e.g. relying only on objective technical grounds, but it is influenced by experts knowledge, experience and professional training.

That discretion is widespread in conservation choices and taken for granted is shown by the difficulties of adopting standards for conservation. To what extent standards in conservation should be considered compulsory or simply voluntary, as benchmark of best practices to orientate practitioners and professionals in the heritage field? While there is increasing favourable attention of public opinion toward the standards, it is difficult to find the specialists' agreement on this topic, stressing the highly subjective judgement underlying conservation choices.[12]

As the above analysis shows, conservation choices can exert relevant economic effects because they impinge upon property rights and may also generate a distributional impact.

If a conservationist stance is adopted and heritage is simply preserved, its full enjoyment and utilization might be prevented and, therefore, its potential benefits cannot be fully generated. As Rizzo (2002) outlines, restrictions on the use of buildings, their appearance and the way in which restoration and re-use is carried out might undermine the possibility of restoring and revitalising historical centres which is usually one objective on the political agenda of local authorities. Conservation, therefore, generates costs which depend on the stance adopted by the regulator: apart from the administrative and bureaucratic ones, some of these costs can be foreseen in advance because they are closely connected to the

[11] The differences among *preservation, restoration or reconstruction* refer to the artistic, historic and architectural considerations which are outside the scope of this paper.

[12] Somehow similar issues occur at international level whenever conservation principles built on Western culture and experience are applied in different context. For this reason, for instance, the appropriateness of the application of the Burra Charter policy to places of cultural significance to Aboriginal people is questioned (James, 1996).

conservation (for example, the requirement to use special materials, qualified operators, etc. to ensure quality) while others are subject to a high degree of uncertainty, as a consequence of an undue 'conservationist' approach to the fabric, well beyond what is justified by the costs-benefits comparison (Pignataro-Rizzo,1997). At the same time, the indirect costs imposed on any activity that interfere with heritage regulation should not be undervalued.

It might be argued that a conservationist stance might be perceived as a 'signal' of quality, therefore stimulating other potential sources of support for heritage, such as forms of supra-national intervention or of international philanthropy[13] as well as cultural tourists. However, the extent of such an effect, in reality, does not seem strong enough to orientate policies.

The above mentioned problems mainly arise when the decision-making process is supply-oriented, e.g. mainly driven by the preferences of the experts rather than by society and when the public decision-maker has no incentives to take into account society's preferences. Sicily offers a good example of the occurrence of the above mentioned problems as it will be outlined in the following section.

3. Institutional features and policy tools in sicilian heritage conservation

Sicily is an Italian region which enjoys full autonomy in the field of heritage policy. Political decisions about heritage policy are taken by the Regional government while their implementation is carried out by nine Heritage *Soprintendenze*, which are responsible for any decision regarding heritage conservation. Their activity offers an interesting case study both for understanding the features of Sicilian conservation policy and for analysing the role of the regulator in the heritage field.

As it was said before, heritage is a vague and broad concept and, as a consequence, the conservation activities of *Soprintendenze* are discretional, wide-ranging and impinge upon private as well as public decisions. In other research,[14] it has been pointed out that *Soprintendenze* are run by experts, enjoy great freedom not only because of the choice of instruments and their intensity but also because the scope of their activity largely depends on their autonomous evaluation, given that the concept of heritage is not well defined ex ante and is expanding through time. However, the degree of autonomy enjoyed by

[13] The international dimension is explored by Netzer (1998).
[14] See Rizzo (2002, 2003).

Soprintendenze is very low at the operational level, for example as far as the management of personnel is concerned.

For expository reasons, in what follows, on the grounds of Rizzo (2002) we distinguish two types of *Soprintendenze* activities: passive conservation (PC) and active conservation (AC).[15] Such a distinction might be questioned, since PC and AC activities may be interconnected in some cases[16]; while recognizing the significance of these links, using such a distinction is useful because it recalls the conventional distinction between monetary and non monetary tools (spending and regulation)[17] and, thus, helps to understand the complexity of conservation activities from an economic point of view. Moreover, the distinction allows for empirical investigation by introducing the possibility of devising indicators for each activity. Indeed, some *Soprintendenze* also run museums with permanent collections consisting of items belonging to the area under the *Soprintendenza*'s control and supervision. So far the collection of data has not been completed because of bureaucratic problems and, therefore, this activity is not included in the analysis.

3.1. Passive conservation activity

Passive conservation (PC) pertains to the activity of providing rules and monitoring their implementation; *i.e.*, the regulatory activity for both public and private heritage situated in the territory of *Soprintendenze*. PC activity implies many different administrative acts, enforceable on both private and public owners, such as:

- *constraints* (limitations on the use of heritage whose strength depends on the type of heritage and includes items such as monumental constraints, prohibition of alterations and land constraints);
- *demolition orders*;

[15]Indeed, some *Soprintendenze* run museums, conserving artistic and/or archaeological collections of local relevance. The difficulties encountered in the collection of the data referring to such an activity has not allowed so far to include it into the analysis; the authors hope to be able to overcome such a problem by the time the final version of the paper will be ready.

[16] For instance, research and study activities underlying both can be considered interdependent; a discovery resulting from an archaeological excavation might call for imposing constraints; at the same time, expropriation is prerequisite to direct intervention.

[17] See above, *par. 2.1*.

- *authorisations* (consent for carrying out activities such as restoration and rehabilitation of heritage);[18]
- *permission to import and export.*

In some cases, such as authorizations, the above regulatory activity is in response to the owner's demand. In other cases, they can be spontaneous measures to constrain owner's activity (landscape constraints*)* or punishment for violations (for instance, demolition orders). *Soprintendenze* decisions are taken on the grounds of technical (given that their staff is made up of experts) and administrative grounds and are subject to judicial review only if those affected dispute the decision in court.

3.2. Active conservation activity

Active conservation (AC) refers to direct intervention to provide conservation. AC involves a wide array of activities such as taking an inventory, performing scientific research, training staff, updating, excavating, and restoring. In other words, AC refers to the activities put in practice by *Soprintendenze* via direct expenditure, mainly through the hiring of external contractors to carry out physical operations and draw up contracts.

The degree of autonomy enjoyed by *Soprintendenze* is very high at the planning level while low at the operational level.[19] No autonomy exists as far as the operation of funds is concerned, given that any expenditure decision – even within the program – has to be approved at the regional level. The only cases in which *Soprintendenze* enjoy financial freedom is in so-called situations of high emergency.

The *Soprintendenze*'s expenditures are constrained by the availability of funds. Diagnostic activity is usually not feasible on a large scale and, therefore, poor information does exist on the health status of heritage and AC activity cannot be directed where it is most needed, with the likely consequence of reducing the overall effectiveness of the allocation of resources in this sector. The amount requested to the Regional government usually exceeds the amount granted.

[18] The strength of this act depends on the type of heritage and the constraint to which it is subject. For instance, it is more severe if the constraint refers also to the interior of a listed building and less severe if the building is only subject to restrictions on its appearance.

[19] Once the yearly activity program submitted by each *Soprintendenza* is approved at the regional level, no discretionary variation is allowed.

Soprintendenze performance is not adequately monitored at the Regional level nor evidence emerges that an incentive system exists (in terms of the size of budget or private benefits for bureaucrats, such as career and salary) to induce *Soprintendenze* to fulfil government objectives, however they are defined. As a consequence, conservation would seem to be mainly driven by objectives and preferences of the specialists and experts within the *Soprintendenze.*[20]

Indeed, the devolution of conservation to the Regional government does not seem to guarantee in itself that local preferences are adequately represented;[21] as Rizzo and Towse (2002) suggest the lack of institutional forms for representing local opinion in the decision-making process is likely to limit the beneficial impact of devolution.

4. EMPIRICAL ANALYSIS

4.1. Methodological issues in efficiency measure

The theoretical literature on productive efficiency originates with the work of Koopmans (1951), Debreu (1951), and Shephard (1953). The first attempt to estimate efficiency was found in Farrell (1957) and later developed by Charnes *et al.* (1978). Following the seminal work by Farrell (1957) economic efficiency is typically decomposed into three types: technical, allocative and scale efficiency. Technical efficiency measures the firm's ability to use the available technology in the most effective way. Allocative efficiency is dependent on prices and measures the firm's ability to make optimal decisions on product mix and resource allocation. Combining measures of technical and allocative efficiency yields a measure of economic efficiency. Scale efficiency measures the optimality of the Decision Making Unit's (DMU) size.

As a nonparametric approach, DEA (Charnes *et al.,* 1978; Färe *et al.,* 1994) is used to derive technical and scale efficiency. DEA method can be applied using either output-based or input-based approach depending on whether input distance function or output distance function are used. Only in the last ten

[20] Finocchiaro Castro and Rizzo (2008) calculate the efficiency scores of heritage conservation activity showing that in the period 1993-2000 *Soprintendenze* performance exhibited a high degree of variability and reaching the conclusion that the choice of the output mix (AC and PC) seems mainly driven by specialists according to their own objectives.

[21] One possible explanation lies in the fact that the accountability of regional government in Sicily has been very low: lack of real fiscal autonomy coupled with a proportional political system has so far implied a very low degree of political accountability. The voting system changed recently; in 2001, for the first time, the regional governor was elected directly by voters.

years DEA has been applied to measure the efficiency of art organizations, showing a great degree of flexibility. Luksetich and Nold Hughes (1997) investigate, by means of DEA and regression analysis, the efficiency and its determinants of funding activities of a sample of symphonic orchestras in the United States. The efficiency of religious organizations is studied by Zaleski and Zech (1997). They applied DEA methodology to the U.S. Catholic Church to examine the relative shortage of priests. Also, two contributions focus on the efficiency analysis of museums. Pignataro and Zanola (2001) analyze the efficiency levels of museums located in two very different Italian regions (Sicily and Piemonte), whereas Basso and Funari (2004) focus on some public Italian museums computing DEA efficiency levels and decomposing the efficiency scores into pure technical and scale components.

In this paper, we use DEA method to estimate input-based technical and scale efficiency. The input-based technical efficiency under variable returns to scale (VRS) is the focus of our study, although we also report the techincal efficiency scores computed under constant return to scale (CRS). Based on a smoothed bootstrap procedure for DEA estimators proposed by Simar and Wilson (1998, 2000), the paper estimates the bias and the confidence interval of the input-based technical efficiency with VRS.[22]

While DEA methods have been widely applied, most researchers have largely ignored the statistical properties of the estimators. Ignoring the statistical noise in the estimation can lead to biased DEA estimates and misleading result because all the deviations from the frontier are considered as inefficiency. Simar and Wilson (1998, 2000) argue that bootstrap is the most currently feasible method to establish the statistical property of DEA estimators. This paper applies smoothed bootstrap procedure to correct the bias in DEA estimators and to construct their confidence intervals. Finally, we employ the most recent literature on two-stage analysis of the determinants of efficiency, that suggests the use of efficient estimators based on single and double bootstrap procedure (Simar and Wilson, 2007), to investigate the influence of environmental variables on performance.

[22] The package FEAR 1.1 developed by Wilson (2007) is used.

4.2. Estimate technical efficiency

Following the contribution of Finocchiaro Castro and Rizzo (2008), we assume that the function of production of *Soprintendenze* is given by 1 input – personnel - and 2 outputs - expenditure (AC) and weighted administrative actions (PC). The PC data refer to the number of administrative actions, produced by each *Soprintendenza* as listed in the Official Regional Registry, weighted to take into account the differences in the technical and the administrative difficulty faced in implementing each type of the actions listed.[23] The AC data refer to the expenditures (i.e. payments) of *Soprintendenze* (at 2000 fixed price). Payments represent the true outcome of the public intervention more clearly than the allocations[24].

Data come from official Regional sources and refer to the period 1993-2005 on 9 *Soprintendenze*. Thus, our sample is a balanced panel data with 117 observations. Table 1 shows the descriptive statistics of variables employed.

<< TABLE 1 around here >>

There are several possible ways to deal with the panel data in efficiency DEA models (Estache *et al*. 2004). A first possibility is to compute a frontier for each period and compare the efficiency of each DMU relative to the frontier in each period. Another possibility is to treat the panel as a single cross-section and pool the observations. In this case each observation being considered as an independent one, a single frontier is computed, and the relative efficiency of each DMU in each period is calculated. We follow the latter approach in order to increase the model estimation power.[25]

The efficiency scores are measured with Farrell (1957) efficiency definition. Tables 2 and 3 report the estimates of the mean efficiency for each *Soprintendenza* and for each year, respectively. It has to be noted that we decided to analyze the mean value of efficiency estimate for each *Soprintendenza* pooling

[23] Weights (ranging from 1 to 5) have been assigned on the grounds of a questionnaire submitted to some experts employed by both the *Soprintendenze* and the *Assessorato*) to take into account the differences in the technical and the administrative difficulty faced in implementing each type of the actions listed.

[24] As reported by Kneip et al. (1998), the rate of convergence of Farrell's estimate efficiency score also depends on the number of input and output. The choice of a simple estimation model makes it possible to derive more consistent estimates of efficiency scores.

[25] This choice is also based on the hypothesis that the conservation activity in Sicily is not affected by relevant technological changes.

the data across the 13 years of observations. Following Simar and Wilson (1998, 2000), we implement the smoothed bootstrap procedure to correct the bias in DEA estimators and obtain their confidence intervals[26].

<< TABLE 2 around here >>

<< TABLE 3 around here >>

In both tables, column 2 provides the mean of original DEA efficiency scores, columns 3 and 4 provide the bootstrap bias estimates and the bias-corrected efficiency scores, respectively. Columns 5 and 6 provide two types of 95% confidence intervals for the bias- corrected efficiency scores. Finally, column 7 reports efficiency estimate under CRS. In fact, Table 2 shows a poor efficiency level (0.498) for the whole sample. In order to check whether the assumption of VRS is sustained by the data, we include the efficiency computation under CRS. Table 2 shows that the portion of scale inefficiency (i.e. the penalty suffered when assuming CRS instead of VRS) is quite low, barely reaching 10 percent. Table 3 reports the mean efficiency estimates for each year of observation. Data show a high variability in efficiency scores and, overall, quite low performance at year level. The highest efficiency scores are 2001 (0.600), 2003 (0.579), and 2004 (0.576).

Finally, Table 4 offers some descriptive statistics regarding the bias corrected estimates of the efficiency scores for each *Soprintendenza*. If we look at the two most efficient DMUs (Ragusa and Caltanissetta), it is possible to note that their standard deviations are lower than the average one, i.e. they both report a low variability in the scores. In addition, the intervals in which their efficiency scores fall have the highest lower and upper bounds showing that they performed better that the other DMUs across the whole observation period and not because of the effect of outliers.

<< TABLE 4 around here >>

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[26] The confidence intervals and the bias-corrected efficiencies were estimated using the smoothed bootstrap procedure with 2,000 bootstrap draws.

Figure 1 describes the scatter plot of sample observations ordered by the bias-corrected efficiency score. The 95% confidence intervals for each DMU are represented by the lower and the upper bound, and original efficiencies are indicated by the circle. It is evident that the original efficiencies are not included in the confidence interval. This result is an intrinsic outcome of the theory behind the construction of these intervals (Simar and Wilson, 1998, 2000)

The observation of scatter plot indicates that the efficiency ranking of the original DMU efficiencies changes compared with the bias-corrected efficiency ranking but the changed is quite small. This suggests a relative small degree of noise and this has also been reflected in a little bias correction downward. The results have clear implications on the analysis of efficiency determinants reported in the following section. The relative small confidence intervals and bias of VRS estimates imply that the results are relatively stable and suggest that they could explain the sources of efficiency variations.

<< FIGURE 1 around here >>

4.3. The empirical analysis of the determinants of performance in heritage conservation

The standard DEA models incorporate only discretionary inputs, whose quantities can be varied at DMU's need, to investigate the determinants of performance and do not take into account the presence of environmental variables or factors, also known as non-discretionary inputs. However, differences in the levels of non-discretionary inputs may play a relevant role in determining heterogeneity across DMU because non-discretionary and discretionary inputs jointly contribute to each DMU outputs.

To investigate the determinants of the performance of *Soprintendenze* conservation activity, we consider economic as well as managerial variables[27]. The estimated models can be expressed by the following general formulation:

$$\theta_i = f(z_i) + \varepsilon_i \qquad (1)$$

[27] We do not include the stock of heritage as explanatory variable because the official available data on the amounts of heritage under the supervision of each Soprintendenza are rather obsolete and not complete.

where θ_i is the efficiency scores that resulted from previous stage, z_i is a set of possible non-discretionary inputs and ε_i a vector of error terms.

As far as the economic variables are concerned, supply and demand variables are used. Looking at the supply, we check whether the performance is affected by the scale of production. The scale of production can be expressed using two variables. Being heritage scattered in the Provincial territory, the size of the area, expressed in squared Kms (SIZE), other things being equal, is likely to affect negatively the cost of producing both AC and PC activities. A second variable can be the density of each Province (DENSITY) that summarizes the effects of POPULATION and SIZE. Finally, the allocations might also offer a variable representing the size of each *Soprintendenza*. This is not to say that greater allocation necessarily implies greater heritage[28] but only that the greater the size of the budget the greater the scope of the *Soprintendenza* activity. However, in our analysis the use of such a variable is not advisable because the efficiency scores, i.e. the dependent variable, have been calculated using the expenditures that are closely related with allocations.

Looking at the demand, it would be useful to use per capita cultural spending as a measure of the demand for cultural activities. Such a variable would give also an indication of the cultural environment and, therefore, might be able to represent the interest of the local community for heritage conservation. So far, we have not found reliable data of per capita cultural spending at provincial level for the entire period covered by the analysis and, thus, we have looked for alternatives. Income per capita is used as a proxy for the demand of conservation (INCOME), on the assumption that heritage is a luxury good. Income per capita is also a proxy for the socio-economic status of the population, such as for instance, education which, in turns, positively affects the demand for heritage. Moreover, a further measure is given by the population served. In our example, being the territory of each *Soprintendenza* perfectly overlapping with the Province area, we consider the population of each Province (POPULATION).

The first managerial variable we deal with is the seniority of *Soprintendenti*[29] (SENIORITY), i.e. the length of appointment of *Soprintendenti* in monthly terms[30]. The interpretation of the impact of such a

[28] As Guccio and Mazza (2005) point out socio-political variables affect allocations.
[29] *Soprintendente* is the Provincial Director for Culture (Rizzo and Towse, 2002).

variable is not straightforward. On the one hand, a long tenure implies more experience and, therefore, a positive effect on efficiency; on the other hand, adopting a public choice interpretation, a long tenure would imply a more powerful bureaucrat, who would have a greater bargaining power to extract resources from the political decision-maker and would be less accountable and, therefore, a likely negative impact on efficiency might be expected. Finally, a variable representing the expertise of each *Soprintendente* might be used especially to investigate whether a change in expertise might affect the efficiency scores. For this purpose, we introduce a dummy to control for the change in the field of specialization when a new *Soprintendente* is appointed (EXPERTISE). Finally, to take into account the time effects we adopt a linear time trend (TREND). Table 5 describes the variables employed and Table 6 summarize the main statistics for each of those variables.

<< TABLE 5 around here >>

<< TABLE 6 around here >>

In usual two-stage approach researchers adopt censored regression techniques (Tobit) or, in a few cases, OLS estimates to take into account the censored nature of dependent variable. The most recent literature shows that the estimates are biased because of serial correlation of efficiency scores and suggests to apply semi-parametric two-stage technique to perform an estimation on non-discretionary input (Simar and Wilson, 2007)

We estimate an OLS, Tobit, truncated regression and a double bootstrap estimation on efficiency scores[31]. According to Simar and Wilson (2007) the truncated regression model provides better statistical inference than the Tobit and OLS regression models but the double bootstrap estimation provides the most robust check. Table 7 reports the results of the estimated models.

All estimates show similar values confirming the robustness of our empirical analysis. However, it has to be noted that our investigation does not aim at providing a punctual estimate of the marginal effects on

[30] To take into account for possible endogeneity we introduce a lagged variable.
[31] See the appendix for description of the algorithm employed.

performance of non-discretionary input. Thus, the following comments refer to an overview of average effects.

Looking at the supply side, we notice that the variables SIZE and DENSITY are significant, showing that the DMU's performance is affected by specific features of the scale of production. The negative sign seems to indicate that, being heritage scattered in the Provincial territory, the dimension of the area under control and the urbanization level, *ceteris paribus*, affect negatively the cost of producing both AC and PC activities. This result is confirmed by the three estimated models.

Moving to the demand-side of the production process, our results show that the size of the demand positively affects the efficiency scores. The variables POPULATION and INCOME are always significant with positive sign. This confirms that the demand exerts a positive effect on efficiency because of the *stimulus* of the heritage owners on DMUs performance (Finocchiaro Castro and Rizzo, 2008).

The linear time trend variable (TREND) is never significant suggesting the absence of a learning-by-doing process in conservation activity. Moreover, it is worth mentioning that none of the managerial variables (SENIORITY and EXPERTISE) is significant in any estimated model. A possible explanation lies on the above mentioned limited operational autonomy of *Soprintendenti* as far as the personell and management of financial resources are concerned. Hence, the efficiency scores of the Sicilian *Soprintendenze* seem to be affected by the demand and supply variables only.

5. Concluding remarks

In this paper, we focused on the regulation of heritage conservation and its relevant effects on the allocation of resources. Among the several regulation models of heritage conservation, we considered the Sicilian model of heritage authorities (Soprintendenze) as a case study.

The present work extends the previous literature on the empirical analysis of regulation in the field of heritage conservation in various directions. First, we define and test a production function, based on the activities carried out by regulatory authorities. We apply Simar and Wilson (1998, 2000) smoothed bootstrap procedure to correct the bias in DEA estimators and establish their confidence interval. This new procedure sheds some light on the effects of statistical noise on DEA estimates, often ignored by most of the researchers in the field of efficiency analysis.

Second, we investigate, from both a theoretical and empirical point of view, the determinants of efficiency estimates using economic and political variables to distinguish objective from discretionary causes. Following the most recent literature on statistical inference in nonparametric DEA models (Simar and Wilson, 2007), we apply a two-stage semi-parametric estimate to explain the sources of efficiency variations of Heritage Authorities.

The results shown a poor efficiency level for the whole sample which did not crucially depend on the assumption of VRS instead of CRS. We also reported a high variability in efficiency scores and, overall, a quite low performance at year level. The patterns of efficiency levels turn out to be clearly decreasing or stagnant. This results seems confirm *Baumol's disease* hypothesis also in the field of heritage conservation (Baumol and Bowen,1966).

To explore the variability of the performance we investigated, from both a theoretical and empirical point of view, the determinants of *Soprintendenze*'s performance using economic and managerial variables. To estimate the determinant we employed a double bootstrap procedure as suggested by Simar and Wilson (2007). To the best of our knowledge this is the first paper applying this new techniques to the field of heritage conservation.

Our results shown that the efficiency scores of the Sicilian *Soprintendenze* seem to be affected by demand and supply variables only, whereas the variables related to the managerial features of heritage authorities do not affect the efficiency results.

Tentative policy implications stemming from our analysis stress the positive role on efficiency exerted by incentives. So far, given the institutional features of the Sicilian heritage organizational structure, the only *stimulus* depends on demand whereas no incentives are built in the decision–making process. A greater operational autonomy of *Soprintendenti* combined with a systematic assessment of their performance might introduce positive incentives toward efficiency.

At the same time the analysis shows that there is room for improving the territorial design of *Soprintendenze* since the coincidence with the provincial area seems not justified by any sound economic reason and bears negative effects on the costs of production.

APPENDIX A – EFFICIENCY ESTIMATE

A DEA input-oriented efficiency score θ_i is calculated for each DMU solving the following program for *i=1,…., n* (CRS case):

$$\begin{array}{ll} \text{Min}_{\lambda,\theta_i} & \boldsymbol{\theta_i} \\ \text{subject to} & \boldsymbol{-y_i} - \boldsymbol{Y}\lambda \geq 0 \\ & \boldsymbol{\theta_i x_i} - \boldsymbol{X}\lambda \geq 0 \\ & \lambda \geq 0 \end{array} \qquad [1.a]$$

where $\boldsymbol{x_i}$ and $\boldsymbol{y_i}$ are respectively the input and output of *i-th* DMU ; $\boldsymbol{X}$ is the matrix of input and $\boldsymbol{Y}$ is the matrix of output of the sample; λ is a $n \times 1$ vector of constant. The model [1.a] can be modified to account for VRS (variable return to scale) by adding the convexity constraint: $\boldsymbol{I}'\lambda = 1$.

To correct for bias in the estimate we employed the following algorithm that replicates Simar and Wilson (2007). The computation of the efficiency score that solves problem [1.a] is then considered as an estimate $\hat{\theta}_i$ of the efficiency score θ_i. The maximum likelihood is used in the truncate regression of $\hat{\theta}_i$ on z_i obtaining the maximum likelihood estimates $\hat{\beta}$ and $\hat{\sigma}_\varepsilon$ of β and σ_ε.

Then, compute a L_1 bootstrap estimates of β and σ_ε with the following steps:

a) for each DMU *i=1, ….., n*, we compute $\boldsymbol{\varepsilon_i}$ from $\boldsymbol{N}(0, \hat{\sigma}_\varepsilon)$ with left truncation at $(1 - \hat{\boldsymbol{\beta}}_{\boldsymbol{i}} \boldsymbol{z_i})$;

b) compute $\theta_i^* = \hat{\beta} z_i + \varepsilon_i$;

c) employ a data set of pesudo data $x_i{*} = x_i$ and $y_i{*} = y_i \dfrac{\theta_i}{\theta_i^*}$

d) estimate $\hat{\theta}_i^*$ using $x_i\,*$ and $y_i\,*$

We obtain a *n* set of bootstrap estimate $\Psi_i = \left\{\hat{\theta}_i^*\right\}_{j=1}^{L_1}$

For each *i=1,…., n* compute the bias-correted estimator $\hat{\hat{\theta}}_i^*$ using Ψ_i and $\hat{\theta}_i$ as follows: $\hat{\hat{\theta}}_i^* = \hat{\theta}_i^* - BI\hat{A}S_i$, where $BI\hat{A}S_i$ is the bootstrap estimator of bias obtained as Simar and Wilson (1998).

Use the method of maximum likelihood to estimate the truncated regression of $\hat{\hat{\theta}}_i^*$ on z_i to provide an estimate $\hat{\hat{\beta}}$ of β and an estimate $\hat{\hat{\sigma}}$ on $\hat{\sigma}_\varepsilon$.

Loop over the next three steps L_2 times to obtain a set of bootstrap estimate $\Phi_i = \left\{\hat{\theta}_i^*\right\}_{s=1}^{L_2}$

a) for each DMU *i=1, ….., n*, we compute ε_i from $N(0, \hat{\hat{\sigma}}_\varepsilon)$ with left truncation at $(1-\hat{\hat{\beta}}_i z_i)$;

b) again for each DMU *i=1, ….., n*, compute $\theta_i^* * = \hat{\hat{\beta}} z_i + \varepsilon_i$;

c) maximum likelihood is used in the truncate regression of $\hat{\hat{\theta}}_i$ on z_i to obtain an estimate $\hat{\hat{\beta}}*$ of β and an estimate $\hat{\hat{\sigma}}*$ on $\hat{\sigma}_\varepsilon$.

We use the bootstrap values in Φ_i and the original estimates $\hat{\hat{\beta}}$ and $\hat{\hat{\sigma}}$ to construct estimated confidence intervals for each element of β and $\hat{\sigma}_\varepsilon$.

The same method is applied to construct confidence intervals for the efficiency scores (Simar and Wilson, 2000).

REFERENCES

Australia Icomos Burra Charter, (1999). http://www.icomos.org/australia/burra.html. Accessed 5 September 2008

Basso A. and Funari S. (2004). A Quantitative approach to evaluate the relative efficiency of museums. *Journal of Cultural Economics*, 28, 195-216.

Baumol W.J. and Bowen, W.G. (1966) On the performing arts: the anatomy of their economic problems, *American Economic Review*, 50, 495-502.

Charnes A, Cooper W, Rhodes E. (1978). Measuring the inefficiency of decision making units. *European Journal of Operational Research*, 2, 429–444.

Debreu, G. (1951). The coefficient of resource utilization. *Econometrica*, 19(3), 273-292.

Färe R, Grosskopf S, Lovell C. (1985). *The measurement of efficiency of production*. Boston: Kluwer-Nijhoff Publishing.

English Heritage (2006), *Conservation Principles. For the sustainable management of the historic environment.* London (http://www.english-heritage.org.uk/upload/pdf/Conservation_Principles_A4%5B1%5D.pdf). Accessed 5 September 2008

Estache, A., Rossi, M. A., Ruzzier, C. A. (2004). The case for international coordination of electricity regulation: Evidence from the measurement of efficiency in South America. *Journal of Regulatory Economics*, 25(3), 271–295.

Farrell M. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society*, 120, 253–281.

Finocchiaro Castro, M. and I. Rizzo (2008). Performance measurement of heritage conservation activity in Sicily, *International Journal of Arts Management forthcoming*.

Guccio, C. and I. Mazza (2005). Analisi politico-economica del finanziamento regionale dei beni culturali. In Mignosa A. and I. Rizzo (Eds.), *Tutela e valorizzazione dei beni culturali in Sicilia*, Franco Angeli: Milano.

Koopmans, T.C. (1951). *Activity analysis of production and allocation*. New York, Riley.

Kneip, A. Park, B.U, Simar, L. (1998). A note on the convergence of nonparametric DEA estimates for production efficiency scores. *Econometric Theory*, 14, 783-793.

James, P. C. (1996). The Burra Charter at Work in Australia, in CRM, n.3, pp. 49-51 (http://sres.anu.edu.au/people/richard_baker/EPP2004/Topic%208.htm).

Luksetich, W. and Nold Hughes P. (1997) Efficiency of fund-raising activities: an application of data envelopment analysis, *Nonprofit and Voluntary Sector Quarterly*, 26, 73-84.

Mazza, I (2003). Public choice. In R. Towse (Ed.), A Handbook of Cultural Economics, (pp. 379-388). Cheltenham:Edward Elgar Publishing.

Netzer, D. (1998). International aspects of heritage policies. In A. T. Peacock (Ed.), Does the Past Have a Future? The Political Economy of Heritage, (pp. 135-154). London:IEA.

Peacock A. T. and Rizzo I. (2008). The Heritage Game. Economics, Policy and Practice. Oxford: Oxford University Press.

Pignataro, G. and I. Rizzo (1997). The Political Economy of Rehabilitation: the Case of the Benedettini Monastery. In M. Hutter and I. Rizzo (Eds.), Economic Perspectives of Cultural Heritage, (pp. 91-106). Baasingstoke:Macmillan.

Pignataro G. and Zanola R. (2001). Analisi dell'efficienza dei musei. In Valentino P.A. and Mossetto G. (Eds.), Museo contro museo: le strategie, gli strumenti, i risultati, (pp. 139-152). Firenze:Giunti.

Ploeg, F. van der (2006). The making of cultural policy: a European perspective. In Ginsburgh V. and Throsby D. (Eds.), Handbook of the economics of the arts and culture, (pp. 1183-1221). Amsterdam:North-Holland Elsevier.

Rizzo I. (2002). Heritage Conservation: the Role of Heritage Authorities. In Rizzo, I. and Towse, R. (Eds.), The Economics of the Heritage: A Study in the Political Economy of Culture in Sicily, (pp. 31-47). Cheltenham:Edward Elgar.

Rizzo I. (2003). Regulation, In Towse, R. (Ed.), A Handbook of Cultural Economics, (pp. 408-414). Cheltenham:Edward Elgar Publishing.

Rizzo, I. and R. Towse (2002). *The Economics of the Heritage: A Study in the Political Economy of Culture in Sicily*. Cheltenham:Edward Elgar Publishing.

Simar L, Wilson P. (1998). Sensitivity analysis of efficiency scores: how to bootstrap in nonparametric frontier models. *Management Science*, 44, 49–61.

Simar L, Wilson P. (2000). A general methodology for bootstrapping in non-parametric frontier models. *Journal of Applied Statistics*, 27, 779–802

Simar L, Wilson P. (2007). Estimation and inference in two-stage. semi-parametric models of productive efficiency, *Journal of Econometrics*, 136, 31–64.

Wilson P. (2007). FEAR: A software package for frontier efficiency analysis with R. *Socio-Economic Planning Sciences forthcoming*.

Throsby, D. (1997). Seven Questions in the Economics of Cultural Heritage. In Hutter, M. and Rizzo, I. (Eds.), Economic Perspectives of Cultural Heritage, (pp. 13-30). Basingstoke:Macmillan.

World Bank (1994). Cultural Heritage in Environmental Assessment, EA Sourcebook Update, no.8, Washington, DC: World Bank.

Zaleski, P.A. and Zech, C.E. (1997). Efficiency in religious organization, *Nonprofit Management and Leadership*, 8, 3-18.

Table 1 – Descriptive statistics on input and output (cross-sectional - time-series distribution)

Variable			**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs.**
input	**PERSONEL**	*overall*	236.34	109.36	62.00	510.00	N = 117
		between		107.79	79.92	437.15	n = 9
		within		39.28	104.19	316.50	T = 13
output	**AC**	*overall*	6567.25	3442.81	1407.81	19685.29	N = 117
		between		2990.74	2623.13	12566.51	n = 9
		within		1958.00	583.01	13686.03	T = 13
	PC	*overall*	317.09	455.58	11.43	3863.40	N = 117
		between		186.24	103.32	636.78	n = 9
		within		420.06	296.29	3543.71	T = 13

Source: our computation of data obtained by the Official Registry of *Regione Siciliana*.

Table 2 – Efficiency estimate – mean value for each *Soprintendenza*

SOPRINTENDENZE	Variable return to scale (input oriented)					Constant return to scale
	Eff. Score (VRS) - mean value	Eff. Bias corr - mean value	Bias - mean value	Lower bound - mean value	Upper Bound - mean value	Eff. Score (CRS) - mean value
Agrigento	0.378	0.348	0.029	0.320	0.371	0.362
Caltanissetta	0.717	0.669	0.048	0.626	0.706	0.703
Catania	0.467	0.421	0.046	0.383	0.458	0.444
Enna	0.495	0.449	0.046	0.405	0.488	0.345
Messina	0.492	0.452	0.040	0.413	0.484	0.466
Palermo	0.568	0.466	0.102	0.395	0.555	0.502
Ragusa	0.807	0.732	0.075	0.667	0.796	0.639
Siracusa	0.602	0.527	0.075	0.474	0.589	0.590
Trapani	0.445	0.414	0.031	0.384	0.439	0.436
All sample	**0.552**	**0.498**	**0.055**	**0.452**	**0.543**	**0.499**
Scale efficiency						***0.903***
Scale inefficiency						***0.097***

Source: our computation of data obtained by the Official Registry of *Regione Siciliana*.

Table 3 – Efficiency estimate – mean value for each year

YEAR	Variable return to scale (input oriented)					Constant return to scale
	Eff. Score (VRS) - mean value	Eff. Bias corr - mean value	Bias - mean value	Lower bound - mean value	Upper Bound - mean value	Eff. Score (CRS) - mean value
1993	0.584	0.537	0.048	0.482	0.578	0.516
1994	0.449	0.407	0.042	0.368	0.443	0.399
1995	0.583	0.511	0.072	0.460	0.573	0.539
1996	0.532	0.477	0.055	0.436	0.524	0.505
1997	0.498	0.458	0.040	0.419	0.491	0.465
1998	0.431	0.398	0.033	0.366	0.426	0.395
1999	0.424	0.397	0.027	0.367	0.420	0.366
2000	0.581	0.538	0.043	0.496	0.574	0.528
2001	0.669	0.600	0.069	0.547	0.653	0.600
2002	0.515	0.469	0.047	0.428	0.506	0.442
2003	0.668	0.579	0.089	0.521	0.652	0.616
2004	0.638	0.576	0.062	0.520	0.627	0.563
2005	0.606	0.522	0.084	0.464	0.591	0.549
All sample	**0.552**	**0.498**	**0.055**	**0.452**	**0.543**	**0.499**

Source: our computation of data obtained by the Official Registry of *Regione Siciliana*.

Table 4 – Distribution of bias corrected estimate of the efficiency score

SOPRINTENDENZE	Mean	Std. Dev.	Min	Max	Observations
Agrigento	0.348	0.070	0.244	0.460	N = 13
Caltanissetta	0.669	0.161	0.435	0.930	N = 13
Catania	0.421	0.169	0.199	0.885	N = 13
Enna	0.449	0.134	0.273	0.732	N = 13
Messina	0.452	0.124	0.294	0.641	N = 13
Palermo	0.466	0.163	0.273	0.731	N = 13
Ragusa	0.732	0.132	0.521	0.913	N = 13
Siracusa	0.527	0.121	0.344	0.783	N = 13
Trapani	0.414	0.126	0.250	0.668	N = 13
All sample	**0.498**	**0.177**	**0.199**	**0.930**	**N = 117**

Source: our computation of data obtained by the Official Registry of *Regione Siciliana*.

Figure 1 - Confidence intervals and point estimates for VRS

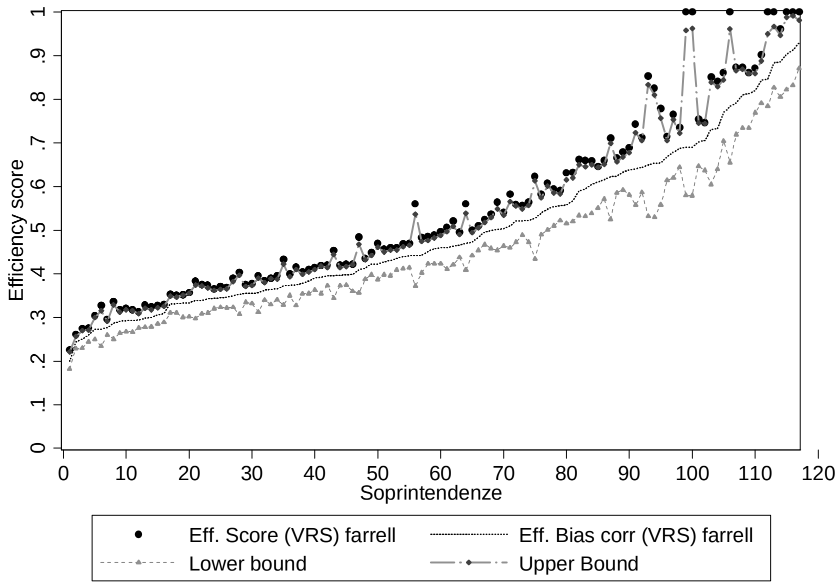

Table 5. Variables employed

Dependent Variable	
EFFICIENCY	Efficiency scores (VRS)
Explanatory Variables	
POPULATION	Population in each Province i=1,..,9 in each year j=1,…,13. (in thousands)
SIZE	Size of the area of each Province i=1,…,9 (in thousands of squared Kms)
DENSITY	Ratio of POPULATION over SIZE for each Province i=1,…,9 in each year j=1,…,13
INCOME	Per capita income in each Province i=1,…,9 (in thousands)
SENIORITY	Length of appointment of each *Soprintendente* measured in months
EXPERTISE	Dummy for the changes in expertise of *Soprintendente* (Dummy=1 when a change takes place)
TREND	A linear time trend

Table 6. Descriptive statistics on variable employed.

Variable	Mean	St. Dev.	Minimum	Maximum
EFFICIENCY	.552	.208	.225	1
POPULATION	555.334	345.133	174.199	1244.851
SIZE	2.856	0.954	1.614	4.992
DENSITY	183.187	61.976	68.000	302.810
INCOME	11.676	2.470	7.075	19.689
SENIORITY	80.453	86.811	12.000	324.000
EXPERTISE	0.145	0.354	0.000	1.000

Source: our computation of data obtained by the Official Registry of *Regione Siciliana*.

Table 7. Models estimate

Independent variable: Efficiency scores (VRS input oriented)
Functional form: linear
Estimation range: 1993 – 2005
Observation: 117

Variable	(1)	(2)	(3)	(4)
	OLS regression	Tobit regression	Truncated regression	Truncated regression with double bootstrap
	EFFICIENCY	EFFICIENCY	EFFICIENCY	EFFICIENCY
Constant	2.156***	2.185***	1.963***	1.944***
	(0.384)	(0.392)	(0.353)	(0.356)
POPULATION	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
SIZE	-0.720***	-0.741***	-0.625***	-0.613***
	(0.138)	(0.141)	(0.127)	(0.119)
DENSITY	-0.009***	-0.009***	-0.008***	-0.008***
	(0.002)	(0.002)	(0.002)	(0.002)
INCOME	0.043***	0.047***	0.035**	0.033*
	(0.016)	(0.017)	(0.016)	(0.020)
SENIORITY	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
EXPERTISE	-0.004	-0.014	0.033	0.035
	(0.051)	(0.052)	(0.046)	(0.051)
TREND	-0.014	-0.015	-0.012	-0.012
	(0.010)	(0.010)	(0.010)	(0.013)
R-squared	0.31			
Adj R-squared	0.27			
F - test	7.05***			
Log likelihood		22.878	51.568	
LR χ^2		$\chi^2(7)$= 43.30***		
Wald χ^2			$\chi^2(7)$= 38.96***	

Notes: standard errors are reported in parentheses.
***, ** and * denote significance at 1, 5 and 10 per cent levels, respectively.