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## ANALYSIS OF PUBLIC FUNDING OF UKRAINIAN EDUCATION: POSTWAR PERSPECTIVES IN DIGITAL SOCIETY

*The study examines an important social problem, namely, the effectiveness of the use of public finance in the field of higher education on the example of Ukraine, that is especially important in the conditions of war and digital society development. This study aims to give the state bodies, business society, the civil community, university lecturers and university leaders some managerial tips to use public finance in the field of higher education in postwar period. The research methods were general scientific research methods and mathematical (regression) modeling. The research hypothesis states that public finance in the field of higher education is used effectively. As a result of the study the research hypothesis was rejected. Thus, the authors met with an important social problem of modern society, that shown the decline in public funding of education. The result allows us to formulate multilevel managerial tips in order to solve the important social problem of digital society in postwar period.*

*Keywords: public finance, effectiveness, education, mathematical (regression) modeling, Ukraine, postwar period.*

**Introduction.** Social sciences consist of many elements, including education. There are many problems of the educational system. Some of them are seen and solved by the business society, the civil community, state bodies, university teachers and university leaders as they appear. Other educational problems are hidden. No one sees them without doing scientific research. Recently, an article [1] was published in the Universal Journal of Accounting and Finance, in which the author gives two examples of ineffective use of public funds in Poland. These examples are of great scientific, practical and social importance, as they describe the use of public finances in one of the post-communist countries. The examples described in [1] have attracted the interest of the authors of this article. These two examples [1] were the impetus for this research and writing this paper.

Therefore, the authors of this paper have further

investigated the use of public finance. Both studies are united by the subject matter of the research. This is public finance. The authors also give example of the use of public finance in Ukraine. This example is interesting, because Ukrainian higher education faces new challenges as functioning during the war in 2022.

The obtained results are very important for Ukrainian social sphere, such as higher education in postwar period and digital society development. They are also important for the business society, the civil community, state bodies, university lecturers and university leaders in other countries.

### **Analysis of the latest research and publications.**

The choice of Ukraine for the study is justified by the fact that country belongs to the Eastern European segment of the higher education services market. The country belongs to the transitive model of the social economy, for which there is a transformation of the sphere of public finance and reform of the social sector [2]. The development trends of the country can correlate with the trends in the efficiency of the use of public finances in other European countries, not EU members, as well as in the countries of Asia with transitive economy. This segment is one of the weakest segments of the global educational services market [3; 4].

I. Shkolnyk, T. Melnyk, Y. Havrysh and A. Ivanchenko [5] studied the use of public finance in Ukraine, who examined the strategy, mechanism, priorities of reforming the public finance system and the transparency of their use at the local level.

Social and digital development of European countries and the need to rethink the effectiveness of the use of public finance in the social sphere, one of the components of which is education, are being studied by European, Ukrainian scientists [3; 6; 7].

The authors chose public funding of higher

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education services in the public finance system for the study, because:

1. Financing of higher education services in different countries ranges on average from 2 to 9% of GDP, i.e. is a significant part of budgetary expenditures.

2. Higher education services have significant social functions in the financial and economic systems (increasing competitiveness, innovative development, investment in the creation of new jobs, etc.).

3. Financing of Higher Education Services is one of the subsystems of the public finance use system.

Different models of financing the university campuses and problems of intensifying the use of non-budgetary sources of funding due to the development of the educational services exports were analyzed by S. Vincent-Lankrin [8] and Efendi [9].

From a theoretical point of view, control over the efficiency of public finances is divided into internal and external, as noted by Ukrainian and foreign scholars [10-11].

Methods of internal control over the efficiency of public finances [10]:

1. Internal control (performed by public and municipal sector bodies);

Internal control is applied by the management of business entities (universities, organizations, enterprises, etc.) to assess compliance with the law and the effectiveness of the use of public finances.

Its essence is to conduct a set of activities to assess the effectiveness of the use of public finances in accordance with the goals, objectives, plans and requirements of the organization.

2. Internal audit (Centralized - by the bodies of the state control and audit service. Decentralized - by an authorized independent unit directly subordinated to the management of the state or municipal sector, but functionally independent of it, within the body or within its management system) [12];

Internal audit is used to improve the management system, prevent illegal, inefficient use of public finances.

Its essence is to conduct a set of activities by the internal audit unit in the organization to improve internal control over the efficiency of public finances.

3. Inspection

Centralized inspection is carried out by the bodies of the state control and audit service.

Decentralized inspection is carried out by control and audit units or other authorized units (officials) of ministries, other central executive bodies and their bodies.

Inspection is applied in cases where it is necessary to combat economic violations and abuses in the field of public finance with the provision of necessary

assistance to the inspected organizations.

The essence of inspection is the state control over the implementation of decrees and laws, decisions of governments in the field of public finance by economic entities by studying documentary facts.

External control over the efficiency of public finances involves checking the compliance of the entity's financial activities with current financial legislation by the relevant authorized control bodies [10, 13]. Methods of external control over the efficiency of public finances also include external audit [11].

The essence of the methods of external control is a set of activities performed by the highest bodies of financial control (for example, the Accounting Chamber of Ukraine, the State Audit Office of Ukraine) in the field of verifying the effectiveness of public finances by organizations.

Effective control over the use of public finances requires a comprehensive approach with methods of internal and external control.

In this study, the authors developed a new method for assessing the effectiveness of public finances in higher education as a whole.

**Definition of the task.** The object of the research is the public finance. The subject of the research is the mathematical model of the use of public finance. The aim of the article is to give managerial tips to use public finance in Ukraine in postwar period. The subsystem of public finance in the field of higher education services was chosen for the study. The study was focused on the analysis of dynamics of the use of the public finance in the field of higher education services. The following research methods were used: general scientific research methods (methods of analysis and synthesis, deduction, historical and logical method); systematic approach; mathematical (regression) modeling.

The information basis of the research was the scientific publications on this issue, the World Bank data, as well as the databases of Central statistical offices of Ukraine.

The research was carried out in the following stages: analysis of documents and scientific literature; data collection via official statistics reports; data analysis.

The new method of the data analysis included the following three steps:

- construction and analysis of mathematical (regression) model for the use of public finance;

- a theoretical overview of the possible reasons for the current position of the trend line and the mathematical (regression) model;

- additional empirical research, including the construction and analysis of the regression equalization for other indicators affecting the use of

public finance.

Further studies have shown that this new method can be applied to such subsystems of the public finance system that are associated with per capita financing.

After the results evaluation and discussions, the

authors prepared conclusions with perspective tips.

**Results.** The statistics on the use of public finance in Ukraine are shown in the Table 1. Statistical data show a gradual decrease in the volume of public finances spent in the field of higher education services.

**Table 1**

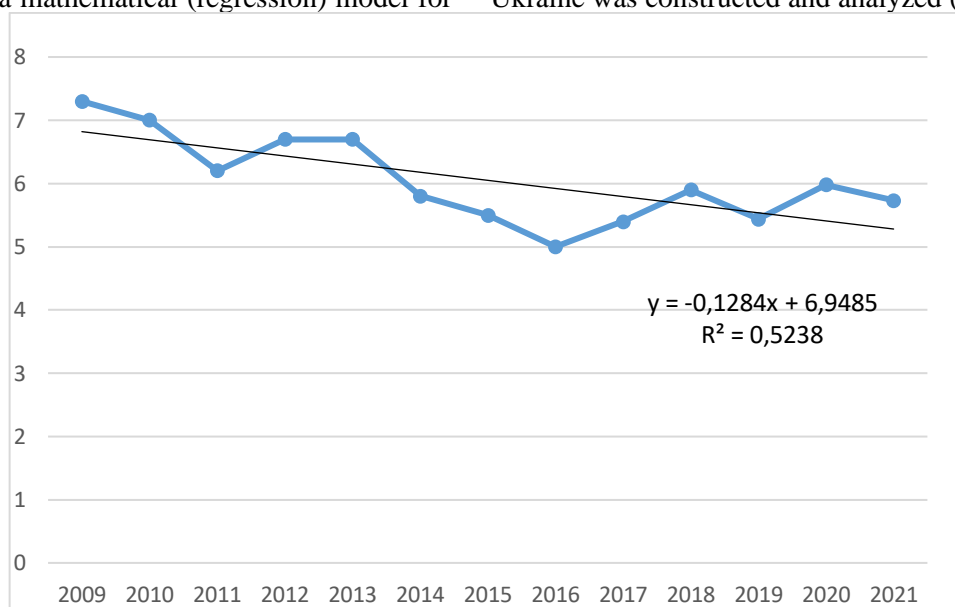
**Dynamics of the public finance use in the field of education in Ukraine in 2009-2021, % of GDP**

|                                     | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|-------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Public spending on education, % GDP | 7.3  | 7    | 6.2  | 6.7  | 6.7  | 5.8  | 5.5  | 5    | 5.4  | 5.9  | 5.44 | 5.98 | 5.73 |

Source: [14-16].

According to the statistical data of Table 1 and the research task, a mathematical (regression) model for

the use of public finance in the field of education of Ukraine was constructed and analyzed (Fig. 1).



**Figure 1. Public finance use in the field of education in Ukraine: trend line.**

Source: [14-16].

So, Fig. 1 shows statistical data on the use of public finance in Ukraine. These data are provided for financing the field of education services of the general system of using public finance. On Fig. 1 previous data are supplemented with trend lines and mathematical (regression) models.

The graphs shown in Fig. 1 do not provide grounds for assessing the effectiveness of the use of public finance in the field of education. The given data should be analyzed in accordance with the author's new method of data analysis.

Table 2 lists the mathematical models for Fig. 1.

**Table 2**

**Mathematical models for the use of public finance in education of Ukraine**

| Country | Mathematical (regression) model<br>(Y= A1 + A2*X) | Coefficient A2 |
|---------|---|----------------|
| Ukraine | Y= 6.948 - 0.128*X                                | - 0.128        |

There are in Table 1:

- X is an independent variable - time (argument),
- Y is the dependent variable - the size of public finance in the field of higher education in Ukraine (function).

The data in Table 1 and Fig. 1 allow us to make a prediction. If there are no significant changes in the system of public finance, then in Ukraine in 55 years (2022-2077) the volume of public finance in higher education services will be zero, assuming no changes in the public finance system.

In world practice, there are different forms and methods of financing higher education services (estimated financing, block subsidies, orders placing, per capita financing, tax incentives for institutions) and students financing (educational vouchers, grants, loans, tax incentives, loan guarantees).

In most developed countries, a system of multichannel financing of higher education services has been created with the dominant public funding combined with various alternative sources of financing, including the development of student loans. At the same time, in developed countries, the state finances university research, capital expenditures, creation and expansion of university infrastructure, as well as current expenditures for higher education.

Thus, the task of the next stage is to conduct additional research. Let's move on to plotting a trend line and mathematical model for the number of students associated with the public finance system. In this case, it is a study of an additional indicator that affects public finance.

A multichannel (mixed) model of financing for higher education services has been created in Ukraine. It includes state (budget) funding, extra-budgetary sources (funds of founders, funds received from income-generating activities) [17]. A significant factor is that public funding for higher education services depends on the number of students.

The practical significance of the study lies in the managerial tips for the business society, the civil community, state bodies, university teachers and university leaders regarding the use of public finance for education services in postwar period.

The limitation of this study is the lack of reliable statistical data of the use of public finance in countries of the European Union.

The study showed the need to increase the attractiveness of higher education from the point of view of the consumer of higher education services [4; 18]. This may require increased use of extra-budgetary funding in higher education services in Ukraine. This refers to grants, projects, clusters (business - University), cooperation with enterprises.

And, of course, university teachers should recognize students as subjects of educational services [4].

In the scientific literature [17] provides advice and recommendations to improve the efficiency of the use of funding for education in Ukraine. They can be divided into two groups: at the state level (for officials) because the state seeks to transform public finance into socio-economic development [19], and at the local level (university rectors). These tips and tricks are aimed at increasing the competitiveness and attractiveness of universities, not only for national and international students, but also for business society. Higher education should attract extra-budgetary funding by business society and more actively provide commercial services (various courses, training, consulting and audit services) for them. And also more effectively use the available public finances for the modernization of the educational base, digitalization, implementation of the achievements of virtual reality [20] and, most importantly, to comply with modern realities and global development trends [21-22].

Some of these tips and tricks can be used based on the results of our research.

The new method consists of three consecutive steps. The new author's method of the data analysis regarding the use of public finance helped to prove two new scientific facts. And it helped to give golden tips for the business society, the civil community, state bodies, university teachers and rectors. The method is simple and effective and can be used to assess public funding in other social areas.

**Conclusions and prospects for further research.** The authors have completed the study and achieved its aim. The authors summarized the theoretical and practical experience of using public finance in the field of education services in Ukraine.

1. The theoretical value of the research lies in the construction of mathematical models for improving the use public finance in the field of the education services in Ukraine. It was for the first time. It was shown that the volume of public financing of education services tends to decrease. This corresponds to the principle of per capita financing.

2. An additional scientific and methodological value of the research lies in the approbation of the new public finance research method. This new method includes three simple steps and can be used to study the use of public finance in other social areas.

3. The practical significance of the study lies in the managerial tips for the digital society, the civil community, state bodies, university teachers and rectors regarding the use of public finance for education services during the war and postwar period.

In order to improve the quality of the use of public finance, the following multilevel tips were given:

- a) At the level of the digital society:
  - to attract extra-budgetary funding for the higher education services sector,
  - to create clusters: business – University,
  - to continue education digitalization development.
- b) At the level of state institutes:
  - to allow higher education institutions to use alternative sources of funding for higher education in the context of budget cuts,
  - to make reliable financial control mechanisms on the part of the state bodies for the use of public finance and numbers of students.
- c) At the level of the civil community:
  - to control the use of public finance not only in the field of higher educational services but all over the budget.
- d) At the level of university teachers and rectors:
  - to use more efficiently budgetary funds for modernization and digitalization of the university to

- increase competitiveness and attract a large number of national and foreign students;
- to expand of real autonomy of structural units of the university (institutes, research laboratories) in terms of financing,
- to develop commercial activities such as retraining of staff, distance learning, scientific research,
- to attract sponsorship,
- to cooperate with business and international organizations,
- to increase attractiveness of universities through high quality of educational services and universities` brand development, etc..

The goal of further research will be to study the mechanisms of the use of public finance in countries of the European Union for Ukrainian practice.

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