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THE IMPACT OF THE BUDGETARY COMPONENT OF FISCAL POLICY ON MACROECONOMIC GROWTH IN CONDITIONS OF FINANCIAL DECENTRALIZATION: CASE OF UKRAINE

Abstract. The article examines the role of the budget component of Ukraine's fiscal policy in macroeconomic growth. The directions of increase of economic growth under the influence of financial decentralization are offered. The expediency of using multifactor economic and mathematical modelling in the study of the dynamics of the national accounts of Ukraine under the influence of indicators of the budget component of fiscal policy is substantiated.

The purpose of this study is to investigate the dynamics of national accounts under the influence of the budget component of fiscal policy in the context of financial decentralization. A number of methods have been widely used in the study, including economic and mathematical modelling, correlation-regression analysis, factor analysis, and so on. These methods will underpin the development of strategic prospects for economic growth of the Ukrainian economy under conditions of financial decentralization.

It is substantiated that an increase in the share of local budget expenditures in consolidated budget expenditures and a decrease in the share of state budget expenditures in GDP lead to an increase in the physical volume index of GDP and an increase in GDP in actual prices. It is also proven that the share of local budget expenditures in consolidated budget expenditures has an immediate direct impact on the GDP physical volume index.

Another significant factor of direct influence on the GDP physical volume index is identified – the share of capital expenditures (development expenditures) in local budgets, as one of the indicators of financial decentralization efficiency. It is substantiated that the share of state budget expenditures in consolidated budget expenditures is a factor of inverse effect on GDP (in actual prices), and the share of capital expenditures is a factor of direct influence.

It is proved that financial decentralization in Ukraine is an important factor of economic growth of the Ukrainian economy, as the increase of the share of local budget expenditures in the consolidated budget expenditures and the reduction of the share of state budget expenditures in GDP lead to an increase in the GDP physical volume index and an increase in actual GDP.

Keywords: capital expenditures, state budget, consolidated budget, local budgets, gross domestic product (GDP), physical volume index.

JEL Classification H61, H72, P24

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ВПЛИВ БЮДЖЕТНОЇ СКЛАДОВОЇ ФІСКАЛЬНОЇ ПОЛІТИКИ НА МАКРОЕКОНОМІЧНЕ ЗРОСТАННЯ В УМОВАХ ФІНАНСОВОЇ ДЕЦЕНТРАЛІЗАЦІЇ: КЕЙС УКРАЇНИ

Анотація. Розглянуто роль бюджетної складової фіскальної політики України в макроекономічному зростанні. Запропоновано напрями підвищення темпів економічного зростання під впливом фінансової децентралізації. Обґрунтовано доцільність застосування багатофакторного економіко-математичного моделювання у дослідженні динаміки національних рахунків України під впливом показників бюджетної складової фіскальної політики.

Мета дослідження — є дослідження динаміки національних рахунків під впливом бюджетної складової фіскальної політики в умовах фінансової децентралізації. У ході проведеного дослідження широко використано ряд методів, зокрема економіко-математичне моделювання, кореляційно-регресійний аналіз, факторний аналіз тощо. Перелічені методи ляжуть в основу розроблення стратегічних перспектив економічного зростання економіки України в умовах фінансової децентралізації.

Обґрунтовано, що зростання частки видатків місцевих бюджетів у видатках зведеного бюджету і скорочення частки видатків державного бюджету у ВВП призводять до підвищення рівня індексу фізичного обсягу ВВП і збільшення обсягу ВВП у фактичних цінах. Також доведено, що частка видатків місцевих бюджетів у видатках зведеного бюджету має безпосередній прямий вплив на індекс фізичного обсягу ВВП.

Визначено інший суттєвий фактор прямого впливу на індекс фізичного обсягу ВВП — частка капітальних видатків (видатків розвитку) у місцевих бюджетах, як один з індикаторів ефективності фінансової децентралізації. Обґрунтовано, що частка видатків державного бюджету у видатках зведеного бюджету є фактором оберненого впливу на обсяг ВВП (у фактичних цінах), а частка капітальних видатків — фактором прямого впливу.

Доведено, що саме фінансова децентралізація в Україні є важливим фактором економічного зростання економіки України, оскільки зростання частки видатків місцевих бюджетів у видатках зведеного бюджету і скорочення частки видатків державного бюджету у ВВП призводять до підвищення рівня індексу фізичного обсягу ВВП і збільшення обсягу ВВП у фактичних цінах.

Ключові слова: капітальні видатки, державний бюджет, зведений бюджет, місцеві бюджети, валовий внутрішній продукт (ВВП), індекс фізичного обсягу.

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ВЛИЯНИЕ БЮДЖЕТНОЙ СОСТАВЛЯЮЩЕЙ ФИСКАЛЬНОЙ ПОЛИТИКИ НА МАКРОЭКОНОМИЧЕСКИЙ РОСТ В УСЛОВИЯХ ФИНАНСОВОЙ ДЕЦЕНТРАЛИЗАЦИИ: КЕЙС УКРАИНЫ

Аннотация. Рассмотрена роль бюджетной составляющей фискальной политики Украины в макроэкономическом росте. Предложены направления повышения темпов экономического роста под влиянием финансовой децентрализации. Обоснована целесообразность применения многофакторного экономико-математического моделирования

в исследовании динамики национальных счетов Украины под влиянием показателей бюджетной составляющей фискальной политики. Доказано, что именно финансовая децентрализация в Украине является важным фактором экономического роста экономики Украины, поскольку рост доли расходов местных бюджетов в расходах сводного бюджета и сокращение доли расходов государственного бюджета в ВВП приводят к повышению уровня индекса физического объема ВВП и увеличение объема ВВП в фактических ценах.

Ключевые слова: капитальные расходы, государственный бюджет, сводный бюджет, местные бюджеты, валовой внутренний продукт (ВВП), индекс физического объема.

Формул: 3; рис.: 2; табл.: 2; библ.: 12.

Introduction. The allocation and redistribution of state financial resources in the form of budget expenditures is an integral part of fiscal policy. There is a problem with the financing of public expenditures — whether the funds spent will contribute to economic development. Since government expenditures are a part of GDP, according to the end-use method, the dynamics of their volume has an immediate direct impact on the dynamics of GDP. Therefore, a study of the impact of fiscal policy indicators on the dynamics of national accounts may answer the question of what fiscal policy instruments can provide the preconditions for positive macroeconomic dynamics.

Research analysis and problem statement. The works of foreign economists such as M. Keen & M. Marchand (1997), who examined the impact of fiscal competition on the level of public expenditures [1]; A. Philippopoulos, P. Varthalitis & V. Vassilatos (2017), who constructed a new Keynesian DSGE model consisting of two heterogeneous countries in a monetary union [2]; S. Ghosh & K. Neanidis (2017), who assessed the impact of bureaucratic corruption on fiscal policy and economic growth [3]; E. Janeba & M. Todtenhaupt (2018), who conducted a theoretical analysis of the impact of changes in the initial level of public debt on fiscal competition and the location of firms [4]; P. Chiades, L. Greco, V. Mengotto, L. Moretti, and P. Valbonesi (2019), who examined the effects of fiscal consolidation in decentralized public finances on the example of Italian municipalities [5]; as well as domestic scholars — K. Pavliuk & O. Shaporenko (2016), who developed recommendations for optimizing the structure of expenditures of the state budget of Ukraine [6]; A. Ivanova (2017), who examined the effectiveness of fiscal consolidation tools in the process of balancing public finances [7]; R. Kalinovskyi (2018), who developed recommendations for improving the efficiency of public spending as a tool of state influence on the economy [8] and others — are devoted to the basic theoretical and methodological principles and applied aspects of the place of state expenditures in fiscal policy.

However, the study of the problem of the impact of budget component of fiscal policy on macroeconomic growth in the conditions of financial decentralization remains a poorly researched problem, addressed by the authors in papers [9; 10].

The purpose of this research is to investigate the dynamics of national accounts under the influence of the budget component of fiscal policy under the conditions of financial decentralization.

Methods of research. The method of linear multivariate economic-mathematical modelling is applied in the article. The linear multi-factor economic and mathematical model is a mathematical description of the regularities of change of the studied economic index, taking into account changes of the main factors that have direct (inverse) and non-functional (indirect) influence on it. The main requirement for this method is the absence of functional linkage between all indicators, both factorial and resultant.

Mathematically, the task of economic and mathematical modelling is to obtain an analytical expression (linear multivariate regression equation) that best reflects the relation of factorial features to the resultant one. The multivariate regression equation in the linear form has the following generalized form:

$$\hat{Y}_X = a_0 + a_1X_1 + a_2X_2 + \cdots + a_nX_n, \quad (1)$$

where $\hat{Y}_X$ — the calculated (theoretical) value of the resulting trait;

$X_1, X_2, \ldots, X_n$ — are the factor characteristics of the model being introduced;

a_1, a_2, a_n — an are equation parameters or regression coefficients that indicate how many units the resulting trait will change as the corresponding factor trait increases by 1 unit;

a_0 — is a constant, the free term is the value of the resultant sign with the equality of 0 factorial signs.

We propose to use the method of linear multivariate economic-mathematical modelling in the following sequence:

1) specification of the model;
2) formation of input data to be entered into the model;
3) analysis of the presence of multicollinearity between factor traits;
4) selection of factor traits, among which there is no multicollinearity;
5) calculation of the parameters of the linear multivariate regression equation;
6) estimation of statistical significance and validity of regression equation based on multiple determination coefficient (R^2) and F-statistics.

Research results. In order to study the dynamics of national accounts under the influence of the budget component of fiscal policy in the context of financial decentralization, it is necessary to develop a multifactor economic and mathematical model. In the first stage, it is necessary to make its specification and generate the output data (quantitative indicators) for modelling. The model specification is its analytical form based on the factors studied. Therefore, it is necessary to select the resultant trait that reflects the state of development of the national economy of Ukraine, as well as the factor traits (factors) that have a direct or indirect impact on the result.

The resulting indicators, which will reflect the state of the economy, will be taken as the GDP Physical Volume Index (GDP_{QI}) as a real indicator and GDP at Actual Prices (GDP_{AP}) as a nominal indicator we take the following factors that formalize the impact of the fiscal component of fiscal policy:

- Share of Capital Expenditures in the Consolidated Budget (CE/CBE), %;
- Share of Capital Expenditures in the State Budget (CE/SBE), %;
- Share of Capital Expenditures in Local Budgets (CE/LBE), %;
- Consolidated Budget Expenditures (CBE), UAH billion;
- the State Budget Expenditures (SBE), billion UAH;
- Local Budgets Expenditures (LBE), UAH billion;
- Share of Consolidated Budget Expenditures in GDP (CBE/GDP), %;
- Share of the State Budget Expenditures in GDP (SBE/GDP), %;
- Share of Local Budgets Expenditures in GDP (LBE/GDP), %;
- Share of Local Budgets Expenditures in Consolidated Budget Expenditures (LBE/CBE), % (*Table 1*).

Thus, the main purpose of economic and mathematical modelling of this study is a correlation-regression analysis of the impact of government spending on the development of the national economy. Before starting the process of economic and mathematical modelling, it is necessary to test for the presence of multicolinearity between factor traits. Multicolinearity is a phenomenon characterized by the presence of a functional or dense correlation between model factors. It is undesirable because it may distort the simulation results. Therefore, when multicollinearity is detected between pairs of factor traits, only those with correlative or non-correlative relationships are introduced into the model. To identify multicollinearity between factors, we construct a matrix of paired correlation coefficients (*Table 2*).

Table 1

Background data for correlation-regression analysis of the impact of budget component of Ukraine's fiscal policy on macroeconomic growth

Years	Share of Capital Expenditures in the Consolidated Budget, %	Share of Capital Expenditures in the State Budget, %	Share of Capital Expenditures in Local Budgets, %	Consolidated Budget Expenditures, UAH billion	The State Budget Expenditures, UAH billion	Local Budgets Expenditures, UAH billion	Share of Consolidated Budget Expenditures in GDP, %	Share of the State Budget Expenditures in GDP, %	Share of Local Budgets Expenditures in GDP, %	Share of Local Budgets Expenditures in Consolidated Budget Expenditures, %	GDP Physical Volume Index, %	GDP at Actual Prices, UAH billion
	CE/CBE	CE/SBE	CE/LBE	CBE	SBE	LBE	CBE/GDP	SBE/GDP	LBE/GDP	LBE/CBE	GDP_{QI}	GDP_{AP}
2004	18,1	17,6	15,1	101,3	62,6	38,7	28,33	17,50	10,83	38,23	111,8	357,5
2005	12,8	9,6	15,3	141,5	89,5	52,1	30,95	19,56	11,39	36,79	103,1	457,3
2006	13,9	11,2	18,8	175,2	102,9	72,3	31,01	18,21	12,80	41,27	107,6	565,0
2007	17,1	14,8	21,5	226,0	129,6	96,5	30,09	17,25	12,84	42,67	108,2	751,1
2008	13,3	10,6	18,7	309,2	182,3	126,9	31,21	18,40	12,81	41,03	102,2	990,8
2009	6,5	4,3	8,4	307,3	180,2	127,1	32,45	19,03	13,42	41,37	84,9	947,0
2010	8,1	6,9	8,3	377,9	225,8	152,0	33,72	20,15	13,57	40,24	104,1	1,120,6
2011	10,1	9,4	9,6	416,9	238,6	178,3	30,90	17,68	13,21	42,77	105,4	1,349,2
2012	8,3	7,5	7,3	492,5	271,2	221,2	33,75	18,59	15,16	44,92	100,2	1,459,1
2013	5,8	4,4	6,5	505,8	287,6	218,2	33,22	18,89	14,33	43,14	100,0	1,522,7
2014	3,9	1,7	6,2	523,1	299,6	223,5	32,96	18,88	14,08	42,73	93,4	1,586,9
2015	6,9	3,0	11,5	679,9	402,9	276,9	34,19	20,26	13,93	40,73	90,2	1,988,5
2016	8,7	4,0	15,0	835,6	489,3	346,2	35,03	20,51	14,52	41,44	102,4	2,385,4
2017	9,9	3,3	15,6	1,056,8	566,6	490,1	35,42	18,99	16,43	46,38	102,5	2,983,9

Source: the calculations according to the data given in [11; 12].

Table 2

Matrix of even correlation coefficients

	CE/CBE	CE/SBE	CE/LBE	CBE	SBE	LBE	CBE/GDP	SBE/GDP	LBE/GDP	LBE/CBE	GDP_{QI}	GDP_{AP}
CE/CBE	1											
CE/SBE	**0,9339**	1										
CE/LBE	**0,8249**	0,6019	1									
CBE	-0,5431	**-0,7355**	-0,2097	1								
SBE	-0,5622	**-0,7510**	-0,2194	**0,9973**	1							
LBE	-0,5160	**-0,7114**	-0,1962	**0,9961**	**0,9869**	1						
CBE/GDP	**-0,7510**	**-0,8786**	-0,4050	**0,8738**	**0,8828**	**0,8565**	1					
SBE/GDP	-0,6058	**-0,7087**	-0,3196	0,5026	0,5453	0,4472	**0,7500**	1				
LBE/GDP	-0,6328	**-0,7406**	-0,3460	**0,8798**	**0,8623**	**0,8947**	**0,8833**	0,3523	1			
LBE/CBE	-0,3692	-0,4188	-0,2080	0,6519	0,6136	0,6936	0,5388	-0,1512	**0,8695**	1		
GDP_{QI}	0,7687	0,7542	0,5514	-0,3004	-0,3219	-0,2721	-0,4952	-0,4808	-0,3599	-0,1459	1	
GDP_{AP}	-0,5534	-0,7381	-0,2221	0,9988	0,9964	0,9945	0,8654	0,4829	0,8819	0,6664	-0,3064	1

Source: calculations made with the help of MS Excel.

In the *Table 2*, the values of even correlation coefficients between pairs of factors are in bold type, that have high density correlation with each other (even correlation coefficient values is greater than 0,7). The economic-mathematical model will introduce factors, multicollinearity between which is absent, because, due to the close relationship between the factor traits, the results of the economic-mathematical modelling will be distorted and unsuitable for further use in the study.

Thus, in the course of the economic and mathematical modelling of the impact of government expenditures on the GDP actual physical volume index, the obtained results are shown in *Fig. 1*.

GENERATION OF RESULTS

Regression Statistics	
Multiplex R	0,997119443
R-squared	0,994247184
Normalized R-squared	0,902292126
Standard error	8,675226414
Observations	14

Variance analysis

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	143076,4649	47692,15497	633,7023389	1,05954E-11
Remainder	11	827,8550867	75,25955334		
Grand Total	14	143904,32			

	Coefficients	*Standard error*	*t-statistics*	*P-value*	*Lower 95%*	*Upper 95%*
Y-crosscut	0	#N/D	#N/D	#N/D	#N/D	#N/D
CE/LBE	1,157725996	0,461030984	2,511167442	0,02892635	0,143003642	2,172448349
CBE/GDP	0,36155505	1,291558826	0,279936959	0,784719997	-2,48114676	3,204256859
LBE/CBE	1,786488041	1,034182764	1,727439389	0,112022118	-0,489732875	4,062708956

Fig. 1. The results of modelling the volume index of GDP

Source: calculations using MS Excel.

According to the data given in *Fig. 1*, we form the final form of the three-factor linear function of the index of physical volume of GDP on the share of capital expenditures in local budget expenditures, the share of consolidated budget expenditures in GDP (in actual prices) and the share of local budget expenditures in consolidated budget expenditures:

$$GDP_{QI} = 1{,}16\ CE/LBE + 0{,}36\ CBE/GDP + 1{,}79\ LBE/CBE \quad (2)$$

From the data of formula (2) it can be seen that when the share of capital expenditures in local budget expenditures increases by 1 %, the level of the GDP physical volume index increases by 1,16 %, the increase of the share of expenditures of the consolidated budget in GDP (in actual prices) causes an increase the GDP physical volume index by 0,36 %, while the share of local budget expenditures in the consolidated budget expenditures by 1 %, the GDP physical volume index grows by 1,8 %.

The statistical significance and reliability of the obtained equation is significant, because it is described by high values of statistical coefficients and criteria. In particular, the multiple correlation coefficient is R = 0,997, indicating a high degree of correlation between the factor and the resultant trait. Multiple determination factor R^2 = 0,994 means that the dynamics of the GDP physical volume index is 99,4 % due to changes in the share of capital expenditures in local budget expenditures, the share of consolidated budget expenditures in GDP (in actual prices), and the share of local budget expenditures in consolidated budget expenditures, while the impact of the other factors is 0,6 %. The observed Fisher's F value of F = 633,7 is 170 times higher than the critical value, indicating a statistically significant stochastic relationship between the indicators entered in the model.

In the course of the economic and mathematical modelling of the impact of state expenditures indexes on GDP in actual prices, the results are shown in *Fig. 2*.

GENERATION OF RESULTS

Regression Statistics	
Multiplex R	0,999046926
R-squared	0,998094761
Normalized R-squared	0,997523189
Standard error	37,38212186
Observations	14

Variance analysis

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	7320658,418	2440219,473	1746,228173	6,79041E-14
Remainder	10	13974,23034	1397,423034		
Grand Total	13	7334632,649			

	Coefficients	*Standard error*	*t-statistics*	*P-value*	*Lower 95%*	*Upper 95%*
Y-crosscut	213,8748077	588,5721709	0,363379069	0,723885875	-1097,545714	1525,295329
CBE	2,754674089	0,083923176	32,82375894	1,6249E-11	2,5676816	2,941666577
SBE/GDP	-13,41539497	17,28293213	-0,776222163	0,455584572	-51,92416753	25,0933776
LBE/CBE	3,550709178	8,198623085	0,433086037	0,674144566	-14,71696145	21,81837981

Fig. 2. The results of GDP modelling at actual prices

Source: calculations using MS Excel.

According to the data given in *Fig. 2*, we form the final form of the three-factor linear function of interrelation of GDP volume in actual prices and the volume of consolidated budget expenditures, the share of state budget expenditures in GDP (in actual prices) and the share of local budget expenditures in consolidated budget expenditures:

$$GDP_{AP} = 213{,}87 + 2{,}75\ CBE - 13{,}42\ SBE/GDP + 3{,}55\ LBE/CBE \quad (3)$$

From the data of formula (3) it can be seen that as the volume of consolidated budget expenditures increases by UAH 1 billion, the GDP in actual prices increases by UAH 2,75 billion, the increase of the share of state budget expenditures in GDP (in actual prices) by 1 % causes a decrease in volume GDP at actual prices by UAH 13,4 billion, while the share of local budget

expenditures in the consolidated budget expenditures increasing by 1 % , the physical volume index of GDP increases by UAH 3,55 billion.

The statistical significance and reliability of the obtained equation is significant, because it is described by high values of statistical coefficients and criteria. In particular, the multiple correlation coefficient is R = 0,999, indicating a high degree of correlation between the factor and the resulting trait. Multiple determination coefficient R^2 = 0,998 means that the dynamics of GDP volume in actual prices is 99,8 % due to changes in the expenditures of the consolidated budget of Ukraine, the share of state budget expenditures in GDP (in actual prices) and the share of local budget expenditures in consolidated budget expenditures, and the impact of other factors is 0,2 %. The observed Fisher's F value of F = 1746 is 470 times the critical value, indicating a statistically significant stochastic relationship between the indicators entered in the model.

Conclusions. Thus, according to formula (1) it can be concluded as for the positive impact of financial decentralization on the development of the national economy on the budgetary component of fiscal policy of Ukraine. Since the direct indicator of financial decentralization in the model is the share of local budget expenditures in consolidated budget expenditures — the greater the value of this indicator, the greater the fiscal policy of the state is financially decentralized. Another factor for economic growth is the increase in the share of capital expenditures (development expenditures) in local budgets, one of the indicators of financial decentralization efficiency. The conclusion about the positive impact of financial decentralization on the development of the national economy by the budget component of Ukraine's fiscal policy can also be made using formula (2). The share of state budget expenditures in the consolidated budget expenditures can be considered as an indirect indicator of financial decentralization in the model — the greater the value of this indicator, the more the fiscal policy of the state is financially centralized, and conversely — the decrease of the indicator indicates a deepening of financial decentralization. Another factor of economic growth is the positive impact of the share of capital expenditures (development expenditures) in local budgets — an increase in this indicator, i.e. a deepening of financial decentralization, causes an increase in GDP at actual prices.

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