



ACEI working paper series

**SUPPORTING THE DANCE SECTOR. DOES
EFFICIENCY CLASH WITH SUCCESS WHEN
PROGRAMMING?**

Maria Jose Del Barrio-Tellado Luis Cesar Herrero-Prieto

AWP-03-2018

Date: July 2018

SUPPORTING THE DANCE SECTOR. DOES EFFICIENCY CLASH WITH SUCCESS WHEN PROGRAMMING?

María José DEL BARRIO TELLADO(*) and Luis César HERRERO-PRIETO
Universidad de Valladolid (Spain)
mjose@emp.uva.es - herrero@emp.uva.es

Abstract

Dance has received scant attention in economic literature perhaps because it is an activity that appears under a number of legal forms and diverse formats and due to the fact that –in many instances- it is affected by a high degree of instability time-wise, thus making it difficult to have the necessary data available required for economic analysis. Nevertheless, this sector's dependence on public funding provides grounds for it to be the subject of performance related studies. This work aims to offer an evaluation process for a public project designed to spread dance in Spain. The project involves a number of stakeholders: public authorities, performance venues and dance companies. Each participant plays a role in the project: public authorities provide the funding while the theatres and dance companies offer the artistic idea that is taken to the audience. By applying Data Envelopment Analysis techniques (DEA), the present work seeks to evaluate the efficiency of the stakeholders involved in the project, as well as the efficiency of the programme itself by relating resources and objectives. We find that efficiency in resource performance often runs counter to other cultural aims such as increasing audiences or extending repertoire diversity.

JEL Codes: Z11, C61, H44, L83

Keywords: Efficiency evaluation, dance sector, performing arts, data envelopment analysis, Spain

(*) Corresponding Author

Department of Accounting and Finance and Recognized Research Group on Cultural Economics

Faculty of Commerce. University of Valladolid

Plaza del Campus Universitario, 1 47011-Valladolid, Spain

Tel. +34 983 184642 // Fax: +34 983 423 056

www.emp.uva.es/giec

Acknowledgments

We kindly thank the participants at the Sessions on Performing Arts held at the International Conference on Cultural Economics (ACEI Melbourne 2018) for the comments and discussion on a preliminary version of the paper. All remaining errors are our own.

1. Introduction

Economic studies exploring dance have failed to receive as much attention compared to other cultural goods and services. Framed within the domain of performing arts, dance reflects many of the features inherent to the sector such as the labour intensive nature of its productions and a cost structure that evidences few significant gains in productivity, thereby condemning it to the typical performance outcomes resulting from the so-called costs disease (Baumol and Bowen, 1966) and the inevitability of having to rely on public funding. One part of dance shows is identified with the most refined cultural and classical version, ballet, and therefore resembles studies into opera, with which they often share an orchestra and resident theatre. Public intervention in this field, in the form of maintaining so-called *national dance companies* is justified on the basis of merit goods arguments, and even protection of inherited cultural heritage (Schimmelpfennig, 2003), an issue which may be extended not only to classical ballet, but also to other ethnic dances and forms that are the fruit of cultural idiosyncrasies, such as flamenco in Spain (Aoyam, 2009). Yet these types of dance live alongside other more popular forms of dance that have survived in the market as viable projects. These range from musicals, which combine dance, acting and singing and that prove very popular, to a wide variety of differing dance styles (ethnic, popular, hip-hop, urban dance, etc.) in which a large group of professionals and aficionados survive, offering artistic productions and many times focusing on teaching dance as a leisure activity.

As pointed out, the economic literature on dance remains quite limited. Attendance and the drivers of cultural participation in the sector have been analysed by Schimmelpfennig (1997) and Borowiecki and Marvao (2015). The former examines performances of the UK Royal Ballet and finds that demand for ballet exhibits a significant downward trend; whereas the latter analyse dance participation and attendance in Denmark, reflecting the strong correlation between cultural participation and the well-being of this particular audience group. Skinner (2013) also argues that dancing contributes to higher levels of happiness, social inclusion and better ageing, even for those who do not practice dance professionally. We can also find positive externalities in terms of the socioeconomic benefits derived from specific activities and events related with dance, as evidenced by Palma et al. (2013) for the spring fiestas in Seville. As regards labour market studies in the dance sector, Montgomery and Robinson (2003) analyse the earnings and work conditions of dancers, showing that returns to dance are small and that many dancers have a second job to increase their incomes. Finally, Tobias (2004) discusses the quality of performing arts, including ballet, based on expert judgements.

Based on these premises, the present study addresses one of the lesser explored issues in this domain, namely the organisation of the dance sector and an evaluation of various stakeholders' performance: the dance companies as cultural creators and the venues where they stage their productions. For this, we use participation in an incentive programme for dance fostered by the public sector in Spain between 2001 and 2016, specifically the *Danza a Escena* programme, promoted by the Spanish Ministry of Culture through the National Institute of Performing Arts and Music (INAEM) and implemented by the Spanish Network of Public Theatres in conjunction with associated performing arts areas.

Studies evaluating the performance of performing arts have benefitted from a number of different contributions over the last few years in the field of theatres and music, although less so in the dance sector. The work of Throsby (1977), which estimates a Cobb-Douglas production

function for a set of non-profit institutions in the performing arts sector in Australia, may be deemed the starting point. Other works have subsequently proposed an estimation of cost functions in the area of symphony orchestras (Lange et al., 1985 and Lange and Luksetich, 1993), and theatres (Taalas, 1997, Zieba, 2011). The lack of evaluation studies in the field of dance as a specific artistic discipline is due to a number of reasons, basically because it is a heterogeneous sector involving a small number of accredited companies who usually hold the status of *resident companies*, together with other smaller yet more numerous companies that survive by taking part in various performing arts circuits, competitions and festivals. The major resident companies may be public –as is the case of the large national companies - or private, although all of them maintain stable funding and activities linked to a specific performing sector. In contrast, the other companies suffer from a certain degree of instability due to their having no permanent link to a fixed performing area, depending as they do on how much they participate in each performing season or campaign. This lack of uniformity is also reflected in the legal status chosen by the companies. In the case of Spain, whilst some of the main public companies such as the National Dance Company and the Spanish National Ballet receive funding through the budget of the INAEM and form part of the public authority structure, private companies –which are larger in number- adopt a different legal status: as an individual company, a limited company, a non-profit entity, and even as self-employed workers who hire dancers for a limited number of days in order to fulfil performing engagements. This proves to be a major obstacle when attempting to access financial and performance related data that would allow efficiency evaluation studies to be carried out into the various units involved in the sector.

Despite the difficulties highlighted, there are key reasons justifying the timeliness of efficiency evaluation studies into management in the field of dance. Firstly, the difficulties companies face when seeking to secure financial resources underlines the importance of analysis geared towards enhancing performance from an economic standpoint. Secondly, the various performing areas and venues may also be keen to evaluate and compare their programming strategies. Finally, the public sector, as a supplier of many of the financial resources channelled into the dance sector, demands information concerning how the funds provided are being used and regarding the extent to which the aims pursued by the programme designed to foster the performing arts are being met.

Our work thus seeks to make an innovative contribution to efficiency and performance evaluation in the dance sector, where studies remain few and far between. To achieve this, we draw on a case study involving the participation of various stakeholders in a national programme aimed at promoting the dance sector in Spain and which, in turn, pursues various objectives linked to the growth in the number of performances being staged, the spectators as well as diversity in performing arts productions. The methodological innovation lies in the fact that the activity being evaluated is carried out jointly by two kinds of bodies (dance companies and performance venues), forcing us to identify the goals established for each of them and to assess the achievements accomplished by each separately. The aim is not, therefore, to evaluate stakeholder behaviour in the market but rather to gauge their performance in a specific programme in the field of dance promoted by the public sector. The outcomes to emerge will therefore prove useful in three aspects: estimating the degree of success of dance companies in performing arts production, measuring management performance when handling performing arts venues and, finally, assessing how effective a public incentive programme has been.

The work is organised as follows. Section 2 provides a review of works addressing efficiency and productivity in performing arts. Section 3 describes the elements that make up the sample in

our case study and presents the methodological approach applied. The results to emerge from the research are presented in section 4. The work finishes with the main conclusions reached.

2. Literature review on the efficiency evaluation of performing arts

Despite the gap between the artistic and the economic value of cultural activities and the difficulty in translating many cultural institution functions and the resources employed to achieve them into actual goods and services, works related to efficiency evaluation in the area of culture have made great strides in recent years (Fernández-Blanco et al., 2013). This interest stems from the need to measure the management performance of the institutions that provide cultural goods and services using rational criteria, particularly at the present time, ensuring survival that depends on a necessary agreement between artistic values, social function and rational management criteria (Daigle and Rouleau, 2010), given the dwindling financial resources available. This rekindles interest in evaluating how efficiently cultural entities are managed in an effort to gauge the efficient use of available resources. In this regard, efficiency studies –into any branch of activity- seek to link the resources employed to the aims achieved. Measuring the relation or gap between the two may be addressed in a number of ways. One initial approach involves resorting to tables of simple indicators to assess various aspects of management. Such is the line followed, for example, by the work of Turbide and Laurin (2009), who select a set of variables and financial ratios that provide comparisons in a wide network of performing arts institutions in Quebec, Canada, or the study by Weinstein and Bukovinsky (2009) who summarise various management indicators in the form of an integrated dashboard for the institution analysed, the Boston Lyric Opera. Nevertheless, such techniques do not allow the units analysed to be ranked since they fail to provide measures of relative efficiency that simultaneously compare the results obtained in terms of the resources used.

Such a limitation may be overcome by using frontier techniques that examine the position of each entity vis-à-vis a frontier of efficient behaviours that can be estimated through parametric or non-parametric methods. Parametric models for estimating stochastic frontiers have often been used in the field of culture and more specifically in the performing arts sector. Framed within this category is the work of Last and Wetzel (2010), which focuses on publicly owned German theatres; Zieba (2011), which estimates the production technology and production efficiency of a sample of 20 Austrian and 30 Swiss non-profit theatres, and Castiglione et al. (2017) who evaluate the determinants of a firm's technical efficiency in the Italian performing arts sector by estimating a stochastic production frontier for an unbalanced panel of 107 firms. Other works in this area include Taalas (1997) and Fernández-Blanco et al. (2017), who expand current understanding in the field of allocative efficiency, taking a sample of Finnish and Polish theatres, respectively, as their focus of analysis.

Another group of studies to address efficiency in the performing arts sector draws on the use of non-parametric techniques, principally data envelopment analysis (DEA), to estimate the frontier of efficient behaviour. This approach has been less common in the field, although it does adapt conveniently to the features of the sector where production processes are highly complex and involve different types of activities and intermediaries. Moreover, these techniques are also suited to evaluating multi-output production functions. In this regard, it should also be remembered that the public funding allocated to certain programmes in the field of performing arts is not confined to drawing as large a number as possible of attendees to the scheduled

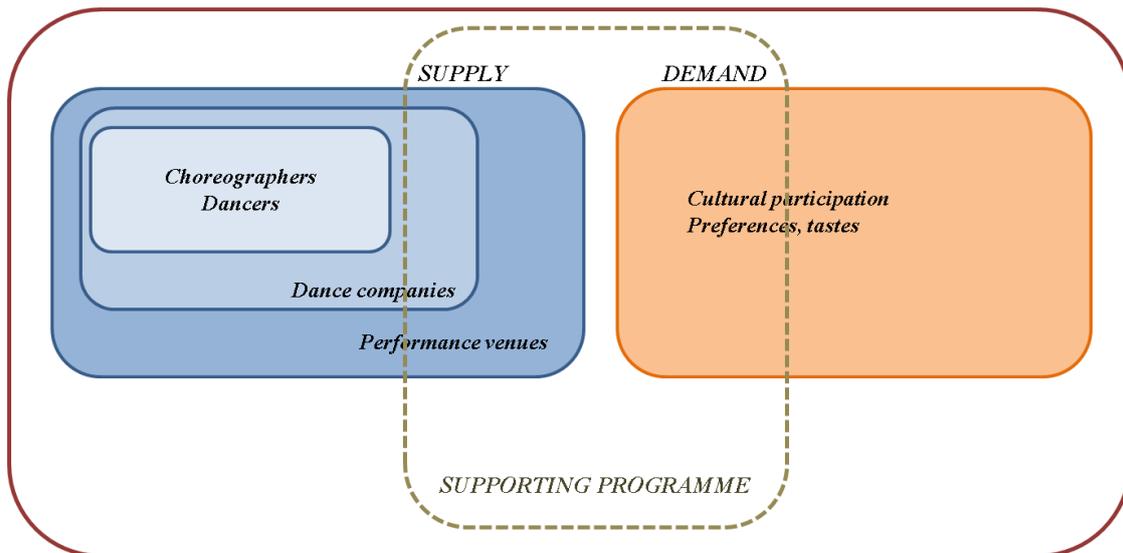
events but also pursues other goals such as disseminating new genres, creating new audiences, or providing access to performing areas for less popular creative formats that do, however, foster cultural diversity. From this standpoint, DEA efficiency evaluation techniques emerge as an ideal tool for performance assessment in the performing arts sector and have been the preferred option in works such as Marco-Serrano (2006), who evaluate the technical efficiency of a regional network of theatres in Spain using different performing models, or Rausell et al. (2013), who measure the efficiency of a network of music associations. The work of Boyle and Throsby (2012) pursues a similar line, in this case focusing on estimating the relative efficiency of a small group of orchestras in Australia in an effort to pinpoint the effects brought about by a change in their organisational structure. Similarly, Gómez and Herrero (2017) calculate a quality indicator for Spanish symphony orchestra repertoires using DEA. Finally, Hong (2014) posits a two-stage DEA model that allows for the efficiency evaluation of fundraising activities as well as a programme that provides services to the community, for a set of 48 young orchestras in the United States.

As outlined thus far, various contributions have been made to measuring performance in the performing arts sector although, to the best of our knowledge, no study has to date specifically addressed the field of dance as its subject matter. In this regard, our work aims to assess the efficiency of a programme designed to promote dance in Spain, using non-parametric techniques, DEA. This programme was devised by the public authorities and led to an annual circuit of dance shows involving two kinds of actors: the dance companies themselves, who provide the primary cultural supply, and the theatres and venues, who distribute and stage the performances. Each type of participant therefore plays a different role within the programme, which is why we are forced to posit a two-fold performance analysis model, which is described in the following section.

3. Case study and methodological approach

We start with a diagram of the chain of value in the dance sector, summed up graphically in Figure 1. On the supply side, we have the primary artistic, choreographic and dance performer resources, which face the same initial obstacles when seeking to enter the labour market as many cultural producers or creators in other fields and which entail demonstrating their talent, forging an accredited career and the particularities of stardom (Benhamou, 2003; Rosen, 1981). We then have dance companies as institutional units that organise the production and exploitation of the cultural work in question in a viable manner, whilst the performance venues constitute the means and infrastructure where said productions are staged, and which also take the form of an institutional body. The coming together of the two, artistic production and means of distribution and performance, represents the short side of the market, in other words the supply of dance shows which, on the demand side, are faced with audience consumption decisions and preferences. This is the artistic market of the dance sector, supply and demand, which in turn might involve the intervention or influence of public programmes that are subject to certain objectives, such as increased and more diverse supply or promoting cultural participation.

Figure 1. Dance market and chain of value



Based on this approach, we present the particular case study for this research. This involves the evaluation of a dance circuit called *Danza a Escena*, promoted by the Spanish Ministry of Culture, and which seeks to provide a meeting point that can bring together dance companies and firms, on the hand, and publicly owned theatres and concert halls, on the other. The general aim of the programme is to increase the presence and visibility of dance in the programmes of publicly owned performance venues. Specifically, its particular goals are stated as being: to increase the number of dance shows and hired and expand their tours, foster the diversity and languages of artistic formats, and foster increased spectator numbers and the creation of new audiences. The project involves both the performance venues that configure and choose the final cultural supply that reaches the public, and the companies who put forward their artistic proposals to a panel of experts for initial selection, which is then revalidated through the selection of the actual performance venues. The programme guarantees 50% of the chosen company's fees for each performance with the venues agreeing to pay the remaining fifty percent.

This way of organising the activity leads us assess the performance of both kinds of participants in the programme, and how successful policy-makers have been in achieving their goals. Firstly, dance companies are involved in the programme by including quality shows that can draw audiences into the sector. Secondly the mission of the venues is to provide a diverse cultural programme able to attract the public and to foster the creation of new audiences. Finally, the programme as a whole seeks to secure increased demand for dance shows, as well as expanding the available supply and the artistic diversity.

The source of information for the work is provided by annual reports of the above-mentioned dance circuit between 2011 and 2016, taking as the starting point the second year the programme was in operation due to the lack of complete records for the first season. As can be seen in Table 1, data show a drop in the amount of funding available for the programme over the period in question, and a subsequent upturn after 2015, more or less in line with the economic crisis and the recovery. The total amount devoted to directly funding dance shows by the INAEM over the six years studied comes to more than one and a half million euros. This

accounts for half of the resources provided to the programme, with the total amount of public funding made available to the programme exceeding three million euros if we add the co-funding provided by the performance venues. The number of companies participating in the programme has remained more or less stable over the years, whereas the number of venues has increased over the last year, after a downward participation trend. The number of people attending has evolved along similar lines, reflecting the fact that demand is closely linked to the programme supply and not so much to the artistic production. Following on from this logic, the mean cost per attendee has increased, except for the last year due to the rise in the number of spectators, whilst the mean cost of the dance shows is associated to the level of dance company participation in the programme. Overall, the mean number of those attending per show has remained stable over the period analysed.

Table 1. Details of the funding provided and participation in the programme 2011-16

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|--------------------------|------------|-----------|------------|------------|-----------|------------|
| Companies | 18 | 24 | 21 | 16 | 20 | 24 |
| Performance venues | 79 | 76 | 47 | 43 | 37 | 56 |
| Spectators | 30,937 | 26,337 | 18,639 | 15,172 | 13,758 | 21,799 |
| Funded shows | 169 | 147 | 96 | 69 | 85 | 92 |
| Total shows | 174 | 169 | 102 | 83 | 100 | 118 |
| Mean attendance per show | 178 | 156 | 183 | 185 | 138 | 185 |
| Funding | 350,823.17 | 307,057.5 | 268,645.59 | 189,092.75 | 209,288.9 | 223,028.96 |
| Mean cost per spectator | 11.34 | 11.66 | 14.41 | 12.46 | 15.21 | 10.23 |
| Mean cost per show | 2,075.88 | 2,088.83 | 2,798.39 | 2,740.47 | 2,462.22 | 2,424.23 |

Source: annual *Danza a Escena* reports and authors' own.

Our study aims to evaluate how successful dance venues and dance companies are at accomplishing the objectives pursued by the circuit as a single unit. In other words, the aim is not to measure the programme's progression over time but to gauge a cultural intervention policy's ability to achieve a series of goals that involve drawing audiences to dance shows or fostering the diversity of artistic formats. A total of 98 different venues were thus identified that provide significant and regular participation over the six years the programme was running. Open public spaces have been excluded as have venues that have only taken part in the programme once. The idea is to prevent outliers entering the analysis, and which might reflect situations of closure or irregular participation. Table 2 shows minimum differences with regard to the number of attendees and mean costs depending on whether the whole sample is considered or only the part corresponding to venues that participate in the programme on at least a minimally regular basis, such that we understand that the results obtained based on the reduced sample may be extrapolated to the sample that includes all the venues. We also took the total number of dance companies participating in the programme, a figure which came to 91 over the period analysed. This is thus the basic sample involved and whose performance in the dance circuit we aim to evaluate.

Table 2: Mean participation and cost indicators for selected and whole sample

| | Whole sample | Selected sample |
|--------------------------|--------------|-----------------|
| Mean attendance per show | 167.0783 | 164.871 |
| Mean cost per spectator | 13.26745 | 13.43896 |
| Mean cost per show | 2216.702 | 2215.694 |

Source: annual *Danza a Escena* reports and authors' own.

The research’s methodological approach thus follows these premises, establishing two evaluation models; one for each agent taking part in the programme (see Figure 2). First, we evaluate the participation of venues as channels of cultural supply, and whose performance involves maximising audience appeal and programme diversity, subject to their material and financial resources. A simple production function is thus established that identifies as input variables the funding provided by the programme; in other words, half of the appearance fees for the companies’ shows (FUNDING-PV) and the available capacity (CAPACITY)¹. The chosen output variables are the number of spectators (SPECTATORS-PV) as a measure of the programme’s total impact, the number of scheduled works (OBRAS-PV), and the number of scheduled genres (GENRES), seen as a measure of the venue’s contribution to disseminating new styles and trends in order to attract new audiences². Second, we have the evaluation of the dance companies taking part in the programme. Whilst the venues’ function is more closely related to management and scheduling, the dance companies make the artistic contribution in the sense of offering shows that are appealing to the public and that also contribute towards diversity in the supply of dance. In this case, output is measured through the number of spectators (SPECTATORS-DC) drawn by each company, whereas resources are defined as the funding secured (the appearance fees paid by the programme) (FUNDING-DC) and the number of works (WORKS-DC) the company offers in the programme. In both instances, companies and venues, a single time window has been considered that spans the six seasons the programme for promoting dance was in operation.

Figure 2. DEA models for evaluating performance venues and dance companies

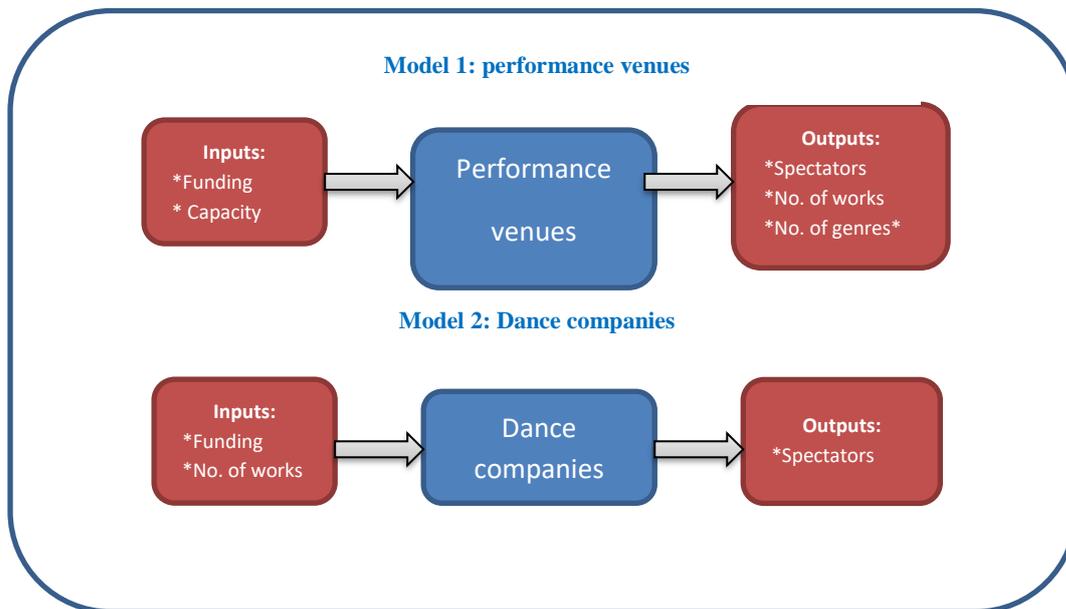


Table 3 shows the main statistics for the input and output variables considered in each model. Data reflect substantial differences in terms of participation in the programme by the various venues. It can also be seen how no company has taken part in more than three editions of the

¹ In order to standardise data on funding, net amounts have been taken, excluding the effect of taxes. As regards available capacity, this has been calculated as the number of seats at the venue multiplied by the number of performances scheduled.

² Genres have been differentiated as follows: contemporary dance, neoclassical dance, Spanish dance (flamenco and contemporary Spanish dance), children’s dance (for children, the family and all audiences), new formats of dance (urban dance, circus dance, vertical dance, avant-garde proximity shows, physical theatre and techno-dance) and small format shows (solos and short pieces).

programme, with the mean number of participations being 1.34. This is explained by the large number of projects presented by the companies in each edition, which makes it difficult for companies to access the programme³. As regards participation of the performance venues, substantial differences can also be seen in terms of the diversity of works and genres scheduled; some focus their offer on a single genre (in most cases geared towards children) whilst others seek to provide a diversified supply embracing a wide range of genres. As for the capacity variable, major differences can also be seen between participants in the programme. Part of this difference stems from the physical capacity of the venues although another part is linked to the number of performances scheduled by the theatres.

Table 3: Variables and descriptive statistics

| | FUNDING PV | CAPACITY | SPECTATORS PV | WORKS PV | GENRES | FUNDING DC | SPECTATORS DC | WORKS DC |
|---------|------------|----------|---------------|----------|--------|------------|---------------|----------|
| Mean | 12615.89 | 3431.63 | 938.76 | 5.45 | 3.32 | 15509.48 | 1293.85 | 1.34 |
| Median | 7577.25 | 2274.00 | 612.00 | 3.00 | 3.00 | 10500.00 | 678.00 | 1.00 |
| Minimum | 1875.00 | 130.00 | 69.00 | 2.00 | 1.00 | 1000.00 | 11.00 | 1.00 |
| Maximum | 60898.64 | 29844.00 | 3779.00 | 24.00 | 10.00 | 94350.00 | 10737.00 | 3.00 |
| Range | 59023.64 | 29714.00 | 3710.00 | 22.00 | 9.00 | 93350.00 | 10726.00 | 2.00 |
| St DEV | 12682.46 | 4232.78 | 868.24 | 5.06 | 2.07 | 15423.43 | 1764.89 | 0.56 |

As regards the method used, in order to identify the most efficient behaviour in the programme, both in terms of venues and dance companies, we employed DEA, which allows us to consider multiple inputs and outputs when assessing performance, without having to define the production function corresponding to the activity being assessed. Use of the DEA method means that it is possible to calculate the relative efficiency of a set of units, defined as the relation between the weighted sum of the inputs and the weighted sum of the outputs. Efficiency indices are calculated by solving a mathematical programming problem which, in its output oriented version, and considering a set of units to be evaluated (DMU), m inputs and s outputs, may be expressed as follows (Charnes, Cooper and Rhodes, 1978):

$$\begin{aligned}
 \min_{\mu, \delta} \quad & \omega_0 = \delta^t x_0 \\
 \text{s.a.:} \quad & \mu^t y_0 = 1 \\
 & \delta^t X - \mu^t Y \geq 0 \\
 & \mu^t, \delta^t \geq I\varepsilon
 \end{aligned}$$

with X and Y being the matrices of inputs and outputs of order $m \times n$ and $s \times n$ respectively; x_0 and y_0 the vectors of inputs and outputs of each unit analysed; and δ and μ the vectors representing the weights of the inputs and the outputs, respectively.

In its envelopment form, the problem can be set out as follows:

$$\begin{aligned}
 \max_{\varphi, \lambda, s^+, s^-} \quad & z_0 = \varphi + \varepsilon(Is^+ + Is^-) \\
 \text{s.a.:} \quad & \varphi y_0 - \lambda Y + s^+ = 0
 \end{aligned}$$

³ The selection process is indeed quite selective. For instance, in the last year analysed, 353 proposals were presented, although only 30 dance companies were chosen to form part of the catalogue of shows for the 2016 programme.

$$\lambda X + s^- = x_0$$

$$\lambda, s^+, s^- \geq 0$$

Solving this model provides an optimal solution (φ^*, s^+, s^-) , being $\varphi^* \geq 1$. Therefore, the greater the φ^* , the more inefficient the unit analysed. A unit is classified as technically efficient if $\varphi^* = 1$ and all the slacks are null ($s^+ = 0, s^- = 0$). In an output oriented model, the measure of technical efficiency can be expressed as $1/\varphi^*$ (Shephard, 1970).

As pointed out by Coelli et al. (1998), input and output oriented models estimate the same frontier and, therefore, indicate the same set of efficient units. Nevertheless, the efficiency measures corresponding to inefficient units may differ between the two models. In our case study, we opted to follow the output oriented model in which the aim is to maximise the proportional increase in outputs that could be achieved by the unit evaluated, given its input levels. We understand that output orientation is the most appropriate for the case in hand since any action in the programme taken by those managing the venues is geared more towards achieving service objectives than towards reducing the cost of the activities, given that we take funding as an input. Likewise, when companies take part in the programme, the expenses incurred by the activity are defined previously in the projects that have taken part in the initial selection, and their involvement in the programme is geared more towards achieving service objectives than minimising activity costs. Cutting the costs linked to the activity might be set out as a dance company goal, but in this case the aim is to evaluate how successful the company is in a specific activity.

In the form in which we set it out (CCR), the model provides technical efficiency assuming constant returns to scale (Charnes et al., 1978). This assumption may be relaxed by introducing a new restriction ($\bar{1}\lambda = 1$). The new model posited (BBC) considers variable returns to scale (Banker et al., 1984) and provides a measure of pure technical efficiency, excluding the effects derived from the scale in which each unit operates. The quotient between technical efficiency and pure technical efficiency allows scale efficiency to be calculated in order to know whether the unit evaluated is operating efficiently.

One limitation traditionally ascribed to the DEA procedure is its sensitivity to variations in the sample. Nevertheless, this limitation may be overcome by applying bootstrap procedures. In order to do this, based on the original sample, other pseudo-samples are obtained that increase the initial amount of data, thus enabling statistical inference. We therefore obtain an estimator of efficiency from the initial information, as well as the confidence intervals with a certain level of significance that will let us determine whether the value obtained for the estimator is representative or not. The Simar and Wilson algorithm (1998) allows us to apply the bootstrap procedure to obtain robust efficiency indices.

4. Results

Table 4 shows the general results of the efficiency analysis of the various stakeholders involved in the programme aimed at fostering dance in Spain. The first three columns show the technical efficiency, pure technical efficiency and scale efficiency data. In order to correct biases in the technical efficiency estimations, we applied a bootstrap procedure with 5,000 iterations so as to obtain the robust efficiency indices displayed in the final three columns of the table, although

the structure of the results does not differ, except in the smoothing of the efficiency levels. Results would seem to suggest that performance venues are more efficient than dance companies at meeting the programme’s objectives, basically production and distribution of dance shows as well as the increase linked to the number of spectators. A detailed look, however, does reveal certain differences that merit highlighting.

To evaluate the performance of the venues, we built three different models. The first, called the multi-output model, links the resources used, evaluated in terms of capacity and funding received from the programme, with all of the goals pursued, measured through the variables for the number of spectators, number of works programmed and range of styles shown (see formulation of Figure 2). These evaluation results point to a 60.07% mean level of efficiency for performance venues over the period the programme was in operation, such that theatres might be expected to improve their objectives vis-à-vis programming and attracting spectators by 40% using the same resources. There seems to be somewhat of a gap between performances caused by purely technical reasons (84.49%) and scale reasons (71.38%), highlighting problems of diversity and size and evidencing that smaller venues might hold an advantage in terms of efficiency for standard programmes with similar resources.

Table 4: Mean efficiency levels of venues and dance companies

| | TE | PTE | Scale E | Bootstrap TE | Bootstrap PTE | Bootstrap Scale E |
|-----------------------|-------|-------|---------|--------------|---------------|-------------------|
| Venues | | | | | | |
| Multi-output model | 60,07 | 84,49 | 71,39 | 54,91 | 82,04 | 67,19 |
| Demand oriented model | 42,59 | 53,22 | 84,06 | 38,07 | 49,19 | 77,38 |
| Supply oriented model | 47,46 | 76,31 | 63,01 | 42,55 | 72,95 | 58,33 |
| Dance companies | 35,86 | 42,21 | 86,88 | 31,90 | 38,08 | 83,77 |

Source: authors’ own

Yet, which are the most efficient venues? Table 5 shows the results of the multi-output evaluation model classified into ranges. Data confirm that those with the best efficiency results are the venues who participate less in the circuit; in other words, those which schedule a smaller number of works and styles and draw a lower average number of spectators. As pointed out earlier, these are small venues that boast the lowest mean capacity (433.7 seats) and offer fewer tickets, which is linked to the number of scheduled performances. This group includes some theatres located in intermediate size towns and cities that have hardly any competition from other venues and which, by offering a well-measured programme of shows and with only limited resources, are able to draw audiences and achieve their goals at a lower relative cost. In contrast, the less efficient theatres in terms of resource allocation are venues with a larger capacity and that offer a greater number of tickets, in other words more shows, because they provide a more diverse and intense dance programme. They also attract a larger mean number of spectators although, following the allocative logic of the model, they do so at a greater relative resource cost. Here we find an initial discrepancy between individual efficiency results and meeting the programme’s aim of promoting dance, since venues that more closely meet the programme’s objectives or that provide a wide and varied schedule as well as increasing audience numbers are those that do so at the greatest relative cost of resources.

Table 5: Venue efficiency ranges: multi-output model

| Efficiency range | No. of venues | Mean efficiency | Mean no. of spectators | Mean no. of works | Mean no. of genres | Mean no. of tickets offered | Mean capacity |
|------------------|---------------|-----------------|------------------------|-------------------|--------------------|-----------------------------|---------------|
| 0-20 | 0 | - | - | - | - | - | - |
| 20-40 | 7 | 35.83 | 1317.57 | 8.86 | 4.71 | 10130.00 | 1028.43 |
| 40-60 | 47 | 48.80 | 946.21 | 5.77 | 3.72 | 3891.60 | 638.06 |
| 60-80 | 31 | 67.79 | 949.61 | 5.42 | 3.00 | 2101.45 | 450.35 |
| 80-100 | 13 | 95.46 | 681.92 | 2.54 | 1.85 | 1333.85 | 433.77 |

Source: authors' own

The fact that some venues which only programme shows that cover one or two styles achieve the best positions in the evaluation might suggest that certain styles of dance are more popular with audiences. However, the venues' mission is not only to draw audiences to the shows. Their ability to help disseminate new formats and genres is also valued. In order to separate the results of these two objectives, which might lead to conflicting outcomes, we devised two new evaluation models: a demand oriented model, where the production function of the theatres takes only one output into consideration, measured in terms of spectators, and a supply oriented model where, with the same resources, output involves a richer programme, in other words, staging a greater number of works and offering a wider range of styles. The mean efficiency results for the two models are quite similar (Table 4), although there are greater problems of diversity of scale when evaluating the supply model. Nevertheless, there are differences in the composition of the efficiency ranges. In fact, as can be seen in Table 6, the most efficient venues in the demand model are medium size theatres that programme a small number of shows and styles but which enjoy audience success. Specifically, these are specialised venues that focus on programming children's shows and offering new styles (urban dance, hip-hop and circus dance), these being the styles that seem to be most popular amongst audiences. In contrast, when there is a greater diversity of works and styles, which obviously corresponds to larger theatres, mean efficiency in terms of attracting audiences drops.

Table 6: Venue efficiency ranges: demand model

| Efficiency range | No. of venues | Mean efficiency | Mean no. of spectators | Mean no. of works | Mean no. of genres | Mean no. of tickets offered | Mean capacity |
|------------------|---------------|-----------------|------------------------|-------------------|--------------------|-----------------------------|---------------|
| 0-20 | 16 | 14.85 | 636.00 | 6.00 | 3.75 | 5961.81 | 824.88 |
| 20-40 | 34 | 32.12 | 966.97 | 5.88 | 3.62 | 3881.82 | 582.09 |
| 40-60 | 29 | 50.22 | 1140.48 | 6.66 | 3.72 | 2755.86 | 437.72 |
| 60-80 | 14 | 66.68 | 726.79 | 2.43 | 1.86 | 1349.93 | 579.21 |
| 80-100 | 5 | 90.81 | 1139.20 | 2.20 | 1.60 | 2022.00 | 599.20 |

Source: authors' own

As regards the supply model, the results classified into efficiency ranges are shown in Table 7. In this case, it can be seen that the highest efficiency levels correspond to smaller venues and, again, ones that are specialised or that offer a short programme in terms of styles and a low mean number of spectators. Venues offering larger and more diverse repertoires correspond to larger theatres that make a greater effort in terms of cost due to their scheduling more and more varied shows. In sum, the results with these specifications in the production function again point to the same overall result, in the sense that the most efficient theatres are the smaller ones that offer shorter and more specific repertoires. This is therefore an optimal result in technical terms of use of resources, yet far removed from the criteria of diversity and spreading repertoires stated by the programme that seeks to promote dancing.

Table 7: Efficiency ranges of venues: supply model

| Efficiency range | No. of venues | Mean efficiency | Mean no. of spectators | Mean no. of works | Mean no. of genres | Mean no. of tickets offered | Mean capacity |
|------------------|---------------|-----------------|------------------------|-------------------|--------------------|-----------------------------|---------------|
| 0-20 | 0 | - | - | - | - | - | - |
| 20-40 | 37 | 34.52 | 1299.54 | 5.68 | 3.49 | 4879.14 | 718.81 |
| 40-60 | 44 | 46.71 | 864.98 | 6.11 | 3.64 | 3178.82 | 565.59 |
| 60-80 | 12 | 69.89 | 372.92 | 3.42 | 2.17 | 1052.00 | 351.50 |
| 80-100 | 5 | 96.01 | 276.20 | 2.80 | 2.00 | 656.00 | 217.60 |

Source: authors' own

As regards the results obtained when evaluating the performance of dance companies, Table 4 shows low mean levels of efficiency (35.86%) which, in this case, are more due to technical reasons (42.21%) than to scale reasons (86.88%). In this case, it should be remembered that dance companies produce one work at most for the programme each year and that, therefore, the resources available to measure their level of success and performance are the number of times they have taken part over various editions of the programme, with the mean contribution being 1.34 works over the period studied (Table 3).

Table 8 describes the dance companies in terms of levels of efficiency, and shows how the most efficient companies are those that have most often taken part in the programme, with a high number of shows and also reaching a high mean number of spectators. In this case, we can establish a direct relation between efficiency and quality, perceived as fulfilling the programme's objectives. Firstly, these are companies that have been awarded the required accreditation to take part in the programme on a regular basis. In addition, they are companies that take part with a greater number of shows because they have passed the experts' filter and subsequent selection by the venues. Finally, they are also the most popular amongst the public since they are able to attract the highest mean number of spectators.

Table 8: Mean data by ranges. Dance companies

| Efficiency range | No. of companies | Mean efficiency | No. of shows | Mean no. of spectators | Mean no. of works |
|------------------|------------------|-----------------|--------------|------------------------|-------------------|
| 0-20 | 25 | 12.91 | 3.80 | 323.88 | 1.20 |
| 20-40 | 39 | 28.21 | 6.03 | 870.79 | 1.38 |
| 40-60 | 10 | 46.51 | 8.20 | 1614.60 | 1.40 |
| 60-80 | 8 | 67.68 | 8.50 | 2132.25 | 1.25 |
| 80-100 | 9 | 92.64 | 19.78 | 4719.78 | 1.56 |

Source: authors' own

Continuing with this particular line of argument, we once again sought to find out the public's preferences for certain styles. Table 9 shows companies' mean efficiency indices for six groups of styles that sum up the various types of dance contained in the programme. As expected, the highest efficiency data correspond to companies working in the area of children and new styles (urban dance, circus-dance, vertical dance, etc.), as also is found by Fernández-Blanco et al. (2017). Yet these are not the companies who most often take part in the programme; the most numerous sector is contemporary dance with 32 companies and 46 new works and which, nevertheless, displays low levels of efficiency. Explaining this leads us to suppose there are, in practice, two thematic dance circuits. One specialises in children and new dance formats, and has a greater impact in terms of audience. It tends to extend the tour also to medium-size venues

located in intermediate size cities where there is little cultural competition, such that performance outcomes are optimal in technical terms. In contrast, contemporary, neoclassical and Spanish dance companies mainly perform in larger theatres in major cities where there is greater cultural competition in the city and in the theatre's actual programming, such that results in terms of efficiency in the use of resources are poorer. This thematic duality⁴, which has implications for both the structure and size of companies, as well as how they are distributed around the venues, means that the efficiency results of the promotion programme through participant performance are not as consistent as might be expected.

Table 9: Efficiency indices and level of participation in the programme by dance company style

| No. of companies | No. of companies | Mean Tech. Eff. | Mean Pure Tech. Eff | Mean Scale Efficiency | Funding | Shows | Audience | Works |
|--------------------|------------------|-----------------|---------------------|-----------------------|---------|-------|----------|-------|
| Contemporary dance | 32 | 22.80 | 28.14 | 86.82 | 444,575 | 173 | 23,013 | 46 |
| Neoclassical dance | 6 | 34.80 | 46.79 | 76.17 | 129,014 | 39 | 8,178 | 9 |
| New formats | 14 | 52.22 | 57.62 | 89.41 | 289,492 | 138 | 31,542 | 19 |
| Spanish dance | 9 | 27.32 | 37.85 | 80.95 | 146,360 | 52 | 8,574 | 12 |
| Children | 23 | 50.04 | 55.75 | 91.94 | 376,207 | 235 | 44,280 | 29 |
| Small format | 7 | 28.09 | 32.86 | 82.25 | 25,714 | 21 | 2,153 | 7 |

Source: authors' own

3. Conclusions

Although different contributions have been made to performance analysis in the performing arts sector, only rarely has the dance sector been taken as a specific case study. In this regard, our work seeks to make an original contribution to a sector, dance, where the survival of creators and performers who are outside the upper echelons of national companies and other resident companies is closely linked to public allocation of resources through promotion programmes.

Our work focuses on evaluating the performance of a specific programme for promoting dance; the *Danza a Escena* circuit set up by the Spanish Ministry of Culture and whose particular aims are to increase the number of dance shows, broaden the range of artistic styles and boost the number of spectators as well as create new audiences. Our aim was not to assess the programme's progression over time but to gauge the contribution made by the principal stakeholders involved (venues and dance companies) towards accomplishing the programme's objectives. To achieve this, we design two kinds of production function linked to each stakeholder's activity, and which are evaluated using non-parametric frontier techniques, specifically DEA. Venues seek to maximise the number of spectators, as well as the size and range of their repertoires using certain material (available capacity) and financial resources (programme subsidies). For their part, dance companies aim to achieve the greatest possible audience success in the programme, based on their artistic productions and the funding received.

In this regard, the results prove paradoxical, since the most efficient venues turn out to be those that are smaller and that offer a shorter and more monothematic programme in terms of dance shows, contradicting the aims of the promotion programme. In contrast, the evaluation of dance companies does evidence a direct relation between effectiveness and quality, measured in terms of artistic production and audience success. Although consistent with the rationale of optimal

⁴ This dual behavior concerning the repertoire styles is also found in the programming of Warsaw Theatres, as is shown in Wisniewska and Czajkowski (2017).

use of available resources, these results mask problems of scale diversity, both in companies and venues, particularly in the thematic diversity of artistic dance productions, which has different implications vis-à-vis distribution strategy and public interest. In this regard, there seems to be a kind of twin thematic circuit. On the one hand, dance shows geared towards children and new styles of dance are extremely popular among the general public and are widespread, particularly in medium size theatres and venues located in intermediate size cities that have little cultural competition, such that they display high levels of efficiency. In contrast, contemporary, neoclassical and Spanish dance shows tend to have greater technical requirements and prove more costly. Even though a major effort may be made when creating new artistic productions, these tend to be scheduled for larger theatres located in cities with bigger populations and that have greater competition in terms of cultural and leisure activities. Performance evaluation in terms of the resources used and the impact among the public emerges as less favourable.

These results have major implications with regard to cultural policy. Firstly, they evidence the appropriateness of evaluating programmes that support cultural promotion by gauging the performance of the various stakeholders involved, particularly in the dance sector, where only a few studies exist. Secondly, they reflect the need to assess the efficiency of cultural promotion programmes by measuring to what extent the aims for which they were designed have been met, not only through the efficient use of resources, since a context of thematic and scale diversity of participants may lead to contradictory conclusions. Finally, and particularly in this case study, it seems convenient to segment the funding received into different styles of dance depending on their requirements and distribution strategy around the various venues. It would thus also seem appropriate to posit a shift in the way funding is awarded lineally in terms of appearance fees for any show and replace it with price discrimination in the funding provided following the criteria set out in this work.

References

- Aoyam, Y. (2009). Artist, Tourist, and the State: Cultural Tourism and the Flamenco Industry in Andalusia, Spain. *International Journal of Urban and Regional Research*. 33 (1), 80-104.
- Banker, R.D., Charnes, A. and Cooper, W. W. (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Science*, 30 (9), 1078-1092.
- Baumol, W.J. Bowen, W.G. (1966). *Performing arts: The economic dilemma*. New York: The Twentieth Century Fund.
- Benhamoud, F. (2003). "Artists' labour markets" in R. Towse (Ed.) *A Handbook of Cultural Economics*. Edward Elgar Publishing Ltd, 69-76.
- Boyle, S. and Throsby, D. (2012). Corporatization, Economic Efficiency and the Australian Symphony Orchestras. *Economic Papers: A journal of applied economics and policy*, 31, 36-49. doi:[10.1111/j.1759-3441.2011.00150.x](https://doi.org/10.1111/j.1759-3441.2011.00150.x)
- Borowiecki, K. and Marvao, C. (2015). Dance Participation and Attendance in Denmark. ACEI Working Paper Series, AWP-01-2015.
- Castiglione, C., Infante, D. and Zieba, M. (2017). Technical efficiency in the Italian performing arts companies. *Small Bus Econ*. <https://doi.org/10.1007/s11187-017-9931-1>
- Charnes A., Cooper, W.W. and Rhodes, E. (1978). Measuring the Efficiency of Decision Making Units. *European Journal of Operational Research*, 2, 429-444.

- Coelli, T., Schmidt, P. and Battese, G.E. (1998). *An introduction to efficiency and productivity analysis*. Kluwer Academic Publisher.
- Daigle, P. and Rouleau, L. (2010). Strategic plans in arts organizations: a tool of compromise between artistic and managerial values. *International Journal of Arts Management*, 12 (3), 13-30.
- Fernández-Blanco, V., Herrero, L.C., and Prieto-Rodríguez, J. (2013). "Performance of Cultural Heritage Institutions" in: Ilde Rizzo and Anna Mignosa (Eds.) *Handbook on the Economics of Cultural Heritage*, Edward Elgar Publishing Ltd, Cheltenham.
- Fernández-Blanco, V., Rodríguez-Álvarez, A. and Wisniewska, A. (2017). Measuring the efficiency and marginal cost in the performing arts: the case of the municipal theatres of Warsaw. ACEI Working Paper Series, AWP-09-2017.
- Gómez, M. and Herrero, L.C., (2017). Measuring emotion through quality: evaluating the musical repertoires of Spanish symphony orchestras. *8th European Workshop on Applied Cultural Economics*, Krakow, Poland.
- Hong, J. (2014). Data envelopment analysis in the strategic management of *Youth Orchestras*. *The Journal of Arts Management, Law and Society*, 44(3), 181-201.
- Lange, M., Bullard, J. Luksetich, W. and Jacobs, P. (1985). Cost Functions for symphony orchestras. *Journal of Cultural Economics*, 9 (2), 71-85.
- Lange, M. and Luksetich, W. (1993). The cost of producing symphony orchestra services. *Journal of Cultural Economics*, 17 (2), 1-15.
- Last, A. K. and Wetzel, H. (2010). The Efficiency of German Public Theatres: A Stochastic Frontier Analysis Approach. *Journal of Cultural Economics*, 34 (2), 89-110.
- Marco Serrano, F (2006). Monitoring Managerial Efficiency in the Performing Arts: A Regional Theatres Network Perspective. *Annals of Operations Research*, 145 (1), 167-171.
- Montgomery, S. and Robinson, M. (2003). What becomes of undergraduate dance majors?. *Journal of Cultural Economics*, 27 (1), 55-71.
- Palma, M., Palma, L. and Aguado, L.F. (2013). Determinants of cultural and popular celebration attendance: the case study of Sevilla Spring Fiestas. *Journal of Cultural Economics*, 37 (1), 87-107.
- Rausell, P., Coll-Serrano, V., Abeledo, R. and Marco-Serrano, F. (2013). Eficiencia de las Sociedades musicales de la Comunidad Valenciana. *Revista de Métodos Cuantitativos para la Economía y la Empresa*. 15, 117-132.
- Rosen, S. (1981). *The economics of superstars*. *The American Economic Review*, 71 (5), 845-858.
- Schimmelpfening, J. (1997). Demand for Ballet: A Non –Parametric Analysis of the 1995 Royal Ballet Summer Season. *Journal of Cultural Economics*, 21 (2), 119-127.
- Schimmelpfennig, J. (2003). "Ballett" in R. Towse (Ed.) *A Handbook of Cultural Economics*. Edward Elgar Publishing Ltd, 85-90.
- Shephard, R. W. (1970). *The theory of cost and production functions*. Princeton University Press.
- Simar, L. and Wilson, P. (1998). Sensitivity analysis of efficiency scores: How to bootstrap in nonparametric frontier models. *Management Science*, 44 (1), 49-61.
- Skinner, J. (2013). Social Dance for Successful Aging: The Practice of Health, Happiness, and Social Inclusion Amongst Senior Citizens. *Anthropology and Aging Quarterly*, 34(1), 18-29. DOI: 10.5195/aa.2013.24
- Taalas, M. (1997). Generalised Cost Functions for Producers of Performing Arts – Allocative Inefficiencies and Scale Economies in Theatres. *Journal of Cultural Economics*. 21 (4), 335-353.

- Throsby, D. (1977). Production and cost relationships in the supply of the performing arts services. In *Economics of the Australian Service Sector*, Ed. K.A. Tucker. London, 414-432.
- Tobias, T. (2004). Quality un the Performing Arts: Aggregating and Rationalizing Expert Opinion. *Journal of Cultural Economics*, 28 (2), 109-124.
- Turbide, J. and Laurin, C. (2009). Performance Measurement in the Arts Sector: the Case of the Performing Arts. *International Journal of Arts Management*, 11 (2), 56-95.
- Weinstein, L. and Bukovinsky, D. (2009). Use of the Balanced Scorecard and Performance Metrics to Achieve Operational and Strategic Alignment in Arts and Culture Not-for-Profits, *International Journal of Arts management*, 11 (2), 42-56.
- Wisniewska, A. and Czajkowski, M. (2017). Designing a socially efficient cultural policy: the case of municipal theaters in Warsaw. *International Journal of Cultural Policy*. <https://doi.org/10.1080/10286632.2017.1308504>.
- Zieba, M. (2011). An Analysis of Technical Efficiency and Efficiency Factors for Austrian and Swiss Non-Profit Theatres. *Swiss Journal of Economics and Statistics*, 147 (2), 233-274.