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THE ASSESSMENT OF TECHNICAL EFFICIENCY IN PUBLIC EMPLOYMENT SERVICES[1]

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INTRODUCTION

The European Union countries are currently introducing reforms of social and economic policy due to the aging of society, past experiences of the world crisis and as a result of the need to rationalise public expenditures. Development of methods aimed at the optimisation of public expenditures is a significant challenge for both scientists and policy makers. It is crucial for entities implementing employment policy in the era of the formation of the employee labour market and changing the priorities of public intervention. Public employment services (PES's) as the units responsible for the implementation of labour market instruments are the subject of evaluation. European PES's have undergone profound changes, and the present situation is characterised by a combination of reduced budgets, increasing diversity of target groups and rising demands for accountability and organisational performance (Ejler, and Sidelmann 2016).

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However, the assessment of efficiency of these units is a multidimensional problem as it should take into account not only the comparison of inputs and outputs but also the employability potential of regional labour markets. It is worth mentioning that various forms of PES activities do not always have identical goals, therefore, when examining employment effects, it should be remembered that their efficiency is not only examined in the context of employment. Additionally, it is not possible to apply simply any available methods, including all those that prove effective when analysing private entities. The reason for that is that only some of them reflect the peculiarities of the public sector.

The authors propose a method of assessment of efficiency of regional PES's by selecting statistically significant inputs and outputs as well as the environmental variable. The Data Envelopment Analysis (DEA) method was used to identify the best performers in the analysed group of regional PES's and to create a ranking in terms of the efficient utilisation of resources. Regional labour offices from two Polish voivodships representing significantly different economic conditions (Podlaskie and Mazowieckie provinces) were selected as decision making units (DMU).

Therefore, to accomplish the set objectives, this article was divided into three parts. The first one, which is an introduction to the selected topic, touches upon the essence and measurement of efficiency of Public Employment Services. The second one is devoted to theoretical considerations about the selected measurement method – DEA. The last part constitutes the major portion of the paper and comprises the case study of two chosen Polish provinces – Podlaskie and Mazowieckie.

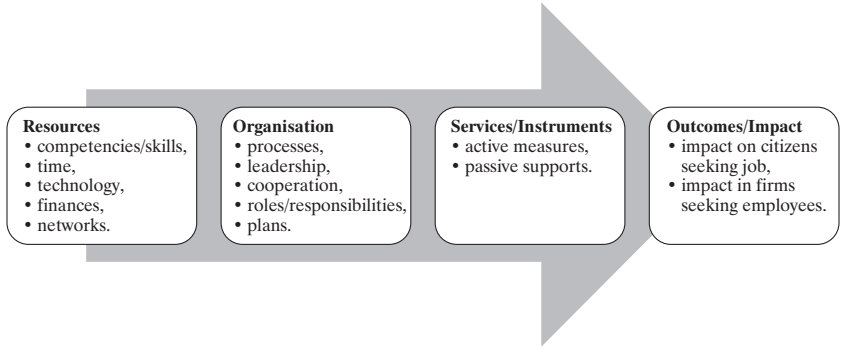
Due to the adopted scope of this article, the research methods applied in the first two theoretical parts include an in-depth analysis of the literature on the subject and examination of documents. The third, empirical part constitutes the result of the selected components of the monographic method and, mostly, econometric analyses, including modelling.

Efficiency of Public Employment Services – definition and measurement

Public Employment Services have at their disposal a variety of resources and represent a range of organisational components the aim of which is to implement labour market instruments and services. As a result these entities support not only jobseekers but also enterprises seeking employees – Figure 1.

Figure 1

The main components of PES's



Source: Ejler, N., and Sidelmann, P. (2016) *Application of Process Efficiency Techniques in PES. Analytical Paper*. Luxembourg: Publications Office of the European Union, p. 7.

According to the study by Thuy, Hansen, and Price (2001), four main functions associated with PES's can be determined, such as job broking, providing labour market information, administering labour market adjustment programmes and administering unemployment benefits. When analysing the efforts made by PES's to realise these functions, it is important to distinguish between two concepts: efficiency and effectiveness.

Drucker defines efficiency as doing things right and effectiveness as doing the right things (Drucker, and Maciariello 2005). More precisely efficiency is associated with using the 'right' methodologies in order to skilfully manage resources and thus maximise returns. Effectiveness is about achieving the 'right' outcomes by meeting the demands and expectations of various stakeholders (Ejler, and Sidelmann 2016: 7).

The efficiency and effectiveness of PES's are interlinked and cannot be separated from each other, but to illustrate how the two terms work with regard to the functioning of PES's, efficiency primarily concerns the first three components presented on Figure 1, namely resources, organisation and services/instruments (i.e. 'using the "right" methodologies'), whereas effectiveness is more concerned with the last component, outcomes/impacts (i.e. 'achieving the "right" outcomes').

Vilfredo Pareto's optimality is crucial for the development of the efficiency theory. According to the Pareto criterion, the economy/organisation produces effectively, when it proves impossible to improve the economic well-being of the individual unit without worsening the situation of another entity (Stiglitz 2000: 122).

In 1957 Michael Farrell divided productive efficiency into allocative and technical (Farrell 1957: 253–281). Pareto (allocative) efficiency is the concept that goods most desired by consumers are produced at the lowest cost. Another type of efficiency introduced by Farrell is technical efficiency (also defined as technology efficiency). It refers to the conversion (processing) of resources (inputs) into specified outputs. The evaluation of technical efficiency is determined by the difference between the result of the relationship outputs/inputs achieved by a given entity and the result of such a relationship for the 'best benchmark' (which may be theoretically or empirically defined). Technical efficiency can be expressed as the potential to increase the number of outputs at a given amount of inputs or the potential of reducing the inputs used to produce a given quantity of outputs. The technical efficiency level remains under the influence of the scale efficiency of the analysed entity and applied non-scale technical efficiency. Technical efficiency is based on 'technological capabilities', but it is not connected with the level of prices and costs (Kozuń-Cieślak 2011: 16).

PES's use a variety of analytical techniques to measure the level of efficiency of their activity. The most popular methods are the cost-benefit-analysis, the DEA method and evaluations.

The cost-benefit analysis (CBA) is an analytical technique that is used to compare different courses of action in order to identify the optimal choice. CBA compares various alternatives to ascertain which one creates the biggest benefit (often measured as the highest economic biggest/outcome) at the lowest cost. CBA makes it possible to compare different positive as well as negative effects (for different actors) of different courses of action by measuring them using a common yardstick: most often money (European Commission 2013: 7–8).

It is mostly used to assess and compare the allocative efficiency of PES offices in order to identify the outcome objectives most useful when operationalised to help unemployed people into employment. It is used to compare the allocative efficiency of different alternatives, it is mostly aimed at analysing the ability of different active labour market programmes (ALMPs). In these analyses all the costs and benefits of the transition have to be estimated in order to calculate the total positive or negative economic sum of this transaction. Numerous factors have to be taken into account, i.e. both the costs and benefits of the individual getting a job and the wider societal impact (European Commission 2013: 9).

A similar technique is the cost effectiveness analysis (CEA) that compares different alternatives, assessing which creates the highest effect at the lowest

cost. It is thus necessary within CEA to compare alternatives whose effects are comparable, i.e. measured in the same way.

The Data Envelopment Analysis (DEA) is a methodological framework for modelling and thus measuring productive efficiency of production units, which can be private firms or public service provider offices (Andersson, Månsson, and Sund, 2013: 57). The scientific literature on efficiency of PES offices indicates that DEA is the predominant and the best suited framework for analysing productive efficiency of PES's (European Commission 2013: 21).

Evaluation of programmes can be qualitative and quantitative. Quantitative evaluations are mostly focused on assessing the output or outcome of a given programme or a way of organising service delivery. Especially when doing quantitative evaluations it is very important to apply a counterfactual approach, i.e. comparing citizens or organisations affected by the programme under study with a similar group of citizens or organisations that have not been affected by the programme (Ejler, and Sidelmann 2016: 13). Qualitative evaluations, on the other hand, are better suited for investigating why or how a programme or a way of organising service delivery works.

DEA METHOD – THEORETICAL ASSUMPTIONS

The indicators most frequently used to measure the effects of active labour market policy undertaken by PES's in Poland arouse numerous doubts, in particular as regards their credibility and the possibility of their comparison between individual territorial units. For example, the disadvantages of the employment efficiency rate include, among others: overvaluation resulting from the methodology of measurement, not reflecting the actual scale of the problem (in the case of trainings and internships by approx. 25% »Supreme Audit Office 2015«) or accepting as an indicator of the effectiveness the number of positions created or retained, not the actual number of the unemployed who, thanks to the activation, obtained employment. Another important problem is the inability to take into account the regional specificity of the territory, e.g. in a situation where only one large employer (offering most jobs in the given area) operates or large production plants have closed down. In connection with the above, searching for the alternative measurement methods, the authors propose DEA as a method of evaluation of PES efficiency.

The DEA method is based on the concept of technical efficiency (TE), which is efficiency of managing inputs (input, legacy or available data) and

converting them (with the use of various transformation processes) into outputs (effects, results, products). It is commonly used all over the world to examine public sector entities (Ruggiero 1996: 553–565), while in Poland it was also applied to analyse higher education (Nazarko et al. 2008) or healthcare sector institutions (Kozuń-Cieślak 2012).

DEA allows one to identify these entities that most efficiently manage their inputs (here: support instruments, financial investments, human resources, etc.), i.e. achieve the best efficiency parameters (measured by the inputs-effects ratio), and consequently, set the empirical limit of efficiency, i.e. the curve marking the cap of production capacity for the group of units being surveyed. The production process, according to the DEA methodology, is any process of transformation of inputs (understood broadly) into outputs, i.e. both public institutions such as schools, hospital or offices and business entities which provide services or manufacture goods may be examined by means of this method.

The concept of efficiency (or productivity) in DEA is the relation of the weighted sum of results produced by the analysed unit to the weighted sum of inputs utilised in the process. For a given set of units or objects (which in the DEA methodology are referred to as *Decision Making Units*, or DMU), the maximum efficiency values of individual objects J are determined with the use of the following formula (Pawłowska 2005: 36):

$$\text{maximum efficiency of object } J = \frac{\sum_{r=1}^{s} \mu_{rj} y_{rj}}{\sum_{i=1}^{m} v_{ij} x_{ij}}$$

where:
μ_{rj} – weight of effect r of object j,
y_{rj} – effect r of object j,
v_{ij} – weight of input i of object j,
x_{ij} – input i of object j,
with the following limitations:

$$0 \leq J = \frac{\sum_{r=1}^{s} \mu_{rj} y_{rj}}{\sum_{i=1}^{m} v_{ij} x_{ij}} \leq 1; k = 1, 2, 3, ..., J$$

$$\mu_{i,j}, v_{i,j} \geq 0; i = 1, 2, ..., m; r = 1, 2, ..., s$$

The DEA method is recommended for preparing analyses of efficiency of those objects whose operations are described by more than one input and effect, and such units definitely include regional PES's. It may be applied even to those units which may not be characterised by the use of efficiency measures based on financial ratios.

In the DEA method inefficient units are compared to other, real objects, not to statistical measuring values, thus the isolation of fully efficient units within a group of units provides others with important information about where to seek benchmarks and good practices in the area of operations being surveyed (Cooper, Seiford, and Zhu 2004). An important benefit of the DEA productivity models (e.g. BCC, which provides for variable scale effects) is a more precise definition of the reason for inefficiency of a given unit, which may arise both from improper use of the desired inputs, resulting in wasting these inputs, and from performing operations in a non-optimal area of scale (Cooper, Seiford, and Zhu 2004).

The selection of variables must be complete and must comprise the unit's most important inputs and effects of operations. Additionally, according to the DEA methodology, the optimal ratio of variables in the efficiency model to the number of objects is 1:3, thus, the recommended number of variables in the model (input variables – inputs and output variables – effects) should not exceed a total of 30% of the surveyed objects, because then the results of the analysis are the most reliable. Therefore, the starting point for determining the number of variables was a smaller voivodship (province) – Podlaskie, which comprises 14 *poviat* administrative units. Hence, 4 variables were included in the basic model (the methodology allowed 4–5 variables to be used as the optimal number) and the choice of these variables is justified by the subject matter and statistics. During the research process, for the purpose of comparison, another model was constructed as well that contained the fifth variable – the environment.

The analysis revealed that environment variables significantly affect the results of actions (technical efficiency results were generally improved). The results of the analysis also allowed benchmark counties and areas which need improvement to be identified. Additionally, the obtained results may constitute the grounds for selecting these factors the change of which may contribute to the improvement of efficiency more noticeably than in the case of other variables.

What is important for the study is the fact that the super-efficiency DEA model was used. It is so because standard DEA provides the classification of DMUs into two groups – efficient and inefficient. Unfortunately only the inefficient ones can be ranked. The model does not allow for ranking efficient DMUs on the efficiency frontier (Bogetoft, and Hougaard 2004: 14–21). At the same time it has a desirable feature of differentiating some of the efficient DMUs that have identical efficiency scores equal to one (100%) in the standard DEA model (Xue, and Harket 2002: 705–710). One

of the methods is a super-efficiency DEA model which makes it possible to differentiate between the efficient DMUs. The basic idea of this approach is to exclude the efficient DMUs from the comparison set, so it cannot be compared against, thus it can obtain a score better or worse than one in the super-efficiency evaluation (Akbarian 2013).

It must be pointed out that DEA is not a flawless method. For example, this method is good at estimating relative efficiency but it means difficulties when DMU is to be compared with a theoretical maximum. Another of its drawbacks is high sensitivity to changes in the group of the analysed units (Berg 2010) – a different set of variables, significantly contrasting values or addition/removal of one of the units may cause serious changes in the results of efficiency of individual units, as well as of the entire group under examination. Nevertheless, this method is recommended to be applied in public sector entities because of its flexibility in selecting variables for the model. It is, however, important to ensure that this selection is thorough and justified in terms of the subject matter and statistics. Several technical efficiency models may also be constructed to study various areas of operations of decision-making units and align the results for the purpose of comparison.

Technical efficiency of PES's – the case study of two Polish regions

PES governance structures vary significantly between the Member States. In Poland PES's include 338 county and 16 voivodship labour offices, the Ministry of Family, Labour and Social Policy and 16 voivodship offices, performing the tasks specified by the law. The entities which are responsible for the implementation of labour market policy are mainly county labour offices. They are decentralised and they are managed on the level of local authorities. These units fulfil all four functions mentioned above but the increasing pressure is put on the third function by the realisation of active labour market instruments – both supply and demand oriented.

The efficiency of PES's in Poland is assessed regularly by the evaluation of two indicators – employment efficiency and cost efficiency. However, these measures do not reflect the assumptions of efficiency relating to inputs and outputs.

The first indicator – employment efficiency (the reemployment rate) is the ratio of the number of the unemployed who, after completing or interrupting participation in a specific form of activation, in a period of

3 months were employed for at least 30 days, to the number of persons who completed participation in a given form of activation (Ministry of Family, Labour and Social Policy 2016: 6). Therefore, this indicator can be considered as a measure of effectiveness and not efficiency.

Whereas, the other indicator – cost efficiency (the cost of re-employment) is the share of the amount of expenditure incurred on a given form of activation to the number of the unemployed who, after completing their participation in a given form of activation, obtained employment for up to three months (Ministry of Family, Labour and Social Policy 2016: 6). This indicator concentrates on the inputs without comparison of outputs.

Moreover, current measures of efficiency of regional PES's in Poland do not take into account the diversification of counties in terms of their employment potential (Kobylińska et al. 2016).

Therefore, the authors used the DEA method to create a model of assessment of the efficiency of regional PES's by extracting substantively and statistically significant input and output data as well as the environmental variable – Figure 2. In the research the BCC model was used.

As the input in the PES's is rather difficult to control (they follow the legal regulations and the algorithm of PES financing included in the Act on the promotion of employment and labour market institutions of 20 April 2004 »with later amendment«), the output-oriented model seemed to be more appropriate for this study. The hierarchy used in the ranking of selected DMUs was provided by the application of the super-efficiency extension.

Data for the analysis were collected from the resources of the Ministry of Family, Labour and Social Policy as well as voivodship labour offices in Bialystok and Warsaw. The time period of the analysis was determined by the availability of the data.

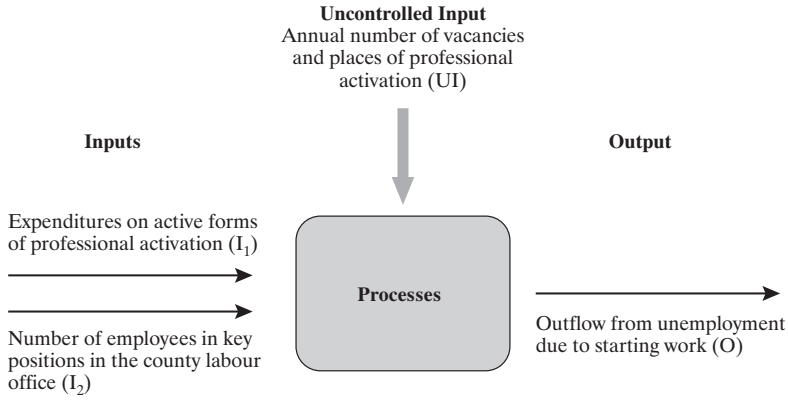
The analysis of the Pearson correlation coefficient between variables allowed for the selection of variables with strongly linear dependence. We selected two input variables – expenditures on active forms of professional activation (I_1) and the number of employees in key positions in the county labour office (I_2), one output variable – outflow from unemployment due to starting work (O). Moreover, the uncontrolled input was extracted – the annual number of vacancies and places of professional activation (UI).

The analysis was carried out for 14 DMUs of Podlaskie province and 39 DMUs of Mazowieckie province.

Tables 1 and 2 present values of basic statistical indicators – the average, standard deviation, the coefficient of variation and the Pearson correlation coefficient for selected variables.

Figure 2

Model of technical efficiency of regional PES's in Poland



Source: own study.

Table 1

The basic statistics of variables included in the model of technical efficiency – Podlaskie province

Variable	Average	Standard deviation	Coefficient of variation	Pearson correlation coefficient values
				O
I_1	8,589.14	6,033.18	70%	0.97
I_2	20.86	20.98	101%	0.96
UI	1,987.43	1,547.68	78%	0.97
O	2,630.29	3,040.53	116%	1.00

Source: own study.

The variables selected for the model listed in Podlaskie voivodship in 2014 were characterised by a high level of volatility. In addition, the input variables and the uncontrolled input variable correlate positively and statistically significantly with the output variable – Table 1.

As in the case of Podlaskie voivodship, the variables selected for Mazowieckie were characterised by a high level of volatility. The input variables and the uncontrolled input variable correlate positively and statistically significantly with the output variable – Table 2.

Table 2

The basic statistics of variables included in the model of technical efficiency – Mazowieckie province

Variable	Average	Standard deviation	Coefficient of variation	Pearson correlation coefficient values
				O
I_1	10,692.69	7,689.71	72%	0.88
I_2	24.74	25.79	104%	0.86
UI	3,356.28	7,130.48	212%	0.90
O	3767.77	4,674.10	124%	1.00

Source: own study.

In the first step, technical efficiency for both voivodships was calculated taking into account two controlled input variables I_1 and I_2 and the output variable O. Next, the relationship between the obtained TE scores and the influence of the environment represented by the variable UI (the annual number of vacancies and places of professional activation) was assessed using the Pearson correlation coefficient. The correlation occurred to be positive (0.46 for Podlaskie province and 0.28 for Mazowieckie province). Therefore, it was statistically justified to include the variable expressing the impact of external conditions on the efficiency scores.

Tables 3 and 4 present the result of the analysis carried out using the Frontier Analyst Application software. It is organised in descending order, so the best performers in terms of technical efficiency are ranked at the top.

Efficiency scores obtained from the BCC-DEA model for Podlaskie province show that among the fourteen studied PES's, six units turn out to be the best practices. Siemiatycki county reached the rank of technically efficient when the uncontrolled variable was included. The remaining eight PES's exhibit varying degrees of inefficiencies. The inclusion of the environmental variable (UI) improved the scores of technical efficiency. The distributions of results for both models (without inclusion of UI and with UI variable) are presented in Figure 3. It can be observed that the groups with lower scores contain a smaller number of units in the second model (with UI), while the groups with higher scores (more than 90%) comprise more units if UI is included.

Table 3

Ranking of PES technical efficiency in Podlaskie province in 2014

DMU	TE (without UI)	TE (with UI)	Super-efficiency (with UI)
Hajnowski	100.00%	100.00%	1,000.00%
Moniecki	100.00%	100.00%	1,000.00%
Sejneński	100.00%	100.00%	1,000.00%
Siemiatycki	**64.80%**	**100.00%**	**1,000.00%**
Białostocki with c. Białystok	100.00%	100.00%	328.10%
Suwalski with c. Suwałki	**100.00%**	**100.00%**	**165.60%**
Bielski	**81.70%**	**93.40%**	**93.40%**
Zambrowski	88.20%	88.20%	88.20%
Kolneński	**53.40%**	**86.70%**	**86.70%**
Augustowski	86.00%	86.00%	86.00%
Wysokomazowiecki	**75.00%**	**76.20%**	**76.20%**
Łomżyński with c. Łomża	68.70%	68.70%	68.70%
Grajewski	68.60%	68.60%	68.60%
Sokólski	54.30%	54.30%	54.30%

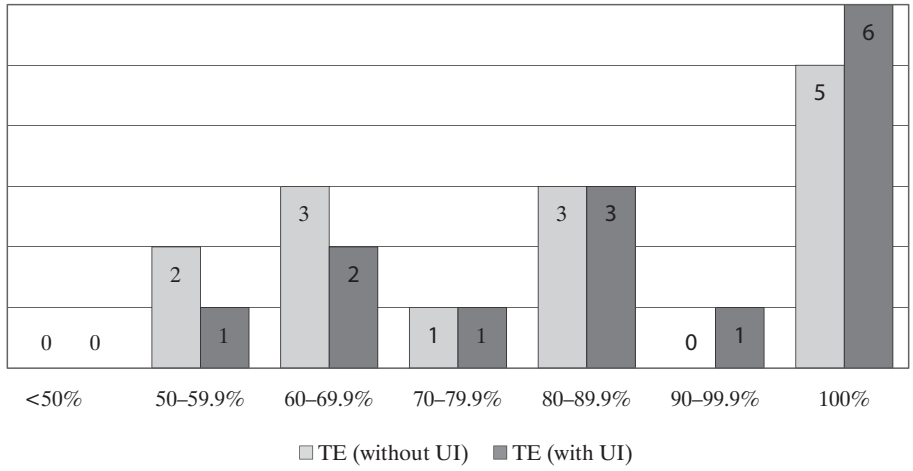
Source: own study based on *Frontier Analyst Application* software calculation.

The mean technical efficiency score with the uncontrolled variable amounting to 87.3% indicates good resource management by Podlaskie PES's. However, the result implies that these entities still have 12.7% of room to improve their operating efficiency on average.

The level of technical super-efficiency scores shows that the most distinguished PES's, which can be treated as benchmarks in Podlaskie voivodship, are Hajnowski, Moniecki, Sejneński, Siemiatycki counties. Białostocki county (with the capital city included) and Suwalski county (with Suwałki included) represent lower super-efficiency scores.

Figure 3

The distribution of technical efficiency scores for Podlaskie province



Source: own study.

Table 4

Ranking of PES technical efficiency in Mazowieckie province in 2014

DMU	TE (without UI)	TE (with UI)	Super-efficiency (with UI)
Grodziski	100.00%	100.00%	1,000.00%
Poviat Warsaw	100.00%	100.00%	230.10%
Radomski with c. Radom	**58.80%**	**100.00%**	**220.30%**
Ciechanowski	**95.40%**	**100.00%**	**111.20%**
Wołomiński	**77.50%**	**100.00%**	**111.20%**
Legionowski	**74.80%**	**91.10%**	**91.10%**
Żyrardowski	**90.50%**	**90.70%**	**90.70%**
Poviat Płock	**69.40%**	**86.00%**	**86.00%**
Nowodworski	**84.30%**	**85.90%**	**85.90%**
Ostrołęcki with c. Ostrołęka	**62.80%**	**85.00%**	**85.00%**
Garwoliński	**68.90%**	**84.20%**	**84.20%**
Siedlecki with c. Siedlce	**62.00%**	**83.40%**	**83.40%**

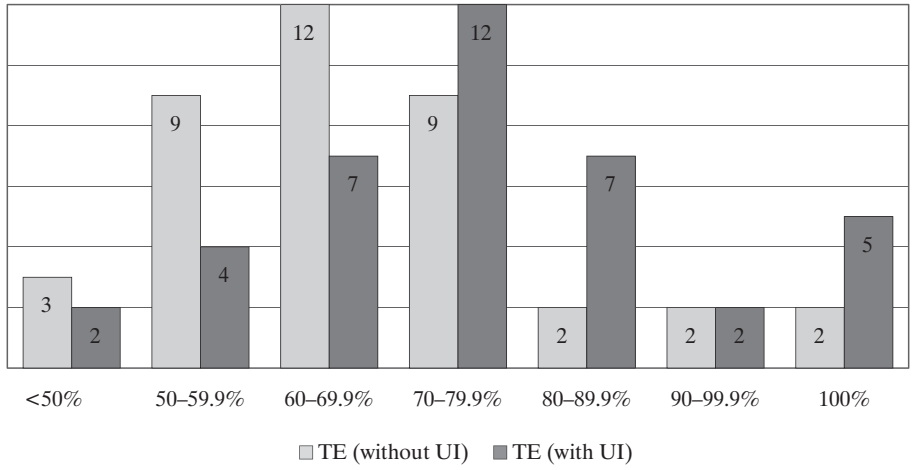
DMU	TE (without UI)	TE (with UI)	Super-efficiency (with UI)
Pruszkowski	81.40%	81.40%	81.40%
Mławski	**56.60%**	**80.40%**	**80.40%**
Miński	**66.70%**	**79.30%**	**79.30%**
Płocki	**56.20%**	**79.00%**	**79.00%**
Płoński	**75.60%**	**78.50%**	**78.50%**
Sokołowski	77.70%	77.70%	77.70%
Gostyniński	**71.80%**	**76.90%**	**76.90%**
Sierpecki	**74.20%**	**76.50%**	**76.50%**
Piaseczyński	76.00%	76.00%	76.00%
Makowski	75.70%	75.70%	75.70%
Warszawski zachodni	**65.80%**	**73.90%**	**73.90%**
Wyszkowski	**71.00%**	**73.10%**	73.10%
Szydłowiecki	**43.70%**	**71.90%**	**71.90%**
Otwocki	**69.10%**	**71.40%**	**71.40%**
Przasnyski	**60.40%**	**69.30%**	**69.30%**
Sochaczewski	**65.30%**	**68.90%**	**68.90%**
Kozienicki	**62.70%**	**68.10%**	**68.10%**
Przysuski	**51.60%**	**65.40%**	**65.40%**
Zwoleński	**63.20%**	**65.40%**	**65.40%**
Węgrowski	**56.50%**	**64.40%**	**64.40%**
Białobrzeski	63.20%	63.20%	63.20%
Grójecki	**59.10%**	**59.80%**	**59.80%**
Żuromiński	**57.40%**	**59.20%**	**59.20%**
Ostrowski	**53.40%**	**56.50%**	**56.50%**
Pułtuski	**51.20%**	**53.20%**	**53.20%**
Lipski	**36.80%**	**48.70%**	**48.70%**
Łosicki	**39.30%**	**40.10%**	**40.10%**

Source: own study based on *Frontier Analyst Application* software calculation.

Efficiency scores obtained from the BCC-DEA model for Mazowieckie province show that among all studied PES's, five units turn out to be the best practices. Three of them (Radomski with Radom included, Ciechanowski, Wołomiński) reached the rank of technically efficient when the uncontrolled variable was included. The remaining thirty four PES's exhibit varying degrees of inefficiencies. Figure 4 presents the graphical comparison of the TE score distribution for both models – with and without the uncontrolled variable. The improvement of scores is noticeable in the shift of results towards higher scores. In the group of the best performers (TE = 100%) the number of participants increased more than twice (from 2 to 5) when the uncontrolled variable was included in the model.

Figure 4

The distribution of technical efficiency scores for Mazowieckie province



Source: own study.

The mean technical efficiency score with the uncontrolled variable amounting to 75.9% indicates worse than intuitively expected resource management by Mazowieckie PES's. The result implies that these entities still have as much as 24.1% of room to improve their operating efficiency on average. At the same time, it is noticeable that in many counties in Mazowieckie voivodship the introduction of the environmental variable affected the results.

The level of technical super-efficiency score shows that in Mazowieckie voivodship only Grodziski county represents the group of the most

distinguished PES's and can be treated as a benchmark. The *poviat* of Warsaw (the capital of Poland), Radomski with Radom included, Ciechanowski and Wołomiński counties represent lower super-efficiency scores.

Conclusion

Improving efficiency and eliminating expenditure on ineffective services is a key objective for PES's. Therefore, it is important to develop appropriate methods for assessing the efficiency of these entities. Such a method should take into account PES's resources, the results of their activity, as well as the impact of environmental factors.

The conducted analysis shows that the use of the DEA method is justified when testing the PES efficiency, and the results obtained by this method should better reflect the actual use of inputs in relation to the produced effects. What is more, it would be also valuable to create benchmarking based on DEA (a ranking comparison of *poviats* with similar features) instead of comparing very diverse *poviats* across the whole country or even the voivodship.

The DEA method is a way to measure efficiency of PES's, including inputs and outputs and also the environmental variable. In the paper, one of the models of technical efficiency evaluation was presented but a number of alternative input and output measures are possible under the DEA framework, which mitigates or modifies the specific findings of this study.

The conducted study proves the importance of taking into account environmental variables in assessing the efficiency of PES's (which improved the efficiency of the analysed units). Moreover, in some counties, both in Podlaskie as well as in Mazowieckie province, the inclusion of the environmental variable ensured full technical efficiency as in these regions the potential of labour demand strongly determines the activity of PES's.

PES's in Podlaskie voivodship are relatively better at managing their resources than in Mazowieckie voivodship – the mean technical efficiency score in Podlaskie amounted to 87.3% as compared to 75.9% in Mazowieckie.

The obtained results show a clear necessity to continue research in the field of technical efficiency and to deepen the studies aimed at determining the reasons for the diversity in the level of effectiveness observed in PES's located in the analysed counties.

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The Assessment of Technical Efficiency in Public Employment Services

Summary

The authors propose a method of assessment of efficiency of regional PES's by selecting statistically significant inputs and outputs as well as the environmental variable. In the final DEA model variables which show the

positive correlation and statistically significant relationships between input variables and outputs (effects) were selected. Among the environmental variables the one with the strongest relationships with output variables was chosen. For the purposes of the resource management assessment of PES's an analysis of technical relative efficiency of two Polish provinces was conducted using the Data Envelopment Analysis (DEA) method. These provinces represent a different labour market situation as Podlaskie is one of the peripheral regions and Mazowieckie voivodeship has the best economic indicators in Poland. The analysis has shown that the environmental variable has a significant impact on PES performance (overall improvement in technical efficiency results). The results of the analysis also enabled the identification of benchmark PES's, the identification of areas requiring improvement and the selection of changes that will contribute to improving efficiency more prominently than for other variables.

Key words: DEA; technical efficiency; public employment services; labour market policy

Ocena efektywności technicznej w publicznych służbach zatrudnienia

Streszczenie

Autorki proponują metodę oceny efektywności lokalnych PSZ poprzez wyodrębnienie danych wejściowych i wyjściowych oraz zmiennej środowiskowej. W modelu z wykorzystaniem metody DEA, zostały wybrane zmienne wykazujące pozytywną korelację i statystycznie istotną zależność pomiędzy nakładami i efektami. Spośród zmiennych środowiskowych została wybrana ta, która wykazuje najwyższą zależność wobec danych wyjściowych. W celu oceny gospodarowania zasobami przez PSZ została wyznaczona ich efektywność techniczna przy użyciu metody DEA. Do analizy zostały wybrane powiaty z dwóch polskich województw, które odznaczają się odmienną sytuacją na rynku pracy – Podlaskie stanowi region peryferyjny, zaś Mazowieckie osiąga najlepsze poziomy mierników ekonomicznych w Polsce. Analiza wykazała, iż zmienne środowiskowe mają istotny wpływ na efekty działania (uzyskano ogólną poprawę wyników efektywności technicznej). Rezultaty analizy pozwoliły również na identyfikację powiatów wzorcowych (benchmarków), wyodrębnienie obszarów wymagających poprawy oraz

wytypowanie tych, których zmiana przyczyni się do polepszenia efektywności w sposób bardziej wydatny, niż w przypadku pozostałych zmiennych.

Słowa kluczowe: DEA, efektywność techniczna, Publiczne Służby Zatrudnienia, polityka rynku pracy

Оценка технической эффективности в государственных службах занятости

Резюме

Авторы предлагают метод оценки эффективности локальных PSZ путем извлечения входных и выходных данных и переменной окружающей среды. В модели, использующей метод DEA [метод охвата данных], были выбраны переменные, которые показали положительную корреляцию и статистически значимую взаимосвязь между выходными данными и конечными результатами. Среди переменных среды выбрана та, которая выявляет самую высокую зависимость от выходных данных. Чтобы оценить управление ресурсами PES, их техническая эффективность была определена с использованием метода DEA. Для анализа были выбраны повяты из двух польских воеводств, для которых характерна особая ситуация на рынке труда – это Подляское воеводство, которое представляет собой периферийный регион, и Мазовецкое, которое достигло лучших уровней экономических показателей в Польше. Анализ показал, что переменные среды оказывают существенное влияние на результаты деятельности (было достигнуто общее улучшение показателей технической эффективности). Результаты анализа позволили также идентифицировать образцовые повяты (контрольные показатели), выделить регионы, нуждающиеся в улучшении ситуации, и выбрать те, изменение которых будет способствовать повышению эффективности более эффективным образом, чем в случае других переменных.

Ключевые слова: DEA [метод охвата данных], техническая эффективность, Государственные службы занятости, политика занятости на рынке труда

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