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BUDGETARY AND HOUSEHOLD EXPENDITURES
AS A FACTOR OF EDUCATION AVAILABILITY FOR UKRAINIAN POPULATION

Abstract. This article contains a results of testing the analytical techniques, designed to assess the contribution of budgetary sectors of the social industries to the dynamics of household well-being.

Whereas the real consumption of free-to-use goods may be measured only conditional (by the amount of resources spent on creating such goods), we estimated the contribution of the budgetary education sector to the well-being of Ukrainian households through the dynamics of demand for goods, provided by commercial sector of education. We assume from the hypothesis about interchangeability of the goods, which received by households through the budgetary and commercial sectors of education. For empirically testing of this hypothesis, the article examines the functional relationship between the rate of extension of the budgetary education sector resource provision (as a factor) and the demand of households for the goods, supplied by the commercial sector of this industry (as a dependent value).

For investigating such a functional dependence, the article evaluates the parameters of the function, where the dependent variable is the basic growth rate of real consumption of goods, which is provided to Ukrainian households by the commercial sector of education. Factor variables are the basic growth rates of real resources of the commercial and budgetary sectors of the Ukrainian educational industry. According to the logic of setting, this model is similar to the Working model, but does not provide a logarithmic form of the representation of the factor variables. The latter is predetermined by that fact, that both explanatory and dependent variables are expressed as growth rates, which significantly increases the likelihood of the hypothesis about linear nature of the connection between variables and the stability in time of absolute increments of the dependent variable value.

The Working model was actively used to explain the dependence of changes in the pattern of household's consumption on household income, before it was developed by Taylor, who incorporated in that model a term to reflect the impact of relative prices. We turned to the primary form of the Working model because we have add to it a factor, whose nature of connection with dependence variable is similar wit impact made by total household incomes.

The simulation results have not empirically confirmed the inverse relationship between the expansion of the resource provision of the budgetary education sector and the growth rate of consumption of goods supplied by the commercial sector of the industry. At the same time, there are signs that during the retrospective period, the expansion of the budgetary education sector's resource provision was accompanied by an increase in pressure on the commercial sector's resource potential: there is a crowding out effect known in the macroeconomics of public and private investment.

We have not received empirical evidence of the ability of budget expenditures to replace consumption of goods, provided by the commercial education sector in Ukraine. Both sectors of education are forced to operate in a mode of resources scarcity and adverse dynamics of resource provision, which threatens to erode the quality of educational services and undermines the fundamental foundations of commercial education financing: the connection «investments to education — income growth».

The social performances of both the budgetary and commercial education sectors are clearly deteriorating due to the chronically negative tendencies in resource provision. Increasing the rigidity of education financing conditions, both at the expense of household incomes and at the expense of the budget, limits the choice of consumers so much that it is more correct to interpret our results as forms of adaptation to the negative dynamics of well-being, rather than as a manifestation of rational consumer choice. In this context that we interpret the lack of indications of households' attitude to the goods, supplied by the commercial education sector, as to the goods of luxury: during the retrospective period, the share of education expenditures in household income declines. It is an expression of extremely low economic opportunities, not of consumer preferences of Ukrainian households, who are forced to spend about half of their individual consumer spending on meeting primary needs (food and utilities).

Keywords: social sectors, education, budget expenditures, goods availability, commercial sector, budget sector, consumption.
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БЮДЖЕТНІ ОСВІТНІ ВИДАТКИ І ВИТРАТИ ДОМОГОСПОДАРСТВ ЯК ФАКТОР ДОСТУПНОСТІ ОСВІТИ ДЛЯ НАСЕЛЕННЯ УКРАЇНИ

Анотація. Стаття містить апробацію аналітичних прийомів, призначених для оцінки внеску бюджетних секторів соціальних галузей економіки в динаміку добробуту домогосподарств.

Оскільки реальні масштаби споживання благ, що надаються безоплатно, підлягають лише умовній оцінці (за обсягами ресурсів, витрачених на їх створення), ми оцінюємо внесок бюджетного сектору освіти у добробут домогосподарств опосередковано: через динаміку попиту на послуги комерційного сектору освіти. Ми виходимо з гіпотези про взаємозамінність благ, що домогосподарства одержують від бюджетного і комерційного секторів освіти. Для емпіричної перевірки цієї гіпотези досліджується функціональний зв'язок між масштабами ресурсного забезпечення бюджетного сектору освіти і попитом домогосподарств на блага, що постачає комерційний сектор цієї галузі.

Для дослідження такого функціонального зв'язку оцінено параметри функції, де залежна змінна — базисні темпи зростання фізичних обсягів споживання благ, що постачає українським домогосподарствам комерційний сектор освіти. Факторні змінні — базисні темпи зростання реальних ресурсів комерційного і бюджетного секторів української освітньої галузі. За логікою побудови ця модель аналогічна моделі Воркінга, але не передбачає логарифмічної форми представлення значень факторних змінних, бо і пояснюючі, і залежні змінні виражені в темпах зростання, що значно підвищує вірогідність гіпотези про лінійний характер зв'язку і сталість у часі абсолютних приростів значення залежної змінної.

Модель Воркінга активно застосовувалась для пояснення залежності змін у структурі споживання від доходів домогосподарств до того, як була розвинута в роботах Тейла, який інкорпорував до моделі терм для відображення впливу відносних цін. Ми звернулись до первинної форми моделі Воркінга, бо додаємо до неї чинник, характер зв'язку якого з масштабами споживання аналогічний характерові впливу загальних доходів домогосподарств.

Результати моделювання емпірично не підтвердили наявність оберненого зв'язку між розширенням ресурсного забезпечення бюджетного сектору освіти і темпами зростання обсягів споживання благ, що постачає комерційний сектор галузі. Водночас виявлено ознаки того, що протягом ретроспективного періоду, розширення ресурсного забезпечення бюджетного сектору освіти супроводжувалося зростанням тиску на ресурсні можливості комерційного сектору: спостерігається ефект витіснення, відомий у макроекономіці стосовно державних і приватних інвестицій.

Ми не отримали емпіричного підтвердження здатності бюджетних витрат заміщати споживання благ, створюваних комерційним сектором освіти в Україні. Обидва сектори освіти вимушені функціонувати в режимі дефіциту ресурсів і несприятливої динаміки ресурсного забезпечення, що створює загрози розмивання якості освітніх послуг і підриває фундаментальні основи комерційного фінансування освіти: зв'язок «витрати на освіту – зростання доходів».

Суспільні результати функціонування і бюджетного і комерційного секторів освіти явно погіршуються через хронічно негативні тенденції ресурсного забезпечення. Зростання суворості умов фінансування освіти як за рахунок доходів домогосподарств, так і за рахунок коштів бюджету, настільки обмежує вибір споживачів, що отримані нами результати коректніше трактувати як форми адаптації до негативної динаміки добробуту, а не як прояв

раціонального вибору споживачів. Саме в такому контексті ми трактуємо і відсутність ознак ставлення домогосподарств до благ, що постачаються комерційним сектором освіти як до благ розкоші: протягом ретроспективного періоду питома вага видатків на освіту в складі доходів домогосподарств скорочується. Це вираження вкрай низьких економічних можливостей, а не споживчих уподобань українських домогосподарств, які вимушені витрачати близько половини своїх індивідуальних споживчих витрат на задоволення першочергових потреб (їжа і комунальні послуги).

Ключові слова: соціальні галузі, освіта, бюджетні витрати, доступність благ, комерційний сектор, бюджетний сектор, масштаби споживання.

Формул: 2; рис.: 1; табл.: 3; бібл.: 20.

Introduction. In modern Ukraine, the state-funded and provided to households free of charge educational services (primary / vocational education, higher education by state order) remains a significant factor for well-being of all sections of the population. At the same time, commercial education is being actively developed, sometimes competing with the industry's budgetary sector for resources, sometimes sharing them. For example, state-run Ukrainian higher education institutions provide services on a state-ordered basis (free of charge for students, through receiving budget funding of institution) as well as on a commercial basis. We leave the operation on a large informal market of educational services (tutoring, hidden «charitable» payments in educational institutions) beyond our research. However, the complex interaction of budgetary and commercial financing mechanisms, which are characterized by specific incentives and levers of influence on the activities of educational institutions, explains a considerable part of the opportunities and constraints that Ukrainian education faces.

The above determines the relevance of empirical researches aimed at assessing the social impact of changes in state presence in educational industry. The methodology of this article is based on the fact that the final results of the functioning of industries (and in particular their budgetary sectors, as suppliers of goods and services) are manifested through the characteristics of household consumption (dynamics of real amount of consumption, relative prices of goods and their availability). Accordingly, by examining the link between changes in the structure of a particular industry (in this case, changes in the proportions of budgetary and commercial financing of education) and changes in the availability of goods, provided by educational institutions to households, we will receive a meaningful assessment of the possibilities of improving the well-being of the population.

For this purpose, the article addresses a number of tasks, related, first of all, to the problem of estimating the dynamics of real volumes of consumption, relative prices and the availability of goods, created through the budget financing and provided to consumers free of charge. To resolve these challenges, we formulated hypotheses regarding the relationship between consumption of goods, created within the commercial and budgetary sectors of education in Ukraine. In particular, we seek answers to the following questions: Is there a positive relationship between the increasing of real value of the resources, received by the commercial and budgetary sectors of the educational industry and the real amount of consumption of goods supplied by them to households? Is the expansion of industry budgetary funding accompanied by a reduction in the consumption of goods, generated by the commercial sector of education? Reducing the prices at which they are provided through market mechanisms? On the contrary, does the increase in private spending on goods, supplied by education, allow reduce budget expenditures without compromising the provision (at least its average) of households with relevant goods?

The subject of this research is leading industry of Ukraine's social sphere — education. This choice is due to the two circumstances.

First, although the budgetary and commercial sectors of the educational industry are strongly linked (for example, state-funded universities provide services both on a commercial basis and free of charge within the framework of public financing), but commercial and budgetary financing leads to completely different models of development, direct activity of performers by different priorities,

create different incentives for their functioning. Accordingly, the redistribution of the overall funding of education between budgetary and commercial sectors can significantly affect the functioning of the industry, improve, or impair the results that society receives from the education industry.

Secondly, the available indicators of educational resource provision accurately reflect the scope and structure of industry's financing, and the indicators and volume of household consumption expenditures sufficiently accurately track the consumption and availability of goods generated by the commercial sector of education. Whereas businesses in Ukraine show very low activity to finance the education of their employees, household expenditures can be considered as the sole source of commercial financing for education without creating a significant deviation our model from the reality.

These two circumstances allow us to examine the relationship between size of resource provision, demand and the scale of consumption of goods, supplied by the commercial and budgetary sectors of the industry.

This article uses a rather simplistic analytical toolkit to outline the prospects of its further refinement and adaptation to using with statistical base of different countries. In particular, we do not take into account such forms of governmental influence on the demand and supply of educational services as pricing regulation, setting educational standards, regulating the labor market, etc. We do not take into account the fact, that not all educational products are consumed by households. However, the specificity of the Ukrainian conditions (the Ukrainian business shows very low activity to finance the education of their employees) allows as considering the second limitation as such, that cannot significantly affect the results of the study.

Concerning to the first limitation (the impact of institutional factors, first of all, regulatory acts), our focus is only on the connection between the resource conditions of the commercial and budgetary sectors of education (as factor) — and the provision of goods to the population (as dependent parameter). The impact of regulatory acts, norms and rules of engagement, and the forms of control over their compliance in this research are considered as «under other things being equal» (ceteris paribus) and will be explored in our further work.

Problem analysis and problem statement. The determining principles of evaluating the social results of changes in scale and structure of social industries funding are developed in works, devoted to evaluating social implications of programs and policies. These works are aimed at a comprehensive assessment of the benefits and costs (welfare changes) of a wide range of individuals whose interests are affected by government programs or regulations [1—4]. The fundamental principle of such assessments is the using of value measure for various forms of manifestation of the social consequences of project and policy principles implementation: cost units express life expectancy growth and infant mortality rates, subjective satisfaction of community representatives or other interested groups, reducing of the injury risk of and frequency of occurrence of complications in diseases or reduction the frequency of incidence of early school leaving. As both results and costs of projects become clear over long periods of time, the moments of costs and benefits do not coincide, the valuation techniques include discounting procedures and in many respects are similar to investment planning procedures (in particular, calculating the net present value of projects as main support for decision).

This article differs by the statement of the problem and, accordingly, is based on other methodological principles. In particular, our research does not cover the whole complex of social consequences of the implementation of a particular project or a certain direction of economic policy and does not provide an integrated assessment of the welfare (welfare changes) of the target group as a result of the using of certain volumes of resources (rejection of available alternatives). It studies the dynamics of only a separate component of well-being — the provision of the population with the goods supplied by the educational industry in connection with the scale of resources that, through public and commercial frameworks, come into the hands of its production entities. The procurable of goods is valued by the dynamics of three characteristics: the real size of consumption of such goods, their relative prices and availability. The last characteristic for each year is defined

as the ratio of the nominal households' income index to the nominal price index for the respective group of goods. Our research is analysing the changes in these characteristics in the complex that allows evaluate the contribution of the industry on the whole and its public and commercial sectors separately to the change in the welfare of consumers of products (goods and services supplied by educational industry).

Thus, our research determines the tendency to change in the level of goods provision of population in connection with the trends of resource supply of industry, but it does not quantify the «costs / benefits». This creates some advantages from the point of view on «replicability» of research results: such a methodology does not require defining of the exogenous parameters that are not caused by empirical data or theoretical framework and affect quantitative estimates of cost and benefits (such as risk preferences, discount rate and other).

The works on the assessment of the public effect of the state presence in the social sphere (primarily in the field of education), which are united by the common ideology «more value for money» are the closest to our research by both the object and the researched problem.

Our paper based on three basic principles of such researches that will allow as identify the size of budget expenditures caused by the production of those categories of goods, which information on their consumption amount is reflected by Ukrainian national statistics as «education».

First, to solve the problem of identifying expenditures, associated with the creation of a certain group of goods, methods of combining the sectoral, program and functional classification of budgetary expenditures have been used. Such approaches are commonly used in modern studies of the efficiency of state economic activity, united by the ideology «more value for money» [5; 7].

Second, for the formulation of an indicators system, reflecting the effectiveness of state economic activity in the industry, the researches use the groups of instrumental (for example, the number of teachers per thousand population of school age — to assess the effectiveness of public educational activities) and final (self-valuable) indicators (average expected life expectancy and the mortality rate by certain nosology — to measure the health effect, or the level of knowledge, and earnings increasing rate of graduates — to assessment the effect for educational activity) [6; 8].

For the interpretation of the quantitative indicators we used, it is important that they are directly related to the well-being of consumers of educational services: real amount of consumption of goods, generated by education; their relative prices; affordability (as a ratio of households' income and price dynamics). The weakness of the indicators used is that they are not able to directly take into account the quality of educational services and the economic benefits, gained by consumers in future periods. However, the dynamics of relative prices (the ratio of changes in prices of goods, created by a particular industry to the average level of consumer prices) to some extent reflect the change in the quality of goods, created by education (through household's agreement to pay higher price awaiting the bigger increment in earnings, caused by education acquired). In particular, the fundamental thesis of consumer behavior researches suggest that if price increases are accompanied by an increase in the share of expenditures on the corresponding goods in the consumer budget, then this reflects the higher value of such goods for the consumer [9—11].

We also do not take into account the economic benefits of consumers of educational services gained through the differentiation of income of employees with different educational levels. We interpret well-being only in the context of current benefits: opportunity to consume the goods desired in accordance with their preferences and budget constraints, but do not take into account the possibility of expanding consumption in the future, which distinguishes our approach from numerous works in field of human capital theory [12; 13].

Third, the size of the target indicators of state economic activity per unit volume of resources used is interpreted as the basis of a comparative assessment of the institutions quality in the different sectors or in different economic systems (such as a state policy, procedures of bureaucracy activity, compliance of incentives and motives created for officials with the goals and objectives of society, etc.). To do this, a functional connection between the volumes of resource involved in the industry's production and the size of targets, achieved by industry may be

determined [13—15]. Cases that turn out to be «outlays» are considered as indicating that there are efficiency improvement reserves due to institutional reforms (in case of fixation of worse target indicators than those estimated by the trend at the actual level costs) or the presence of higher quality institutions than the one that formed the basis for determining the trend (in the case of higher indicators of results than those estimated by the trend at the actual level of expenditure).

The next fundamental approach, shaping the theoretical basis of our research is the works devoted to the structure of consumer expenditure of households using aggregated data. The fundamental provision according to which the analytical tools of this article are formed is the provision on the dependence of consumption of any good (group of goods) on such basic factors as consumer income, relative price of good and the price of related goods (complementary goods and substitutes). For example, models where the consumer spending structure are determined by real incomes (consumer spending) and relative prices of commodity categories (Florida-PI and Florida-Slutsky), have a high explanatory capacity for national patterns of consumer behaviour [11].

However, with regards to substitution (addition) relationship between the goods supplied by the commercial and public sectors of the industry, such a model cannot be applied, since the prices of goods supplied by the state sector are not defined, and their consumption sizes are conditionally estimated at the level of production costs and are not dependent on choice of the consumer (determined only by the policy of budget expenditures).

Thus our research contains an attempt to clarify the presence or absence of signs of interdependent or complementarity between the goods supplied by the commercial and state sectors of educational industry, with the use of simplified mathematical tools.

In addition, the basic principle of classifying goods for the groups of «normal goods» («necessities»), «luxury goods» («luxuries») is used in relation to the goods supplied by the commercial sector of the healthcare industry in Ukraine. If the growth of real sizes of consumption of these goods surpasses the growth of real incomes, it is possible to consider consumers' attitudes towards such goods as luxury goods. As a sign of consumers' attitude to the goods supplied by the certain sector of the educational industry as a «low quality goods», the inverse connection between dynamics of the real incomes and real consumption of these goods was used, as in a number of works, where a similar classification of different groups of goods is represented [9—11].

Our research develops popular in the scientific literature approaches to the analysis of the structure of households' consumption in two aspects. First, unlike research, where the structure of consumer spending is considered as the result of a rational choice of households, determined by income, relative prices and socio-demographic factors, it considered the significant impact of the government-sponsored supply of free goods on the structure of consumption, since the choice between market good and good provided free of charge within the framework of state programs, cannot be described by the same models that describe the choice between alternative market goods.

Second, unfavourable macroeconomic conditions, which are powerful restrictions to solvency of households, and financial capabilities of the budget, distinguish Ukraine as a country with a strong industrial base and developed social infrastructure, which for a long time cannot overcome the economic downturn. In the world, there are few countries, which according to the results of 2018, have a smaller absolute size of GDP and GDP per capita than the size achieved in 1990. Therefore, the experience of Ukraine is a specific example of adaptation of the social sector to a long-term reduction in funding, contrary to the global trends on education funding.

Research results. Initial hypotheses of the study, which are subject to empirical verification, can be formulated as follows:

1. Are there any signs of the interchangeability between the goods supplied by the commercial and state sectors of the education in Ukraine?

2. Are there any signs of the complementarity between the goods supplied by the commercial and public sectors of the education in Ukraine?

3. Does the link between the dynamics of incomes of Ukrainian households and the dynamics of the real size of consumption of goods supplied by the commercial sector of education show the possibility of their classification as «luxury goods» or «normal qualitative goods»?

Following the formulation of the initial hypotheses, an array of indicators was formed, which characterize:

1. The volumes of resources received by the commercial and budgetary sectors of Ukrainian educational industry.

2. The provision of households with goods supplied by the commercial sector of the educational industry in Ukraine.

The analysis does not use indicators that directly characterize the real size of consumption of goods supplied by the public educational industry in Ukraine, for specific reasons. In particular, the characteristics of the provision of households with goods supplied by the public sector do not represent an economic choice of households, but are defined as the result of the actions of political and administrative mechanisms, therefore, cannot be interpreted unambiguously in the context of assessing the well-being of households.

Consumer expenditures of households on the goods of individual consumption provided at market prices (ideally, as a result of balance of supply and demand in competitive market, but often more or less regulated and skewed due to the presence of market power in conditions of imperfect competition), allow to estimate real size of consumption, change in relative prices, and change in the availability of goods for consumers (for example, through the dynamics of the ratio of nominal incomes and prices). The influence of the provision of these goods on the households' welfare may be assessed with reasonable accuracy by researching the complex of these characteristics. At the same time, the consumer expenditures characterize the scale of resource provision received by suppliers of these goods at their disposal. By comparing the scale of resources that the market provides to suppliers with their contribution to increasing the welfare of households, it is possible to evaluate the social outcomes of the functioning of a complex of industries involved in the creation of a certain type of goods.

The following two sets of indicators are formulated.

The first set includes indicators of the resources provision of the public and commercial sectors of educational industry in Ukraine.

The resources of the commercial education sector in Ukraine are formed mainly by household expenditures, since the involvement of businesses in financing human capital investment is minimal and the budgetary expenditures on education, even if received by commercial institutions, are considered as elements of budgetary sector financing. The latter is due to the fact that most of the budgetary expenditures on education are received by institutions, for which the main role in the provision of resources is played by budget expenditures, but not by the spending of consumers of their services.

Accordingly, the nominal size of household expenditures for the purchase of goods supplied by the commercial sector of educational was determined as result of two variables multiplication. The first — is average (specific) households' spending on education and the second — is number of households in Ukraine. The resulting figure was reduced to the annual dimension and expressed in UAH millions. This amount is practically the only source of funding of the commercial sector of the educational industry in Ukraine.

The resources of the state sector are formed by expenditures of the local and central budgets. Since a significant part of the budget expenditures for the educational industry generates added value not of this industry, but of the industries providing resource for their activities, then the functional classification of budget expenditures is used instead of the economical one.

Thus, the «resource provision of the public sector of education» defines the expenditures of the local and central budgets of Ukraine that meet the three conditions. First, they are carried out within the economic (productive) activity of government structures. Second, the scope of their use is localized by a value chain, aimed to creation certain category of goods, but not only the creation of added value of a particular industry. For example, the cost of paying community utilities, consumed by educational institutions, does not belong to the added value of education, but should be taken into account as the part of resource provision of education. Third, all forms of state participation in the expansion of the supply of a certain category of goods should be taken into

account: costs of government production, public procurement, end-user subsidies (if the implementation mechanism does not include subsidies as a part of individual consumer household expenditures), direct subsidies to producers, etc.

Accordingly, for estimating the nominal size of resource provision of the budgetary sector of Ukrainian education, the size of the consolidated budget expenditures in annual dimensions by functional classification was used (Section «Economic activity», the function «education» — «0900» code).

For recounting the nominal sizes of education resource provision in real indicators, the GDP deflator is used. This is due to the fact that resource support for the creation of goods, supplied by the educational industry is purchased from producers of various industries. In further studies, in case of the need to clarify the burden of inflation, which exists in a separate economic sector, it is possible to refer to Leontief coefficients in order to identify the industries that become the important vendors of education's intermediate consumption. It would allow take into account the price indices for the products of these industries in accordance with their relative weight in intermediate consumption of educational industry. On this stage of research it possible to get an acceptable accuracy of calculations using deflators of GDP.

On the grounds of the obtained indicators, the basic (2005 = 100%) indices of the real value of resource provision of the public and commercial sectors of the education were calculated.

The second set of indicators is the characteristics of the provision of households with goods supplied by the commercial sector of the educational industry in Ukraine.

This set includes the following indicators.

1. Real (expressed in base year prices) size of household expenditures for the payment of goods, supplied by the educational industry (over the years of the retrospective period). To recount nominal values into real, industry indexes of prices for the relevant years were used. On the grounds of these values, the basic (2005 = 100%) indices of real growth rate of consumption of goods supplied by the commercial sector of the educational industry are calculated.

2. Indices of relative prices for products of the educational industry's commercial sector.

3. Index of accessibility of goods supplied by the educational industry's commercial sector (defined as the ratio of the index of nominal average household incomes to the index of prices for industry's products).

Such a database allows assessing the parameters of three functions that reflect the connection between the dynamics of budget expenditures and households' expenditures on education (as the explanatory variables) and the characteristics of households' provision with the goods of the commercial sector of the education (as a dependent variable).

The first function reflects the dependence between:

dependent variable — growth rate of real consumption of goods supplied by the commercial sector of education;

explanatory variables — the growth rates of real resources of commercial (X_1) and budgetary (X_2) sectors of the educational industry. According to the construction logic, it is analogous to the Working model [18] but does not use a logarithmic representation of the values of factor variables. It is due to fact, that both explanatory and dependent variables are expressed in growth rates, which greatly increases the probability of a hypothesis about the linear nature of the connection and the constancy of absolute values of increments.

The Working model [18] had been actively used to explain the dependence of changes in the consumption structure on household income, before it was developed in Theil's works, which incorporated the terms into the model to reflect the effects of relative prices [19]. The study used the primary form of Working's model, since it added factor, which nature of connection with the amount of consumption is similar to the nature of the impact of total household incomes.

The mathematical specification of the function looks like this:

$$Y_1 = a_0 + a_1 \cdot X_1 + a_2 \cdot X_2, \tag{1}$$

where a_0 — is constant term of the function, reflects the autonomous, independent from the factors included in the model, real growth rate of consumption of goods supplied by the educational industry;

a_1 — is the coefficient for the variable «the basic growth rates of the real scale of resource provision of the commercial sector of the educational industry» — reflects the marginal change in the real growth of consumption as a result of changes in the growth rates of real resources of the education's commercial sector;

a_2 — is the coefficient for the variable «the basic real growth rates of scale of resource provision of the budgetary sector of the education» — reflects the marginal change in the growth of real volumes of consumption as a result of changes in the growth rates of real resources of the education's budgetary sector.

The results of the evaluation of the model parameters are treated according to the following principles. First, in the case of the existence of a substitution relationship between the goods supplied by the commercial and state sectors of the industry, the coefficients at the second explanatory variable should be negative, and the greater the elasticity of the response of the dependent variable to the second explanatory is, the greater the potential of the budgetary sector will become a substitute for the goods, supplied by the commercial sector of education.

If there is a complementarity relation between the goods provided by the commercial and budgetary sectors of education, then the coefficients of both explanatory variables should be positive by sign. At the same time, the ratio of elasticity coefficients will reflect a comparative indicator of the efficiency of the resources using in two sectors of the education: the higher is the coefficient of dependent variable elasticity on the explanatory, then, on other equal conditions, the higher is efficiency of the resources using in the relevant sector of education.

The second model is similar by mathematical form and explanatory variables, but as a dependent variable the basic index of relative prices for products of the education's commercial sector is used: Y_2 — is the basic (2005 = 100%) indices of sectoral relative prices for products, supplied by commercial sector of education.

The evaluation results of this model help clarify the features of connection between the goods supplied by the budgetary and commercial sectors of the education.

If there is a significant reverse connection between the dynamics of the budgetary sector resources and the price dynamics, this is an indication that the expansion of resources of the budgetary sector of the industry can significantly limit the growth of prices for the products, supplied by commercial sector. It will be additional confirm of existing substitutional relations.

If there is a direct connection between the volume of resources of the budgetary sector and the dynamics of relative prices of goods, supplied by commercial sector, this will be a sign of the complementarities between the goods supplied by two sectors of the education in Ukraine. And more, it will be a sign of the shortage of resource provision in both sectors to meet the growing demand on the education services.

Consequently, a sign of the ability of the budgetary sector of education to limit the growth of the relative price of goods, supplied by its commercial sector will be a negative coefficient at the second explanatory variable.

The more significant is this dependence (the higher is the partial elasticity of the dependent variable on the second explanatory variable and the greater explanatory ability of the model), the stronger are chances of the budgetary sector to take over the functions of commercial one.

The third model reflects the dependence of the real dynamics of consumption of goods supplied by the commercial sector of the education on the dynamics of incomes (individual consumer spending) of Ukrainian households. This model is used to classify such goods into a group of «normal goods» or «luxury goods»: if by the coefficients of elasticity, growth rate of real consumption exceeds the growth rate of real incomes, then this is a sign of the belonging of these goods to the «luxury goods» for Ukrainian households. If the growth rate of real incomes will be higher, then this is a sign of the attitude of Ukrainian households to such goods as a «normal goods».

Partial coefficients of elasticity in all models are calculated according to the formula:

$$E_i = \frac{a_i \cdot \bar{x}_i}{\bar{Y}},\qquad (2)$$

where a_i — is estimation of model parameter;

x_i — is the mean of the explanatory variable for the retrospective period;

Y — is the mean of the dependent variable for the retrospective period.

Since both the dependent and the explanatory variables are expressed in growth rates, the form of the calculation of the average is geometrical mean.

The dynamics of parameters of resource provision for both commercial and public sectors of Ukrainian education, and the provision of Ukrainian households by goods supplied by commercial sector of education for the retrospective period 2005—2017 is described at *Fig*.
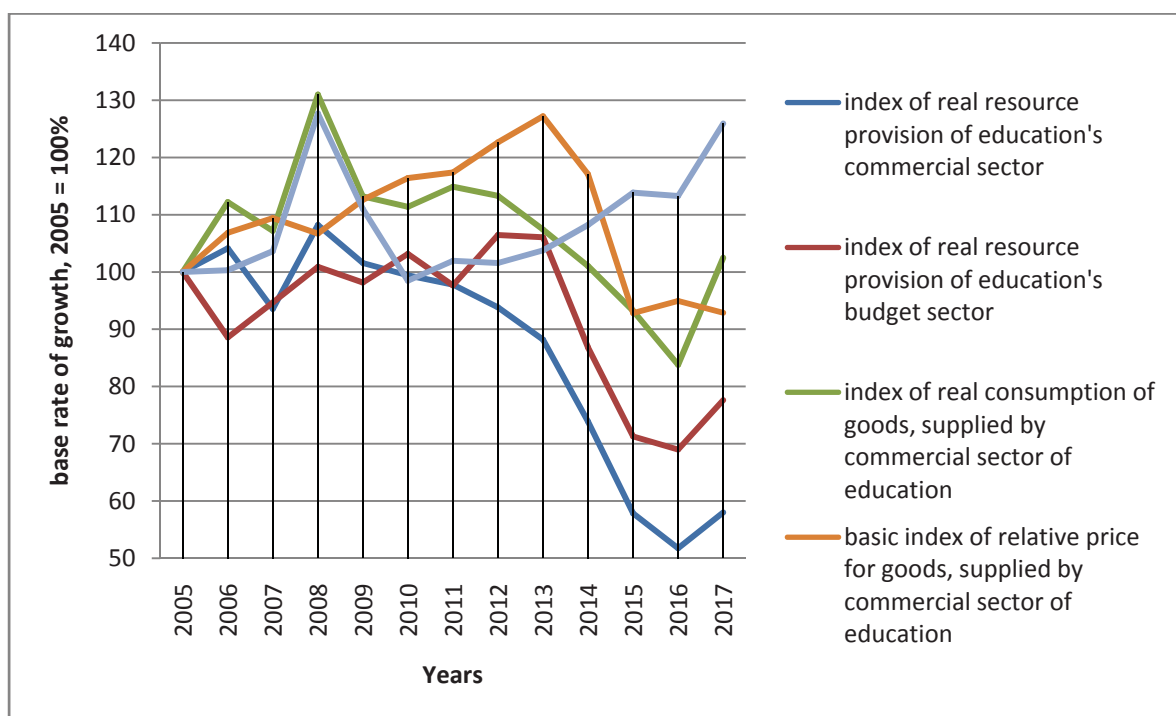

Fig. **Real dynamics of the budgetary and commercial education resource provision and characteristics of the goods consumption, supplied by commercial sector of the industry**

The resources provision of both education sectors have declined substantially in the retrospective period. Through the budget financing mechanisms, the industry in 2017 received only 77.6% of real resources that came in 2005. And the reduction in financing through commercial mechanisms exceeded 40% (in 2017, the real scale of commercial financing was only 58.0% of the 2005 level).

As a result of these trends, the share of budget financing for education increased from 90.4% in 2005 to 92.6% in 2017, which reflects increasing of the weight of budgetary funding for Ukrainian education during the retrospective period.

At the same time, real consumption of goods, produced by the commercial education sector consistently showed higher growth rates (smaller rates of decline) compared to the indicators of the resource provision of the commercial education sector and in 2017 amounted to 102.5% of 2005 volumes.

The above shows that the commercial education sector is under pressure of resource scarcity due to the lag in the growth of prices for its services from the inflation rate in the economy. This means that sector's institutions are deprived of the opportunity to shift the burden of resource appreciation on the consumers of their services by raising their prices. Accordingly, it can be argued that in the commercial education sector efficiency of resource utilization increased during the

retrospective period: the real growth rates of consumption of goods, produced by the sector, were higher than the real growth rates (reduction) of the resources received.

The first two functions, which parameters were estimated, allow clarifying the role of the budgetary sector, for improvement the household's ensuring by educational services.

The first function reflects the dependence of the dynamics of real amount of consumption of goods, supplied by the commercial education sector to Ukrainian households on the dynamics of real resources of the commercial (first explanatory variable) and budgetary (second explanatory variable) sectors of education.

The estimation results are given in *Table 1*.

Table 1

Parameters estimated for function were real rate of growth of consumption amount is dependent variable, real rate of growth resource provision of commercial education sector — is the first explaining variable and real rate of growth resource provision of budgetary education sector — is second explaining variable*

Parameters	Parameter's estimate	*t*-statistic
a_0	60,918	3,623
a_1	0,426	2,073
a_2	0,099	0,313
R^2	0,670	
F	10,15 (more than tabulated value at $p = 0,05$)	

* Developed by authors.

The explanatory capacity of the model is relatively high (about 67% of the dependent variable variation is explained by the variation of the factors, according to the size of the coefficient of determination). The size of the Fisher criterion allows one to recognize the model as significant (the obtained estimate of the coefficient of determination is not accidental).

The second model reflects the influence of the dynamics of the resources provision of the aryary and commercial education sectors on fluctuations in the relative prices of educational services provided by the commercial sector of the industry.

The estimation results are given in *Table 2*.

Table 2

Parameters estimated for function were the growth rate of relative price on educational services is dependent variable, real rate of growth resource provision of commercial education sector — is the first explaining variable and real rate of growth resource provision of budgetary education sector — is second explaining variable*

Parameters	Parameter's estimate	*t*-statistic
a_0	35,675	2,20
a_1	-0,252	-1,27
a_2	1,031	3,39
R^2	0,679	
F	10,585 (more than tabulated value at $p = 0,05$)	

* Developed by authors.

Explaining ability of the model is above average (the coefficient of determination is 0.68), the value of the *F*-criterion is more than tabulated. Accordingly, despite the fact that the parameter estimates have fairly significant standard errors (the coefficient sizes of the t-statistics range from 1.27 for the first to 3.39 for the second explanatory variable), the nature of the connection between the variables is fairly reliable. The estimates obtained thus correspond to the theoretical model. A negative coefficient near the first explanatory variable (the real growth rate of the volume of resources, received by the commercial education sector) can be interpreted as an indication that the growth of resources obtained by that sector is holding back the rise in prices for its products.

The third model reflects the dependence of the dynamics of real consumption of goods, supplied by the commercial education sector, on the dynamics of Ukrainian households' total consumer spending. The estimation results are given in *Table 3*.

Table 3

Parameters estimated for function were the real growth rate of consumption amount of goods, supplied by commercial sector of education — is dependent variable, real rate of growth household's incomes — is the explaining variable*

Parameters	Parameter's estimate	*t*-statistic
a_0	24,992	1,385
a_1	0,813	4,572
R^2	0,655	
F	(20,904 more than tabulated value at $p = 0,05$)	

* Developed by authors.

Formal estimates of the reliability of a model indicate its average explanatory capacity. According to the coefficient of determination, about 65% of the variation in the dependent variable (real growth rate of the consumption of commercial education services) is explained by the variation of the factor variable (the index of real household consumption expenditures). The size of the Fisher coefficient allows us to consider the determination coefficient estimate not random, and the parameter near the factor variable can accurately reflect the quantitative connection between the growth rate of consumer spending and the consumption of education by Ukrainian households.

The first model (see *Table 1*) should formalize the connection between the resource provision of the two sectors of the industry and the scale of consumption of its products. Accordingly, the coefficients of elasticity for each factor variable and the signs of such coefficients should empirically justify the answer to the first basic question of our study: how do changes in the resources of the two education sectors relate to the amount of consumption of goods, supplied by the commercial sector of industry? Is there an appreciable impact of expanding or narrowing budgetary education financing on the volume of goods, provided to the households by the commercial sector?

Significantly, both coefficients have a positive sign, that is, on an existing database, between the goods of the commercial and budgetary education sectors, existing relationships of complementarity, not interchangeability. Such estimates of model parameters may indicate that, with a clear predominance of budgetary education (the share of budget funding in total industry resources has not fallen below 90% during the retrospective period), commercial education is in a fairly stable demand: there are services and consumers for whom budgetary education opportunities to replace goods, provided by commercial sector, is quite limited.

The large, relative values of the parameters, their standard errors do not allow us to consider the obtained estimates reliable (this is evidenced by the small size of t-statistics). However, we can consider the big difference between the coefficients of elasticity of consumption to the resource provision of the budgetary and commercial sectors not accidental. The elasticity of real consumption of goods, supplied by the commercial sector of the education, to the resources of the commercial sector is equal to 0.33. It means that an increase of the real resources of the commercial sector by 1% causes an increase in consumption of its products by more than 0.33%. In terms of budgetary resources, elasticity equals 0.08, meaning a 1% expansion of budgetary resources causes almost four times less growth in consumption of commercial sector products: an additional percentage of budgetary sector resources increases commercial sector consumption by 0.08%.

It is important that the dynamics of the commercial sector's resource provision affect the dependent variable directly (the difference between them is determined only by the lag of the sector price index from the GDP deflator), while the budgetary sector's resource provision affects indirectly, only by creating a more or less acceptable alternative to the commercial consumption.

Therefore, this assessment cannot be interpreted in the context of the social effect, would be obtained by the shift of resources between the commercial and budgetary sectors of the industry. In addition, it is important that the leading tendency of the retrospective period is reducing the resources of the industry, both at the expense of households' spending and at the expense of budget financing. Accordingly, the relationship formalized in the model expresses more specific form of adaptation to negative change, than a manifestation of increased consumer choice. In any case, the

calculated elasticity coefficients should not be interpreted as a sign of the possibility of gaining social effect by redistributing resources from budget financing in favor of commercial ones. Moreover, any decision on such redistribution is impossible without taking into account social and moral-ethical aspects. The short retrospective period and the weight of many factors that were not taken into account in the model do not allow us to interpret the quantified elasticity values as reliable for predicting the effects of resource movement between the budgetary and commercial sectors of the industry.

The second model (see *Table 2*) reaffirmed the ability to act as restrict of the growth rate of education price for expansion of resource provision of commercial sector and did not identify (at least in the available data set) such capacity for expanding the resources provision of budgetary sector of education.

By itself, the negative coefficient (the inverse connection between the dynamics of explanatory and dependent indicators) reflects non-random (not «mechanical») results of the simulation, because at first glance, the increase in relative prices for goods, supplied by the industry, should facilitate its resource support expanding. However, in fact, there is another connection: higher rates of resource expansion would limit price increasing. An important aspect that remains beyond the scope of this study is the presence and duration of the time lag between changes of explanatory and dependent variables. In the further works, we will refine our mathematical tools of modeling to build a distributed lag model and to determine the length of time during which the dynamics of the commercial sector's resource provision affects the scale of consumption of commercial educational services.

The positive coefficient near the second variable indicates that the increase of resources, involved in functioning of budgetary education sector does not act as a restriction on the growth rate of prices for services, provided by the commercial education sector. Given that the budgetary sector has a much higher share of the overall education services (i.e., the potential for restrictive impact is quite high), such results indicate that there is an effect of competition for resources between sectors of education. The estimates obtained can be interpreted as an indication that the expansion of the budgetary education sector's resource provision is accompanied by increasing pressure on the commercial sector's resources. Accordingly, there is a crowding-out effect, which is known in the macroeconomics concerning the public and private investment. Given that the dominant tendency of the retrospective period — the reduction of real amount of resources provision for both, the commercial and budgetary education sectors, we can assume that both sectors of the education are in extremely unfavorable conditions. Such conditions are caused by critical shortage as households' purchasing power, as well as budget's possibilities, which restrict ability of each sector to act as a substitute for the goods, supplied by the other.

Finally, the third model should have empirically test the correctness of the classification of educational services, provided by the commercial sector to luxury goods or necessities, according to the demand of Ukrainian households.

The estimates obtained indicate a relatively high elasticity of real volumes of consumption of educational services in terms of consumer spending — 0.76. That is, a 1% increase in consumer spending is accompanied by a 0.76% increase in consumption of educational services, and, accordingly, there are no formal signs of treating goods, created by commercial sector of education as «luxury goods», but as «normal quality goods» with income elasticity higher, than have most of necessity commodities.

However, it is important that the retrospective period covers the years when the purchasing power of Ukrainian households has been declining. Accordingly, unlike residents of countries with positive population purchasing power dynamics, Ukrainian households have been more adapting to deteriorating economic opportunities, than expanding their choices.

The actual structure of consumer expenditures of Ukrainian households testifies to their being at the stage of income evolution and consumption patterns that developed countries experienced in the early twentieth century. There is a fundamental relationship between rising revenues (consumer spending) and diversifying the structure of such expenditures, which is ensured

mainly by overcoming the dominance of spending on food [20]. In the context of this pattern, there is a close link is established between rising incomes and expanding consumption of services in general and education in particular. In many papers on the dynamics of consumer spending patterns, education expenditures have been classified as luxury goods, i.e. their consumption has grown faster than real incomes [10]. However, with regard to Ukraine, this universal pattern has a very specific way of manifestation. As real spending levels did not increase but decreased over a sufficiently long period, the expansion of consumption of goods supplied by the commercial education sector is not due to, but against income dynamics, a compulsory form of adaptation to curtailing public sector budgetary financing.

Given that the availability of services, provided by the commercial sector of education have been increased during retrospective period (*Fig.*), it can be argued that the industry is forced to limit prices for its services below inflation, which is not only restricts its opportunities for development, but threatens to maintain the quality of education provided. The erosion of the industry's product quality standards is extremely dangerous for society and, unfortunately, is widespread in Ukraine for social sectors as a form of adaptation to critical resource shortages. The actual refinement of the forms of manifestation and social consequences of the long-term degradation of the social sphere observed in Ukraine will be the subject of our further researches.

Conclusions. The results obtained illustrate the following characteristics of the relationship between the dynamics of real amount of resources released to commercial and budgetary sectors of educational and the consumption of goods supplied by the commercial sector of education.

1. The scale of resource provision received by the industry, both through budget financing and through household expenditures, declined over the retrospective period, while the commercial education sector's resources declined faster (its share in total industry resources declined from 9.6% to 7.4%). Reducing the size of the commercial education sector against the backdrop of chronic under-budgeting of public education is an extremely unfavorable trend. First, it testifies to the negative dynamics of the purchasing power of Ukrainian households. Second, the lack (inefficiency) of mechanisms for financing education with the attraction of credit and resources of business entities. Third, the reduction of incentives for developing the quality of budgetary education, by reducing the competitive pressure of the potential substitute, produced by commercial education.

2. We have not received empirical evidence of the ability of budget expenditures to replace consumption of goods, generated by the commercial education sector in Ukraine. Both sectors of education are forced to operate in a mode of resources scarcity and adverse dynamics of resource provision, which threatens to erode the quality of educational services and undermines the fundamental foundations of commercial financing of education: the link «investment in the education — growth of income».

3. It is in this context that we interpret the lack of empirical indications of households' attitudes toward the goods, supplied by the commercial education sector as luxury goods. It is an expression of extremely low economic opportunities, not of consumer preferences of households, who are forced to spend about half of their individual consumer expenditures on meeting primary needs (food and utilities).

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