STOWARZYSZENIE EKONOMISTÓW ROLNICTWA I AGROBIZNESU
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Roman Lusawa

Mazovian Center of Agriculture Consultancy in Warsaw, Poświętne Branch in Płońsk, Poland

EFFECTIVENESS OF TEACHING IN ELEMENTARY SCHOOLS IN RURAL AREAS OF THE MAZOVIAN PROVINCE

EFEKTYWNOŚĆ NAUCZANIA W SZKOŁACH PODSTAWOWYCH NA TERENACH WIEJSKICH WOJEWÓDZTWA MAZOWIECKIEGO

Key words: public services, education, effectiveness, financing of education assignments
Słowa kluczowe: usługi publiczne, oświata, efektywność, finansowanie zadań oświatowych

Abstract. The paper deals with the issue of economic effectiveness of education. It has been assumed that education is possible thanks to the system of objective evaluation of teaching results on individual levels of education and thanks to the recording of expenditures by school authorities. On that basis an attempt has been made to separate the factors determining the effectiveness of expenditures made.

Introduction

Research shows the impact of the education level on a number of phenomena which condition the quality of society's life. An example may be a very close relationship, observed in the Mazovian province, between the average level of education of members of society and the amount of income earned by them, which is reflected in taxes paid. A less close relationship may be found when analyzing the impact of the education level of members of society on unemployment figures. From an analysis of the growing movement of people and directions of such movement it may also be concluded that units with higher average level of education of their population offer better living conditions for such population. Papers by Layard [2009] and Binswanger [2010] show that this is a result of higher supply of intangible goods. In the Polish literature the issue of intangible goods was first discussed in 1936 by Pszczółkowski. According to this author, intangible goods include knowledge, ethics, culture and feelings. From this perspective, education should be understood as a process of producing such goods. It is therefore legitimate to ask what is its economic effectiveness. Still, economics has so far not found any effective tools measuring the value of intangible goods. It seems that the solution to this problem could possibly be arrived at thanks to the introduction of uniform systems of measurement of teaching results on different education levels. An attempt has been made in the present paper to evaluate the effectiveness of teaching in elementary schools of the Mazovian province and to find the factors determining such effectiveness.

Methods

The study covered all communes of the Mazovian province. For the purposes of that study, information of the Examination Board in Warsaw was used which concerns average results obtained by pupils of individual communes in a test in the sixth form of elementary school held in 2008. On the basis of information on the amount of expenditures made this year by communes for the running of elementary schools, an average cost of obtaining one point was calculated. It became a starting point for further analyses, whose aim was to determine the factors affecting the effectiveness of teaching. The calculation of ratios for: communes, education organization and costs incurred by local government units in connection with the running of elementary schools, was possible thanks to data made available by the Central Statistical Office in the Database of Local Data. The set so created contained 80 measures characterizing each commune of the province. It included:

– measures characterizing a commune with consideration given to features that may affect the effectiveness of teaching (62),
– measures characterizing education organization in communes (13),
– measures characterizing the amount of costs incurred by communes for the running of elementary schools and the performance of pupils in a knowledge test held in the sixth form (5).

The aforementioned data was analyzed by means of statistical methods, using correlation methods and a cluster analysis method available in the Statgraphics package.

Results

The differences in the average cost of obtaining one point in the sixth-form test held in elementary schools should be considered significant (coefficient of variation = 31.33%). It ranged between PLN 964.10 (commune Maków Mazowiecki) to PLN 6780.03 (rural commune: Ciechanów). It averaged PLN 1728.03 (81% of examined population spent between PLN 1000 and PLN 2000 for one point. Other measures of location showed as follows: 25% of communes with lowest costs spent no more than PLN 1396.34, with half of them spending no more than PLN 1645.84. One fourth of communes with the highest value of the ratio had to pay at least PLN 1927.70 for one test point. It may therefore be interesting to discuss the reasons for such differences since they prove that public money is used with varying effectiveness in individual local government units.

Nonetheless, economics dealing with public sector effectiveness [Pszczółkowski 1936, Stiglitz 2004] demands that the effectiveness of that sector's actions be evaluated not only on the basis of expenditures made, but also on the basis of the quality of the services provided. Therefore, the second factor that should be taken into account is the average number of points obtained by pupils from individual communes. There are definitely less differences in that number. The coefficient of variation in the test results was just 7.2%. Minor differences in average results obtained and major differences in the amount of expenditures made for education suggest that there is only a weak relationship between those values. Such thesis was confirmed in a test conducted by means of correlation methods. A simple regression model between the average test result and expenses incurred by communes for elementary schools per 1 pupil accounted for merely 2.3% of the total variability of the response variable.

Groups of communes with statistical similarity in teaching effectiveness

The use of the cluster analysis method enabled the division of examined population into six groups (clusters) with statistical similarity of results obtained at similar expenditures.

Cluster 1. It included 48 communes (15.3% of communes in the Mazovia region). Those communes recorded on average the highest test results (on average 27.8 point) and expenditures made for obtaining 1 point amounting to the average of PLN 1488. The communes belonging to that group should be considered the most effective since at a similar level of expenditures as in communes forming clusters 2 and 3 they obtained better teaching results. The majority (36) of units of the group concerned was located in the center of the region.

Cluster 2. It included 71 (22.6%) units. A statistical pupil obtained here 25.9 point, for which communes had to spend on average PLN 1409. 32 units belonging to this cluster, including 12 cities and urban/rural communes, were located in the center of the region. In the area of external subregions there were located 39 communes, including 3 big centers (Ostrołęka, Płock, Radom), 7 towns and 8 urban/rural communes. Only four cities were not poviat capitals.

Cluster 3. It included 53 communes with the lowest average costs of obtaining one point and the worst average test results.

Cluster 4. This Group consists of 45 communes (14.3% of examined population). Pupils obtained on average 25.2 point. Expenses per 1 point ranged between PLN 1700 and PLN 2380. Within the central subregions there were located 11 communes, including one town (Marki) and two urban/rural communes (Brwinów, Tarczyn, Żelechów).

Cluster 5. It consisted of 76 (24.6%) units. It was characterized by the lowest average results obtained by pupils. They obtained on average 22.9 point. The cost of obtaining it (on average PLN 1861) did not vary in a statistically significant manner from the one characteristic of communes grouped under cluster 4. This cluster comprised 10 rural communes located within the central subregions. Only 2 of them were located east of the capital city. Besides, the eastern Warsaw subregion included an urban/rural commune of Halinów, which belongs to the group concerned.

Cluster 6. It is formed by 14 rural communes, located in the external subregions of the province. Characteristic of it were the biggest differences both in terms of test results and costs per one point. Pupils obtained on average between 20.5 point and 25.5 point. The obtaining of one point cost between PLN 2511 and PLN 6780.

It is notable that communes belonging to separated clusters form dense spatial structures. Within subregions located in the center of the region there were in total 67 communes belonging to clusters 1 and 2. This means that 65% of communes of that area may be considered as being more effective. In the external subregions of the province the share of communes organizing education in a more effective manner was significantly lower. From an analysis of the external subregions it

follows that the Radom subregion located in the southern part of the province scored much higher than the units located in the north. The spatial concentration of statistically similar communes shows the existence of certain factors determining on the one hand the amount of expenditures made for the functioning of elementary schools and on the other hand those determining the effectiveness of teaching. These may include factors of a cultural, historical or economic nature. It is therefore worthwhile to try to determine the reasons for the differences found.

Reasons for differences in the cost of obtaining 1 point in the sixth-form test

The amount of cost incurred by the communes for obtaining one point in an elementary school leaving test is influenced by: 1) average cost of education per one pupil, 2) average number of points obtained by pupils of a given unit taking a test. The study carried out by means of correlation methods demonstrated that the amount of cost incurred by the communes for education per one pupil depended mainly on five factors. They were as follows:

– the amount of capital expenses – including education investments, per capita; this factor accounted for 23.3% of the total variability of the dependent variable,
– varying average number of pupils in schools run by a commune accounted for further 17.7%, the negative sign of the estimated partial regression coefficient means that each additional pupil attending school decreased the cost of education of one child statistically by PLN 2.82,
– the amount of expenses for education assignments covered by the communes from their own funds, per capita; the inclusion of that variable in the model accounted for 2.7% of the total variability of costs of educating one child,
– commune type; the estimated partial regression parameter was equal to 623.6, which means that the costs incurred for education of one child in urban communes were statistically lower by that amount compared to urban/rural communes, and in urban/rural communes compared to rural communes; it means that rural communes spent statistically PLN 1249.2 more than urban communes; the variable concerned accounted for 2.4% of the dependent variable,
– the average number of pupils in a class, this variable accounted for 1.6% of the total variability of the dependent variable; the estimated partial regression parameter means that when the average number of pupils in a class increases by one child, the average costs of education of one child are statistically lower by PLN 90.3.

The aforementioned interdependence may be summed up by the following statement: the major factor varying the average costs of education of one child in a commune is capital expenses for education (including investments). Factors contributing to the lowering of costs include: urban nature of a commune and degree of concentration of education centers.

Where the dependent variable was the average number of points obtained by pupils taking a test in individual communes, the independent variables described those factors that could potentially influence the results obtained. The first observation that may be made following an analysis of the model arrived at is that despite having used numerous independent variables it was only possible to account for not quite 40% of variability of the response variable. This proves that there exist factors that have not been taken into account in the study. The second observation is the lower than expected impact of factors taken into account. The study made it possible to demonstrate the probable impact of just three of them. A variable with the highest correlation with the average result obtained by pupils of a given commune was the average level of education of its inhabitants. The variable concerned accounted for 32.61% of the total variability of the response variable. The "commune type" variable accounted for – 2.86%, whereas the relative variability ratio for wealth of commune inhabitants[1] – 0.97. The calculated values of estimators justify the statement that the effectiveness of teaching in elementary schools depends mainly on factors which local governments have only limited influence on. The most significant of those factors is the level of education of local community, which forms a kind of climate in which children are brought up. It is linked with the level of wealth of inhabitants. It may not be categorically stated that education is the reason for wealth of a certain local community. It should be rather suspected that there exists a certain type of feedback since high mobility of people results in migration of educated individuals to (or near) growth centers offering higher income and to better developed areas. Thanks to such migration, better developed areas are provided with additional growth stimuli. The third factor is commune type. The positive sign of the estimated partial regression coefficient indicates that, with other factors the same, rural children perform better at school. There is no evidence that, in terms of potential opportunities, rural children outperform their peers in towns and cities. Still, economic sciences show the

[1] Theoretical assumptions for the ratio are presented in a separate paper [Lusawa 2009].

motivating role of competition for status[2]. It pertains not only to adults, but also to children. It is visible in different areas of activity and the stronger it is the smaller number of such fields. Cities offer young people more opportunities for self-fulfillment, which is why education loses importance as the field of building position within a social group. Rural youth, which has less opportunities, is more interested in competition in that field despite being offered objectively worse conditions. Apart from the factors mentioned above, the problem of commuting to school is also notable here. In places where that problem needs to be solved by a commune, not only are education costs higher, but at the same time its effectiveness is declining. This is demonstrated by the regression between average costs of transporting one child to school and the average results of the knowledge test held in the sixth form. In communes with higher expenses on that account, youth obtained statistically lower test results. This may be a consequence of the loss of time and fatigue of transported pupils as well as of limited access to after-school classes.

Conclusions

Local government units make, within the limits of their competence[3] and possibilities, decisions concerning the amount of funds designated for the functioning of schools and education organization: number and localization of centers. Still, the effectiveness of the teaching process is influenced by a number of factors which are beyond control of local authorities and educational staff. They have a minor influence both on the unit type (urban or rural commune), level of its wealth and level of education of its inhabitants. The study has also demonstrated that many instruments available to local authorities (such as organization of cultural life in communes, technical equipment of education centers) play a less vital role than expected. On the other hand, the level of regression explained for the average costs of education of a pupil, which is equal to 47%, and the level of regression explained for the results obtained by pupils – 37% demonstrate that there exist other factors which have not been considered. These may include factors which are hardly possible or impossible to be measured (e.g. teaching ethics or attitude of youth to learning). Other factors may include specific local environment, which varies in individual communes and is incapable of being reflected by means of statistical methods.

The material gathered has shown that concentration of education, which is characteristic of the rural areas of the Mazovia region, brings significant financial savings while not causing any clear changes in the level of knowledge of school-leavers. From that perspective, actions promoting education concentration should be considered economically effective according to Pareto. However, the discussion does not take into account children's effort involved in longer travel to and from school[4], or transfer of some of the costs of education functioning (e.g. transport of children) to parents, i.e. to a private sphere. Since no evidence exists as to the positive impact of concentration on teaching results, such solution does not have to be economically effective even according to a less restrictive Hicks-Kaldor principle. The question of compensation for additional effort put by children and their parents remains open. It should also be remembered that schools play an upbringing role, which has not been examined, as any changes in the education organization have to influence that aspect of activity of education centers.

Therefore, actions aimed at increasing the economic effectiveness of teaching should be performed with deliberation and with consideration given to as much local factors as possible. The development of school rankings on the basis of effectiveness ratios seems to be misguided. As certain criteria are adopted for their purposes, such rankings may reward centers operating in a certain environment and discriminate schools functioning in another environment. As a result of different education centers competing for a ranking position, those centers that lag behind strive to adopt solutions considered more effective, which may lead to unreasonable and sometimes even harmful decisions[5].

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[2] This issue has been introduced in papers by Layard [2009] and Binswanger [2006].

[3] A significant limitation to the freedom of decision of communes in that respect is education regulations governing (for the sake of public interest) a number of issues affecting the amount of costs incurred. These include for instance: regulations concerning professional promotion, working time and teachers' remuneration, regulations concerning organization of the didactic process (school curricula, standards for the number of pupils in a class).

[4] The problem of burden on children, in paricular on younger pupils of elementary schools, caused by longer way to school, is touched upon by Kozińska-Bałdyga [2005].

[5] The subject of rankings has been elaborated on by Binswanger [2010] "Curing obsession with rankings".

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Streszczenie

W opracowaniu podjęto zagadnienie ekonomicznej efektywności oświaty. Założono, że umożliwia ją system obiektywnej oceny wyników nauczania na poszczególnych poziomach edukacji oraz ewidencjonowanie nakładów przez organy prowadzące szkoły. Na tej podstawie podjęto próbę wyodrębnienia czynników decydujących o efektywności ponoszonych nakładów.

Corresponding addres:
Dr Roman Lusawa
Mazovian Center of Agriculture Consultancy in Warsaw, Poświętne Branch in Płońsk
Sienkiewicza Str. 11
09-100 Płońsk, Poland
tel. +48 23 663 07 33
e-mail: roman.lusawa@modr.mazowsze.pl