MEASUREMENT OF EFFICIENCY IN CULTURAL INSTITUTIONS

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Abstract

Cultural institutions can be run as public institution as well as private one. In both cases they need to be efficient. Efficiency of cultural programs is rather specific for it ranges in multivariable characteristics severely. Ownership being one of the characteristics, the other one might be permanency of museums expositions or changed topics in their expositions or partly permanent and partly varying its shows to achieve increase in number of visitors. As for groups of visitors; it can be distinguished for permanent residents, who have almost effortless accession to enjoy provided service. Visitors from abroad expect higher quality as they have travelled and their expenses are higher in terms of money and especially time. Only with this few variables mentioned it was sketched how complex is the crux of such institutions as the cultural ones. Paper aims for first statistical view on data of cultural institutions in Slovak Republic, it will mainly be descriptive statistics. Based on examination of the data and literature the main result is producing hypothesis regarding efficiency of cultural institutions. Third additional aim is using Data Envelopment Analysis (DEA) for a modest validity check of hypothesis suggested for further research.

Key words: cultural institutions, visitors, data envelopment analysis

JEL Code: Z10, Z30, R10

Introduction

Active involvement of recipient of the public service such as cultural institutions (theatregoers, visitors) influences an efficiency of provising. This means that in order to produce the service it is first to allow it, to offer a potential of museum collections and second to welcome visitor, who can either amuse or learn or transform his/her visit to his individual outcome. This outcome then is manifold in its substance, but measured by a number of visits,

sometimes also satisfaction questionnaires can take place or simply a book of visitors, blog for sharing your feelings etc.(Witte & Geys, 2011) Similarly, with the authors Witte and Geys we employ Data Envelopment Analysis (DEA) for the sake of finding efficiency units in our sample. Despite the fact that we apply traditional variables for this DEA we would suggest to apply also less conventional data in future such as: data about use of a cultural institution web-site. As we consider this already a part of a service that brings utility to user. For instance, when a museum informs about existence of certain exhibition or advertises a T-shirt linked with exhibition content and having special features that attract youngsters such as android applications. It is all extra bonus service that increases chances to visit cultural institution even several times. Thus the product of cultural institution is becoming more complex and compound one or in other words there is more than one output to cultural institution.

Cultural institutions (museums, galleries and the like) are amongst tourists` attractions. Cultural institutions can be run as public institution as well as private one. In both cases they need to be efficient. Efficiency of cultural programs is rather specific for it ranges in multivariable characteristics severely. Ownership being one of the characteristics, the other one might be permanency of museums expositions or changed topics in their expositions or partly permanent and partly varying its shows to achieve increase in number of visitors. As for groups of visitors; it can be distinguished for permanent residents, who have almost effortless accession to enjoy provided service. Visitors from abroad expect higher quality as they have travelled and their expenses are higher in terms of money and especially time. They need to choose wisely which of the attractions they are going to see as their time of trip is rather limited. Only with this few variables mentioned it was sketched how complex is the crux of such institutions as the cultural ones. Paper aims for first statistical view on data of cultural institutions in Slovak Republic, it will mainly be descriptive statistics. Based on examination of the data and short meta-analysis of literature the main result is producing hypothesis regarding efficiency of cultural institutions - museums. Third additional aim is using data envelopment analysis (DEA) for a modest validity check of hypothesis suggested for further research.

Evaluation of cultural institutions is not possible to be realized only by means of financial indices for these institutions have variety of goals. To evaluate these goals there are methods appropriate and comparing variety of inputs and outputs. It is mainly non-parametric models that are traditionally used for measurement of relative efficiency of service

production, e.g. DEA (Data Envelopment Analysis). DEA is often used to search efficiency in museums by use of Free Disposal Hull (Mairesse & Eeckaut, 2002) or input-oriented models of DEA (Basso & Funari, 2004) and output-oriented models (Herrero-Prieto, 2017).

1 Measurement of efficiency – preparing and analysing data

1.1 A few notes towards methodology of efficiency in general

In respect to analyse efficiency of service of cultural institutions, a Free Disposal Hull (FDH) (Deprins, 1984 In: Daraio & Simar, 2005) could be appropriate to employ for some of the collection were found by archaeologists or were a gift to a museum, therefore there such items are missing buying price. FDH analysis is dispensing the convexity assumption and provides estimator, popularized as linear programing estimator in DEA (Charnes et al., 1978 In: Daraio & Simar, 2005). It also reflects inefficiency postulate from technical point of view. Statistical inference based on DEA/FDH type of estimators, particularly bootstrap could be applied for categorical factors (ownership in three forms: municipalit – Slovak equivalent in statistics: obec, upper-tier-territorial unit authority - Slovak equivalent in statistics: VUC, state – Slovak equivalent in statistics: štát, other legal form of the business - Slovak equivalent in statistics: iná právna forma). FDH can dominate the DEA approach on the goodness-of-fit criterion (as it was the case of Belgian banks, where "FDH is supported by 75% of the observations, whereas DEA; the DEA frontier, even allowing for variable returns to scale, is supported by only 5% of the observations. (Chander, Drèze, Lovell, & Mintz, 2007 , p. 284)).

Another point to be made in terms of methodology is that resources available for cultural institutions are "not free to divert" (Charnes, Cooper, & Rhodes, 1978, these authors` names stand for CCR model hereinafter) to other programs, e.g. different displays or exhibits, thus referring to relative efficiency for outputs that there real market does not exist, i.e. market for museum collections. Therefore it is of advantage to consider the Allen partial elasticity of substitution or Morishima elasticity of substitution as there is a multiple-input and Multifactor productivity index as well (T. J. Coelli, Rao, O'Donnell, & Battese, 2005).

DEA models in general offer a result by means of so-called virtual unit that suggests an improvement of inputs (cost minimization) and / or outputs (revenues maximization). Assumptions about returns to scale (constant or variable) are of importance, according to this criterion we distinguish model CCR and BCC, i.e. Banker, Charnes, Cooper (these authors names` stand for – BCC model). That model was used in this research (Banker, Charnes, & Cooper, 1984) and returns to scale were variable (VRS). As already mentioned classification

is BCC and CCR that can be both input or output oriented can be broaden as shown in Figure 1, where N is number of outputs and M is number of inputs. Authors, that we have adapted the figure from, were showing adequacy of when to use DEA analysis.

Fig. 1: Classification of problem situation and adequate DEA use

<table>
<tr><td colspan="3" rowspan="2"></td><td colspan="4">Output</td></tr>
<tr><td colspan="2">problems of valuation: No</td><td colspan="2">problems of valuation: Yes</td></tr>
<tr><td colspan="3" rowspan="2"></td><td>N=1</td><td>N>1</td><td>N=1</td><td>N>1</td></tr>
<tr><td rowspan="4">Inputs</td><td rowspan="2">problems of valuation: No</td><td>M=1</td><td rowspan="2">Situation 1:
Performance-cost ratio</td><td rowspan="2">Situation 2:
Unit costs</td><td rowspan="2">Situation 5:
Allocation Input-Efficiency
Cost Efficiency (total)</td></tr>
<tr><td>M>1</td></tr>
<tr><td rowspan="2">problems of valuation: Yes</td><td>M=1</td><td rowspan="2">Situation 3:
Financial productivity</td><td>Situation 4:
Physical productivity</td><td rowspan="2"></td></tr>
<tr><td>M>1</td><td colspan="2">Situation 6:
Allocation Output-Efficiency
Revenue Efficiency (total)</td><td>Situation 7:
Technical Efficiency</td></tr>
</table>

Source: translated from (Musshoff, Hirschauer, & Herink, 2009)

Productivity is defined as a ratio of outputs and inputs. It explains efficiency of employing inputs for producing a desired level of outputs (T. Coelli & Perelman, 1999). Its interpretation is profit for one unit of output.

$$Productivity = \frac{output}{input} \qquad (1)$$

Following this, paper takes advantage of examined subjects with highest productivity and productivity of the rest of subjects in the sample in comparison to the most productive unit. This can be stated as ratio of productivity of the subject and maximal productivity achieved. This ratio is efficiency.

$$Efficiency = \frac{productivity\ of\ unit}{maximal\ productivity} \qquad (2)$$

Afterwards, DEA searched efficiency of museums in terms of multiple inputs and outputs. Coefficient of efficiency calculation itself was achieved with help of proportional index of sum of weighted outputs and inputs. This is formulated as follows (Jablonský & Dlouhý, 2004):

$$Efficiency = \frac{weighted\ sum\ of\ outputs}{weighted\ sum\ of\ inputs} = \frac{\sum_{j=1}^{n} u_j y_{jk}}{\sum_{i=1}^{m} v_i x_{ik}} \leq 1 \qquad (3)$$

where:

v_i ; i = 1, 2, 3, ..., m, are weights of i–th input

u_j, j = 1, 2, 3, ..., n, s are weights of i–th output

x_{ik}; values of input variables for k-th production unit

y_{jk}; values of output variables for k-th production unit.

1.2 Particular notes on efficiency in sample of cultural institutions - museums

Paper analysis technical efficiency of museums in Slovak Republic in year 2017. Museum inputs for its specific production are: expositions, employees, museums funding of state budget, grants or donors and others. Outcomes of this specific production of museum`s service are often exhibitions, events, number of visitors, revenues and others. This paper has aim to find efficiency of museums in terms maximum production, keeping the inputs unchanged, the most of outcomes. It is an output-oriented DEA model: BCC model with assumed VRS. Inefficiency postulate becomes information about inefficient units and their outcomes that are suggested for change in order to achieve efficiency. We examined how the outcomes of efficiency were changing, when we include volume indicators into models and subsequently volume indicators plus financial ones.

The analysis focused on variables from data of Ministry of Culture of the Slovak Republic (It is evidence under KULT 9-01). Yearly produced reports on museums (KULT 9-01) cover data on:

- Modul 1: with information on expositions and outcomes of museum, where volume indicators can be found such as number of collections` objects, exhibitions, number of visitors, published books etc.,

- Modul 2 watches for economic indicators such as revenues, own earnings, operational costs of museum, capital expenditures etc.,
- Modul 3 provides us with information on employees' characteristics.

For the calculation of productivity and efficiency of museums, basic indicators were selected: subsidy, objects, expositions events, exhibitions, collection objects, new collection objects, renovated objects, digitalization of objects and documents, published documents, employees and visitors. As for the financial indicators total expenditures of museum and own earnings of museum were selected for analysis.

We have analysed museums with all data filled. As for the sample: one outlier was dismissed from observations. It was the Spiš Castle for it there was lack of information on new collections. Otherwise it is a significant cultural institution, with number of visitors reaching 306 439 persons and with revenues of 881 820 EUR in year 2017.

We have generated model with specifications concerning: (1) Inputs: number of employees, total expenditures and (2) Outputs: number of events and visitors.

In the DEA analysis, we evaluated two most frequently used simple DEA models, i.e. the BCC and the CCR model. As mentioned above, the difference between the models is that the CCR model considers a constant return to scale (thus, a change by a unit on the side of inputs leads to the same change by one unit on the side of outputs). The BCC model considers a variable return to scale (thus, a change by a unit on the side of inputs results in a bigger or smaller change than by a unit). Therefore, the results of the BCC model take into account the museum's size. As we compare museums of different sizes, the BCC model is more suitable for the analysis. The DEA analysis was performed using DeaSolver software.

2 Measurement of efficiency – analysing data - results

There were two models that allowed comparison. First model (referred to as DEA_1 hereinafter) was set-up with two inputs: number of employees and total expenditures and two outputs: number of events and visitors. Second model (referred to as DEA_2 hereinafter) was set-up with the same two inputs: number of employees and total expenditures and three outputs: number of events, visitors and own earnings.

We examined museums in Slovak Republic. Basic description of sample is in Table 1 regarding variables (inputs, outputs).

Tab. 1: Descriptive statistics for sample as of 2017 (N=103)

2017	Max	Min	Average	SD
Employees	96	0	20	21
Expenditures	9 941 533	0	501 620	1 062 466
Events	573	0	80	120
Visitors	375 072	201	40 280	62 659
Own earnings	1 210 679	0	100 383	209 616

Source: own based on calculation

As for the ownership, it could be identified with founding body, i.e. state or governmental institution, municipalities at different level (towns, districts), others. Frequencies are shown in Table 2.

Tab. 2: Number of museums regarding founder ownership as of 2017

2017	Number	Relative frequency
State	35	34%
Upper-tier territorial unit (VUC)	34	33%
Municipality	20	19%
other legal form of the business	14	14%
Total	**103**	**100%**

Source: own based on calculation

Finally, Table 3 divides museums for efficient and inefficient. DEA_1 model recognized 11 museums as most efficient ones, whereas DEA_2 model already 16 cultural institutions. The change of only one variable was having obvious impact on results.

Tab. 3: Number of museums regarding score – comparison of DEA_1 and DEA_2

Score	DEA_1		DEA_2	
1	11	*10,7%*	16	*15,5%*
0,8	6	*5,8%*	8	*7,8%*
0,5	11	*10,7%*	20	*19,4%*
0,2	15	*14,6%*	19	*18,4%*
0	60	*58,3%*	40	*38,8%*
Total	**103**	***100%***	**103**	***100%***

Source: own based on calculation

Further inspection of data was even more intriguing, but this would be beyond the scope of this paper. It can also be considered for one of many limitations this paper has. The score was broken to intervals, separately for the top ranking (score=1) and so forth.

Detailed information on change of variables in the two models are in Table 4. Ratio indicators are enriching understanding of only efficient part of the sample, i.e. museums ranking in top of the list among 103 examined institutions. In DEA_1 and DEA_2 it was 11 and 16 respectively. Expenditure per employee is worse in DEA_2, because of the change in expenditures. Other particulars are left for discussion or opened, for instance in digital era the number of employees may be decreasing with substitution of artificial intelligence and the like.

Tab. 4: Average values of indicators and values of ratios for efficient museums (score=1) – comparison of DEA_1 (n=11) a DEA_2 (n=16)

Indicators	**DEA_1 Mean**	**DEA_2 Mean**	**Ratio indicators**	**DEA_1 Mean**	**DEA_2 Mean**
Employees	3	11	Expenditure/employee	14 200	21 656
Expenditures	41 311	231 451	Visitors/event	647	469
Events	136	146	Earnings/visitor	x	2,3
Visitors	87 781	68 463	Earnings/event	x	1 100
Own earnings	x	160 594	*x*	x	*x*

Source: own based on calculation

Conclusion and next challenge

We understand that museums are often related to region then its expositions are specialized for famous artists, composers or companies. Some museums are focused on fundamental themes such as nature. Other museums can be unspecified, very specific or a mixture of the previous two main groups. Museums were the cultural institutions in this paper to provide an example for measurement of efficiency to such organizations that are to preserve treasures of various values people and priceless treasures for the markets sake.

It could be appropriate to challenge not only cultural institutions itself but also a measurement methodology to collect data necessary for assessment complex public goods in new era of digitalization. Often the collections are digitalized in numerous ways, interactive use.

As suggested in few notes towards methodology of efficiency in general the approach of FDH would have been of advantage. Especially the approach described by Ray (2004, p. 134) the efficiency measurement without convexity assumption. Another point leading towards new hypothesis for further research is obviously the fact that collections are unique for each museum. However, a modification of collections and its offer to visitors is digital provisioning. By this we overlap with public goods that allows a broad space for creating new visions for hypothesis.

We understand the limitations of the paper, nonetheless results of research showed us importance of methodology approach. Variables measurement and their application in models can bring diverse reflections for reality of cultural institutions.

Acknowledgment

This work was supported by the grant VEGA 1/0806/18.

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