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The impact of the COVID-19 pandemic on local government cultural institutions – the productivity of theatres

JEL classification: H2, H7, H18

Keywords: performance art organizations, theatre, technical efficiency, Malmquist index value, total factor productivity

Abstract

The new reality has led us to investigate the changes in productivity in public cultural institutions. The research describes the pandemic period in the theatre sector. We are investigating whether productivity changes occurred and which indicator affected them. We hypothesize that the productivity index in 2020 was most dependent on the technological change. We use the Malmiqusit index to show changes in productivity between 2011–2020. Our results seem to fully reflect the pandemic reality when the technological factor was of crucial importance. However, we would like to point out that technological growth alone does not bring satisfactory results in terms of productivity growth. Properly coordinated actions are also necessary for the broadly understood activities of the theatre. Depending on the organization, the impact of digital technologies may differ. The use of technology alone is not sufficient to achieve an increase in the productivity of the organization.

1. Introduction

In 2020, all cultural institutions referred to as PAOs (Performing Arts Organizations) (Cultural Policies, 2020) suffered a significant loss of revenue from ticket sales and venue rentals. This was the main obstacle linked to the COVID-19 epidemic and

occurred in almost every country (Cultural Policies, 2020). Changing the restrictions guidelines and safety rules for cultural institutions – sometimes overnight – made it much more difficult for them to plan repertoire activities, leading to the cancellation of performances and educational events. The impact of the COVID-19 health crisis has led to an unprecedented slowdown in most sectors of activity, and the cultural sector is one of the most affected by the social distance imposed by the epidemiological context triggered in 2020 (Nicolescu and Dinca, 2021).

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 solutions – ranging from a total ban on the actions to various limits on the number of viewers, which often conflicted with the economic costs. Highly subsidized public theatres were less likely to suspend their activities completely or partially (Krajewski and Frąckowiak, 2021).

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 a study by the Austrian Institute of Economic Research, the pandemic caused cultural damage of EUR 1.5–2 billion, which represents a quarter of the annual added value (Cultural Policies, 2021). Cultural employment represented 3.7% of total employment in 2019 (Nicolescu and Dinca, 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 (Cultural Policies, 2021). The French arts and culture sector is one of the most affected in Europe, due to the restrictions put in place (curfew, restrictions on gatherings, etc.), but is also the most financially supported (Bourle`s and Nicolas, 2021). Different countries introduced many various governmental and private support measures (Khlystova et al., 2022; Betzler et al., 2020). This should entail looking at PAOs and companies whose economic situation deteriorated dramatically during the pandemic, and which, as cultural institutions, must continue to carry out their social mission without ceasing. Making efficiency analysis a standard practice would certainly lead to an efficient allocation of artistic resources, not least in times of constraint. The limitation of the PAOs' activity translated, among other things, into:

– a significant decrease in revenue from ticket sales;

– the need to raise other sources of income/revenue;

– difficulties in organizing work 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 time;

– loss of direct contact with the audience.

Attempts were made to solve these problems, as well as the need for expression, the need to implement subsidized projects, and to arrange for the team to work by transferring the theatre to the net (Buchner et al., 2021).

This made it difficult for PAOs to carry out the most essential actions, i.e., to stage productions. In Poland, despite the restrictions on activity, PAOs still received subsidies from the organizer. All 25 theatres in the biggest cities in Poland surveyed by the authors of this paper maintained statutory subsidies, and the increase in their amount happened in 18 theatres. A decrease of 1–12% was noticed in seven theatres only.

The aim of our research is to identify productivity changes in Polish public theatres during a pandemic situation to reveal the possibilities of improving their productivity in the future. We assume that the productivity level in the time of COVID-19 is mostly dependent on the technology change. The verification of this hypothesis will be based on the productivity understood as the number of viewers during the theatre's own performances.

This is a continuation of our previous research (Gałecka and Smolny, 2021). The present study extends the previous one to include the number of theatres and the research period. We hereby wish to verify the previous results. This study is consistent with the trend towards 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 theatre productivity, understood as the number of viewers and the value of the Malmquist index – TFP (total factor productivity) (Last and Wetzel, 2011; 2010). We assume that the cultural sector has used the time of isolation to create new communication channels or has intensified the existing possibilities of remote transmission. We are investigating whether this process has been uniform. Perhaps in the future, the experience gained will continue to function by continually expanding the access to culture for people excluded from participation in culture, for instance for reasons of communication.

The paper is structured as follows: the following (first) section sheds light on the efficiency of public cultural institutions. In this section, we analyze the concept of efficiency relating to the activities of cultural institutions. We also point out potential factors influencing efficiency, especially in the situation of limiting their activities. We also point out the role of technology in increasing business efficiency. The second section provides information on the data and the empirical approach; the third section presents the estimates and then places the results in the context of existing studies, especially those focused on productivity factors; the last section summarizes the main findings.

2. Theoretical framework of the research

Kosieradzka (2012) defines productivity as the efficient use of the system's input resources: energy, materials, human labor, capital, information, area, time, etc., in the production of goods and services that constitute its output. Farrell (1957) shows, that productivity is defined as production efficiency. Productivity indicates

the effective use of all resources without implying any production technology (Shao and Lin, 2002).

Literature on production in the performing arts is rare. There are several empirical studies related to the measurement of productivity (production technology and efficiency) of the performing arts sector from both the production and cost-function perspectives (Baumol and Bowen, 1965; Throsby, 1977; Gapiński, 1980; 1984; Zieba and Newman, 2007, Last and Wetzel, 2010; Gałecka and Smolny, 2021). When researching the functioning of cultural institutions, one should consider organizational and economic efficiency, which are the criteria for assessing the activities of the analyzed entity and/or its individual areas. In this sense, efficiency refers to the principle of management in terms of performance (the maximization of outputs) and savings (the minimization of inputs) (Suchecki, 2020). For authors, the problem of measuring efficiency is particularly difficult for public cultural organizations (Bosso and Funari, 2004).

In research, we see two general approaches to efficiency: parametric and non-parametric. The TFP (Total Factor Productivity) Malmiquist method, as well as the more common DEA (Data Envelopment Analysis), are non-parametric methods. Non-parametric methods, instead of imposing a specific functional form, allow the observed data from different companies to define the boundary using the envelope function and starting from certain probable assumptions about the production technology. The DEA method is most often used in the cultural economy (Guccio et al., 2014; De Witte and Geys 2011; Del Barrio et al., 2009; Mairesse and Van den Eeckaut 2002; Kol'vekova et al., 2019). With the help of DEA, Marco-Serrano (2006) estimated technical efficiency and cost-effectiveness in the performing arts.

Many cultural institutions, including PAO, had to evolve and switch to remote work to maintain contact with viewers. The dynamics of the impact vary significantly across creative sub-sectors and countries (Khlystova et al., 2022). Pauget et al., anticipated the current situation. They tried to describe French museums' possible future by 2030 (Pauget et al., 2021). Based on the Delphi study (from 2017–2018) with 99 experts in this field, three potential scenarios were identified. One of them was the "crash" scenario, in which institutions would have to evolve to survive. However, the online theatre is merely an account of theatre activities. There is even a term that "online theatrical reality is a prosthesis" or "online as evil" but also as a theatre without borders (Buchner et al., 2021; Krajewski and Frąckowiak, 2021). The actual theatre takes place "here and now." Live performances, even for a small number of viewers, in the context of the foundations and mission of the theatre are more critical (Gadrey, 2002) than any virtual theatre presentation. In an artistic institution whose budget before the pandemic was approx. 40% (Gałecka and Smolny, 2017) based on the institution's resources, it was not possible to carry out activities of the existing scale and formula without receiving financial support from the state (Thorsby, 2010; Gałecka and Smolny, 2019). Especially in large theatres that offer performances incurring high costs of presentation,

the revenue generated by these institutions from ticket sales covers the operating costs and finances the production of new artistic events and often is also a part of fixed costs. All the more, it was necessary during the pandemic (Khlystova et al., 2022; Betzler et al., 2020). The cultural sector has been covered by various public aid initiatives. However, these funds were not considered in our calculations.

New technologies such as live streaming, Instagram TV, and others were often used in PAOs, and even artists themselves, who often used Twitch. This is not new, but especially in theatres, the pandemic expanded the available audience. 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 commenting features. The Goethe Institute has offered a digital platform called "Kulturama" (2021) created out of the need to support cultural actors worldwide due to the coronavirus crisis. The fact that events with live audiences were cancelled and cultural institutions and clubs were closed, triggered existential challenges for artists worldwide (Cultural Policies, 2021). The new reality has led us to investigate the changes in the productivity of public cultural institutions. Productivity is understood as the total number of spectators per year (Throsby and Whiters, 1979; Trzeciak, 2011), but we do not distinguish between classical and online audiences – the theatre reports do not give us such a possibility. We are investigating whether productivity changes occurred, and which indicator has affected them. We think that the official publication of data does not subsume streaming, digitalization and other new forms. The research period is 2011–2020, and the critical year is the year of the COVID-19 pandemic, namely 2020.

3. Research methodology

In the paper all of the municipal theatres were considered. However, many theatres did not supply the financial and technical data. Some of the data did not contain the complete information necessary for the study. The research comprised the 25 municipal public theatres, which operated at least one professional theatre company and at least one permanent stage. The study included both small and large theatres in big cities (taking into account the number of stages and seats in the theatre headquarters). Ultimately, theatres from Krakow, Lodz, Bydgoszcz, and Warsaw qualified for the study. The research period covers the years 2011–2020. 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 2011–2020. The adopted research period is dictated by the author's access to archival and real data. 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 the structure of these changes. The output-oriented

Malmquist index and its decomposition were utilized 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). Therefore, technical efficiency is one component for determining a firm's productivity index. Technical efficiency is understood as the managerial ability to get the maximal output from available resources with the existing production technology (i.e. the given level of inputs) (Zieba, 2011). The efficiency captured in this way shows what is the real relation of effects to inputs in relation to the maximum level that can be achieved under specific technological conditions.

In other words, technical efficiency investigates how well the production process converts inputs into outputs. Technical efficiency is significantly influenced by technical change (techch), better use of technology – change of technical efficiency (effch), and the scale of the organization's operation (sech) (Färe et al., 1997). The scale of operation is very important. When it is too small or too large, the organization cannot achieve a comparable level of overall technical efficiency compared to the entity operating in the area of sustainable economies of scale.

Technological change (techch) is a measure that shows how the production possibility frontier of a decision-making unit (TFP) changes as a result of technological progress. Technological change reflects the impact of new technologies on TFP efficiency and can be positive if new technologies increase production efficiency, or negative if new technologies reduce production efficiency (Färe, Grosskopf and Lovell, 1994).

An input- or output-oriented approach can be used in establishing the Malmquist index. The output-oriented approach was used in the presented research. It was assumed the effect of the theatres' activity is productivity understood as the number of viewers (Y). We use absolute data because in 2020 the number of seats in theatres or the number of rooms did not have a significant impact on the online performances. The Table 1 presents the list of variables.

Table 1. List of variables used in the study

Output	Input
Y – Number of viewers	X1 – Own income X2 – Amount of subsidies X3 – Expenditure on salaries of full-time employees X4 – Expenditure on salaries of part-time employees X5 – Materials and Energy consumption X6 – Other expenses X7 – Number of full-time equivalents (FTE) X8 – Number of premiers X9 – Number of performances

Source: own elaborations.

The Malmquist index was defined with the use of technical efficiency measures for the t-period (Coelli et al., 2005; Färe et al., 1985):

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

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*.

Technology is considered to be the level of technological development of an individual in a given period. When TFP is greater than, equal to, or less than one, the efficiency increases, remains constant or decreases, respectively, in period t + 1 compared to period t.

Table 2. Description statistics / Estimated technical efficiency, cross-sectional model

Variable description	Variable	Mean	Median	Std. dev.	Min.	Max.
Number of viewers	Y	66705.26	47184.5	9848.92	311	2404950
Own income	X1	2611407	1966815	143183.7	72876	11903151
Amount of subsidies	X2	5685741	5355550	188283.7	489500	16600200
Expenditure on salaries of FTE	X3	3890544	3760174	1763948	650559	10519334
Expenditure on salaries of part-time employees	X4	1290324	1186011	1186011	119984	4023142
Other expenses	X5	2859779	2768209	1556772	413452	8381041
Consumption of materials and energy	X6	1420998	658797.5	1618138	39366	7291738
FTE	X7	72.20102	70.325	33.21723	13.25	160
Premiers	X8	4.9448	4	3.059817	0	23
Number of performances	X9	271.252	260.5	144.2062	25	727
Number of observations	250					

Source: own elaborations.

We consider both the cost of permanent staff (full-time employees and part-time employees). Personal wages and salaries include, among others: basic wages and salaries, premiums and prizes, bonuses (e.g. for working in unhealthy conditions, for seniority, for serving in management positions), wages and salaries for working overtime, wages and salaries for time off (paid lay-offs, holidays, illness) and allowances and claim benefits. Expenditure on salaries includes the costs of all employees, i.e., both directly and indirectly linked to the "production" of performances. The costs of materials and energy inherent in the operation of the theatre

have also been taken into account. Additionally, the indicator called other costs was also included. This indicator includes, among others, expenses for external services and other costs – earnings-related contributions (statutory liabilities concerning remuneration and work outsourced on a contract basis as labour costs). Costs in a theatre are used as labour and capital input. Subsidies and own revenues constitute the theatres' important source of finance. We used the indicators: "expenditure on salaries of full-time employees" and "number of full-time equivalents (FTE)" at the same time, due to the very different pay rates per full-time jobs.

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 per 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 is 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 Whiters, 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 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 2 show a significant variance for all variables.

Due to the specific activities of theatres in 2020 (online activities), the number of performances at the seat of the theatre also includes the number of online performances. Similarly, the number of viewers at the seat of the theatre in 2020 also takes into account the number of views and the number of online viewers.

Assuming a significant impact of technology on the productivity result, we also compared the productivity of theatres in 2020 against 2011 and 2019 against 2011. We wanted to check the evolution of components in the year before the pandemic and the pandemic year. We showed the financial figures for 2011 in 2019 and 2020 prices. For this purpose, we used the chain-linked price index for the following indicators: own income, amount of subsidies, consumption of materials and energy and other expenses. To make the costs incurred for remuneration more realistic, we used the indexes of the dynamics of the average wages and salaries in Poland (the average wages and salaries in Poland for section: arts, entertainment and recreation, GUS, 2020 and 2021).

4. Research results

Over the ten-year research period, the Malmquist index (TFP) showed various values among the theatres studied. The average value of the Malmquist index (TFP) was 1.037 (Table 3). This indicated an average productivity increase of about 3.7%. The size of the Malmquist index was affected by the change in technical efficiency (effch), the change in technological progress and the efficiency of scale. However, the technological change (techch) had the most significant impact on the average Malmquist index from 2011 to 2020. The decrease in technical efficiency was mainly caused by changes in the functioning of theatres in 2020 and 2021. The lock-in period significantly influenced the limited activity of theatres, which resulted in a low average value of the indicator (Tables 3 and 4).

On average, the TFP index increased its value by 42%, while the technical efficiency index value decreased (-27.2 %) (Table 3). As Figure 1 clearly shows, the technology index (techch) was a significant component of productivity growth in the years 2011–2020.

Table 3. TFP and its components in years 2011–2020

Theatres	Malmquist Summary index			
	2011–2020			
	effch	techch	sech	TFP
Teatr Polski im. H. Konieczki	0.666	1.395	0.642	0.929
Teatr Ludowy	0.856	1.274	0.964	1.09
Teatr Bagatela im. Tadeusza Boya-Żeleńskiego	0.752	1.207	0.898	0.908
Teatr Lalki, Maski i Aktora "Groteska"	0.847	1.204	0.847	1.02
Teatr Łaźnia Nowa	0.985	1.407	0.986	1.387
Teatr Nowy im. K. Dejmka	0.619	1.533	0.978	0.949
Teatr Powszechny	1	1.508	1	1.508
Teatr Lalek "Arlekin"	0.623	1.415	0.623	0.881
Teatr Lalki i Aktora "Pinokio"	1	1.491	1	1.491
Teatr Muzyczny	0.709	1.395	0.946	0.989
Teatr Ateneum im. S. Jaracza	0.641	1.473	0.954	0.944
Teatr Dramatyczny im. G. Holoubka	0.661	1.53	0.998	1.011
Teatr Lalek Guliwer	0.638	1.415	0.638	0.903
Północne Centrum Sztuki Teatr Komedia	0.688	1.407	0.847	0.967
Teatr Kwadrat	0.752	1.328	0.752	0.999
Teatr Lalka	0.658	1.494	0.903	0.984
Teatr Nowy	0.911	1.478	0.911	1.347
Teatr Ochoty	0.626	1.482	0.626	0.928
Teatr Powszechny im. Z. Hübnera	0.67	1.471	0.96	0.986
Teatr Rampa na Targówku	0.725	1.351	0.714	0.98

Teatr Rozmaitości	0.799	1.606	0.779	1.283
Teatr Studio im. S.I. Witkiewicza	0.639	1.511	1	0.966
Teatr Syrena	0.704	1.341	0.701	0.944
Teatr Współczesny	0.691	1.417	0.675	0.979
Teatr Żydowski im. E., R. i I. Kamińskich	0.584	1.548	0.995	0.904
Mean	0.728	1.424	0.842	1.037

Source: own elaborations.

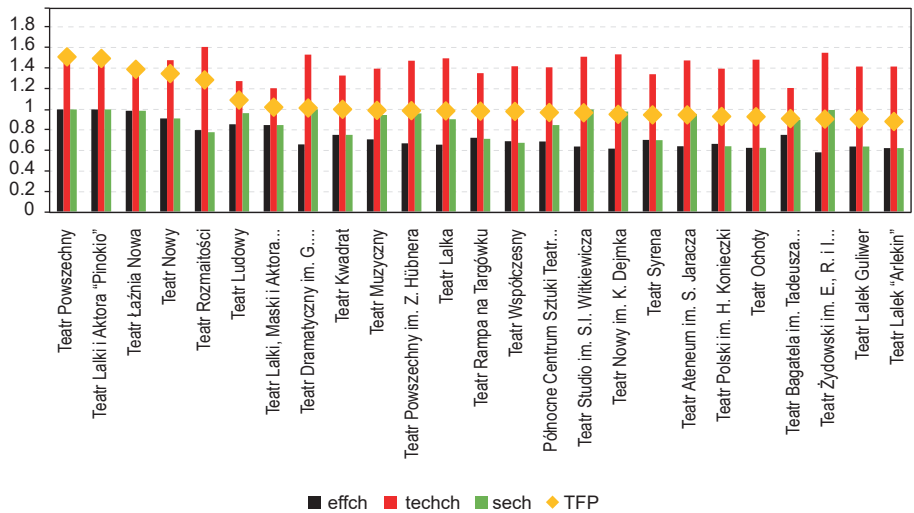

Figure 1. TFP and changes in the technological index and technical index, years 2011–2020

Source: own elaborations.

The significant influence of the technological indicator is also noticeable in the years 2020–2011 and 2019–2011. These differences are important for research because they show the activity of the theatre before and during the pandemic in comparison with 2011. In particular, it is worth paying attention to the multi-fold increase in the index of technological progress.

In the years 2020–2011, the annual change in this index amounted to as much as 1828%, with a simultaneous decrease in technical efficiency by 94.2% and scale effects by 78.8% (Table 4). Due to the difficulties in the management and proper functioning of theatres, the TFP in 2020 finally increased by only 5.4% compared to 2011. The situation was different in 2019 and 2011. The impact of technology is also visible in these years, although the increase is much smaller than in the previous comparison (an increase of 44.6%). Along with the increase in technology, there is a slight decrease in the technical efficiency index (a decrease of 6.5%) and the effects of scale (a decrease of 3.2%) are visible. Consequently, in 2019, the TFP increased by 35.1% compared to 2011.

Table 4. TFP and its components in years 2020 vs 2011 and 2019 vs 2011

No.	Theatres	Malmquist Summary index							
		2020 vs 2011				2019 vs 2011			
		effch	techch	sech	TFP	effch	techch	sech	TFP
1	Teatr Polski im. H. Konieczki	0.026	23.65	0.018	0.613	0.911	1.582	0.933	1.442
2	Teatr Ludowy	0.246	12.14	0.722	2.992	0.917	1.369	0.943	1.255
3	Teatr Bagatela im. Tadeusza Boya-Żeleńskiego	0.077	7.488	0.38	0.574	1	2.034	1	2.034
4	Teatr Lalki, Maski i Aktora "Groteska"	0.225	7.889	0.225	1.772	1	1.601	1	1.601
5	Teatr Łaźnia Nowa	0.874	27.58	0.881	24.11	1.808	1.597	1.575	2.888
6	Teatr Nowy im. K. Dejmka	0.013	25.42	0.818	0.338	0.605	1.588	0.991	0.961
7	Teatr Powszechny	1	21.51	1	21.51	1	1.549	1	1.549
8	Teatr Lalek "Arlekin"	0.014	20.9	0.014	0.294	0.823	1.568	0.823	1.291
9	Teatr Lalki i Aktora "Pinokio"	1	28.27	1	28.27	1	0.972	1	0.972
10	Teatr Muzyczny	0.045	20.59	0.609	0.932	1	1.37	1	1.37
11	Teatr Ateneum im. S. Jaracza	0.018	18.42	0.652	0.337	1.279	2.064	0.783	2.64
12	Teatr Dramatyczny im. G. Holoubka	0.024	20.22	0.986	0.484	0.995	1.452	1.017	1.445
13	Teatr Lalek Guliwer	0.018	13.23	0.018	0.232	1	1.197	1	1.197
14	Północne Centrum Sztuki Teatr Komedia	0.034	12.48	0.225	0.428	1	1.522	1	1.522
15	Teatr Kwadrat	0.077	7.373	0.077	0.568	1	1.249	1	1.249
16	Teatr Lalka	0.023	23.45	0.401	0.546	0.951	1.62	0.951	1.541
17	Teatr Nowy	0.433	23.07	0.433	9.998	0.735	1.344	2.037	0.987
18	Teatr Ochoty	0.015	28.66	0.015	0.424	1.913	1.184	1.913	2.264
19	Teatr Powszechny im. Z. Hübnera	0.027	23.78	0.696	0.651	0.564	1.288	0.864	0.726
20	Teatr Rampa na Targówku	0.056	10.1	0.048	0.562	1.008	1.148	0.878	1.157
21	Teatr Rozmaitości	0.132	34.85	0.106	4.613	0.573	1.392	0.46	0.797
22	Teatr Studio im. S.I. Witkiewicza	0.018	28.14	1.001	0.502	0.801	1.356	0.89	1.086
23	Teatr Syrena	0.042	14.74	0.041	0.625	1.052	1.978	1.008	2.08
24	Teatr Współczesny	0.036	16.29	0.029	0.583	0.794	1.328	0.693	1.054
25	Teatr Żydowski im. E., R. i I. Kamińskich	0.008	28.49	0.956	0.224	0.66	1.356	0.61	0.895
Mean		0.058	18.28	0.212	1.054	0.935	1.446	0.968	1.351

Source: own elaborations.

The increase in productivity (TFP) results from the level of technical efficiency, technology index and scale index (Figure 2). There are cases of theatres where, despite a high level of the technological index, productivity has decreased (e.g. theatre no. 6, 17, 19, 21, 25). This means that the mere increase in the technological progress index did not improve productivity, although it certainly prevented its further decline. When trying to improve productivity, one should take into account the symmetrical growth of all components of the analyzed indicator.

Compared to previous studies conducted in a shorter period and on a smaller number of theatres, we notice that the present result shows less/weaker TFP and a stronger technological indicator – which is logical – because technological changes felt more strongly in the period 2011–2020 than only in the period 2016-2020 as it was counted in an earlier study. Additionally, a smaller increase in efficiency indicates that it is significant to symmetrically raise all indicators – a decrease in technical efficiency (request, marketing, organization) causes the impact of an increase in the technological indicator to weaken. Theatres benefit not only from the increase in technological facilities but also from technical and large-scale production.

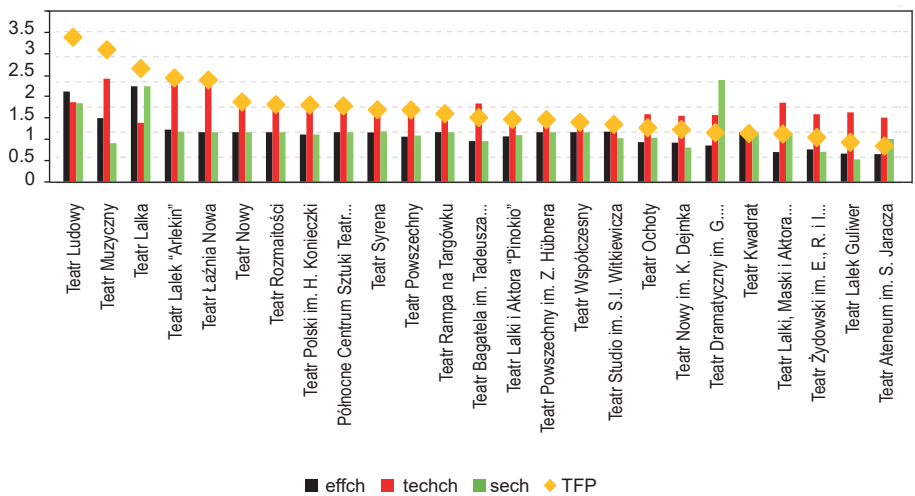

Figure 2. TFP and changes in the technological index and technical index, 2019 vs. 2011

Source: own elaborations.

5. Discussion

The current research focuses on finance and productivity, but we consider also new concepts that would allow us to face forward into the changed social and cultural situation after COVID-19. The period of the COVID-19 pandemic is undoubtedly 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 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 newly emerged forms began to be used as artistic tools (Grau, 2003), which of course also aroused opposition, thus shifting the future of theatre to television (Kuksa and Childs, 2014).

Poland, as an Eastern European country, was less prepared and burdened with multiple challenges long before COVID-19 (Cultural Policies, 2020) – fragile institutions, weak public finances, and so on. Here, we still have to answer a fundamental question: Why should arts and culture be supported in a democratic society and how best to do it (Dümcke, 2021)? In 2020, theatre was going through a painful moment that television, film, and music have already gone through. The moment when technology suddenly makes previous structures of activity obsolete. The strict pandemic restrictions on in-person theatre forced the theatres to numerous changes, and it can be said that they raised the stakes. Theatre-makers of every kind, at every scale, are filming new performances for online distribution. The pandemic has had a strong positive impact on the products and services provided by the IT industry (George et al., 2020). These changes were also visible in theatres.

Research conducted in Poland shows that the implementation of online theatre activities was often done collectively. In the early stages, even actors often took the initiative, not only inventing new activities but also carrying them out at home (Buchner et al., 2021). During the pandemic, employees faced completely new challenges. In larger theatres, additional support was provided by the legal department (contracts and licenses) and the technical department (post-production). Smaller theatres did not have in-house experts in this field (Buchner et al., 2021). This may indicate that the cultural climate in a given organization and the balance between production concerns and human-related issues play a vital role in the implementation of new technological solutions. To enhance productivity, it is important to consider the balanced development of all elements of the measured index. The organization's internal culture can cause distorted application of technologies, that can both improve and hamper the efforts made to introduce a change (Godé, 2006; Gałecka and Smolny, 2023).

We noticed that the productivity index increased in theatres where the decline in technical efficiency and economies of scale was less. It proves the necessity of

cooperation of all factors while maintaining the synergy necessary for the effective development of a given unit. The use of technology is not sufficient to achieve an increase in the productivity of the business. The ability to use the applied technologies also seems to be of significance. Perez-Laborda and Perez-Sebastian (2020) show that technological progress significantly increases the relative productivity of skilled rather than unskilled workers.

6. Conclusions

The conducted research showed a significant increase in the value of the technological progress index during the pandemic period. At this point, it should be emphasized that theatres have been using new technologies in the production of performances for years. The blockade period, however, caused a significant change. In none of the analyzed years was this growth as high as in 2020. Digital technologies have made cultural products more accessible, challenged the established business models and the copyright system, and blurred the line between producers and consumers.

It is worth examining the productivity of theatres in individual EU countries in relation to the introduced restrictions and the support provided by the state. The use of technology is not sufficient to achieve an increase in the productivity of PAOs. There are also needs for systemic solutions in the field of organization and legal regulations that adapt public cultural services to the post-COVID-19 reality (Buchner et al., 2021). Actions that use this technology thoughtfully and harmoniously are essential. The results obtained in the study seem to prove this point. Despite the increase in the technological efficiency index in all theatres (Table 4), the productivity indices were varied. Likewise, we notice different values of the technical efficiency index and the effects of scale. This also demonstrates the significant role these indicators play.

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