EFFICIENCY ANALYSIS OF THE EUROPEAN FOOD BANKS: SOME MANAGERIAL RESULTS

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ABSTRACT

Hundreds of thousands of people in Europe are daily receiving food thanks to local food banks, run basically by volunteers who collect donations, and distribute them to organizations. In this paper, data from a sample of food banks working in 13 European countries are analysed using Data Envelopment Analysis (DEA), trying to learn about their profiles and find some clues about the efficiency of their operations, comparing them according to variables such as the number of volunteers and permanent staff, the tonnage of food delivered and the number of people served. Significant inefficiencies were found in the sector as a result of some food banks' high performance, thus setting a high level standard of operational efficiency. Some additional results regarding food bank sizes and performance are presented.

Keywords: Food banks; Efficiency; Social economy; DEA

1. INTRODUCTION

In the 21st century, poverty has increased worldwide and it is estimated that more people suffer from starvation than at any point in human history (Allen, 2013). Although it is claimed that an average of 11.7% of the world population lives in absolute poverty (The World Bank, 2015), there are important geographical and demographical differences (Allen, 2013), and it is not only a problem of resources: according to FAO (2013), food waste in Europe and Africa alone could feed 500 million people.

While access to healthy food is a human right (Anderson, 2013) the concept of food poverty appears as the inability to acquire or eat enough quantity or appropriate quality of food in an acceptable, social way (Dowler and O'Connor, 2012). Therefore, hunger and malnutrition (under-nutrition as well as over-nutrition) delimit social problems that must be remedied for moral reasons (Vernon, 2007). Within this panorama, the necessity for food assistance has grown (Lambie-Mumford, 2014; Lambie-Mumford and Dowler, 2014), with food banks playing a crucial role in many countries as non-profit organizations of social solidarity (Martins *et al.,* 2011). Usually they are based on volunteering, whose purpose is to recover food excesses and redistribute them through a wide variety of non-profit institutions, reducing any food waste or misuse (Starkey *et al.,* 1998; 1999), and responding to the problem of food poverty and inequality (Riches, 2002).

Some authors believe that as food banks provide help to supplement food assistance, this can lead to a decrease in the attention given by the governments regarding their responsibility to ensure that everyone has enough to eat (Anderson, 2013; Daponte and Bade, 2006; Riches, 2002). Also, food security is a relevant social concern (Hinrichs, 2013) that food banks must considering when operating.

The first food bank was created in 1966 in the USA (Cotugna and Beebe, 2002) while in Europe these organizations did not appear until 1984 in Paris (FEBA, 2014). Since the 1980s, food banks have become one of the fastest-growing charitable industries in developed counties in order to avoid hunger

and food insecurity (Riches, 2002). However, their role is especially important in the USA and Canada (Dowler, 2001), where low income households have great problems regarding food and nutrient intakes (Anderson, 2007; Tingay *et al.*, 2003), together with mentally ill people, homeless people and illegal immigrants (Anderson, 2013).). In the US, 28.8 million people including 16.2 million children lived in food-insecure households in 2010 (Anderson, 2013).This explains why most of the research about these institutions focuses on the American case.

Actually, previous work on food banks is quite scarce and can be grouped under four different topics: volunteering, beneficiary institutions, recipients of help (people), and food collected (in both quantity and quality, with special attention to the problems of the unbalanced nutritional supply). Furthermore, in the conceptualization of food security there is huge divergence (Allen, 2013): on the one hand some researchers analysed the problem according to the stakeholders involved (farmers – Fish *et al.,* 2013; agro-food industry – Brunori *et al.,* 2013; countries and their governments – Dowler *et al.,* 2007; Dowler and O'Connor, 2012; Kneafsey *et al.,* 2013; Taylor-Robinson *et al.,* 2013; individuals and households, and so on), and on the other hand some authors studied policies and practices as a problem or as a solution (Dowler *et al.,* 2007; Lawrence *et al.,* 2013; Marsden, 2013).

The activity of a food bank depends basically on its suppliers (food producers and other donors; whose number has grown in recent years – Jäger and Rothe, 2013), which affects the quantity of food obtained to satisfy the need of the next steps in the chain (first the beneficiary organizations, which will later deliver it to the final beneficiaries, i.e., the families in need). Additionally, the management of food banks is complex due to the manipulation of products which are perishable in many cases, and thus subject to losses of quality and quantity (Rajan et al., 1992; Cai et al., 2013), and due to the intermittent relationship with suppliers (Egri and Váncza, 2013).

Volunteers are the essential human resource in the activities of food banks (Larson and McLachlin, 2011; do Paço *et al.,* 2012), and therefore they are a constrained resource for the quality and quantity of

food that food banks are capable of managing (Tarasuk and Eakin, 2005). Reasons for being a volunteer are based on their social situation, age or personal needs (do Paço and Agostinho, 2012). At least in Spain (Coque *et al.*, 2015) the gender of the food banks' volunteers is usually masculine, which contrasts with the predominance of women as volunteers in other types of non-profit entities (Franco Rebollar and Guilló Girard, 2011); however, this is a logical result, given the kind of jobs to be performed (mainly heavy weight handling). Regarding age, retired people as volunteers are common, making the rejuvenation of the volunteer staff a challenge, even though this could result in a better distribution of tasks, and greater use of information technologies (Evans and Clark, 2010). The paid staff have mainly the coordination functions in a food bank, while most of the daily work of such entities is done by volunteers (Tarasuk and Eakin, 2005).

Regarding the type of beneficiary entities, Berner and O'Brien (2004) distinguished between distribution centres (where batches of food are redistributed among the people and beneficiary groups) and consumption centres (whose users are provided with cooked and prepared food to be consumed on the premises).

About the people benefiting from this help, the main socio-demographic profiles are families, the unemployed, young people seeking their first job and single women with family dependents (Ford et al., 2013). Unemployment and underemployment are behind the significant increase in the need for this type of food service (Tarasuk and Beaton, 1999). Even before the recent economic crisis, the demand for food from food banks and other charities was growing (Davis and Tarasuk, 1994; Starkey, 1994).

Research works, such as those of Cotugna et al. (1994) and Holben (2012), indicate that the success of a food bank can only be measured by the amount of food being distributed to needy people and if it provides the recommended daily nutritional doses. In the end it is non-profit organizations that provide or facilitate access to certain resources (Ebrahim, 2001), in this particular case, food. Handforth et al. (2013) state that food banks' staff strive to offer fresher products to their beneficiaries. Additionally,

some food banks' nutrition systems have implemented a system to assess the quality of the products in order to decrease the distribution of products that are low in nutrients. The amount of food varies, depending on the demand and supply constraints that may restrict the frequency, quantity and variety of food that individual customers receive.

We focus our analysis on the operation and characteristics of the European food banks, trying to fill the existing literature gap in the study of this type of organization in this region. The goal of this paper is therefore to provide relevant information regarding the efficiency of these institutions, and what factors can have an influence on their performance. These findings could provide some clues about how to improve the operation of these institutions which, in the end, will benefit the final recipients of the help. Note that pursuing the efficiency of the institutions' operation does not exclude profit companies. Lecy *et al.* (2012) present a review of this topic, noting that there is a considerable number of models, but their major problem is the lack of empirical testing. Regarding the importance of analysing efficiency in NGOs, we can conclude that in general, organizations that operate more efficiently and provide a better service always make the best of scarce resources.

In the next section we comment on the data gathering, while a description of the observed characteristics of the European food banks is presented in section 3. The efficiency analysis is detailed in section 4, and the main conclusions obtained are presented in section 5.

2. DATA AND METHODS

European food banks are linked to the European Federation of Food Banks (FEBA), founded in 1996. The target population of this research includes all the European food banks affiliated to FEBA, a total of 256 organizations in 21 countries. In 2013, between all of them, 402,000 tonnes of food were distributed (equivalent to 804 million meals) to 5.7 million people. This was done in partnership with

31,000 charitable organizations and social services (FEBA, 2014). Within each country there are national federations supporting local food banks, all of them presenting quite similar management characteristics given their common affiliation and goals. Note, however, that some important countries (remarkably Germany and Sweden) are not members of this federation, given their inherent different characteristics (for instance, the regional network and the number of national members) designed to fulfil their mission.

To analyse the efficiency of food banks in the European context, we conducted a survey to obtain relevant data. A questionnaire was sent to the 236 food banks (92.2% of the total) that we were able to contact by email. The final response rate obtained was 40.7% (96 organizations, Table 1).

[TABLE 1 HERE]

A first draft of the questionnaire, based on the literature review, was discussed within the research team and improved by feedback from experts in the field. To increase the response rate, the final version consisted of just eight questions (Table 2), including the four topics identified in the previous literature review: foundation year, permanent staff and volunteers (number, time since joining the organization, age), tonnes processed, and beneficiaries (number of entities and end users).

[TABLE 2 HERE]

At the beginning of March 2014, a pretest had been undertaken with the purpose of testing and improving the questionnaire. Data collection was carried out between March and June 2014. The survey was sent to the person in charge of each food bank. No incentive was offered to complete and return the questionnaire.

Information achieved from the questionnaire was tabulated and statistically treated. After that, a descriptive analysis was completed before carrying out the efficiency analysis.

The study of the efficiency in non-profit and non-governmental organizations has been previously considered in the literature (Zaleski and Zech, 2006; Mitchell, 2015). Data Envelopment Analysis (DEA), a non-parametric methodology, is the commonest way to carry out this type of relative efficiency assessment. DEA has been used in many different sectors, such as education, health care, energy, transportation, finance, etc. The aim of DEA is to benchmark a number of similar operating units, generally termed Decision Making Units (DMUs), which use inputs to produce outputs. No assumption is made about how this process is carried out. Only the observed input and output amounts are required.

The first step in the DEA methodology is the inference of the Production Possibility Set (a.k.a. DEA technology) from the observations. This is done using some basic axioms, such as envelopment (meaning that the observed operating points are assumed to be feasible), free disposability of inputs and outputs (meaning that inefficiency in the form of consuming more inputs than necessary or producing less output than feasible is always possible) and convexity (meaning that given two feasible operating points all linear convex combinations of them are also feasible). With these three simple axioms and applying the Minimum Extrapolation Principle (which looks for the smallest set of operating points satisfying these three axioms) the Variable Returns to Scale (VRS) technology is derived. Another common DEA technology is known as Constant Returns to Scale (CRS) which results from adding a fourth axiom called scalability (meaning that the inputs and outputs of any feasible operating point can be scaled up or down).

Once the DEA technology has been determined, the corresponding efficient frontier can be ascertained. The efficient frontier corresponds to the best practices and it is formed for the non-dominated operating points, i.e. those for which there are no other feasible operating points producing more output without consuming more input, or consuming less input without producing less output. These efficient operating points are the reference against which all the observations should be benchmarked.

There are different DEA models and variants depending on aspects, such as the orientation or the metric used to gauge the distance to the efficient frontier (Cooper *et al.*, 2006). Thus, input orientation means trying to reduce as much as possible the input consumption without reducing the outputs while output orientation is just the opposite, i.e. increasing the outputs as much as possible with the current input consumption. There are also non-oriented DEA models, which simultaneously try to reduce inputs and increase outputs. In fact, one of the most flexible DEA models is the directional distance function (DDF) DEA model, which specifies a certain direction vector and computes the maximum step size that is feasible along the direction vector (Färe and Grosskopf, 2004). DEA provides, for each DMU, a target operating point that indicates, in the case of an inefficient unit, by how much its outputs should increase and its inputs decrease in order to become efficient. With this information and the identified efficient benchmarks, an inefficient DMU can go and study the way those benchmarks function and try to copy/import their best practices into its own operations.

By comparing the distance from a DMU to the Constant and Variable Returns to Scale (CRS and VRS) efficient frontiers, a DMU can be found to have the Most Productive Scale Size (MPSS) (Banker, 1984) or, alternatively, Increasing or Decreasing Returns to Scale (IRS or DRS). In the MPSS region, CRS prevails, which means that multiplying the inputs by a factor α increases the output also by that same factor α. In the IRS region, multiplying the inputs by a factor α increases the outputs also by that same factor larger than α while in the DRS region, multiplying the inputs by a factor α increases the outputs also by that same factor smaller than α.

The DEA model used in this application considers three inputs (Figure 1): number of years since the food bank was created (labelled AGE), number of volunteers (NoV) and number of permanent staff (STAFF). The first two inputs have been considered non-discretionary (i.e. uncontrollable) and, following the approach in Banker and Morey (1986), those inputs would not be sought to be reduced.

Two outputs are considered: amount of food distributed (TONNES) and number of people attended (NoP).

[FIGURE 1 HERE]

Some caveats are in order before the results of the analysis are presented in the next section. Thus, although DEA has many strong points (such as being a non-parametric, data-driven approach), it also has limitations. Thus, it is a quantitative method that cannot take into account qualitative information, even though that information may be very relevant (e.g. strategic orientation, management policies and procedures, idiosyncratic features, etc.). Therefore, DEA analysis must be taken as a first approximation to the problem, useful to uncover potential inefficiencies, but whose results and conclusions must always be assessed case by case as regards their practical implementation since there may exist some real-world factors, not considered by the methodology, which can affect and hinder achieving the computed efficiency targets.

Another reviewer also rightly pointed out the differences in the way American and European food banks work and that these differences would affect the inputs and especially the outputs considered. The study presented in this paper considers only European food banks and that is why the number of end users has been used as one of the outputs. However, in the case of American food banks it would be more appropriate to consider the number of intermediate partner organizations as outputs. And, in case the sample contained both types of food bank model, then both types of output should be considered. In this regard, the DEA methodology shows some flexibility to adapt to the situation at hand.

Another issue refers to the fact that the number of volunteers is a rough measure since it does not take into account the number of hours they work, which may differ significantly from one person to another. However, since such detailed data were unavailable, we have had to manage with the total number of volunteers as the input variable (i.e. as a valuable resource used by the food bank) implicitly assuming

that the average number of hours worked by these volunteers is more or less the same in the different food banks. This may be a bold assumption but this type of assumption is relatively common in DEA, which generally uses a small number of aggregated inputs. Of course, should Full Time Equivalent (FTE) data be available the results would be more reliable but very often, when dedicated information is not known, a headcount is all that can be used.

3. ANALYSIS OF RESULTS

3.1. Descriptive results for European food banks

The structure and running of European food banks are very different, depending on the countries and the history of the food banks' foundation. While in some countries, such as Ireland or Hungary, there is a smaller number of organizations (therefore larger in size), in others (France or Spain) the structure is much more atomized, thus in closer proximity to the final beneficiaries. The size of the country and the early arrival of the food bank movement have also had an influence on the larger number of organizations.

The characteristics of food bank staff are also very different. In all cases, the presence of volunteers is necessary, given the nature of these organizations based on an altruistic spirit, but their numbers vary according to the country (FEBA, 2014). While in some countries such as Slovakia (where all the staff are volunteers), Spain or Italy (where only 3% of the total staff is permanent), mainly it is the volunteers who run the food bank; in others countries, such as Hungary and Poland, permanent staff numbers are higher than 20% of the total personnel (Table 3). The average age of the volunteers (except in Eastern Europe countries) is quite high (66 in Belgium, 62 in France and Italy, 58 in Spain) indicating that most of them are retired people looking for an activity to help others once their professional life is over. For that reason, they do not usually work for a long time in food banks (between five and eight years in most cases), which means it is necessary to train the new volunteers to

retain the knowledge of how the organization functions.

[TABLE 3 HERE]

Food banks' activities have been severely affected by the economic crisis that has affected the middle classes all over Europe. Comparing unemployment rates between 2008 and 2013, with the number of final users who are recipients of food, we can see how, in all the countries, the number of end user recipients of food has increased (although not always proportionally) with the unemployment rate. Also, except in the Belgian case, the number of organizations receiving food for further distribution has increased as well. Regarding the average tonnes of food collected per food bank, except in the Portuguese case (where the reduction in the average tonnes per food bank is explained by the setting up of some new food banks that started operations between 2008 and 2013), all the countries have been able to collect more food, with an increase in solidarity by consumers, distributors and companies, all of whom are aware of the social problems raised by the crisis.

3.2. Efficiency analysis results

As regards the efficiency analysis, Table 4 presents some results; in particular, for each DMU, the country it belongs to, the Measured Efficiency Dominance (MED) and the scale efficiency scores θ, and the returns to scale (RTS). The MED (Bardhan *et al.*, 1996) is an efficiency measure that sums the relative reductions of inputs and the relative increases of outputs that can be achieved. An MED value of unity means that the DMU is efficient, i.e. no input reductions or output increases are feasible. In our case, there are 16 (out of 96) efficient DMUs (MED_0=1.0). The average efficiency is, however, rather low (0.766). The scale efficiency score results from comparing the CRS and VRS projections and measures the distances, i.e. the separation, between the two efficient frontiers. Thus, a scale efficiency of unity corresponds to the MPSS region where the two frontiers coincide. Scale efficiencies below one imply that the VRS efficient frontier lies below the CRS frontier and that the scale of the operation is

not optimal. The scale size is smaller or larger than the MPSS, depending on whether the DMU exhibits IRS or DRS. In our case, except in some instances (such as DMUs 40, 58, 66 and 94) the scale efficiency is generally high with 36 DMUs operating at their MPSS, 19 exhibiting IRS and the rest (41) exhibiting DRS. This means that, although some food banks are relatively small, nearly half of them are larger than they should be and, therefore, they might consider splitting into smaller, more agile units.

[TABLE 4 HERE]

As an illustration of the detailed assessment and analysis that DEA results provide, let us consider, for example, the case of DMU 42, which is a food bank based in Lugo, Spain. Its inputs are (20; 25; 0) which means that it has been in operation for 20 years, has 25 volunteers and zero permanent staff. Its outputs are (1,700; 30,000) which means that it processed, in 2013, 1,700 tonnes and attended 30,000 people. It has a relatively high MED of 0.912. Its corresponding target point computed by DEA has the same inputs (because the first two inputs are non-discretionary and the third cannot be reduced since it is already zero) and the following outputs (1,958.3; 34,558) which represent a potential improvement of 258.3 tonnes and 4,558 people, which is a 15% output increase. This target operating point results from combining the operating points of DMUs 14, 60 and 64 with coefficients 0.897, 0.014 and 0.089, respectively. Therefore, these three efficient DMUs are its benchmarks, i.e. the food banks which it could take as reference in order to import their best practices and thus be able to achieve the computed target.

Looking at the results per country (see Figure 2), note that five out the seven countries with a single food bank in the sample (and therefore presumably with a higher level of centralization and a higher volume of food processed) are technically efficient. For the other countries with a higher number of food banks, the variance is quite relevant with at least one food bank efficient in all of them, but with most of the values in the range of 0.4-0.6. The remarkable exception is France, where the 15 food banks analysed have quite homogeneous efficiency scores, with values around 0.3.

[FIGURE 2 HERE]

Finally, Figure 3 presents the cumulative amount of food distributed by food banks with an MED score below a certain level and, similarly, the cumulative number of people attended by food banks with an MED score below a certain level. Note the 96 food banks assessed distribute more than 200,000 tonnes and attend 250,000 people. Note also that, although a large fraction of the food distributed and of the people attended correspond to efficient food banks (i.e. with MED=1.0), a significant amount corresponds to relatively inefficient food banks. This means that an increase in the efficiency of those food banks would translate into a significant increase in the amount of food distributed and in the number of people attended by those food banks.

[FIGURE 3 HERE]

4. CONCLUSIONS

In this research, a survey was carried out to gather data on 96 food banks spanning 13 European countries. A descriptive statistical analysis of age, paid and volunteer staff, volume of food and number of people attended, was made. DEA-based efficiency analysis allowed the identification of the efficient and inefficient food banks, estimated potential improvements and benchmarks. Also, the local returns to scale and scale efficiency of each food bank have been estimated. Many of them exhibited DRS, i.e. are bigger than they should be. That may happen to some food banks that operate in certain countries in which this activity is more centralized.

Overall, it has been found that there are significant inefficiencies in the sector. Some food banks, whose best practices should be studied and copied by inefficient organizations, perform much more efficiently than the average. If all food banks achieve efficiency in the future, the amount of food processed and people attended would increase significantly. There is room for improvement in the

sector, which means that the existing food banks, with the help of the donor organizations, can make a bigger impact on their communities.

These results cover the research gap about European Food Banks, because most of the existing literature reviews are related to food banks located in the USA and Canada, where food banks have their origins. However, this is just a first analysis that must be considered taking into account the specific characteristics of assessing efficiency in non-profit organizations and their inherent objectives; further research is needed to gain more insights on the issue. For instance, a cluster analysis to more clearly identify the characteristics of the European food banks could be very illustrative for comparing with the benchmarks of the industry. Also, considering in more detail the social and economic characteristics of each country in the analysis could offer more accurate results. In fact, this research has been limited to FEBA affiliated organizations, while some European countries are out of this federation. Future work could also include an analysis of the different ways some countries have organized these activities.

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Country	Total food banks	Questionnaires received	Response rate
Belgium	9	5	56%
Estonia	11	2	18%
France	76	15	20%
Hungary	1	1	100%
Ireland	1	1	100%
Italy	21	3	14%
Lithuania	1	1	100%
Poland	24	1	4%
Portugal	20	18	90%
Serbia	1	1	100%
Slovakia	1	1	100%
Spain	55	46	84%
United Kingdom	15	1	7%
TOTAL	**236**	**96**	**40.7%**

Table 1. **Collection data about European food banks**

No.	Question	Input/output
1	Foundation year	I
2	Number of volunteer staff	I
3	Number of permanent staff	I
4	Average age of volunteer staff	
5	Average time of volunteers working in the food bank	
6	Tonnes of food managed	O
7	Number of organizations' recipients of food	
8	Number of final users' recipients of food (through the organizations)	O

Table 2. **Items in the questionnaire and their role in the DEA model further developed**

Country	Number of volunteer staff	Number of paid staff	Age of volunteers	Average no. of years of service in the FB
Belgium	61.8	3.2	66.4	6.0
Estonia	57.0	2.1	38	2.6
France	77.9	5.7	62.2	5.5
Hungary	30	8	35	4
Ireland	20	4	46	2
Italy	311.0	9.7	62.3	8.3
Lithuania	324	32	28	1
Poland	8	5	35	N/A
Portugal	32.9	3.2	N/A	N/A
Serbia	2	1	17	1
Slovakia	60	0	50	7
Spain	43	1.5	58.1	6.0
UK	27	3	45	1.2

Table 3. **Average values regarding the staff of the food banks (year 2013)**

DMU	Country	MED_0	θ_0^{scale}	RTS	DMU	Country	MED_0	θ_0^{scale}	RTS
1	UK	1.000	1.000	IRS	49	FR	0.296	1.000	MPSS
2	BE	0.423	0.996	DRS	50	FR	0.333	1.000	MPSS
3	BE	0.797	0.861	DRS	51	ES	0.333	1.000	MPSS
4	BE	0.281	0.759	DRS	52	IE	0.631	0.978	IRS
5	BE	0.576	0.859	DRS	53	FR	0.248	1.000	MPSS
6	ES	0.494	0.962	DRS	54	FR	0.333	1.000	MPSS
7	ES	0.427	0.992	IRS	55	FR	0.239	1.000	MPSS
8	ES	1.000	1.000	MPSS	56	FR	0.299	1.000	MPSS
9	ES	0.333	1.000	MPSS	57	HU	1.000	1.000	MPSS
10	ES	1.000	1.000	MPSS	58	RS	1.000	0.581	IRS
11	ES	0.333	1.000	MPSS	59	IT	0.558	0.977	DRS
12	ES	0.509	0.976	DRS	60	SK	1.000	1.000	MPSS
13	ES	0.728	0.676	IRS	61	ES	0.742	0.933	DRS
14	ES	1.000	1.000	MPSS	62	FR	0.282	1.000	MPSS
15	ES	0.681	0.870	IRS	63	FR	0.283	1.000	MPSS
16	ES	0.379	0.995	DRS	64	BE	1.000	0.971	DRS

17	ES	0.618	0.953	DRS	65	IT	0.497	0.984	DRS
18	ES	0.509	0.872	IRS	66	EE	1.000	0.017	IRS
19	ES	0.434	0.998	DRS	67	IT	1.000	1.000	MPSS
20	ES	0.617	0.955	IRS	68	FR	0.327	1.000	MPSS
21	ES	0.486	0.996	DRS	69	FR	0.336	0.990	DRS
22	ES	1.000	1.000	MPSS	70	FR	0.284	1.000	MPSS
23	ES	0.692	0.966	DRS	71	FR	0.441	0.898	DRS
24	ES	0.437	0.989	DRS	72	FR	0.319	1.000	MPSS
25	ES	0.703	0.989	DRS	73	FR	0.333	1.000	MPSS
26	ES	0.428	0.999	DRS	74	ES	0.870	0.974	DRS
27	ES	0.333	1.000	MPSS	75	ES	0.457	0.985	DRS
28	ES	0.592	0.992	IRS	76	FR	0.333	1.000	MPSS
29	ES	0.617	0.982	DRS	77	PT	0.474	0.996	DRS
30	ES	0.575	0.951	IRS	78	PT	0.536	0.965	DRS
31	ES	0.462	0.991	DRS	79	PT	0.242	1.000	MPSS
32	ES	0.449	0.834	IRS	80	PT	0.333	1.000	MPSS
33	ES	1.000	1.000	MPSS	81	PT	0.516	0.994	DRS
34	ES	0.475	0.992	DRS	82	PT	0.511	0.985	DRS

35	ES	1.000	1.000	MPSS	83	PT	0.414	0.948	DRS
36	ES	0.370	0.999	DRS	84	PT	0.225	1.000	MPSS
37	ES	0.861	0.980	DRS	85	PT	0.488	0.863	IRS
38	ES	0.528	0.980	DRS	86	PT	0.540	0.911	IRS
39	ES	0.456	0.994	DRS	87	PT	0.410	0.961	IRS
40	ES	0.568	0.559	IRS	88	PT	0.333	1.000	MPSS
41	ES	1.000	0.997	DRS	89	PT	0.220	1.000	MPSS
42	ES	0.912	0.960	DRS	90	PT	0.594	0.990	DRS
43	ES	0.333	1.000	MPSS	91	PT	0.627	0.987	DRS
44	ES	0.490	1.000	DRS	92	PT	0.327	0.974	IRS
45	ES	0.514	0.930	DRS	93	PT	0.306	0.875	IRS
46	ES	0.288	1.000	MPSS	94	PT	1.000	0.301	IRS
47	ES	0.551	0.988	DRS	95	PL	1.000	1.000	MPSS
48	EE	0.271	1.000	MPSS	96	LT	0.428	0.943	IRS

Table 4. **Efficiency assessment results (year 2013)**

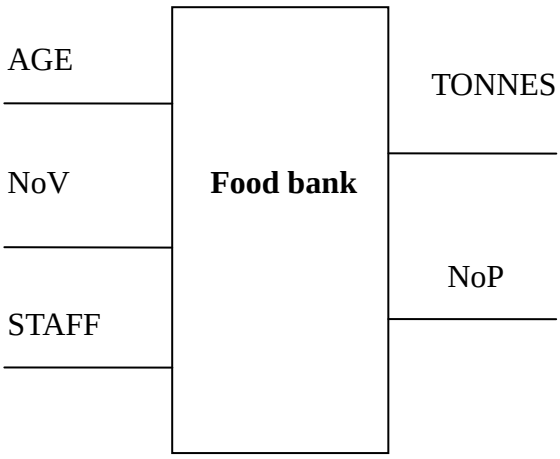


Figure 1. **Inputs and outputs considered for efficiency assessment**

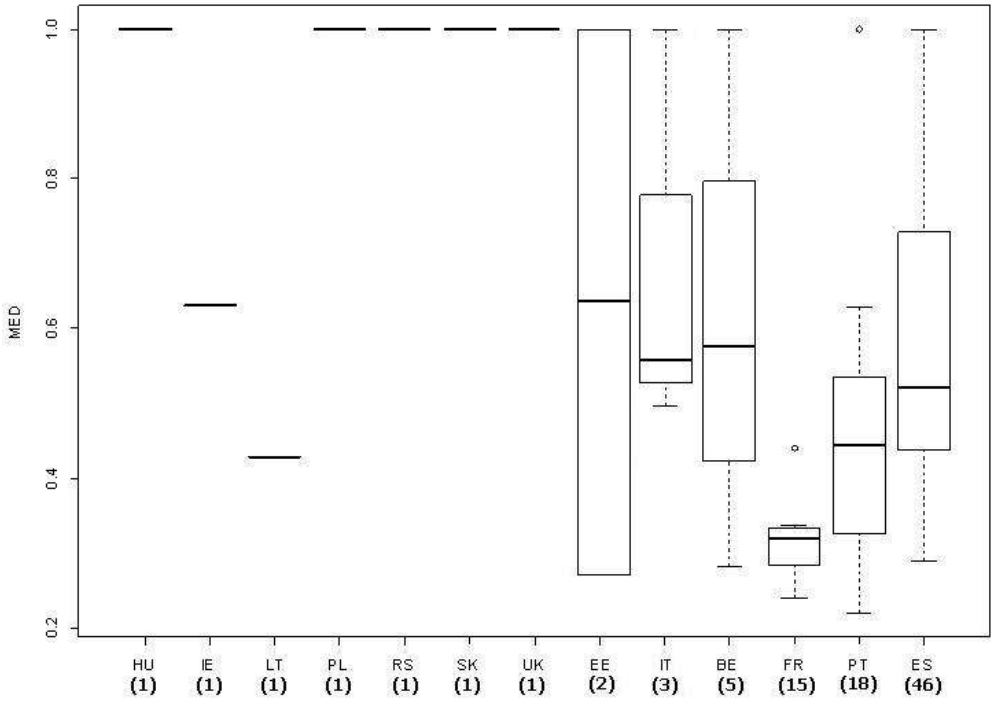
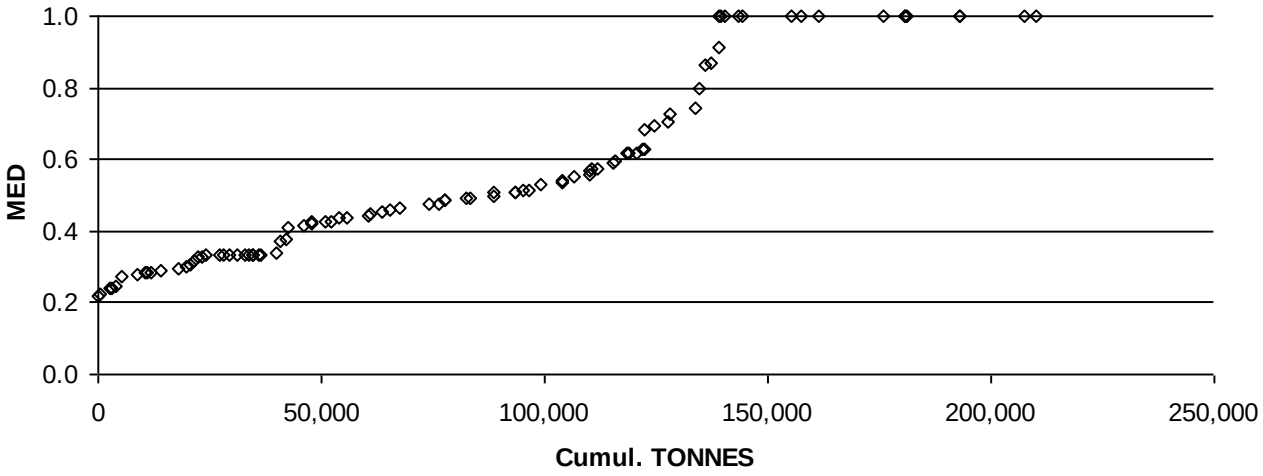


Figure 2. **Boxplot with MED values per country, sorted by number of food banks in each country**



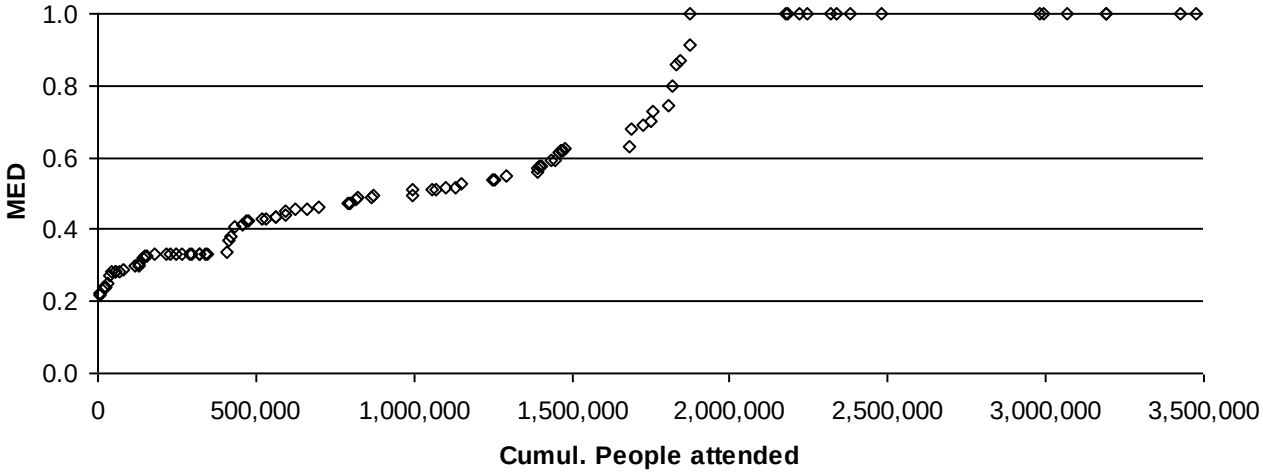


Figure 3. **MED versus cumulative TONNES and NoP**