AN INNOVATIVE MODEL OF FUNDING THE EDUCATION SYSTEM

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ABSTRACT: *This article shows that the effectiveness of the education system can be measured without taking into account the socio-economic environment of students. The use of AVE (Educational added value), which is a measure of the aforementioned effectiveness of the education system, should be accompanied by an analysis of the level of local socio-economic development. These formulations include a certain inconsistency. It stems from the fact that the modelling of AVE using previous educational achievements of students (at the preceding stage) does not take into account the impact of variables modifying these educational achievements. It is assumed that a student's individual family, economic and social situations do not change so rapidly as to affect their educational attainments in the next stage of education. However, research conducted in Poland show that socio-economic variables in areas of local government units strongly modify the AVE. This phenomenon was the reason for proposing the correction in the system of education funding. The proposed model of funding education takes into account the qualitative factors of educational processes. The implementation of such a model should, in the long term, improve the quality of human capital in society.*

KEYWORDS: *educational production function, AVE(Educational Added Value), financing model*

JEL CODES: H52, I21, I22, I29

Introduction

Most authors claim that human capital, developed mainly through education, contributes to GDP growth. There are well-known opinions indicating that 8.5% of GDP growth is dependent on investment in education (Kundu, 2016, pp. 55-68).

In the EU, expenditures on education in 2013 (recent available data) amounted to 5.24% of GDP. The highest expenditures in relation to GDP occurred in Sweden and amounted to 7.43% of GDP, while in Poland they reached 5.00% of GDP and in Romania, 2.70% (http://appsso.eurostat.ec.europa.eu, accessed on 22 June, 2016).

The two quantities quoted above, i.e., the impact of human capital developed through education on the growth of GDP and the share of expenditures on education in GDP, require a careful analysis in terms of their capacity for improving education systems. Improvement processes should, in the long term, contribute to improving the quality of human capital in society. This effect should then translate into increased innovation and a country better able to compete.

In view of the increasingly high costs incurred at each level of education, attempts are often made to link funding for educational services with their efficiency (Todea et al., 2011, p. 5, Escobar, Izquierdo, 2008, pp. 117-152).

There are numerous references in the literature to today's view of the economic efficiency of education. In the nineteenth century, the system of payment for learning outcomes was

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comprehensively studied. The system involved an annual review of each student by one of the royal inspectors, to determine the government's financial allocations (Rapple, 1992, pp. 301-316).

Optimizing the delivery of educational services should lead to equal access to quality education for all citizens. It should also take into account the rational use of material and intellectual resources. The major goals in the mechanism of institutional transformation of education are cost optimization and consumer satisfaction in terms of quality and accessibility of education. The organizational changes at the level of regional education systems are enforced by the dynamics of demographic indicators and internal migrations, as well as organizational and economic changes (Loskutova, 2016, pp. 63-69).

Any qualitative changes in education are correlated with socio-economic factors which significantly determine the quality of education (Czyżewski, Brelik, 2016, pp. 93-104).

The importance of the quality of education is sometimes noticed by the beneficiaries of the education system. This is confirmed by the establishment of foundations aimed at improving the quality of education by providing supplementary funds, usually derived from the parents of students. Critics of this approach claim that such foundations are a potential source of disturbance in the area of education funding (Shoemaker, 1983, pp. 1-14).

Aversion associated with social inequalities clearly leads to inequalities in educational achievements. As a result, this situation requires more attention, through redistribution of funds (Gary-Bobo, 2006, pp. 199-228).

One of the ways of financing education, in turn partly eliminating monopolistic tendencies in education, is financing of education services through a system of educational vouchers (Mangold et al., 2000, pp. 39-59, Bielecki, 2005). This solution, however, does not account for the quality of educational services.

The introduction of education funding based on educational vouchers and enriched with qualitative aspects is the right direction in the search for an optimal solution for education funding.

As follows from the above-mentioned formulations, measuring the effectiveness of educational services is an important issue for education systems. Given the above, the objective of this article is to identify the model of financing education, taking into account measures of the effectiveness of the education system.

Methods for determining the effectiveness of the education system

The simplest methods for determining the effectiveness of the education system are to determine the number of graduates in relation to the number of pupils entering education, analyse exam results (sometimes referred to as the raw results) and to count the students achieving above-average educational success (participating in subject competitions). These measures, however, show a very vague image of a school. They completely ignore the socio-economic context of the analysed environment, the financial expenses incurred on educational processes and the associated effects, as well as the educational level of students at input. Therefore, it is necessary to seek more advanced methods to measure the effectiveness of educational processes.

An educational production function is one such method. It has been explored by many researchers, yet should be considered as still in the experimental stage because of the complicated nature of the examined educational processes.

An educational production function is based on the comparison of learning processes to production processes in companies, as studied by economists. In this comparison, schools are seen as a place where educational resources (teachers, books, buildings, equipment, students) interact

with each other, producing the output: the performance of students, usually expressed in the form of test results or future salaries of graduates (Meyer, Nascimento, 2008, pp. 19-30).

The concept of an educational production function was introduced by Bowles in 1969 (Bowles, 1969, pp. 1-111). Based on the marginal productivity, this function allows determination of the level of social expenditure necessary to provide general education. A method of distributing these expenditures among various types of training areas should contribute to the determination of these teaching techniques that should receive special support. The application of this function should also allow determination of the optimal level and structure of employment in the education system. This function assumes the necessary expenditure on uneducated or partly educated individuals to help them obtain full education through educational activities.

The idea of determining the educational production function has a variety of contexts. One such context is the effect of school resources on student achievements in the learning process (Deutsch et al., 2013, pp. 245-262). Another context in this function is variables related to the implementation of the educational process and the relationship between students, parents, teachers and school principals. Some analysts using the educational production function indicate that the quality of teaching can be improved by introducing institutional changes. The student input is of particular significance in the educational production function (Tobón et al., 2008, pp. 145-173).

There have also been studies on the correlation between the quality of teachers' work and students' performance. These studies involve determining added value in education (AVE) provided by teachers, to estimate the educational production function. They indicate the key role of teachers in the educational achievements of students. At the same time, attention is paid to the difficulty in predicting examination results of students based on the qualifications of teachers; no such correlation has been demonstrated so far (Koedel, Betts, 2007, pp. 1-51).

Authors generally agree about the need to control the socio-economic status and other contextual variables at the level of schools and students when determining educational effects. The approach presented earlier, termed an educational production function, is mainly based on hierarchical linear models. This approach, however, is considered to be problematic, because in the end it does not encourage schools to strive for excellence. There is also a problem of the analysis of contextual variables assigned directly to a student (Thieme et al., 2016, pp. 456-471). The problem of understanding the context of the socio-economic variables affecting a student can be solved by assuming that these variables do not change significantly during the student's educational career. Under this assumption, examination results at earlier and later stages of their education should be modelled and the resulting difference between them should be regarded as AVE.

Modelling AVE uses a set of sophisticated statistical techniques, which use long-term test results of students to assess educational effects achieved in the analysed schools. The determined models of AVE try to isolate the contribution of factors unrelated to the teaching process, from examination performance (Arias et al., 2009, pp. 15-45).

AVE is assumed to improve the quality of school work. Estimated for a school over the entire period of its operation, it shows the effects of school work and the effectiveness of remedial programmes. The monitoring of schools by setting AVE targets should improve the quality of education by modifying the current education policy (Ferrao, Couto, 2014, pp. 174-190).

AVE brings better effects when used regularly. Providing information on an exam result obtained by a student in relation to the total population of examinees can motivate students to obtain higher exam results (Cornell, 1985, pp. 356 – 363).

The introduction of AVE to educational practice can distort the idea of measuring schools, as a result of which the teaching process will focus only on achieving particular examination results

(Arias, 2009, pp. 217-250). This drawback should not depreciate the proposed method, yet its imperfections must be taken into account during its implementation. AVE is suitable for the diagnosis of educational processes and can be helpful in planning educational reforms.

There are reports in the literature indicating that accurate assessment of AVE for a student needs to take into account socio-economic variables and other contextual variables related to the level of school and peer groups (if stability of the student's environment is not assumed) (Thieme et al., 2016, pp. 456-471). This problem will be most important at the first testing of student achievement as it creates a fundamental difficulty in assigning a student to a particular peer group based on AVE.

It is relatively easy to determine AVE for the school subjects that are based on clear, right/wrong answers, such as mathematics, physics, chemistry and biology. The problem is how to measure AVE in the group of subjects that do not yield to the rules of AVE, including physical education, musical education and the arts (Hushman, Hushman, 2015, pp. 23-27). Despite the fact that the United States try to use AVE to assess physical education classes, the tendency to calculate the contribution of schools to every aspect of a student's education seems to be a mistake in the long run and may even distort the idea of AVE.

A model of financing the education system

Previous analyses show that quality of education affects the quality of human capital and this is reflected in the level of economic development. The quality of education is also key to strengthening the level of innovation in the economy. It is therefore necessary to implement a system of financing education that will stimulate educational institutions to raise the quality of education.

The current research on the quality of education indicates that AVE should be treated as the most appropriate tool to determine the contribution of schools to the education of students.

Objective determination of AVE requires a specialized institution, specializing in processes of modelling this value and the implementation of an independent (external) examination system. It can be easily seen that this process is associated not only with the change of approach to learning outcomes but also with additional expenses.

Research conducted in Poland indicates that exam results in secondary schools are highly correlated with the level of socio-economic development at the district level (NTS-3) (Czyżewski, Polcyn, 2016). Regional differences in examination results lead to a belief that the funding system should take into account the level of socio-economic development.

Considering the above, the following model of financing the education system is suggested (Figure 1):
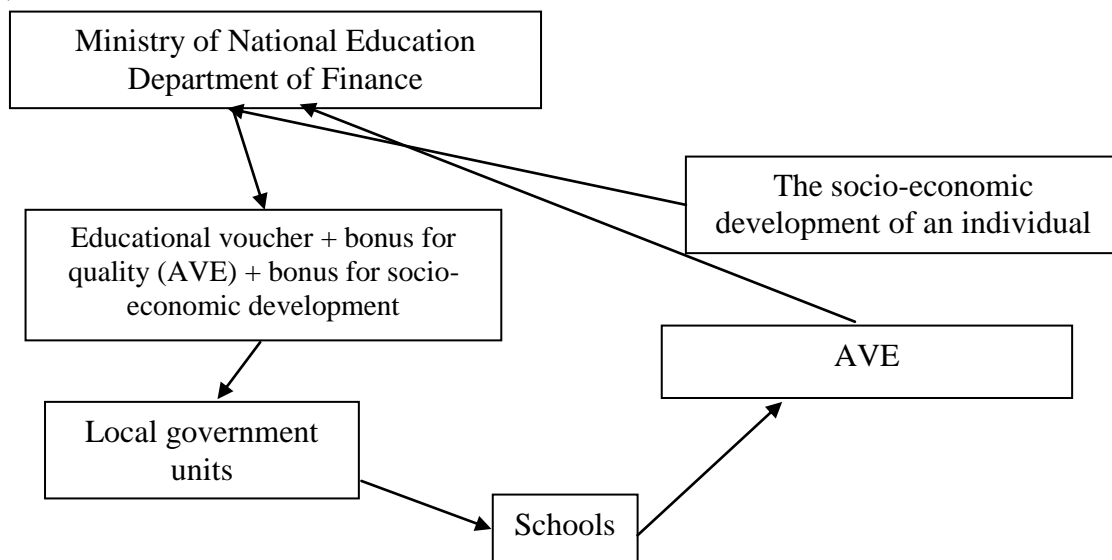
Figure 1. Model of financing the education system
Source: author's elaboration

It should be noted that the proposed model is adapted to the Polish education system. The implementation of this model in countries with a different structure to their education system will therefore require appropriate adjustments. However, although the model refers to a particular education system, the general model seems to be universally applicable.

The introduction of the proposed model requires the support of a complex algorithm, taking into account the financing of other tasks associated with the education system, such as transporting pupils to schools, maintaining dormitories, care and educational tasks, as well as working with difficult youth. This algorithm is specific to the education system of each country and to a large extent is conditioned by political factors.

An adjustment of education funding in local government units with different levels of socio-economic development should enable implementation of additional educational tasks aimed at equal educational opportunities for youth, thus eliminating the source of social inequalities. Omitting the financial adjustment for individuals with lower levels of socio-economic development leads to a reduction in the quality of human capital in society and consequently to a lower level of economic development.

Conclusion

The proposed model of financing the education system requires not only organizational changes but also mental changes among clients of the education system (students and parents), as well as among the teaching staff and the entire society.

Such a system could also lead to the introduction of specific rankings of schools, based on AVE achieved by an individual educational institution. This phenomenon can be seen as an element of competition among schools. Those with a higher AVE can enjoy a higher interest from candidates. The effect of competition will not be noticed in a region in which one school has a characteristic monopoly, but in these cases the school in question will be interested in achieving the highest possible learning outcomes due to more favourable funding for schools with a higher AVE.

It should also be noted that although AVE can be determined for most school subjects, teachers, schools and even local government units, it should be treated as a support for the allocation of funds.

The rationalization of expenditures on educational processes also requires taking into account performance indicators in the assessment of educational processes. A result in the discussed cases is AVE and expenditures are financial resources spent on the maintenance of a school. This approach can be treated as a source of crude data. The state, most often because of its constitutional obligation, is required to provide educational services to citizens free of charge, so the performance indicators of the education system can only be used as a premise for organizational changes to improve the efficiency of state budget spending.

The use of an educational production function at the current stage of research is problematic due to the complicated nature of educational processes. Studies on this function provide knowledge about phenomena affecting the quality of educational processes. The use of the discovered

determinants of the quality of education should allow, in a further step, for improvement of the education system. Therefore, it is appropriate to explore further methods for improving the idea of an educational production function.

Due to their complex nature, educational processes cannot be fully measured. Therefore, a large margin should be left for the creative activities of teachers and students, allowing for full intellectual and emotional development of the latter.

References

1. Arias R. M., 2009. Uses, applications and problems of educational value-added models, Revista De Educacion, pp. 217-250.
2. Arias R. M., Soto J. L. G, Morera M. C., 2009. Concept and evolution of educational value-added models, Revista De Educacion, pp. 15-45.
3. Bielecki P., 2005. Bony edukacyjne. Granice urynkowienia edukacji, Warszawa, Szkoła Główna Handlowa w Warszawie.
4. Bowles S., 1969. Educational Production Function, Washington, Office of Education (DHEW).
5. Cornell G. R., 1985. The value-added approach to the measurement of educational quality, Journal of professional nursing: official journal of the American Association of Colleges of Nursing, 1, pp. 356-63.
6. Czyżewski B., Brelik A., 2016. Modelowanie społeczno-ekonomicznych determinant jakości edukacji, Zeszyty Naukowe WSES w Ostrołęce, 20, pp. 93-104.
7. Czyżewski B., Polcyn J., 2016. Education Quality and its Drivers in Rural Areas of Poland (in print), Eastern European Countryside, p. 22.
8. Deutsch J., Dumas A., Silber J., 2013. Estimating an educational production function for five countries of Latin America on the basis of the PISA data, Economics of Education Review, 36, pp. 245-262.
9. Escobar L. D., Izquierdo M. G., 2008. Incidence Analysis of Higher Education Financing System in Spain Using a Behavioural Model, Hacienda Publica Espanola, pp. 117-152.
10. Eurostat-European Union, http://appsso.eurostat.ec.europa.eu (accessed on: 22 June, 2016)
11. Ferrao M. E., Couto A. P., 2014. The use of a school value-added model for educational improvement: a case study from the Portuguese primary education system, School Effectiveness and School Improvement, 25, pp. 174-190.
12. Gary-Bobo R., 2006. Education, economic efficiency, and distributive justice: a Rawlsian approach, Revue D Economie Politique, 116, pp. 199-228.
13. Hushman G., Hushman C., 2015. Value-Added Modeling in Physical Education, Strategies: A Journal for Physical and Sport Educators, 28, pp. 23-27.
14. Koedel C., Betts J. R., 2007. Re-Examining the Role of Teacher Quality in the Educational Production Function (Working Paper 708), Columbia: University of Missouri -Department of Economics.
15. Kundu A., 2016. The Effectiveness of Public Spending on Education and Health Care in Brazilian Economy, Nile Journal of Business and Economics, 2, pp. 55-68.
16. Loskutova M. V., 2016. The Analysis of Social And Economic Efficiency of Models And Instruments of Transformation of The Education System, Социально-Экономические Явления и Процессы, 11, pp. 63-69.

17. Mangold M., Oelkers J., Rhyn H., 2000. Financing education through educational vouchers - Models and experiences, Zeitschrift Fur Padagogik, 46**,** pp. 39-59.
18. Meyer P. A., Nascimento M., 2008. School Resources and Student Achievement: Worldwide Findings and Metodological Issues, Educate Journal, 3**,** pp. 19-30.
19. Rapple B., 1992. A Victorian experiment in economic efficiency in education, Economics of Education Review, 11**,** pp. 301-316.
20. Shoemaker J. S., 1983. Emerging Role of Educational Foundations in Financing Education. Annual Meeting of the California Educational Research Association (Los Angeles, CA, November 17-18, 1983).
21. Thieme C., Prior D., Tortosa-Ausina E., Gempp R., 2016. Value added, educational accountability approaches and their effects on schools' rankings: Evidence from Chile, European Journal of Operational Research, 253**,** pp. 456-471.
22. Tobón D., Valencia G., Ríos P., Bedoya J. F., 2008. Organización jerárquica y logro escolar en Medellín: un análisis a partir de la función de producción educativa, Lecturas de Economía**,** pp. 145-173.
23. Todea N., Tilea D. M., 2011. Comparative analysis between the models for financing of education in Romania and the United Kingdom, 3rd World Conference on Educational Sciences (2011), 15**,** p. 5.