
Productivity of Public Theatres in the Times of COVID-19: The Example of Polish Theatres

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Abstract:

Purpose: Our article aims to analyze the changes in the productivity of cultural institutions during the Covid -2019 pandemic. We studied how much productivity has changed and saw which indicator was targeting the influx. The number of visitors in the theatre in a given year is taken as productivity. The research period is the years 2016-2020. We hypothesize that the productivity index in 2020 depended on most on the technology change.

Design/Methodology/Approach: The proper study was focused on Polish Public Theatres. The verification of the assumptions was conducted through the Malmquist index -Total Factor Productivity.

Findings: As a result of the research, it was found that the hypothesis was positively verified. The value of the Malmquist index shows significant changes in productivity between 2020-2019 and 2019-2016. In particular, the considerable increase of the technological progress index is worth noting. In 2020-2019, the annual change regarding this index was as high as 1208.8%, while the technical efficiency decreased to 13.9% and TFP was 168.2% - the highest level over the whole period considered.

Practical implications: We noticed that for individual theaters, the productivity results were different. It means that not all of the theatres studied coped with the new conditions. Depending on the organization, the effects of using digital technologies may be different. This proves that each unit should be analyzed individually.

Originality/value: These results seem to fully reflect the pandemic reality in which the technological factor was of crucial importance, an innovative research to describe the pandemic in the theatre sector.

Keywords: Performance art organizations, theatre, productivity, Malmquist index value, total factor productivity.

JEL classification: H2, H7, H18.

Paper Type: Research study.

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1. Introduction

In 2020, all cultural institutions referred to as PAO (Compedium, 2020) suffered a significant loss of revenue from ticket sales and rental of premises. This was the main obstacle linked to the COVID-19 epidemic and occurred almost in every country (Compedium, 2020). Changing the guidelines with restrictions for cultural institutions and safety rules -sometimes overnight -made it much more difficult for them to plan repertoire activities, inducing the cancellation of performances and educational events.

In Poland, as in all European states, the cultural scene was severely affected by the limitations of the activities linked to combating COVID-19. These restrictions were radical and covered a whole spectrum of possibilities -ranging from a total ban on the actions to different limits on the number of viewers, which often conflicted with the economic costs. In Poland, about 75 regulations of various ministers were issued to the so-called "Covid Act" (2020), which defined restrictions and limitations in addition to local laws and internal rules of the PAOs themselves.

2. Literature Review

The loss of revenue/income has posed an imminent threat to many independent artists, cultural operators, and non-governmental organizations in the cultural field. According to the Austrian Institute of Economic Research study, the pandemic caused cultural damage of EUR 1.5-2 billion, which represents a quarter of the annual added value (Country Reports, 2021). Despite severely restricted activities due to the pandemic under the law(s) and based on the opinion of many PAOs, further support from public institutions is necessary for 2021 (Annual Report, 2021). This should entail looking at PAOs and companies whose economic situation deteriorated dramatically during the pandemic, that as cultural institutions must continue to carry out their social mission without ceasing. The limitation of PAOs' activity translated among other things into:

- a significant decrease in revenue from ticket sales;
- the need to raise other sources of income/revenue;
- work organization difficulties due to the need to switch to teleworking (partly depending on current guidelines);
- the need to create completely new artistic and educational activities that can be carried out online in a short period of time;
- loss of direct contact with the audience;

PAOs also pointed out that in addition to the epidemiological restrictions, the "spontaneous" process of their implementation was a significant obstacle and the lack of a clear plan and time in advance for information about government compensation to the institutions. Regarding Poland, the decision on governmental compensation (Culture Support Fund, 2020) was very late (Annual Report, 2021). This made it

difficult for PAOs most essential actions, i.e., to stage productions. In Poland, despite the restrictions on activity, PAOs still received subsidies from the organizer. All the 22 theaters in the biggest cities in Poland surveyed by the authors of the present paper maintained statutory contributions, and the increase in their amount pertained to 18 theaters. The decrease by 1-2% was noticed in 4 theaters only.

Many cultural institutions, including PAO, had to evolve and switched to remote work to maintain contact with viewers. Pauget *et al.* (2021) somewhat anticipated the current situation. They tried to describe French museums' possible future by 2030 (Pauget *et al.* 2021). Based on the Delphi study (dating back to 2017-2018) with 99 experts in this field, three potential scenarios were identified. One of them concerned the "crash" scenario, where institutions were to evolve to survive. However, online theater is merely an account of theater activities. The actual theater takes place "here and now." Live performances, even for a small number of viewers, in the context of the foundations and mission of the theater are more critical (Gadrey, 2002) than any virtual theater presentation.

In an artistic institution whose budget before the pandemic was approx. 40 % (Galecka and Smolny, 2017) based on the institution's resources, it is not currently possible to carry on activities of the existing scale and formula without receiving financial support from the State (Thorsby, 2010; Galecka and Smolny, 2019). Especially in large theaters that offer performances incurring the high cost of presentation, the revenue generated by these institutions from ticket sales covers operating costs and finance the production of new artistic events and is often also a part of fixed costs. In addition, the cultural sector has been covered by several public aid initiatives. However, these funds were not considered in our calculations because they have not yet been paid out and included in the data.

PAOs, artists themselves, often used Twitch, live streaming, Instagram TV, and others. This is not new, but especially in theaters, the pandemic extended the audiences available. Streaming platforms also enabled new methods of earning, including membership in performer channels, which allow early or exclusive access to content and virtual meetings, and paid comment features. The Goethe Institute has offered a digital platform called "Kulturama" (2021) created because of the need to support cultural actors worldwide due to the Corona crisis. The fact that events with live audiences were canceled and cultural institutions and clubs closed triggered existential challenges for artists worldwide (Culture, 2021). Thus, cultural institutions could still be in contact with the audience and generate their revenue from streaming or digital downloads

The new reality has led us to investigate the changes regarding productivity in public cultural institutions. Productivity is understood as the total number of spectators per year (Thorsby and Whitters, 1979; Trzeciak, 2011), but we do not distinguish them between classical and online audiences -theater reports do not give us such a possibility. We are investigating whether productivity changes occurred, and which

indicator has affected them. The research period is 2016-2020, and the critical year is the year of the Covid 19 pandemic, namely 2020.

Research problem: *The aim of our research is to identify productivity changes of Polish public theaters in a pandemic situation.*

Hypothesis: *We assume that the productivity score in the time of covid is mostly dependent on the change in technology. Verification of such a hypothesis will take place in terms of productivity understood as several viewers during theater's own performances.*

This study is consistent with the trend toward methods of optimizing public funding for cultural entities while maximizing their public service and addresses an important issue such as the impact of digitalization in the creative economy sector. The analysis is conducted in terms of theater productivity, understood as the number of viewers and the Malmquist index value -TFP (total factor productivity). We assume that the cultural sector has used isolation time to create new communication channels or has intensified the existing possibilities of remote transmission. We are investigating whether this process has run uniformly. Perhaps in the future, after returning to the "normal" functioning, the experience gained will continue to function by continually expanding the access of culture to people excluded from participation in culture for instance for reasons of communication.

3. Research Methodology

The research pool comprised the 22 municipals public theatres, which operated at least one professional theatre company and at least one permanent stage. The research period covers years 2016-2020. Productivity was tested with the use of the Malmquist index (Last and Wetzel, 2011; 2010). In the theatre, we operate on a change in productivity in 2016-2020. For this purpose, non-parametric methods were used. Productivity can be measured statically against benchmarks, i.e., standard units, and dynamically, i.e., analysis of change over time. The analysis of changes over time makes it possible to compare changes in the productivity index and identify these changes' structure. The output-oriented Malmquist index and its decomposition were utilised for the purpose of this paper. The index decomposition gives room for a broader interpretation of results by pointing out the changes in productivity sources. The observed productivity change reflected in the Malmquist index may result from a change in the production technology (technical change - techch) and/or a technical efficiency change (effch) (Kumar and Russell, 2002).

An input- or output-oriented approach can be used in establishing Malmquist index. The output-oriented approach was used in the presented research. It was assumed that the effect of the theaters' activity is productivity understood as the number of viewers (Y). We use absolute data because in 2020 the number of seats in theaters or the

number of rooms did not have a significant impact on the on-line performances. List of variables:

- Number of visitors - Y
- Own income -X1
- Number of subsidies - X2
- Salary expenses - X3
- Materials and Energy consumption - X4
- Number of full-time equivalents - X5
- Number of premiers - X6
- Number of performances - X7.

Salaries costs and materials and energy consumption costs, the statutory organizer subsidies, the Number of full-time equivalents, the Number of theatre auditoriums, and the Number of theatre shows are considered on the input side. In the study, we do not consider the number of seats in the theatre or the Number of stages. This is dictated by the fact that in 2020 a significant part of the theatre operated remotely, where the technical facilities did not substantially impact the number of viewers. Additionally, the theatres' revenues were also considered as an essential input factor. The Malmquist index was defined with the use of technical efficiency measures for the t period (Coelli, Rao, and Battese, 2005; Färe, Grosskopf, and Lovell, 1994):

$$M(x_{t+1}, y_{t+1}, x_t, y_t) = \left[\frac{D^t(x_{t+1}, y_{t+1})}{D^t(x_t, y_t)} * \frac{D^{t+1}(x_{t+1}, y_{t+1})}{D^{t+1}(x_t, y_t)} \right]^{\frac{1}{2}} \quad (1)$$

where,

$D^t(x_t, y_t)$ -technical efficiency in the t period and technology in t period,

$D^{t+1}(x_t, y_t)$ -technical efficiency in the t period and technology in t+1 period,

$D^t(x_{t+1}, y_{t+1})$ -technical efficiency in the t+1 period and technology in t period,

$D^{t+1}(x_{t+1}, y_{t+1})$ -technical efficiency in the t+1 period and technology in t+1 period

Table 1. Description statistics/ Estimated technical efficiency, cross-sectional model

Variable description	Variable	Mean	Median	Std. dev.	Min.	Max.
Number of viewers	Y	87095	45544	240536.7	311	2404950
Own income	X1	3646372	2049147	4866030	108684	29758474
Amount of subsidies	X2	6832509	6227500	3418974	2003500	16600200
Salary expenses	X3	6604034	6973660	2857848	1941490	15802993
Consumption of materials and energy	X4	1983893	1091673	2880760	764.44	20813781
full-time employees	X5	72.23	73	32.86	17.25	151
Premiers (night shows)	X6	5.15	4	4.41	1	35
Number of productions	X7	246	243	116.57	27	512
Number of observations	110					

Source: Own elaborations.

We consider both the cost of permanent staff (full-time employees) and other costs - earnings-related contributions (statutory liabilities concerning remuneration and work outsourced on a contract basis as labor costs). They include the costs of all employees, i.e., both directly and indirectly linked to the 'production' of performances. Costs in a theatre are used as labor and capital input. Subsidies and own revenues constitute the theatres' important source of finance. In Poland, the subsidies share in the theatre's total revenues is 60% - 80% on average; this is comparable with other countries in Europe. The variables reflecting the theatres' technical conditions may be related to the number of performances of a given theatre.

Furthermore, necessary stage-design changes resulting from the repertoire change, regardless of whether the productions are new or not, lead to higher costs. Therefore, a changing number of shows a year is included as the control factor for the input requirements. In the literature, a premiere, theatrical performance (shows), or cultural experience of the viewer are the theatre service unit. There is also an indicator/concept of "usability" as a function of the number of services, the number of tickets sold (Thorsby and Whitters, 1979), or the number of viewers (Trzeciak, 2011). It is impossible to measure the effects of theatre activity in quantitative terms only - the literature repeatedly stresses the importance of the qualitative criteria. Our article limits ourselves to short-term tools, ignoring the quality of services, which is often criticized. The quality of culture, however, is a more complex phenomenon that we intend to investigate next. The descriptive statistics presented in Table 1 show a significant variance for all variables.

4. Results

In the 2016-2020 period, the average Malmquist index value (TFP) was 1.22. Its components influenced the TFP, namely efficiency (effect) and technological progress changes (techs). The most significant impact on the average level of the Malmquist index value in the years 2016-2020 was exerted by the change in technology- techch (Table 2). On average, this index increased its value by 92%, while the technical efficiency index value (-36.4%) decreased, as is clearly shown in Figure 1.

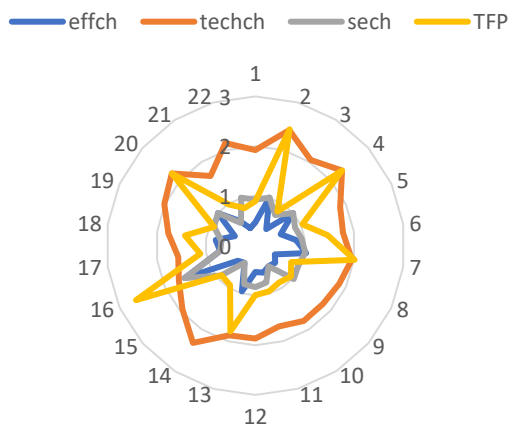
Table 2. *TFP and its components in years 2016-2020*

Nb	Theater	effch	techch	sech	TFP
1	Teatr Nowy im.K.Dejmka	0.465	1.923	0.925	0.895
2	Teatr Powszechny	1.007	2.421	1.007	2.438
3	Teatr Lalek „Arlekin”	0.397	2.05	0.73	0.815
4	Teatr Lalkii Aktora „Pinokio”	1	2.301	1	2.301
5	Teatr Muzyczny	0.557	1.869	0.874	1.04
6	Teatr Lalek we Wrocławiu	0.825	1.78	0.94	1.468
7	Capitol	1.029	1.957	1.011	2.014
8	Teatr Anateum im. S. Jaracza	0.428	1.849	0.948	0.791
9	Teatr Dramatyczny im. G. Holoubka	0.525	1.79	1.022	0.941
10	Teatr Lalek Guliwer	0.489	1.795	0.489	0.879

11	Północne Centrum Sztuki Teatr Komedia	0.567	1.692	0.773	0.96
12	Teatr Lalka	0.531	1.867	0.833	0.991
13	Teatr Nowy	0.957	1.876	0.808	1.796
14	Teatr Ochoty	0.406	2.323	0.406	0.943
15	Teatr Powszechny im. Z. Hübnera	0.467	1.943	0.914	0.908
16	Teatr Rampa na Targówku	1.563	1.689	1.563	2.64
17	Teatr Muzyczny Roma	0.715	1.571	0.715	1.123
18	Teatr Rozmaitości	0.808	1.769	0.689	1.43
19	Teatr Studio im. S. I. Witkiewicza	0.455	2.014	0.916	0.916
20	Teatr Syrena	1	2.222	1	2.222
21	Teatr Współczesny w Warszawie	0.593	1.664	0.538	0.986
22	Teatr Żydowski im. E., R. i I. Kamińskich	0.366	2.153	1.001	0.788
	mean	0.636	1.92	0.836	1.221

Source: Own elaborations.

Figure 1. TFP and changes in the technological index and technical index in 2016-2020



Source: Own creation.

The annual value of the Malmquist index (Table 3), which shows significant changes between 2020-2019 and 2019-2018, is also worth interpreting. These differences are essential for the study as they offer theatre performance during and before the pandemic. In particular, the considerable increase of the technological progress index is worth noting. In 2020-2019, the annual change regarding this index was as high as 1208.8%, while the technical efficiency decreased to 13.9% and TFP was 168.2% - the highest level over the whole period considered. When comparing 2018-2018 with 2018-2017, no such high growth is observed, neither for the technology progress index nor the TFP. It seems that the technical efficiency index (effect) and the change in scale (sech) were much more significant over this period. These results seem to reflect ultimately the pandemic reality where many theatres focused on technological development.

Table 3. *Malmquist index summary of annual means*

years	effch	techch	sech	TFP
2017-2016	1.248	0.942	1.176	1.176
2018-2017	0.911	1.286	0.968	1.171
2019-2018	1.034	0.928	1.07	0.959
2020-2019	0.139	12.088	0.402	1.682
mean	0.636	1.92	0.836	1.221

Source: *Own elaborations.*

It is also worth pointing out that the performance of individual theatres varied. It is easy to note that in 2020, relative to 2019, in all theatres surveyed, the technological progress index was higher than 1 (Table 4). However, productivity increased significantly in part of the theatres (gray color in Table 4). Despite the increase in the importance of technology in their production process, other theatres did not manage to cope at this difficult time, and their productivity decreased significantly, regardless of the costs incurred in maintaining the theatres. This was true for both large and small theatres (estimated according to the full-time positions).

Table 4. *TFP and its components in years 2020 -2019*

Nb	theater	effch	techch	pech	TFP
1	Teatr Nowy im.K.Dejmka	0.064	14.73	0.099	0.94
2	Teatr Powszechny	1	21.008	1	21.008
3	Teatr Lalek, „Arlekin”	0.026	24.107	0.088	0.617
4	Teatr Lalki Aktora „Pinokio”	1	39.606	1	39.606
5	Teatr Muzyczny	0.096	9.607	0.165	0.922
6	Teatr Lalek we Wrocławiu	0.287	8.755	0.386	2.513
7	Capitol	1.196	10.46	1	12.508
8	Teatr Anateum im. S. Jaracza	0.043	11.5	0.052	0.49
9	Teatr Dramatyczny im. G. Holoubka	0.091	9.07	0.105	0.829
10	Teatr Lalek Guliwer	0.057	10.235	1	0.587
	Północne Centrum Sztuki Teatr				
11	Komedia	0.103	4.726	0.289	0.489
12	Teatr Lalka	0.081	11.272	0.165	0.917
13	Teatr Nowy	0.793	9.182	2.774	7.279
14	Teatr Ochoty	0.009	29.225	1	0.257
15	Teatr Powszechny im. Z. Hübnera	0.076	12.408	0.103	0.949
16	Teatr Rampa na Targówku	0.108	7.051	1	0.761
17	Teatr Muzyczny Roma	0.261	3.54	1	0.924
18	Teatr Rozmaitości	0.519	9.368	0.937	4.86
19	Teatr Studio im. S. I. Witkiewicza	0.062	15.322	0.072	0.946
20	Teatr Syrena	1.043	23.828	1.032	24.857
21	Teatr Współczesny w Warszawie	0.12	8.602	1.311	1.034

Teatr Żydowski im. E., R. i I.					
22	Kamińskich	0.023	17.921	0.02	0.42
	mean	0.139	12.088	0.364	1.682

Source: Own elaborations (gray colour- an increase in the productivity of theaters).

At the same time, as the index of technological progress increases, there is an apparent decrease in the technical efficiency index and the scale benefit index in selected theatres. In theatres, where technical efficiency fell by almost half and more in 2020 compared to 2019, even the increase in the index of technological progress did not improve productivity compared to the previous year. However, it certainly prevented it from falling even further. As a result, productivity growth in 2020 was caused to a large extent by higher technological efficiency rather than technical efficiency, which justifies considering the hypothesis as positive.

5. Discussion

The time of the Covid-19 pandemic is undoubtedly a part of the evolution of the visual arts following the emergence of cinematography, computer technology, and VR (Kuksa and Childs, 2014). Perhaps it is another proof that the drama is an actual 'collective artwork' and the 'synthesis of the arts' -the Gesamtkunstwerk (Wagner, 1849). Besides, the concept had many supporters. At the beginning of the new millennium, innovative techniques such as interface design, virtual interaction, and their freshly emerged forms began to be used as artistic tools (Grau, 2003), which, of course, also aroused opposition, thus shifting the theater's future in television (Kuksa and Childs, 2014).

Today we know that there is no return to the TV model from the last century, and we treat video transmission as the same tool as light or sound. Digital technologies change the way many creative works are generated, distributed, and used. They have made cultural products more accessible, challenged the established business models and the copyright system, and blurred the borderline between producers and consumers. This is evident in the music and film industries. In music production, technological changes led to a cultural revolution that fundamentally changed the network of music production, distribution, and consumption.

Theaters are increasingly using digital technologies and the time of Covid 19 accelerated this process. Examples include devices for audio descriptions to help blind people break the barriers and encourage them to visit theaters. In turn, digitization gives us the chance to discover an increasingly broad range of arts, such as the Digital Parisian Stage (Grive-Smith, 2019), and expands its accessibility in general. In Poland, a Digital Museum of the Grand Theatre in Lodz is being created. Thanks to the digitization of historical productions, it will remind those performances that had already disappeared from the theater repertoire. Such projects are developed throughout the EU (European Commission, 2011). In Belgium, the Flemish Institute of Archiving (VIAA) set itself the objective of completing the digitization of, e.g.,

PAO by the end of 2023 (European Commission, 2011). However, it is worth noting that this process usually pertains to archival productions. In turn, devices for audio description are used in real-time performances only in theater buildings.

Looking at the study results, it seems essential to pose a question why only some theaters successfully implemented many new technologies and, as a result, enjoyed a highly competitive advantage while others did not? Did the PAO internal environment contribute to the success or failure? Harper and Utler's (2001) study conducted in 18 companies involved in government and commercial projects showed a correlation between specific cultural characteristics and successful deployment of new technologies (in this case, IT systems). In addition, the researchers found that human-oriented aspects, not the production-oriented ones, had the most significant impact.

This may indicate that the cultural climate in each organization and the balance between the production concerns and human-related issues play a vital role in implementing new technological solutions. The organization's internal culture can create distorted applications of technologies that can both improve and hamper the efforts made to introduce a change (Gode, 2006). This shows that each situation is individual, depending on a given organization's background and cultural pattern. In addition, the ability to use the applied technologies appears to be of significance as well. Perez-Laborda and Perez-Sebastian (2020) show that technological progress significantly increases the relative productivity of skilled rather than unskilled workers.

Unfortunately, in our study, we do not have data demonstrating whether technological changes only in part of the theaters were possible due to the workers' already existing infrastructure, procedures, and skills, or changes induced by the Covid-19 caused it. We suspect that the PAOs with equipment and personnel resources had previously introduced digitalization of their activities and used it for live streaming or remote online access. We may investigate this issue in another study.

2021 has already relaxed the restrictions in many countries, allowing PAOs to stage plays in theater buildings. It is worth considering which scenario the cultural institutions will adopt in the future. This applies to the conditions where the pandemic will pose a threat once again and to the so-called "normal" time. Furthermore, a vital issue occurs whether new ways these institutions can interact with observers can be a strategy for more robust long-term customer contacts. Drawing attention to the results of a part of the theaters where the productivity increased by far is worth noting due to the technology applied. Of course, an online play or even so-called live streaming cannot compensate for visiting the theater or participating in a live sport. In addition, it will be difficult for theater artists to maintain a certain level of interactivity desired to maintain the audience's sense of immersion and involvement in the performance.

Implementing the new technology also requires the ability to balance the use of technology and artistic creativity so that the story does not disappear behind the "new

media decoration" (Kuksa and Childs, 2014). Nevertheless, it is worth focusing attention on the mixed form of service provision, which for many people (often excluded, disabled, living in a long-distance from cultural centers, etc.) can be the only source of access to high culture.

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