

An evaluation of the technical efficiency of cultural institutions in Poland: a case study of the regional system of public libraries

Adam Mateusz Suchecki¹

Department of Public Finance, University of Lodz

+48 603-07-11-67

Adam.suchecki@uni.lodz.pl

Abstract

The political transformation of 1989 as well as Poland's accession to the European Union in 2004 had a significant impact on the cultural sector and forms of its organisation and funding. These events also contributed to setting new directions for Polish cultural policy. This is a part of a wider public policy understood as an intentional and purposeful process of achieving objectives in particular areas of public life. Currently, the library policy is an integral component of Polish cultural policy. It aims at achieving specific objectives and implementing tasks in the field of the social circulation of library books and preservation of linguistic, cultural and civilisation heritage for future generations.

Since 2001, public spending on culture in Poland has remained below 1% of total expenditures of the state budget. Limited financial resources from the national and provincial budgets earmarked for culture are the main reason for performing a comparative study of the technical efficiency of cultural institutions in Poland using the example of libraries. The Polish system of public libraries consists of national, educational, school, medical, agricultural, prison and military libraries. The functioning of these institutions requires adequate funding to guarantee the satisfaction of society's reading and information needs.

The research presented in this paper focused on the analysis of public libraries operating in the Polish provinces. In this study, one of the nonparametric methods, Data Envelopment Analysis (DEA) was applied.

Keywords: Culture · Economics of culture · Data Envelopment Analysis · Libraries · Public Policy · Efficiency

JEL: C69, H72, Z18

1. Statement and importance of the problem

1.1. The organisation and funding of culture in Poland

The system of cultural institutions currently operating in Poland results from the systemic changes to the economy which started in 1989. They consisted of the regular introduction of elements of decentralisation. It was this process that had the greatest impact on the functioning of the cultural sector, particularly the decentralisation of public tasks in the field of culture involving the transfer of the

¹ MA, PhD (economics), University of Lodz, Poland, Faculty of Economy and Sociology, Institute of Finance, Department of Public Finance.

majority of these tasks from the state to the local government level (Głowacki, Hausner, Jakóbiak et. al. 2009). In the process of decentralisation of the cultural sector, one can distinguish four main stages of change in the management of cultural institutions, including public libraries.

The first stage was implemented in the years 1989-1991. This was the initial stage of the transformation, during which the book and the music markets were privatised and the process of decentralisation of public tasks in the field of culture was initiated. During this period, most of the existing cultural institutions, including libraries, community centres, day-care rooms, clubs and some of the museums, were taken over by the communes. Transfer of the management of institutions of cultural dissemination to the communes resulted not only from the implementation of the principles of the new local government system and free market, but was dictated also by poor economic conditions and changes to the rules for the management of cultural institutions.

The second stage, implemented between 1991-1993, was an attempt to carry out a systemic reform of cultural institutions. These changes were based on the introduction of two acts: the Local Government Act (Polish Journal of Laws/1990 No 16, item 16) and the Competence Act (Polish Journal of Laws/1990 No 34, item 198). Under these acts, cultural institutions (especially public libraries and community centres) were handed over to local commune governments (municipal, municipal-rural and rural). The local commune governments were set up as direct organisations establishing, managing and independently financing cultural institutions. Provincial and national cultural institutions remained under state supervision. The primary role of the Minister of Culture and Art in the management of public libraries was eliminated, just as the supervision of commune libraries by provincial public libraries (Czajka 1991).

In the analysed period, one can clearly observe decentralisation in the management and financing of cultural institutions. This was reflected in their new divisions, which corresponded to the three levels of organisation of the country. The first level includes cultural institutions of particular importance to national culture which remain under the direct supervision of and are financed by the Ministry of Culture. The second level consists of cultural institutions which are under the care of the state. They are supervised and financed by province

governors with considerable support from the national government. The third level consists of institutions subordinate to local governments, the activities of which are supported at the provincial level. The sum of the legislative work carried out by the government came in 1991 with the adoption of the Act on the Organisation and Conducting of Cultural Activities, which, following a few amendments, is still in force today (Polish Journal of Laws/1991 No 114, item 493).

The third stage of decentralisation in the field of culture occurred in the years 1993-1997. During this period, no significant continuations of the decentralisation process in culture occurred. However, there were also a number of gestures by the national government designed to emphasise the state's caring nature towards the cultural sphere.

The fourth stage of decentralisation commenced in 1997 and lasted till 2001. Under the Local Government Act (Polish Journal of Laws/1998 No 91, item 578) and the Second Competence Act (Polish Journal of Laws/1998 No 106, item 668) full control over cultural institutions was transferred to local governments. These institutions included provincial cultural institutions and reactivated district institutions, including the district public libraries. During this period, decentralisation reforms were completed. Local province, district and commune governments appeared, and the province governments became the organisers of most of the previously state-run cultural institutions. Acts introduced after 2001 on the functioning of cultural institutions, including public libraries, put in order the principles of their organisation and activities. Pursuant to these acts, the National Library and local government units, which may be independent cultural institutions or part of other cultural institutions (Polish Journal of Laws/2011 No 207, item 1230), are considered to be public libraries. These acts also specified the tasks assigned to these cultural institutions (Polish Journal of Laws/2011 No 10, item 406), such as the digitisation of cultural institutions (Polish Journal of Laws/2005 No 65, item 565), keeping records of library materials (Polish Journal of Laws/2008 No 133, item 883), archiving documents (Polish Journal of Laws/2011 No 123, item 698), administration and determining employees' pay (Polish Journal of Laws/2005 No 10, item 565; Polish and Journal of Laws/2012 No 10, item 1105) and the scope of public funding (Polish Journal of Laws/2009 No 15, item 1241).

In the Polish model of organising and financing culture, one can classify cultural institutions, including libraries, in terms of their importance. This classification divides cultural institutions into three basic categories: national, regional and local. National institutions, including the National Library, have a high priority in terms of the quality of the services provided. Their prestige also results from the nature of the tasks they perform, which is the cultivation of the cultural heritage of the generations. This group includes some institutions intended to meet basic and higher level needs. Since they should provide high quality services, they receive substantial funds (Table 1).

Table 1. Classification of the cultural institutions in Poland in term sof their importance

Institution category	Provided services
National institutions	Basic and higher level needs national importance.
Regional institutions	basic and higher level needs of supra-local importance
Local institutions	Needs of local communities.

Source: Kietlińska 1995, p. 119.

The aim of regional institutions is to meet specific basic and higher level needs of supra-local importance. Local institutions are responsible for providing services to meet the needs of local communities.

The state can support cultural institutions directly and indirectly. Funding cultural institutions directly usually takes the form of grants and subsidies. Indirect actions on part of the state consist of tax relief, ranging from preferential VAT rates to tax reductions and exemptions for private sponsors and the subsidisation of prices (van der Ploeg 2005).

In Poland, the obligation to organise and manage cultural activities remains vested in the supreme and central state administrative bodies, and the Minister of Culture is the main state administrative body in the field of culture. The Minister is also a direct organiser of cultural activities for national cultural institutions.

After 1991, besides the Minister of Culture, province governors and commune governments have also participated in the organisation and financing of

cultural activities in Poland. Province governors were authorised to organise the activities of state cultural institutions such as provincial public libraries, art exhibition offices, opera houses, philharmonics, theatres and museums until 1998, when the right to organise cultural activities was awarded to commune governments as a part of their tasks. The tasks of communes in the field of culture consist mainly of managing cultural institutions and local libraries. Despite the inclusion of cultural activities in the tasks of the communes, the responsibilities in this area are not specified. This generates a serious problem because the cultural life of a given community remains largely dependent on the will and commitment of the local government and on the activity of the cultural environment in the region (Przybylska 2007).

1.2. Libraries as an element of public policy

The basic organisational form of public libraries in Poland is as a cultural institution. State policy, one of the components of public policy, plays a decisive role in determining the scope and direction of the activities of cultural institutions. Generally defined, public policy is understood to be an intentional and purposeful process that aims to achieve goals in different areas of public life, and is shaped by public authorities and public institutions. The previously discussed acts showed that national, regional and local authorities may be the subject of this policy, while the collective needs emerging on the national, regional or local level are the object of this policy (Budyńska and Jazierska 2012).

The fundamental aim of public policy is to determine the direction and the purpose of activities undertaken to resolve essential social problems, setting priorities and ways for their implementation. These problems are also the issues of implementation of cultural policy, which is a component of general policy and manifests itself in the political authorities' desire to construct tangible and spiritual values (Kieliszewski, Poprawski, Landsberg and Gołek 2009). This means that this policy is connected with social development strategy and is not autonomous. Moreover, it is seen through the prism of the activities of the state and consists entirely of intentional and organised activities by state and local government bodies (Krzysztofek 1999). Currently, the activities of cultural institutions in Poland are supported by national regulations and EU instruments.

Library policy is linked to public and cultural policy. According to the general definition a library policy is the sum total of measures undertaken by the competent authorities for the purpose of influencing the circulation and social reception of books and other materials collected in libraries. The main assumption of this policy is the achievement of specific objectives and the implementation of tasks in the field of the social circulation of library books as tools of education, culture and progress (Wołosz 2002). In the wider sense, library policy is the constant supervision of the state over the improvement of structures; the optimisation of all means, methods and techniques applied to meet the needs of citizens in terms of the recordings of thought; as well as the harmonisation of this communication channel with particular areas of public life such as science, education, culture and the national economy (Polish Journal of Laws/2003 No 24, item 199).

Since 1996, library policy in Poland has been established by legal acts regulating the matters of public librarianship. The directives introduced by the legislators show that the policy is established by the Council of Ministers (Polish Journal of Laws/2003 No 24, item 199), while this policy is designed and implemented by the Minister of Culture. Apart from the fundamental laws, the provisions of detailed laws establish the rules and procedures for the organisation of public librarianship in Poland, with particular attention given to public libraries. An important role in library policy is played by the National Strategies for Cultural Development. The latest of them – the National Strategy for Cultural Development for 2004-2020 takes into account the library policy of the Minister of Culture both in strategic and financial terms. It shows that public libraries are maintained primarily from public funds and are managed by public administration.

Public libraries in Poland, organised in the form of cultural institutions, can be divided into public and academic libraries. Public libraries include the National Library and libraries belonging to local government units, with academic libraries constituting a separate category. Academic libraries include (apart from the National Library):

- libraries organised by higher education institutions,
- libraries of the National Academy of Sciences,
- libraries organised by research and development units.

Taking into account the changes introduced in culture after the system transformation, one can notice that their main goal was to establish mechanisms conducive to the rational and efficient management of public funds, introduce changes in the competences of public administration, decentralise the management of cultural institutions and increase their autonomy, and to enable private entities to participate in implementing tasks in the field of culture and the arts. Despite the introduction of many changes, cultural policy after the transformation can be considered passive and chaotic, due to which culture has been passively adjusted to changes taking place in the country, economy and society (Głowacki, Hausner, Jakóbiak et. al. 2009).

2. Methodology

2.1. Data Envelopment Analysis (DEA)

The nonparametric DEA method allows for the study of efficiency as an economic category based on models that do not require a prior determination of functional relationships between inputs and outputs. In economic analyses, including research in the field of cultural economics, it is assumed that efficiency is one of the main categories used to describe the condition, functioning and development of various economic institutions and entities. In research into the functioning of institutions in the public sector, one should consider organisational and economic efficiency, which are the criteria for assessing the activities of the analysed entity and/or its individual areas. In this sense, efficiency refers to the principle of sound management in terms of performance (maximisation of the effect/result) and savings (minimisation of expenditures). To express the relationship between expenditures and effects, three basic numerical formulas expressing efficiency can be proposed as follows (Matwiejczuk 2000):

- a difference between effects (outputs) and expenses (inputs) - a result greater than zero means that the results achieved are greater than the incurred expenses;
- a quotient of effects compared to the incurred expenses - a result greater than unity means that the incurred expenses are lower than the achieved results;
- a quotient of the difference between effects and expenses compared

to the incurred expenses, defined as return on investment (ROI) and expressed as a percentage.

It should be noted that the application of the first two formulas requires the expression of expenditures and results in the same units of measurement. The fulfilment of this condition is often a limitation in performing of the relevant empirical research.

In scholarly literature, in addition to different definitions of efficiency, economic efficiency is distinguished by taking into account the principle of sound management. Technical efficiency is one of its major components. Generally, this term should be understood as the maximisation of production through the application of relevant expenses incurred for the implementation of a selected production technology. In this context, one can consider technical efficiency and efficiency of scale. To assess technological efficiency, the ratio of the obtained production value to a certain theoretical maximum value determined by the production function as a criterion. The technical efficiency of the scale means the achievement of a higher value of the ratio of production volume to expenditure as production increases, regardless of unit prices of products and expenses (Begg, Fischer and Dornbusch 2005). The above-mentioned definitions indicate its relative character because the evaluation depends on the following three major factors (Kryk 2003):

- scope of included effects on the side of expenditure and results;
- identification of all effects of a particular economic activity;
- the adopted reference criterion for a given portion of expenditure and effects.

As it was already mentioned, due to certain limitations resulting from difficulties in expressing expenditure and effects in the same measurement units as well as the relative nature of the technical efficiency as described in the literature, the DEA method and its variants have been proposed with increasing frequency (Shim and Kantor 1998). The main advantage of these methods is the fact that they do not require knowledge of the functional dependence between expenditure and results, and the structure of the proposed models is not adjusted to the empirical data. The basis of this method is the application of mathematical programming methods and the relevant empirical observations, allowing determining the efficiency frontier that reflects the shape of a function, describing

the position of the analysed objects recognised as the most effective within a homogeneous set of observed individuals. The collection of homogeneous objects includes groups of objects of similar technology represented by a set of production capacity (Charnes, Cooper and Rhodes 1978), which is determined on the basis of available data (this is considered to be a fundamental defect of the deterministic DEA method). The main advantages of this method include:

- no need for a parametric specification of the production function, both for one and for many products,
- applicable in the case of large amount of expenses and number of products (effects),
- use of linear programming for the calculation of measurement values,
- values of expenditure and effects may be expressed in different units (invariability of the effectiveness measure).

The application of the mathematical programming method allows determining the shape of the efficiency frontier with respect to the value of the efficiency score resulting from the position of the analysed object. In the traditional classical approach, the definition of technical efficiency as proposed by Debreu (1951) and Farrell (1957) is adopted. According to Authors, the technical efficiency of a given object indicates a relationship between the productivity of the object and the productivity of the most effective unit. The basic point of the DEA is the *identification of* so-called efficient frontier in a comparison to the set of DUMs. All units of this frontier are said to be operating at 100% efficiency, while objects that are below the efficiency frontier are inefficient (efficiency below 100%). In DEA, to each DMU the weights that maximise its efficiency score is assigned (Shim and Kantor 1998).

2.2. Evolution of DEA application in libraries

DEA techniques are quite often used in Poland to assess the technical or allocative efficiency of institutions functioning in various sectors of the national economy, especially those financed by public funds. In contrast, only a few studies on the efficiency of public libraries and other institutions of the cultural sector have been conducted so far. One of the first papers on the efficiency of public libraries in Poland was a study conducted in 1998 by Osiwealski and

Osiewalska (2003), which concerned the assessment of the operational costs of libraries. This study was based on microeconomic theories. From the point of view of these theories, a library can be regarded as a production unit that uses specific production factors to manufacture products in the form of services meeting specific social needs. From this point of view, it is important to objectively assess whether the given prices of the resources, the scale and structure of the provided services (the effect of scale) corresponds to the incurred costs. The activities of a library can be assessed in two ways: (1) by comparing the generated and actual products with the maximum product that could be achieved with the determined expenditures (analysis of the technical efficiency based on the frontier production function), defining the minimum cost at the fixed prices of production; or (2) by comparing the costs actually incurred, with the smallest cost at which it would be possible to get the product in question (analysis of cost efficiency based on the frontier cost function), defining the minimum cost at given prices of the factors.

In order to estimate the cost efficiency of libraries, one can apply deterministic methods (e.g. DEA) or stochastic ones (e.g. based on the Cobb-Douglas stochastic cost function). Stochastic cost/production functions are often called Stochastic Frontier Models (SFMs), which can be used to estimate the potential inefficiency of cost carriers. The application of these models was described by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977). The application of the C-D cost function in studies on cost-effectiveness of libraries was presented by Vitaliano (1997).

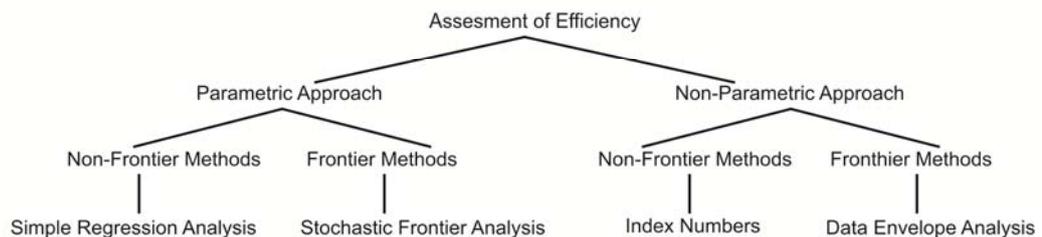
In the library section, one of the most important areas is the evaluation of library performance; efficiency has more meaning and importance for the decision-makers at the parent institution (Li and Yang 2014). There are two approaches to evaluate relative efficiency across cultural institutions: parametric and non-parametric. The parametric approach includes simple regression analysis and Stochastic Frontier Analysis (SFA) as the econometric techniques to estimate a production and cost function, while SFA is used to estimate a frontier of a set of functions with different underlying levels of efficiency. DEA can be seen as an extension of the simple techniques of index numbers; it is a non-parametric approach that uses mathematical programming techniques. Detailed classification of these two approaches is presented by Sarafidis (2002).

In the rapidly developing research on the efficiency of libraries, three major trends can be discerned. The scope of this research includes assessing the degree resources (Morse 1972) utilisation and whether user’s needs are met (van House and Childers 1993), as well as measuring cost-efficiency of economic data (DeBoer 1992, Chen 1997).

Although the first proposal for the application of DEA was presented by Charnes, Cooper and Rhodes in the late 1970s, the first publications on using DEA techniques to measure the efficiency of the libraries appeared as late as the 1990s (Li and Zijang 2014), and their increased popularity and applications have been observed only for the last two decades of the twentieth century. It should also be emphasised that increased interest in the results of such research resulted from the economic slowdown and the reduction of expenditures for operating cultural institutions, including public libraries, and the search for effective and efficient tools to support management decisions.

The application of different effectiveness measurement methods presented in Figure 1 requires specifying a set of input and output variables. The set of values used in the DEA analysis method allows obtaining relative measures of efficiency, while measuring the effectiveness of changes over time and its decomposition is possible with the Malmquist’s index.

Figure 1. Taxonomy of efficiency measurement techniques.



Source: Sarafidis 2002, p. 3.

In works on the measurement of the efficiency of libraries, different Authors defined these two sets of variables and compared them with various institutions and countries. Table 2 presents the results of some research conducted in between 1993-2013 (Li and Yang 2014).

The presented review of the selection of input and output variables shows that with an increased number of studies on the efficiency of libraries applying the DEA method, the number of institutions and the scope of their research changed.

Table 2. The review of the section of input and output variables in international studies on libraries.

Author and year	Libraries and country	Inputs	Outputs
Kwack, 1993	20 national University Librarise in California, USA	Library staff, area of library space, number of library books	Reader visits, circulation of books
Chen, 1997	23 university and college, non-profit comparative libraries,US	Library staff, book acquisition expenditure, area of library space	Reader visits, book circulation, reference transaction and online search, interlending service
Vitaliano, 1998	184 public libraries in NY, US	Total holdings of all items, total hours of operation per week, new books purchased and total serial subscriptions currently active	Annual total circulation of all library materials, in-library use of materials measured by the number of reference question answered
Sharma et al., 1999	47 public libraries in Hawaii	Collection, library staff, days open, non- personal expenditures	Circulation, reader visits, reference transactions
Shim, 2003	95 academic research libraries from the Association of Research Libraries (ARL), US and Canada	Discretionery and nondiscretioney, including 7 discretionary inputs, including 3 nondiscretionary inputs.	The total number of interlibrary lending transaction filled, total number of interlibrary borrowing transaction filled, number of people who participated in group presentations or instructions, number of reference transactions excluding directional

			questions, the total number of circulation including renewals
De Carvalho et al, 2012	37 libraries affiliated to a federal university in Rio de Janeiro	Number of employees, area and number of volumes	Consultations, loans, enrolments and user traffic
Hwang, Shieh and Hsieh, 2012	12 e-resources in libraries, University in Taiwan	Target user number and purchase fee of databases	Connection, searches and downloads

Source: Li and Yang 2014, pp. 12-14

3. The research

3.1. Selection of data and hypotheses

This research was conducted for public libraries at the province level applying generally available public data from the Central Statistical Office in years 2003-2014. The selection of the first period of the study is directly conditioned by changes to the organisation and financing of culture in Poland and the completion of the local government reform.

In order to use the DEA (non-parametric methods of measuring the efficiency) it was necessary to adopt a relevant category of expenditures and effects. The following categories were adopted for expenditures: the number of libraries (in units) and the amount of funding (in thousands of PLN) that the local government units allocate from their budgets to libraries. The following data were adopted as the results: book collection (number of books per 1000 inhabitants of a given province) and the number of readers in the province per 1000 inhabitants.

Table 3. The expenditures (inputs) and effects (outputs) categories of data for libraries in year 2003 and 2014.

	2003		Outputs	
	Inputs			
	Number of libraries (in units)	Amount of funding (in 1000 PLN)	Book collection (per 1000 inhabitants)	Number of readers (per 1000 inhabitants)
POLSKA	8 727	683579	3 514,9	198
DOLNOŚLĄSKIE	674	53395	3 707,0	224
KUJAWSKO-POMORSKIE	475	31674	3 711,7	184

LUBELSKIE	627	40387	3 229,7	211
LUBUSKIE	270	16623	3 890,0	209
ŁÓDZKIE	575	42088	3 425,2	184
MAŁOPOLSKIE	773	50042	3 257,1	218
MAZOWIECKIE	1 040	107092	3 190,7	178
OPOLSKIE	326	17710	3 973,5	171
PODKARPACKIE	704	33951	4 191,1	204
PODLASKIE	259	17779	3 612,8	162
POMORSKIE	357	34281	2 780,7	175
ŚLĄSKIE	845	98176	3 552,3	232
ŚWIĘTOKRZYSKIE	304	18254	3 394,3	170
WARMIŃSKO- MAZURSKIE	356	25830	3 821,7	199
WIELKOPOLSKIE	752	64279	3 524,8	192
ZACHODNIOPOMORSKIE	390	32018	4 172,6	201

2014

	Inputs		Outputs	
	Number of libraries (in units)	Amount of funding (in 1000 PLN)	Book collection (per 1000 inhabitants)	Number of readers (per 1000 inhabitants)
POLSKA	8 094	1304664	3 397,6	164
DOLNOŚLĄSKIE	607	95129	3 170,9	164
KUJAWSKO-POMORSKIE	423	68911	3 513,2	132
LUBELSKIE	585	86131	2 906,3	176
LUBUSKIE	252	32185	3 614,6	151
ŁÓDZKIE	542	71330	3 461,4	156
MAŁOPOLSKIE	724	97099	3 252,4	195
MAZOWIECKIE	964	218940	3 290,9	180
OPOLSKIE	316	34763	3 887,4	157
PODKARPACKIE	678	63720	4 071,7	162
PODLASKIE	240	43507	4 020,1	122
POMORSKIE	322	63462	2 359,5	163
ŚLĄSKIE	800	173988	3 599,0	179
ŚWIĘTOKRZYSKIE	269	34872	3 395,3	133
WARMIŃSKO- MAZURSKIE	304	45826	3 186,9	145
WIELKOPOLSKIE	694	115359	3 437,1	152
ZACHODNIOPOMORSKIE	374	59442	4 049,2	150

Source: Own calculations, Local Database of Polish Statistical Office (GUS)

In the analysed period in Poland, the number of libraries and their branches decreased by 633, from 8727 in 2003 to 8094 in 2014. A similar trend could also be observed in the individual provinces. In the first year of the research, the largest number of public libraries were located in the Mazowieckie and Śląskie provinces – 1040 and 845 respectively. The fewest public libraries were recorded in the Podlaskie and Lubuskie provinces – 259 and 270

respectively. In 2014, the most and fewest public libraries and their branches were located in the same provinces as in the first year of the research. There were 964 libraries in the Mazowieckie province, 800 in the Śląskie province, 240 in the Podlaskie province and 254 in the Lubuskie province.

Between 2003-2014, expenditures on public libraries from the budgets of local government units in Poland gradually grew. In 2003, these expenses amounted to PLN 683,579,000 and in 2014 they almost doubled to reach the amount of PLN 130,466,000. In 2003, the highest expenses from the budgets of local government units were incurred in the Mazowieckie (107,092,000) and Śląskie (PLN 98,176,000) provinces. In the same year, the lowest expenses from the budgets of local government units were recorded in the Lubuskie (PLN 16,623,000) and Opolskie (PLN 17,710,000) provinces. In 2014, the highest expenditures from the budgets of local government units were incurred in the Mazowieckie (PLN 218,940,000) and Śląskie (PLN 173,988,000) provinces and the lowest ones were recorded in the Lubuskie and Opolskie provinces (PLN 32,630,000 and PLN 185,347,000 respectively).

In the analysed years, the number of books per 1,000 inhabitants in Poland decreased from 3,514.9 in 2003 to 3,397.6 in 2014. In 2003, the largest numbers of books per 1,000 inhabitants was recorded in the public libraries of the Podkarpackie (4,191.1) and Zachodniopomorskie (4,172.6) provinces, while the fewest books were recorded in the Pomorskie (2,780.7) and Mazowieckie (3,190.7) provinces. In 2014, the largest numbers of books per 1,000 inhabitants was recorded in the public libraries and their branches in the Podkarpackie (4071.7) and Zachodniopomorskie (4049.2) provinces, and the fewest one in the Pomorskie (2359.5) and Lubelskie (2,906.3) provinces. The greatest rates of change in the number of books per 1,000 inhabitants in the analysed period could be observed in the Podlaskie province (11:27). The following provinces could also boast a positive rate of change: Łódzkie (1.06), Mazowieckie (3.14), Śląskie (1.31) and Świętokrzyskie (0.03). The lowest rates of change (decrease) in the number of books per 1,000 inhabitants were noted in the public libraries and their branches in the Warmińsko-Mazuskie (-16.61), Pomorskie (15,15) and Lubelskie (-10.01) provinces.

In the analysed period, the number of readers in libraries per 1,000 inhabitants in Poland dropped from 198 in 2003 to 164 in 2014. The rate of these

changes amounted to -17.44. In 2003, the largest numbers of readers in public libraries per 1,000 inhabitants were recorded in the Śląskie (232), Dolnośląskie (224) and Małopolskie (218) provinces, while the lowest numbers were recorded in the Podlaskie (162) Świętokrzyskie (170) and Opolskie (171) provinces. In 2014, the largest numbers of readers in libraries per 1,000 inhabitants were recorded in the public libraries and their branches in the Małopolskie (195), Śląskie (179) and Lubelskie (176) provinces, while the lowest were recorded in the Podlaskie (122), Kujawsko-Pomorskie (132) and Świętokrzyskie (133) provinces. The greatest rates of change in the number of readers in the libraries per 1,000 inhabitants in this period occurred in the Mazowieckie province (1.47). This was the only province which recorded an increased number of readers in libraries per 1,000 inhabitants. The lowest rates of change for these effects occurred in the Kujawsko-Pomorskie (-28.21), Lubuskie (-27.84) and the Warmińsko-Mazuskie (-27.26) provinces.

Taking into account the results of the analysis of statistical data on public libraries and their branches, as well as on expenditures from the budgets of local government units for this purpose, one can conclude that increased expenditures from the budgets of local government units on public libraries and their branches have not translated into the increased efficiency of these institutions in the analysed period.

1.2. DEA research results - 2003

The values of the efficiency ratio (Θ) for the provinces obtained from an audit using the DEA nonparametric method (result-oriented CCR model) in 2003 show that full efficiency with a given amount of expenditures was achieved only in the Lubuskie province, for which the Θ efficiency ratio reached the value of 1. The remaining provinces with given expenditures in 2003 could have increased their results. Assuming that the expenditures are permanent, the Mazowieckie province could have increased its effects by up to 354% ($\Theta = 4.54$), and the Wielkopolskie province by 204% ($\Theta = 3.04$). The Podlaskie and Opolskie provinces were the closest ones in terms of achieving the efficiency threshold, and they could have increased their effects in relation to the expenditures by 3% and 4% respectively. The values of the efficiency ratios for the individual provinces and the rank of provinces in the efficiency ratio is presented in Table (4).

The analysis of slacks in the DEA model used in the research of efficiency of libraries in Poland in 2003 for the discussed facilities that have achieved the best results in the ranking in terms of the efficiency ratio is as follows.

The Opolskie province should reduce the number of libraries by 38 and increase the number of readers per 1,000 inhabitants by 44 to achieve the efficiency threshold. The Podlaskie province should increase its expenditures on libraries by PLN 1,833,000 per 1,000 inhabitants and simultaneously increase the number of readers per 1,000 inhabitants by 33 to achieve full efficiency.

Table 4. The values of the efficiency ratios for the individual provinces and the rank of provinces in the efficiency ratio (year 2003)

2003	
	rank theta
dmu:DOLNOŚLĄSKIE	11 2,33096
dmu:KUJAWSKO-POMORSKIE	8 1,84376
dmu:LUBELSKIE	10 2,30933
dmu:LUBUSKIE	1 1
dmu:ŁÓDZKIE	12 2,41859
dmu:MAŁOPOLSKIE	13 2,74793
dmu:MAZOWIECKIE	16 4,53988
dmu:OPOLSKIE	3 1,04299
dmu:PODKARPACKIE	9 1,89567
dmu:PODLASKIE	2 1,03285
dmu:POMORSKIE	7 1,58379
dmu:ŚLĄSKIE	14 2,82501
dmu:ŚWIĘTOKRZYSKIE	4 1,25847
dmu:WARMIŃSKO-MAZURSKIE	5 1,34208
dmu:WIELKOPOLSKIE	15 3,04571
dmu:ZACHODNIORSKIE	6 1,34661

Source: Own calculations, Local Database of Polish Statistical Office (GUS)

Table 5. Presentation of slacks in DEA model for the individual provinces (year 2003)

2003				
	Inputs		Outputs	
	Number of libraries (in units)	Amount of funding (in 1000 PLN)	Book collection (per 1000 inhabitants)	Number of readers (per 1000 inhabitants)
dmu:DOLNOŚLĄSKIE	0	11899,1	1069,72	0
dmu:KUJAWSKO-POMORSKIE	0	2429,83	0	29,6633
dmu:LUBELSKIE	0	1784,7	1574,9	0
dmu:LUBUSKIE	0	0	0	0
dmu:ŁÓDZKIE	0	6687,17	0	0,555472
dmu:MAŁOPOLSKIE	0	2450,97	2186,56	0

dmu:MAZOWIECKIE	0	43062,7	498,07	0
dmu:OPOLSKIE	38,3443	0	0	44,3376
dmu:PODKARPACKIE	152,549	0	0	41,3393
dmu:PODLASKIE	0	1833,23	0	33,4568
dmu:POMORSKIE	0	12301,7	739,301	0
dmu:ŚLĄSKIE	0	46152,2	2138,9	0
dmu:ŚWIĘTOKRZYSKIE	7,50839	0	0	15,6
dmu:WARMIŃSKO- MAZURSKIE	0	3912,27	0	8,51096
dmu:WIELKOPOLSKIE	0	17980,9	98,7223	0
dmu:ZACHODNIORSKIE	0	8007	0	32,3198

Source: Own calculations, Local Database of Polish Statistical Office (GUS)

In the case of provinces which ranked last in terms of the value of the efficiency ratio (Mazowieckie, Wielkopolskie and Śląskie), in order to achieve the efficiency threshold they should:

- 1) The Mazowieckie province should reduce its expenditures on libraries by PLN 43,062,000 per 1,000 inhabitants and increase the number of books per 1,000 inhabitants by 498.
- 2) The Wielkopolskie province should reduce its expenditures on libraries from the budgets of local government units (per 1,000 inhabitants) by PLN 17,980,000 and increase the number of books per 1,000 inhabitants by 99.
- 3) The Śląskie province should reduce expenditures from the budgets of local government units on culture by PLN 46,152,000 per 1,000 inhabitants and simultaneously increase the number of books per 1,000 inhabitants by as many as 2,138.

1.3.Results of DEA research - 2014

The values of the efficiency ratio (Θ) for the provinces obtained from an audit using the DEA nonparametric method (result-oriented CCR model) in 2014 show that full efficiency of the libraries with the given amount of expenditures was achieved only by the Lubuskie and Podlaskie provinces, for which the Θ efficiency ratio reached the value of 1. The remaining provinces would have to increase their effects compared to expenditures on public libraries to achieve the efficiency threshold.

The Opolskie, Świętokrzyskie and Pomorskie provinces came highest in the ranking in terms of the value of the efficiency ratio. In order to achieve full efficiency for their libraries (assuming that the expenditures for this purpose remain unchanged) in 2014, the public libraries in these provinces should increase their effects by 4% (Opolskie province), 14% (Świętokrzyskie province) and 18%

(Pomorskie province). The Mazowieckie, Wielkopolskie and Śląskie provinces came last in the ranking. To achieve full efficiency in 2014, the province should increase their effects (assuming that the expenditures on public libraries and their branches remain unchanged) by 221% (Mazowieckie province), 173% (Wielkopolskie province) and 168% (Śląskie province).

Table 6. The values of the efficiency ratios for the individual provinces and the rank of provinces in the efficiency ratio (year 2003)

	rank	theta
dmu:DOLNOŚLĄSKIE	11	2,33096
dmu:KUJAWSKO-POMORSKIE	8	1,84376
dmu:LUBELSKIE	10	2,30933
dmu:LUBUSKIE	1	1
dmu:ŁÓDZKIE	12	2,41859
dmu:MAŁOPOLSKIE	13	2,74793
dmu:MAZOWIECKIE	16	4,53988
dmu:OPOLSKIE	3	1,04299
dmu:PODKARPACKIE	9	1,89567
dmu:PODLASKIE	2	1,03285
dmu:POMORSKIE	7	1,58379
dmu:ŚLĄSKIE	14	2,82501
dmu:ŚWIĘTOKRZYSKIE	4	1,25847
dmu:WARMIŃSKO-MAZURSKIE	5	1,34208
dmu:WIELKOPOLSKIE	15	3,04571
dmu:ZACHODNIORSKIE	6	1,34661

Source: Own calculations, Local Database of Polish Statistical Office (GUS)

Table 7. Presentation of slacks in DEA model for the individual provinces (year 2003)

	2014			
	Inputs		Outputs	
	Number of libraries (in units)	Amount of funding (in 1000 PLN)	Book collection (per 1000 inhabitants)	Number of readers (per 1000 inhabitants)
dmu:DOLNOŚLĄSKIE	0	17604	1685,06	0
dmu:KUJAWSKO-POMORSKIE	0	7226,94	0	0
dmu:LUBELSKIE	0	11415,8	2598,37	0
dmu:LUBUSKIE	0	0	0	0
dmu:ŁÓDZKIE	0	2106,71	567,267	0
dmu:MAŁOPOLSKIE	0	4630,98	3139,2	0
dmu:MAZOWIECKIE	0	95819,6	3275,63	0
dmu:OPOLSKIE	43,8149	0	0	5,79602
dmu:PODKARPACKIE	179,089	0	0	14,8116
dmu:PODLASKIE	0	0	0	0
dmu:POMORSKIE	0	22336,7	1829,22	0

dmu:ŚLĄSKIE	0	71813,4	1799,33	0
dmu:ŚWIĘTOKRZYSKIE	0	0	0	8,28661
dmu:WARMIŃSKO- MAZURSKIE	0	6999,65	355,067	0
dmu:WIELKOPOLSKIE	0	26722,5	540,889	0
dmu:ZACHODNIORSKIE	0	4210,47	0	0

Source: Own calculations, Local Database of Polish Statistical Office (GUS)

An Analysis of slacks for provinces that occupied opposing positions in the ranking of the efficiency ratio in 2014 is as follows:

- 1) To achieve the efficiency threshold in 2014, the Opolskie province should reduce the number of libraries by 43 and simultaneously increase the number of readers per 1,000 inhabitants by 6.
- 2) The Świętokrzyskie province should increase the number of readers per 1,000 inhabitants by 8 without changing expenditure levels.
- 3) The Pomorskie province should reduce expenditures on libraries per 1,000 inhabitants by PLN 22,337,000 and at the same time increase the number of books per 1,000 inhabitants by about 1,829.
- 4) The Mazowieckie province should increase the number of books per 1,000 inhabitants by 3,276 and simultaneously increase expenditures by PLN 95,819,600.
- 5) The Wielkopolskie province should increase the number of books per 1,000 inhabitants by 541 and simultaneously increase expenditures by PLN 26,722,500.
- 6) In order to achieve full efficiency, the Śląskie province should increase the number of books per 1,000 inhabitants by 1,799 and simultaneously increase budget expenditures by PLN 71,813,400.

1.4.Comparison of DEA results for the years 2003 and 2014

Throughout the analysed period, the majority of libraries in the individual provinces maintained or increased their technical efficiency. The greatest efficiency in the analysed period was achieved by public libraries and their branches in the Lubuskie province, which came first in the ranking both in the first and in the last year of the research, with the ratio Θ for the province amounting to 1 in the first and last years of the research. The Podlaskie province came second in terms of the efficiency. In 2003, it came second in the ranking

with the value of the Θ coefficient amounting to 1.03. In 2014, it came first (together with the Lubuskie province) with the Θ coefficient ratio equalling 1.

The libraries of the Mazowieckie, Wielkopolskie and Śląskie provinces were the least efficient throughout research period. These provinces ranked 16, 15 and 14 respectively. However it should be noted that they improved their efficiency in the last year of the research as compared to the first one. For the Mazowieckie province, the Θ ratio was 4.54 in 2003 and 3.20 in 2014, in the Wielkopolskie province these values were 3.04 and 2.74 respectively, and 2.82 and 2.67 respectively for the Śląskie province.

Conclusions

The conducted analysis shows that the research hypothesis should be considered true. Despite a substantial increase in expenditures from the budgets of local government units in Poland on public libraries and their branches between 2003-2014, full efficiency was reached only by the Lubuskie (2003 and 2014) and Podlaskie (2014) provinces. The other provinces proved to be inefficient. However, it should be noted that the majority of provinces increased their efficiency throughout the research period, as evidenced by the declining values of the Θ ratio.

An analysis of slacks in the research period shows that, with unchanged expenditures and the efficiency meter of the number of readers per 1,000 inhabitants, most provinces achieved maximum effects with an unchanged number of institutions. This means that the number of public libraries and their branches is sufficient to meet the current demand for these types of services. In most public institutions, the biggest slacks occurred in the case of expenditures from the budget of local government units in PLN 1,000 and in results measured by book collection volume per 1,000 inhabitants. To become efficient, most public libraries and their branches should increase their income and simultaneously increase the number of books per 1,000 inhabitants.

The performed analysis shows that an increase in expenditures from the local government budgets on public libraries and their branches was incommensurate to increases in the technical efficiency of these institutions during this period. This means that the majority of expenditures incurred for that

purpose was allocated to goals other than the improvement of library reading. They were connected with the necessity to modernise libraries in Poland and incur expenses for their technical infrastructure (computerisation, informatisation replacement of furniture and resources, automation of the borrowing and returns processes). Between 2003-2014, there was a decrease in the number of such institutions in Poland, which had no significant impact on their efficiency. The main impediment for public libraries to achieve efficiency was a lack of sufficient expenditures for supplementing books.

References

- Begg D., Fischer S. and Dornbusch R. (2005), *Economics, Eighth Edition*, McGraw-Hill Education
- Budyńska B., Jezierska M. (2012), *Polityka biblioteczna i finansowanie bibliotek publicznych w Polsce*, Warszawa, Obserwatorium kultury, 122-123
- Charnes A., Cooper W.W., and Rhodes E. (1978), Measuring the efficiency of decision-making units, *European Journal of Operational Research*, vol.2, No 6, 429-444
- Chen T. (1997), A measurement of the resource utilization efficiency of university libraries, *International Journal of Production Economics* No 53(1), [http://dx.doi.org/10.1016/S0925-5273\(97\)00102-3](http://dx.doi.org/10.1016/S0925-5273(97)00102-3) accessed 04 April 2016
- Czajka S. (1991), Biblioteki publiczne w służbie społeczności lokalnej. Potrzeby wymiany informacji i doświadczeń, *Bibliotekarz*, No 10, 4
- DeBoer L. (1992), Economies of scale and input substitution in public libraries, *Journal of Urban Economics* No 32(2)
- Głowacki J., Hausner J., Jakubik K., et al. (2009), *Raport o stanie kultury*, Ministerstwo Kultury i Dziedzictwa Narodowego, 17-19
- House N. A. van, Childers T. A. (1993), *The public library effectiveness study: the complete report*, Chicago.
- Kieliszewski P., Poprawski M., Landsberg P., Gołek P., Projekt przekształceń instytucji upowszechniania kultury w Polsce. In J. Sojka, M. Poprawski, P. Wieliszewski (Ed.), *Instytucje upowszechniania kultury w XXI wieku. Przeżytek czy nowa jakość?*, Poznań, Bogucki – Wydawnictwo Naukowe S.C., 17-18
- Kietlińska K. (1995), *Finansowanie kultury. Dylematy teorii i praktyki*, Łódź, Wydawnictwo Uniwersytetu Łódzkiego, 119.
- Kryk B. (2003), Efektywność ekonomiczno-ekologiczna a cele gospodarowania. In D. Kopycińska (Ed.), *Państwo i rynek w gospodarce*, Szczecin, Polskie Towarzystwo Ekonomiczne, 95-103
- Krzysztofek K. (1999), Ewolucja założeń i programów polityki kulturalnej w Polsce w latach dziewięćdziesiątych. In T. Kostyrko, M. Czerwiński (Ed.), *Kultura polska w dekadzie przemian*, Warszawa, Instytut Kultury
- Li P., Zijang (2014) Performance Evaluation of the Libraries in USA Using Data Envelopment Analysis, *International Journal of Science and Technology*, vol.4, No 2; 10-19
- Matwiejczuk R., (2000), Efektywność-próba interpretacji, *Przegląd Organizacji*, No 11, 7
- Morse P. M. (1972), Measures of library effectiveness, *The Library Quarterly* No 42(1).
- Ploeg van der F., *The making of cultural policy: an European perspective*, CESIFO Working Paper No 1524, Category 1. Public Finance, August 2005
- Polish and Journal of Lows/2012 No 10, item 1105
- Polish Journal of Lows/1990 No 16, item 16
- Polish Journal of Lows/1990 No 34, item 198
- Polish Journal of Lows/1991 No 114, item 493
- Polish Journal of Lows/1998 No 106, item 668
- Polish Journal of Lows/1998 No 91, item 578
- Polish Journal of Lows/2003 No 24, item 199
- Polish Journal of Lows/2005 No 10, item 565

Polish Journal of Lows/2005 No 65, item 565
Polish Journal of Lows/2008 No 133, item 883
Polish Journal of Lows/2009 No 15, item 1241
Polish Journal of Lows/2011 No 10, item 406
Polish Journal of Lows/2011 No 123, item 698
Polish Journal of Lows/2011 No 207, item 1230
Przybylska J. (2007), *Finansowanie działalności kulturalnej w Polsce*, Poznań, Wydawnictwo Akademii Ekonomicznej w Poznaniu, 52-55
Shim W and Kantor P.B. (1998), A Novel Economic Approach to the Evaluation of Academic Research Libraries. In Proceedings of Information Access in the Global Information Economy, *Inf. Today* No 35: 400-410.
Shim W., Kantor P.B., (1999), *Evaluation of digital libraries: A DEA Approach*, http://comminfo.rutgers.edu/~cgal/CV%20PDFs/am99_shim_kantor.pdf, accessed 20 April 2016
Shim, W. (2003), Applying DEA technique to library evaluation in academic research libraries, *Library Trends*, Vol. 51 No. 3, 312-332
Wołosz J., (2001) *Polityka biblioteczna państwa – oczekiwania i nadzieje*, EBIB, www.ebib.pl/biuletyn-ebib/20/a.php?wolosz, accessed 09 April 2016