

**CENTRO PER LA FORMAZIONE IN ECONOMIA
E POLITICA DELLO SVILUPPO RURALE**

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The efficiency of volunteering organisations. A Free Disposal Hull analysis of Italian health volunteering

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Abstract

We propose a model of the volunteering organisation, allowing a very general definition of the production set in the non-profit sector. Subsequently, we measure technical efficiency throughout a sample of 643 Italian volunteering organisations. As most output measures turn out to be ordinal variables, we propose and utilise a non conventional efficiency measure based on the Free Disposal Hull (FDH) approach. Finally, we analyse the impact of some characteristics of the volunteering organisations on their efficiency. Indicators for the information, motivation and educational attainment of volunteers turn out to be positively correlated with efficiency.

1 Introduction

Estimating the efficiency of non-profit organisations and, more particularly, of volunteering organisations (VO's), is interesting both for theoretical and policy reasons. For reasons that shall be expounded below, we also believe our study to be interesting from the standpoint of the quantitative analysis of efficiency.

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The evaluation of efficiency for non-profit organisations is becoming a high policy priority (Andreas 1997; Angeloni and Fiorentini 1997). In fact, from the 1980s, the non-profit sector has been acquiring a very respectable size in advanced market economies, until reaching, in terms of share of the GDP, a weight comparable to (or even greater than) that of the agricultural sector (see Salamon et al. 1999). It is well known that, as an economy develops, consumer demand becomes more oriented toward immaterial goods, including relational goods (Gui 2000) that are the feelings of trust and reciprocity (in sociological parlance, the trust networks) originated by the action of the VO. Besides, there has been a pervasive crisis of the welfare state, making it more difficult for consumers to obtain public and merit goods¹ through this channel. Hence the proliferation of non-profit organisations to which the public sector has found more and more convenient to tender the provision of merit and relational goods. But then, the same need of greater cost-efficiency and transparency of expenditure decisions that has inspired in many countries studies of the efficiency of the public sector, rebounds over these non-profit organisations, which should be selected on the basis of criteria of transparency and efficiency (Barbetta 1997).

In our work, we focus on VO's because we believe that the methodological aspects of defining and estimating technical efficiency for this kind of non-profit organisations are particularly interesting. In at least one case (Callen 1994), measures of the technical efficiency of VO's have already been calculated in a model of donations to non-profit institutions². Our effort differs from Callen (1994) in as much as in his paper the type of VO's analysed (fund-raising charities) makes it easier to define the outputs of these organisations. We attempt to define outputs and inputs in what we think is a more representative kind of VO, the providers of health services. We argue that output measures will often turn out to be ordinal variables, and we propose a measure of (output-oriented) efficiency that can be utilised in this case. Finally, through our analysis, we analyse the impact of some structural characteristics of the VO's (localisation, organisational structure, degree of education of volunteers, and so on) on their technical efficiency.

From a theoretical point of view, there are still difficulties in considering non-profit organisations as economic agents, in defining what they produce and in distinguishing between inputs and outputs. This is all the more true

¹Merit goods are goods involving a positive externality.

²The loci classici of this literature are probably Weisbrod and Dominguez (1986); Posnett and Sandler (1989). In Callen (1994), non-profit organisations compete one another ex-ante to attract donors' funds, even promoting their own image. Ex-post, they are assessed by the donors that can discontinue their funding if they deem as unsatisfactory the performance of the organisation they have chosen.

in the case of the VO's which have as a distinguishing character the gratuity of the productive services supplied by members and volunteers (hence, the particular methodological interest of these institutions). Yet, there are no reasons to believe that the VO members should disregard the result of their own effort only because they do not move within the sphere of market transactions. Indeed, these organisations utilise scarce resources: not only donors' money and volunteers' time, but also public funding. Hence, it seems appropriate to suppose that VO's should be interested in their output-oriented efficiency, although they ought not to be interested in their input-oriented efficiency.

Once the definition of the VO's as producers is accepted, the following theoretical point is to define what they produce. An influential body of works (see for instance Gui 2000) is currently arguing that the real essence of volunteering is the production of relational goods, that is the feelings of trust and reciprocity (in sociological parlance, the trust networks) originated by the action of the VO. Hence, the production of these relational goods should be taken into account in a model defining the objective function of such institutions, their resources and the results of their actions. A related point is how to distinguish between inputs and outputs. For instance, the gathering of human and financial resources is an input or an output for non-profit organisations?

The rest of the paper has the following structure. In Section 2 we propose a simple model of the VO, in which we introduce the definition of the production set of this organisation. In Section 3 we illustrate this production set in greater detail, suggesting some measures of inputs and outputs. Most of the output measures turn out to be ordinal variables, and in Section 4 we consider how the existing frontier approaches can provide sensible efficiency measures in such a situation. We argue that the Free Disposal Hull (FDH) approach (Deprins, Simar, and Tulkens 1984; Tulkens 1993b) offers a natural solution to this problem, and hence adopt it in an empirical application on data from the *Fondazione Italiana del Volontariato*. In Section 5 we analyse the impact of some structural characteristics of the VO's on their technical efficiency. In Section 6 the results are presented and commented, while some concluding remarks are offered in Section 7.

2 A model of the volunteering organisation

In order to propose a model of the VO, we first need to define this kind of organisation and to distinguish it from other forms of organisation belonging to the non-profit sector. The meaning we attach to the term VO is the

following. The VO's are non-profit organisations characterised, not only by the non-distribution of profits and by the large presence of volunteer workers among its members, but also by the gratuity of the services they provide. Indeed, the VO's provide services, usually some kind of merit good, to the public without any monetary counterpart, and they obtain the resources needed for their survival from public funding and from private donations.

As above mentioned, an influential body of works (see Gui 2000) is currently arguing that the real essence of volunteering is in the production of relational goods. Naturally, there is no contradiction between the provision of merit goods and the production of relational goods. Rather, the former fosters and sustains the latter. In fact, the merit good provided by the VO is not an end in itself, but rather a token given in an exchange whose real aim is the creation of a network of trust between the VO and the people it assists.

In order to give to these ideas a (very simple) formal content, let us write:

$$R = f(M; P; \mathbf{W}; \mathbf{Z}; \varepsilon) \quad (1)$$

where R is the (quantity of) relational good, M is the (quantity of) merit good, P is the (quantity of) effort of promoting the values of the VO, \mathbf{W} is a vector gathering some environmental factors, \mathbf{Z} is a vector listing the individual characteristics of the VO, and ε is a random element. The idea contained in the (1) is that the VO can produce relational goods both by providing to the public a merit good and by promoting among the public the founding values of the VO. The success of the VO also depends on some environmental factors (determining the responsiveness of the public) as well as on the individual characteristics of the VO (its intrinsic capability in building a network of trust).

As such, the success of the VO in transforming M and P in R is rather difficult to measure; however, it is possible to analyse the behaviour of the VO, when considering the production of M and P , the vector Y :

$$Y = g(\mathbf{X}; \mathbf{Z}; OE; \mu) \quad (2)$$

In (2), Y is a function of a set of input quantities, \mathbf{X} , of a vector of individual characteristics, \mathbf{Z} , of the organisational efficiency of the decision-making unit, OE , and of a random factor μ . Provided that one has measures for M , P and \mathbf{X} (which *prima facie* seem easier to obtain than measures of R), it is possible to apply frontier analysis in a multi-output multi-input framework to measure the output-oriented technical efficiency of the VO's. But then, as explained in Fried, Schmidt, and Yaisawarng (1999), measures

of technical efficiency usually conflate the role of organisational (or managerial) efficiency with that of some individual characteristics of the units under examination. If one has data about these characteristics (the vector \mathbf{Z}), the role of organisational efficiency proper can be singled out.

Given the above model, it is possible and appropriate to define the VO's technical efficiency, because their ultimate aim (the production of relational goods) is best achieved if they maximise their production of M and/or P for given resources³. We shall subsequently endeavour to assess the impact of the Z variables on the measures obtained for technical efficiency, thus attempting to single out a measure of organisational efficiency.

3 The production set

In the light of the preceding section, we aim to provide measures of technical efficiency for a sample of VO's as far as their activities of promotion and of merit good provision are concerned. Joint allowance will be made of these two activities through a multi-output multi-input approach.

Perhaps of paramount importance among the prerequisites of the measurement of efficiency is the comparability of the units being examined, in this case the VO's. This means that the units under examination must use sufficiently similar technology, inputs and outputs. Here this requirement has been satisfied carrying out the analysis only for a subset of VO's included in the data-bank of the Fondazione Italiana del Volontariato, (henceforward the FIVOL data-bank): the VO's engaged in the provision of health-related services on a territorial scale ranging from a city quarter to a province⁴.

The health-related sector is a very interesting case-study because of its numerical size (26% of the Italian VO's) and its social relevance. What is more, from our standpoint, the analysis of this sector can take advantage of the existence of a sizeable literature about the efficiency of public and private health-related institutions (see for instance Burgess and Wilson 1993).

All the VO's under examination provided services that are either home-care or surgery-based, or both. We excluded VO's engaged on a wider territorial scale because they mostly provide services of a different kind (basically

³It is hardly necessary to point out that the notion of allocative efficiency seems of much more problematic application for the VO's. Not only input and output prices are extremely difficult to be defined and measured, but as argued convincingly in Pestieau and Tulkens (1993), allocative efficiency might not be an appropriate benchmark outside of the private for-profit sector.

⁴Provincia, a territorial administrative unit roughly corresponding in population and scale to a British county.

medical care in developing countries, and emergency help in the case of large-scale public disasters). As it can be appreciated from tables A.1 and A.2 in the appendix, the VO's examined do indeed appear rather homogenous.

Once the kind of VO's to be analysed is defined, the measurement of technical efficiency requires the definition of the production set, that is of the inputs and outputs. Following the considerations made in the preceding section, we need to single out measures for M (the quantity of merit good), P (the promotion effort), the input quantities included in vector X , and the individual characteristics included in vector Z .

Surely, the easier task is to define and measure the key inputs included in the vector X . The efficiency analysis of health-related institutions suggests that in order to produce M , the followings inputs are usually relevant:

- a) labour;
- b) physical capital (buildings, means of transportation, ...);
- c) other variable inputs (fuel, ...).

For all these variables, with the exception of the capital stock, the FIVOL data-bank provides quantitative information. In particular, the data about non-paid labour allow the researcher to distinguish among volunteers (which operate in the VO gratuitously and continuously), conscientious objectors (which have opted out of the army draft system, choosing instead to spend their draft period in social service), and other operators (basically, members of the VO, which do not operate in it on a permanent basis). There is widespread consensus among practitioners that the qualities of labour services provided by these three categories differ rather widely, suggesting that they should be kept apart in the empirical analysis.

The FIVOL data-bank also reports the amount of weekly work-hours provided by volunteers. This makes it possible to compute a measure of full-time volunteer units for each VO. On the other hand, conscientious objectors have been considered by definition full-time labour units, as they work compulsorily 36 weekly hours. As for the third category, other operators, we took their number as a measure of their labour input, since no full-time adjustment could be made in their case. Finally, paid labour (as well as the other paid inputs) was accounted through the current expenditures of the VO. Note that the FIVOL data-bank only provides qualitative information about the capital stock⁵, but, at least to some extent, current expenditures also contain items relevant for the measurement of this input (fuel bills, rents, ...).

⁵Whether the VO owns or rents buildings for administrative and/or operative purposes.

There is more difficulty in suggesting measures for the VO's outputs, M and P. By definition no monetary measures of output can be used. From the efficiency analysis of health-related institutions one can derive quantitative output proxies, such as the number of persons reached and/or treated. The FIVOL data-bank does not contain quantitative proxies of this kind. However, there are in it ordinal measures that convey much the same information:

- a) the population basin served by the VO;
- b) the number of population categories reached;
- c) the number of different services provided.

Most of the services provided by health-related VO's are population-serving, and the number of persons reached and/or treated should be correlated with the size of the population basin potentially served. In the data-bank questionnaire, the VO's are asked to report the kind of population basin they address (the categories are given in Tab. 9). Hence, a proxy for the population served by the VO was constructed cross-tabulating the answers the VO's gave to this question with the population data from the 1991 Census⁶. The number of persons reached and/or treated should also be correlated with the number of population categories reached and with the number of different services provided. The first variable relates to the number of different domains of activity in which the VO is engaged; the second one to the number of different categories of services provided (their distribution across VO's are reported in Tabs. A.4 and A.5). Both indicators (in particular, their ordinal scale) have been elaborated by the same FIVOL researchers who have developed the questionnaire, and who best know the VO's structural features.

From the efficiency analysis of health-related institutions, one also concludes that the number of persons reached and/or treated is a deficient proxy. Different services have varying input requirements, and they are accordingly classified under different Diagnosis Related Groups (DRG's). Our measure for the input requirement of the services provided has been constructed defining on a priori (with the help and advice from the FIVOL researchers) growing scale of the input requirement of the main service provided by the VO.

⁶More precisely, if the VO indicated as population basin a the city area, the proxy took a value equal to one quarter of the municipality population; if it indicated the municipality, the proxy took a value equal to the municipality population; if it indicated more than one municipality or the province, the proxy took a value equal to the population of the municipality where the VO was based plus one eighth of the remaining province population. The use of different weights gave largely unchanged results in the empirical analysis.

Table 1: Input requirement of the category mainly addressed by the VO

1	2	3	4	5
Poor people	Couples and families	Old people	Not self-sufficient old people	Mental illnesses
Environment care	Young people	Physically handicapped	Mentally handicapped	Gypsies
Cultural goods	Civil protection	Sick people	Immigrants	Refugees
Animal care	Prostitutes	Terminal illnesses	Female condition problems	Drug addicts
Population in general		Minors	Homeless	AIDS
Other		Alcoholics Deviance Detainees and former detainees		

More precisely, each VO was asked to state which was the category of users mainly addressed. Now, the input requirement of the services provided to different categories is likely to differ. Assisting people affected by AIDS usually requires greater resources than providing help to the poor. Tab. 3.1 reports this growing scale of input requirements. If a VO declares that the category of users mainly addressed is Population in general, the proxy has a value of 1; if the category of users mainly addressed is Mentally handicapped, the proxy has a value of 4, and so on.

Finally, the search for new members and donors should also be considered as a full-fledged output, proxying P, the effort of creating among the population networks of trust as well as the principles of solidarity upheld by the VO. Of course, the effort of promoting the VO, that is the search for human and financial resources, could also be considered as a capital input produced by the VO in the aim of providing more services in the future. Even in this case, the promotion effort detracts a large amount of resources from the provision of services (Rose-Ackerman 1982), while very rarely the outcome of this activity, in terms of a wider production possibility set, pays out in the same year of its completion. According to such reasoning, to exclude this variable from the output mix can bias in any case the appraisal of technical efficiency: for a given amount of inputs and other outputs, a VO putting more effort into promotion would not appear as more efficient. The variable utilised to

represent the promotion effort is an ordinal measure of the dimension of the VO's promotion activity. The ordinal scale adopted and the distribution of the different cases across our sample of VO's are reported in Tab. 12.

4 The measure of efficiency

The approach adopted for measuring the technical efficiency of the VO's is the FDH⁷. The main reason for this choice is the ordinal nature of the output variables included in the production set. Indeed, the application of either parametric methods or of the DEA is based on the assumption that there exist continuous linear combinations of the observed productive processes. This assumption is not logically tenable when dealing with ordinal variables which are, by definition, variables taking values that cannot be linearly combined. Also, in the case of an ordinal variable it is not possible to carry out quantitative comparisons between different values taken from the same variable. Thus, it should not be possible to apply the traditional measures of efficiency based on the relationship between the outputs of the efficient and inefficient VO's.

Banker and Morey (1986) suggest, when dealing with categorical variables to divide the sample so as to compare among themselves only VO's belonging to the same category or to a higher one. This suggestion would not work in our case, since *all* output variables are ordinal and then categorical. Hence, the possibility to carry out comparisons among the VO's included in the sample would practically disappear. When utilising the FDH, however, it is possible to adopt an alternative measure of efficiency, that is the number of VO's dominating any given VO. Note that this measure, which develops upon the approach propounded in Tulkens (1993b), is isomorphic to more traditional ones, inasmuch as all efficient units have the same score.

Indeed, as can be seen from Fig. 1, this measure yields an efficiency score equal to 0 for all efficient VO's. On the other hand, the score is equal to 3 for a relatively inefficient VO such as VO5, and equal to 9 for a strongly inefficient VO such as VO6. Obviously, when efficiency is measured by the number of VO's dominating any given VO, a higher score singles out a higher inefficiency. What is also interesting about this measure is that it is less sensitive than more traditional ones (say the Debreu-Farrell, or the Russell, measure⁸) to the presence of outliers among the VO's.

⁷Deprins et al. (1984), Tulkens (1993a). The FDH has been implemented through the software kindly made available to us from Antonio Pavone from Istat, Rome.

⁸A recent survey of traditional efficiency measures and of their properties can be found in Destefanis and Pavone (1999).

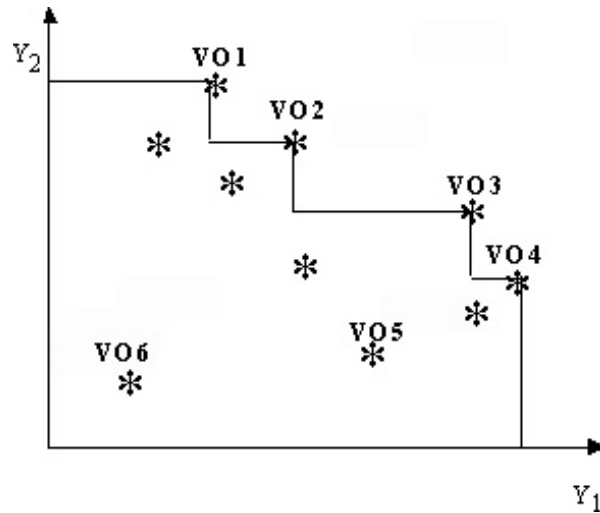


Figure 1: The measurement of efficiency through the number of dominating VO's

5 The explanation of efficiency

Applying the FDH on the production set defined in the Section 3 we can measure the technical efficiency of any given VO. But then, as explained in Fried, Schmidt, and Yaisawarng (1999), measures of technical efficiency usually conflate the role of organisational (or managerial) efficiency with that of some individual characteristics of the units under examination (the vector \mathbf{Z}). Yet, it seems desirable to discriminate organisational efficiency proper from the effects of the \mathbf{Z} variables. This can be done, provided one has data about the latter. The FIVOL data-bank is quite rich in qualitative information and we can test the significance of a rather large number of potential determinants of technical efficiency⁹. We do this using the efficiency scores as dependent variables, and regressing them on the \mathbf{Z} variables. Still, alongside with the \mathbf{Z} variables, one can also test the significance of regressors that are direct proxies of organisational efficiency.

The list of the potential determinants of technical efficiency here considered derives from theoretical arguments of general character (for instance, the size of the VO or the impact of public intervention; Färe, Grosskopf, and Lovell (1985) still provide a very valuable survey of these factors) as well as from the literature concerning non-profit organisations (for instance, the

⁹Indeed, for most of these factors, different empirical proxies could be retrieved in the data-bank and tried in alternative to each other.

nature and severity of the organisation's stakeholders; see Turati 2001).

To represent the size of the VO we applied a principal component analysis to the inputs (all of them cardinal variables); the first factor extracted from this analysis has been utilised as a proxy of scale.

The role of public intervention was represented by

- a dummy equal to one when the VO obtained fiscal rebates;
- a dummy for the presence of broad agreements and common initiatives with public institutions;
- a dummy for the presence of contractual agreements with public institutions.

Other determining factors have been searched among:

- a) the human capital stock of the volunteers, that is their educational attainment;
- b) the presence of training activities;
- c) the demographic size of the municipality where the VO is based;
- d) the links with other non-profit institutions;
- e) the degree of utilisation of the mass-media;
- f) the reputation of the VO, measured through the organisation's age or its being officially registered;
- g) the religious or non religious origin of the VO;
- h) the territorial partition (North-West, North-East, Centre, Continental South and Isles) to which the VO belongs.

Finally, in order to capture the role of labour and managers' satisfaction and motivation (factors directly linked to organisational efficiency) we considered:

- the impact of fund-raising activities on efficiency: we utilised the share of funding from private donations, the presence of self-financing, of donations from private citizens or from foundations;
- the presence of control bodies within the institution;
- the member-serving or public-serving status of the organisation.

Table 2: The results of the Banker test on the exclusion of input and output variables

Variables excluded	statistics	
	Half-Normal	Exponential
Other operators	2.28	1.65
Conscientious objectors	1.12	1.05
Volunteers	1.87	1.59
Current expenditures	1.72	1.38
Size of the population basin served	3.43	1.96
Number of population categories reached	1.47	1.34
Effort of acquiring new members and funding	1.94	1.48
Input requirement of the main service provided	2.12	1.53
Number of services provided	1.39	1.31

6 The results

Our sample includes 643 VO's, which refer to year 1997. We first applied the (output-oriented) FDH to the following production set: Inputs: volunteers, other operators, conscientious objectors, current expenditures Outputs: number of services provided, number of population categories reached, size of the population basin served, input requirement of the main service provided, effort of acquiring new members and funding for the organisation. We then developed some test statistics along the lines suggested in (Banker 1993) to see whether the exclusion of any of these variables made any difference to the distribution of the efficiency scores. The Banker test compares, under various distributional assumptions, the efficiency scores from the restricted model (under H0) with the efficiency scores from the unrestricted model (under H1). If the efficiency scores under H0 are significantly lower than the efficiency scores under H1, H0 is rejected. In the present case, the restricted models are those without the variables listed in Tab. 2 (in each restricted model only one variable is excluded at a time). The distributions assumed for the efficiency scores are the half-normal and the exponential.

Since the critical values for the half-normal and for the exponential are respectively 1.10 and 1.07 (5% significance level), and 1.15 and 1.10 (1% significance level), it can be surmised that excluding the number of conscientious objectors from the production set does not have a significant impact on the distribution of the efficiency scores. Hence, we applied again FDH to the following reduced production set:

- **Inputs:** volunteers, other operators, current expenditures

Table 3: Descriptive statistics of the output-oriented measure of technical efficiency by territorial partition

Statistics	North West	North-East	Centre	Cont. South	Isles
Mean	18.8	24.2	14.5	5.8	16.5
Median	10	7	6	3	11
Std. Dev.	25.3	47.2	22.5	9.1	20.0
Minimum	0	0	0	0	0
Maximum	155	268	110	49	86
Interquartile distance	24	25	16	7	22

- **Outputs:** number of services provided, number of population categories reached, size of the population basin served, input requirement of the main service provided, effort of acquiring new members and funding for the organisation.

Applying Banker’s test to this set suggested that no further reduction could be enacted. The main results obtained with this production set can be summarised in Tab. 3

As can be seen, mean and median values of inefficiency, as well as its dispersion, are rather low, which points to an appropriate specification of the production set¹⁰. These impressions are substantiated by the box-plots shown in Fig. 2. As can be seen in Fig. 2, efficiency scores are also characterised in most territorial partitions by a high degree of skewness, which is well in accordance with the usual a priori expectations about the distribution of these variables.

We then regressed the inefficiency scores on the variables singled out in Section 5. Note that, when adopting this new measure of efficiency, the efficiency scores can vary between 0 and the number of all VO’s less 1. Hence, because the dependent variable takes values defined in a given interval, a Tobit regression is used in the second-stage analysis. The search for the significant determinants of efficiency was carried out trying different combinations of the variables classified under the different headings (always trying to keep in the equation one variable per heading). We got the baseline results reported in Tab. 4.

We can see that MTRPLTN, the size class of the municipality where

¹⁰The theoretically maximum score is $643 - 1 = 642$. Our results imply that efficiency scores have rather high mean and median and not very dispersed. They compare favourably with the results commonly obtained in the literature. See for instance Fried, Schmidt, and Yaisawarng (1999), where descriptive statistics of the efficiency scores are utilised in the same spirit.

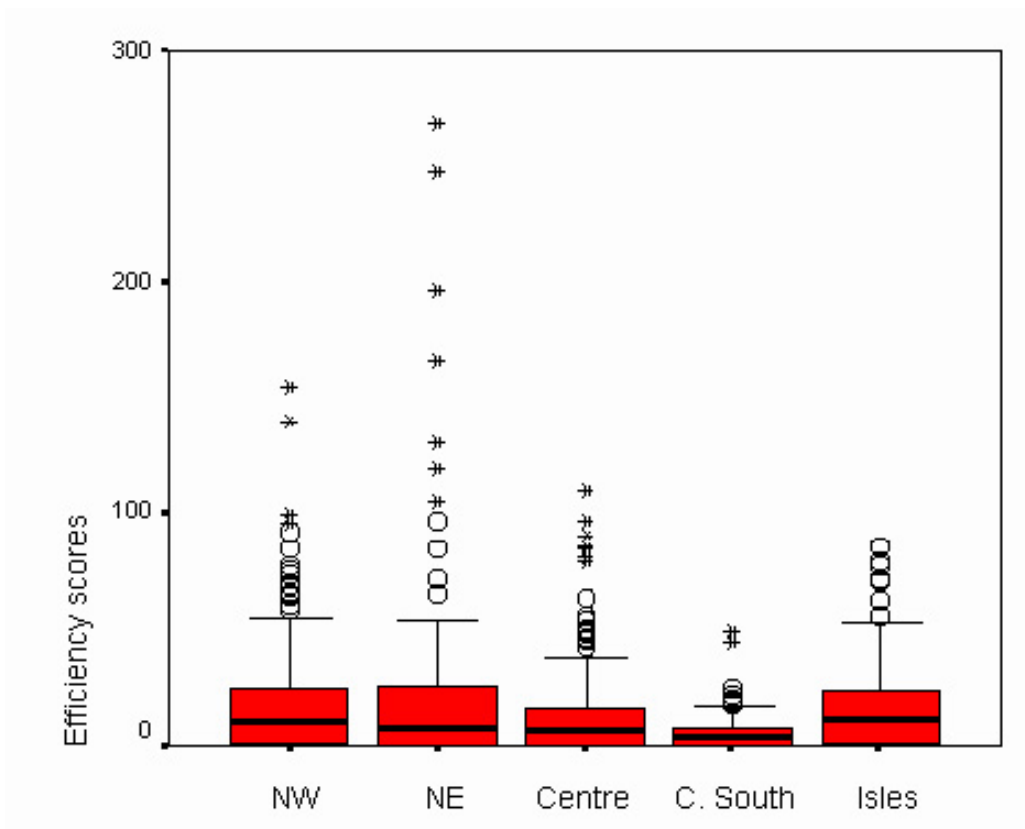


Figure 2: Box-plots of the output-oriented measure of technical efficiency by territorial partition

Table 4: Tobit analysis on the determinants of inefficiency

Variables	Coefficient	Std. Error	z-Statistic	Prob. level
CONSTANT	43.70	9.75	4.48	0.00
NORTH-WEST	4.40	3.53	1.25	0.21
NORTH-EAST	7.80	4.17	1.87	0.06
CENTRE	-4.19	3.93	-1.07	0.29
CONT. SOUTH	-9.94	4.61	-2.16	0.03
MTRPLTN	-9.26	1.28	-7.21	0.00
HK	-2.76	0.68	-4.04	0.00
TRAINING	7.57	1.47	5.16	0.00
PERSONAL	13.20	2.71	4.87	0.00
PROPUBLIC	-15.28	3.60	-4.24	0.00
AGREEMENTS	-5.57	1.81	-3.07	0.00
Adj. R-sq.	0.1865			

the VO is seated, HK, the human capital (or educational attainment) of the volunteers, PROPUBLIC, a dummy for the provision of services to the public only (not to members), and AGREEMENTS, a dummy for the presence of broad agreements with the public sector, affect efficiency positively, *which in the table is seen as affecting inefficiency negatively*. All these results are quite in line with a priori expectations. The role of MTRPLTN probably reflects the easier access to information and means of transportation existing in a large city. HK and PROPUBLIC stand for the importance of the preparation and motivation of the volunteers, and AGREEMENTS probably reflects the better information to which VO's have access through contacts with the public sector. On the other hand, TRAINING, the presence of training activities, and PERSONAL, the presence of donations from private citizens, affect efficiency negatively. As for the presence of training activities, this is due to the draining of resources this activity requires, while PERSONAL probably reflects the tighter monitoring that other kinds of funding (from members, foundations, ...) impose upon the VO's.

It might be interesting to assess how these results are robust to the inclusion among the regressor set of some variable standing for the scale of operation¹¹. Then, we constructed a proxy for the scale of operation (SCALE) as the first factor from principal component analysis on the three relevant inputs (volunteers, other operators, current expenditures). This proxy is found to enter the Tobit regressions non-linearly. We provide results (reported in Tables 6.4 and 6.5) both for a quadratic and a cubic specification, as the latter might be heavily dependent on a few outliers.

The non-linear pattern in the role of SCALE seems to reflect some kind of non-convexity. It is better for a VO to be large or small, rather than of medium size. Also note that size and sign of the other coefficients do not change appreciably, reflecting the orthogonality of the factors they represent with respect to our scale proxy.

7 Concluding remarks

In this paper we computed measures of technical efficiency for a large sample of Italian volunteering organisations taken from the database of the Italian Foundation for Volunteering. After having argued that the notion of technical efficiency is useful for assessing the performance of volunteering organisations, we take up the task of defining an appropriate production set for these organisations.

¹¹Proper calculation of scale efficiency does not seem to be possible in the presence of ordinal variables.

Table 5: Tobit analysis on the determinants of inefficiency

Variables	Coefficient	Std. Error	z-Statistic	Prob. level
CONSTANT	54.43	9.17	5.93	0.00
NORTH-WEST	0.90	3.30	0.27	0.78
NORTH-EAST	1.88	3.94	0.48	0.63
CENTRE	-6.39	3.66	-1.74	0.08
CONT. SOUTH	-6.28	4.29	-1.46	0.14
SCALE	19.33	2.01	9.60	0.00
SCALE SQD.	-2.10	0.32	-6.50	0.00
MTRPLTN	-11.69	1.25	-9.37	0.00
HK	-2.01	0.64	-3.14	0.00
TRAINING	4.57	1.39	3.27	0.00
PERSONAL	9.36	2.56	3.66	0.00
PROPUBLIC	-14.19	3.37	-4.21	0.00
INITIATIVES	-6.64	1.69	-3.92	0.00
Adj. R-sq.	0.3024			

Table 6: Tobit analysis on the determinants of inefficiency

Variables	Coefficient	Std. Error	z-Statistic	Prob. level
CONSTANT	57.02	9.11	6.26	0.00
NORTH-WEST	0.60	3.26	0.18	0.85
NORTH-EAST	3.07	3.91	0.79	0.43
CENTRE	-6.31	3.62	-1.74	0.08
CONT. SOUTH	-4.88	4.25	-1.15	0.25
SCALE	26.95	2.71	9.94	0.00
SCALE SQD.	-6.54	1.11	-5.88	0.00
SCALE CUBE	0.38	0.09	4.17	0.00
MTRPLTN	-12.00	1.24	-9.68	0.00
HK	-1.84	0.64	-2.89	0.00
TRAINING	3.91	1.39	2.81	0.00
PERSONAL	8.92	2.53	3.53	0.00
PROPUBLIC	-13.64	3.34	-4.08	0.00
INITIATIVES	-6.70	1.67	-4.00	0.00
Adj. R-sq. (OLS)	0.3173			

While finding measures for inputs is rather straightforward (basically, we have measures for volunteer labour, paid labour and fixed capital), the measurement of output variables proves more difficult. We finally rely on ordinal measures for the number of services provided, the number of population categories reached, the population basin served, the (a priori defined) input requirement of the main service provided, and the effort of acquiring new members and funding for the organisation.

The measurement of efficiency is carried out through an output-oriented FDH approach, particularly because the notion of convex combination of outputs does not make sense in the presence of ordinal variables. Because of this reason too, the efficiency scores are calculated counting for each VO the number of other VO's dominating it (thus providing an application of the concept of efficiency dominance developed in (Tulkens 1993a)). The descriptive statistics of the efficiency scores obtained are rather well behaved (mean and median efficiency are rather high, and dispersion is not very large). Also, a second-stage regression analysis highlights some interesting features about the determinants of these scores. In particular, proxies for the information, motivation and educational attainment of volunteers are positively correlated with efficiency, while there is a non-monotonic relationship between the latter and the scale of activity.

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A Tables

Table 7: The categories reached by the VO's examined

Categories	Frequency	Percentage
Low incomes	25	3.9
Environment care	47	7.3
Cultural goods	9	1.4
Animal care	21	3.3
Population in general	70	10.9
Other	11	1.7
Couples and families	12	1.9
Young people	11	1.7
Civil protection	195	30.3
Prostitutes	2	0.3
Risk Areas	2	0.3
Old people	101	15.7
Physically handicapped	45	7.0
Illnesses in general	492	76.5
Terminal illnesses	25	3.9
Minors	34	5.3
Alcoholics	9	1.4
Deviance	3	0.5
Detainees and former detainees	1	0.2
Not self-sufficient old people	47	7.3
Mentally handicapped	33	5.1
Immigrants	14	1.4
Female condition problems	4	0.6
Homeless	2	0.3
Mental illnesses	10	1.6
Gypsies	5	0.8
Refugees	10	1.6
Drug addicts	11	1.7
AIDS	12	1.9

Table 8: The services provided by the VO's examined

Services	Frequency	Percentage
Health care	307	47.7
Social assistance	13	2.0
Cultural animation	55	8.6
Education	64	10.0
Prevention	94	14.6
Rehabilitation	30	4.7
Training	32	5.0
First aid and transportation	482	75.0
Civil rights defence	17	2.6
Research and study	28	4.4
Education to world issues	11	1.7
Blood donation	101	15.7
Promotion of organ donation	45	7.0
Other	54	8.4

Table 9: Health-related VO's by population basin

Population basin	Frequency	Percentage
City area	22	3.4
Municipality	440	68.4
More than one municip. or province	181	28.1

Table 10: Health-related VO's by number of categories reached

Value	N. categories reached	Frequency	Percentage
1	1 category	364	56.6
2	2-3 categories	167	26.0
3	3 categories	61	9.5
4	4 and more categories	51	7.9

Table 11: Health-related VO's by number of services provided

Value	N. services provided	Frequency	Percentage
1	1 service	258	40.1
2	2-3 services	305	47.4
3	4-6 services	76	11.8
4	7-10 services	4	0.6

Table 12: Health-related VO's by kind of promotion effort

Value	Kind of effort	Frequency	Percentage
1	No effort	67	10.4
2	Only fund-raising	23	3.6
3	Only recruiting	182	28.3
4	Fund-raising and recruiting	371	57.7

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