

РЕГІОНАЛЬНА ЕКОНОМІКА

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O. A. Vinnytska, Candidate of Economic Sciences, Associate Professor,
A. L. Berzhanir, Candidate of Sociological Sciences, Associate Professor,
I. A. Berzhanir, Candidate of Economic Sciences

О. А. Вінницька, к. е. н., доцент,
А. Л. Бержанір, к. е. н., доцент,
І. А. Бержанір, к. е. н.

SIMULATION OF THE LOCAL BUDGET INCOME STRUCTURE IN THE CONTEXT OF THE FINANCIAL INDEPENDENCE OF LOCAL GOVERNMENT BODIES

МОДЕЛЮВАННЯ СТРУКТУРИ ДОХОДІВ МІСЦЕВИХ БЮДЖЕТІВ В КОНТЕКСТІ ФІНАНСОВОЇ НЕЗАЛЕЖНОСТІ ОРГАНІВ МІСЦЕВОГО САМОВРЯДУВАННЯ

Urgency of the research. The issues of the local budget income structure and identification of reserves for their growth become particularly relevant in the context of decentralization.

Target setting. Given this, in-depth study of the conceptual foundations for the local budget income formation, as well as substantiation of practical recommendations for ensuring their stability and strengthening under the conditions of decentralization becomes relevant.

Actual scientific researches and issue analysis. A significant contribution to the development of the theory and methodology of the development of financial decentralization has been made by domestic and foreign economists: O. Abakumenko, S. Blankart, T. Bondaruk, O. Vasylyk, O. Vlasiuk, I. Volokhova, I. Zapatrina, O. Kyrylenko, S. Mikhaïlenko, V. Outs, V. Oparin, K. Pavliuk, A. Rozhko, V. Savchenko, V. Fedosov, K. Schwabii, I. Chugunov and others.

Uninvestigated parts of general matters defining. Despite the depth of studying these issues, the issue of the local budget income formation under the conditions of financial decentralization needs more detailed research.

The research objective. To achieve this goal, it is necessary to generalize theoretical principles of simulation of the local budget income structure in Ukraine and justify a strategy for improving the process of the local budget income formation under the current conditions of budget decentralization.

The statement of basic materials. The article substantiates the process of simulation of the local budget income structure in Ukraine from the point of view of the financial independence of local self-government bodies under the current conditions of budget decentralization.

Conclusions. It is desirable for state authorities to take measures to increase tax revenues. Almost all regional budgets are characterized by a low impact of property tax revenues which indicates the need to revise the legislative framework regarding the appropriate tax type.

Keywords: local budgets; income; decentralization; tax revenues; simulation.

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Актуальність теми дослідження. Питання оптимізації формування доходів місцевих бюджетів і виявлення резервів їх зростання набувають особливої актуальності в умовах децентралізації.

Постановка проблеми. З огляду на це, стають актуальними поглиблене дослідження концептуальних засад формування доходів місцевих бюджетів, а також обґрунтування системи практичних рекомендацій щодо забезпечення їх стабільності та зміцнення в умовах децентралізації.

Аналіз останніх досліджень і публікацій. Значний вклад у розвиток теорії і методології розвитку фінансової децентралізації внесли вітчизняні та зарубіжні вчені-економісти: О. Абакуменко, Ш. Бланкарт, Т. Бондарук, О. Василик, О. Власюк, І. Волохова, І. Запатріна, О. Кириленко, С. Михайленко, В. Оутс, В. Опарін, К. Павлюк, О. Рожко, В. Савченко, В. Федосов, К. Швабій, І. Чууунув та інші.

Виділення недосліджених частин загальної проблеми. Незважаючи на глибину розкриття цих тем, детальнішого дослідження потребують питання формування доходів місцевих бюджетів в умовах фінансової децентралізації.

Постановка завдання. Для досягнення цієї мети необхідно узагальнити теоретичні засади моделювання структури дохідної частини місцевих бюджетів в Україні та обґрунтувати стратегію вдосконалення процесу формування доходів місцевих бюджетів у сучасних умовах бюджетної децентралізації.

Виклад основного матеріалу. У статті обґрунтовано процес моделювання структури дохідної частини місцевих бюджетів в Україні з позицій фінансової незалежності органів місцевого самоврядування в сучасних умовах бюджетної децентралізації.

Висновки. Органам державної влади бажано проводити заходи щодо збільшення податкових надходжень. Практично для всіх обласних бюджетів характерний низький вплив надходжень від податку на власність, що свідчить про необхідність перегляду законодавчої бази щодо відповідного виду податку.

Ключові слова: місцеві бюджети; доходи; децентралізація; податкові надходження; моделювання.

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Urgency of the research. Acceleration of budgetary decentralization processes remains the most urgent and acute among strategic tasks of the modern process of forming revenues of local budgets in Ukraine. Conducting a policy of fiscal decentralization, numerous factors of the economic development should be taken into account, among which peculiarities of the state political system and historically formed relations between its various links are important. Strengthening the financial independence of local self-government bodies is an urgent task of the policy of budgetary decentralization in Ukraine.

Target setting. A necessary condition for the formation of the optimal structure of local budget revenues is the improvement of methodological bases and methods for assessing the level of financial autonomy of local budgets in Ukraine. The study analysis of the state of financial independence of local budgets in Ukraine at the present stage requires the development of methodological approaches and tools and their application will allow us to assess the optimality of the structure of local budget revenues under the conditions of budgetary decentralization.

Actual scientific researches and issue analysis. Works of such domestic and foreign scientists-economists are devoted to theoretical and practical aspects of the development of financial decentralization, as: O. Abakumenko, S. Blankart, T. Bondaruk, S. Bukovinsky, A. Wagner, A. Vasylyk, A. Vlasiuk, I. Volokhov, I. Zapatrin, A. Kyrylenko, V. Melnyk, S. Mikhailenko, V. Outs, V. Oparin, K. Pavliuk, A. Rozhka, V. Savchenko, O. Sukach, V. Fedosov, K. Schwabius, I. Chugunov, H. Zimmermann and other scientists.

Uninvestigated parts of general matters defining. At the same time, most of the scientific works of aforementioned economists are aimed at revealing general tendencies in functioning of state and local budgets and not many scientific works study peculiarities of the process of modeling the structure of local budget revenues in Ukraine under the current conditions.

The research objective. The article purpose is to deepen theoretical foundations and develop practical recommendations for modeling the structure of local budget revenues under the conditions of decentralization.

Achievement of objectives has caused the following tasks to be solved:

- characterize theoretical principles of modeling the structure of local budget revenues;
- improve the process of modeling the structure of local budget revenues in Ukraine under the modern conditions;
- substantiate strategic directions of improvement of the formation process of local budget revenues under the current conditions of budget decentralization.

The statement of basic materials. Recent trends in the Ukrainian legislation on local self-government show changes in providing local self-government bodies with greater autonomy in decision-making and, therefore, more responsibility for the level of socio-economic development of their own territory. This requires adequate funds, so we will determine the level of financial independence of local self-government bodies, that is, their ability to provide necessary expenditures independently at the level of their own income, in particular tax revenues.

Local budget revenues are the basis of the financial base of local self-government bodies and a decisive factor in the regional development. Availability of local budget revenues strengthens the economic independence of local self-government bodies, activates the economic activity, allows them to develop infrastructure in the subordinate territory, expand the financial potential of the region, identify and use reserves of financial resources, expanding capacities of local authorities to more fully meet the needs of the population [1].

It is necessary to pay attention to the fact that tax revenues as an important tool for the redistribution of gross domestic product provide mobilization of the bulk of own local budget revenues.

Also, the world experience confirms that in forecasting budgetary indicators for the future the main attention is usually paid to forecasting indicators of budget revenues, while the formulation of the expenditure plan is mainly determined by the choice of one or other variant of expenditure policy [2; 3].

Since the largest total revenues in the structure of local budgets in Ukraine are regional budgets, we will calculate the simulation of the structure of local budget revenues of regions.

Clustering, correlation and regression analysis were selected as methods of analyzing the quantitative interrelation of regional budgets. The cluster analysis was used to divide all regions of

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Ukraine into relatively homogeneous groups which were subsequently studied separately for the purpose of detecting regression dependencies.

Using the correlation analysis, the relationship between the indicator of financial autonomy of regional budgets and the size of tax revenues of different types was estimated. In addition, the value of the determinant of the correlation matrix made it possible to conclude that there was the multicollinearity between independent factors.

Correlation-regression dependencies were studied according to the scheme shown in Fig. 1.

An effective indicator of the financial autonomy of regional budgets was the current ratio which was calculated as the ratio of revenues of regional budgets to corresponding expenditures.

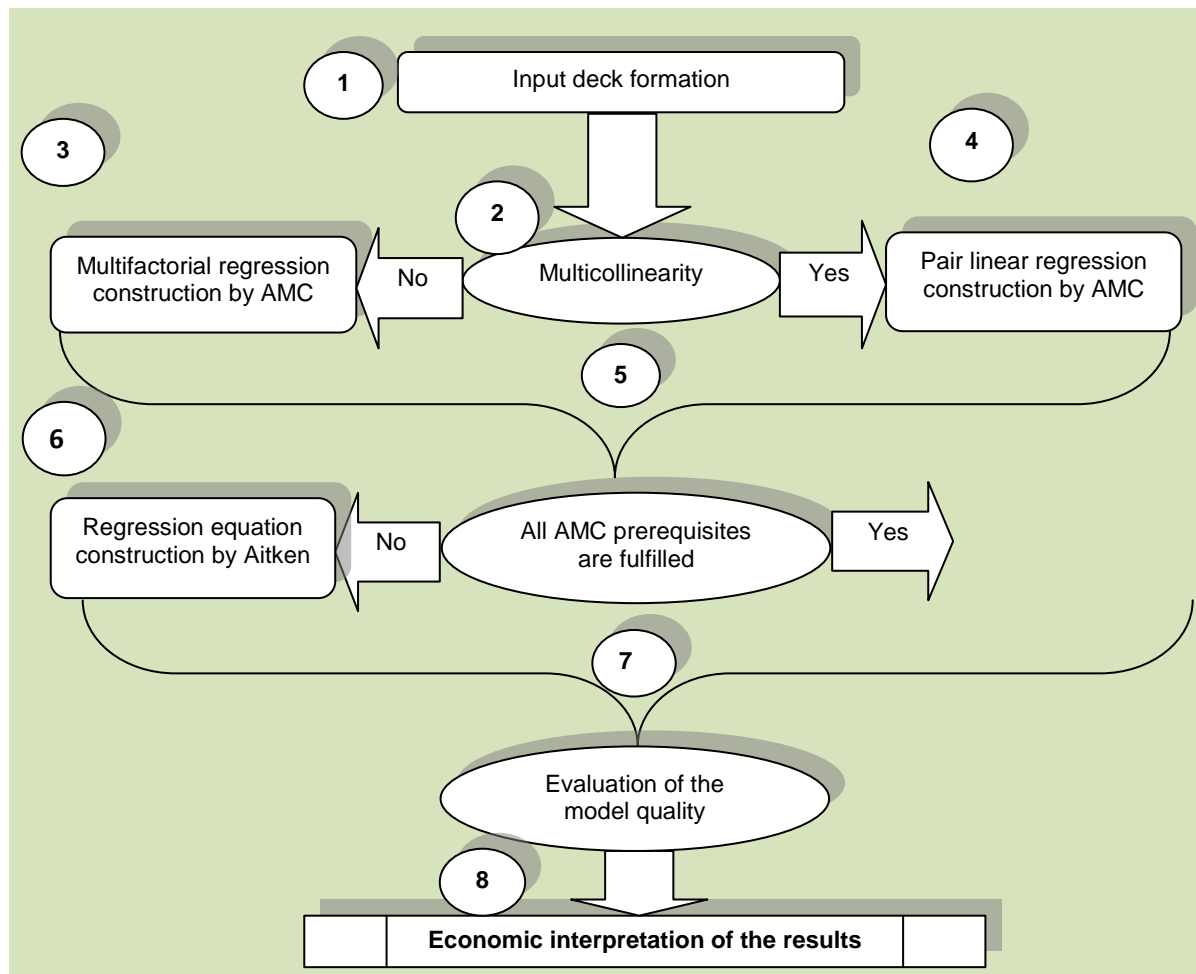


Fig. 1. Algorithm for modeling the research process of correlation-regression dependencies between revenues of regional budgets and tax revenues

Source: created by the authors.

According to the analyzed data, the current ratio of budget expenditures in 2014-2016 ranged from 0.24 to 0.63 (Fig. 2). Consequently, it can be concluded that regional budgets are unable to carry out the assigned tasks independently, without intergovernmental transfers. At the same time, there are regions that provide for themselves more than half (Dnipropetrovsk, Donetsk, Zaporizhzhia and Kiev regions) and regions in which the filling of local budgets does not exceed 30% (Transcarpathian, Ternopil, Volyn, Chernivtsi regions and others).

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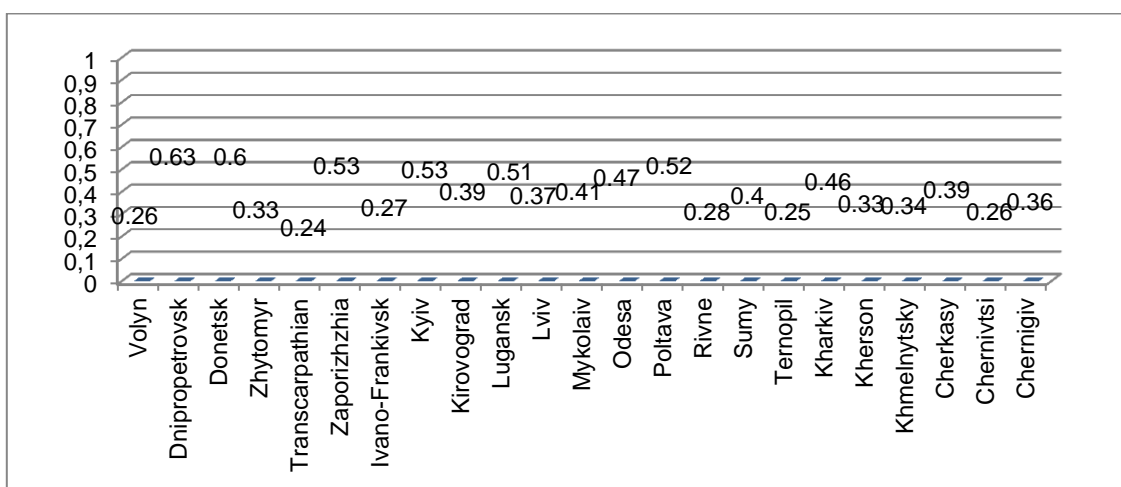


Fig. 2. Current ratio by regions of Ukraine

Source: proposed by the authors according to Ministry of Finance of Ukraine

Since the basis of own revenues of local budgets is tax revenues, for the further analysis of the impact of taxes (by type) on the financial autonomy of regional budgets, it was decided to divide regions into relatively homogeneous groups by the current ratio [4].

The results of the clusterization are presented in Tab. 1.

Table 1

Clusterization results of regions in Ukraine by current ratio

Cluster	List of cluster regions	Average value of <i>Kp</i> cluster	Standard deviation of <i>Kp</i> cluster
1	Dnipropetrovsk, Donetsk, Zaporizhzhia, Kyiv, Lugansk, Odesa, Poltava, Kharkiv	0.53	0.03
2	Vinnitsia, Zhytomyr, Kirovograd, Lviv, Mykolaiv, Sumy, Kherson, Khmelnytsky, Chernivtsi, Cherkasy	0.37	0.05
3	Volyn, Transcarpathian, Ivano-Frankivsk, Rivne, Ternopil, Chernigiv	0.27	0.02

Source: created by the authors

According to Fig. 2, the Ukrainian regions are divided into 3 groups which are conventionally designated by us S1, S2, S3 and are named as clusters of high, middle and low levels of coverage of expenses by own revenues.

Subsequently, quantitative dependencies between tax revenues (by type) and total revenues of budgets of the Ukrainian regions are studied for each cluster separately.

Thus, for each of the clusters, the input deck was created that contained the following variables:

- y – total regional budget revenues (excluding transfers);
- x1 – revenues from taxes on personal income, profits;
- x2 – revenues from property taxes;
- x3 – revenues from fees and charges for special use of natural resources;
- x4 – revenues from local taxes and fees;
- x5 – revenues from other taxes and fees.

In accordance with methods of model calculations, it is necessary to check calculations for applying Fisher's criterion shown in Fig. 3.

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		$F_k = \frac{(p_{kk} - 1)(n - m)}{(m - 1)}$
F1=	29.09766	
F2=	0.520918	
F3=	7.281061	
F4=	5.378727	
F5=	31.2909	
Ftab =	2.852409	
		$r_{kj} = \frac{-p_{kj}}{\sqrt{p_{kk} p_{jj}}}$

Fig. 3. Calculations by Fisher's criterion

Source: created by the authors

As it can be seen from Fig.3, F1, F3, F4 and F5 values are larger than the table ones and the value of F2 is less. We can conclude that x1, x3, x4 and x5 independent variables are multicollinear with others and only x2 is not multicollinear.

Calculations using Student's criterion are shown in Fig. 4.

		$t_{kj} = r_{kj} \cdot \frac{\sqrt{n - m}}{\sqrt{1 - r_{kj}^2}}$
t12=	1.131285	
t13=	0.995155	
t14=	3.569564	
t15=	6.309206	
t23=	0.834186	
t24=	0.705099	
t25=	1.421866	
t34=	1.846701	
t35=	2.62461	
t45=	3.008076	
ttab=	2.160369	

Fig. 3. Calculations by Student's criterion

Source: created by the authors

According to the results illustrated in Fig.4, we can conclude that there is multicollinearity between pairs of variables x1 and x4, x1 and x5, x3 and x5, and x4 and x5.

So, summing up results of applying Farard-Globard algorithm, we recognize the existence of multicollinearity in input deck. This means that in the future for this cluster we will investigate the impact of each type of tax separately on the total revenue of the regional budget.

Verification of the constructed model to fulfill other prerequisites for AMC use gave positive results. The results of further calculations are summarized in Tables 2-4.

So, based on the data in Table 2, it can be concluded that the relationship between x2 (property tax) and y (income) is weak. Accordingly, the obtained regression equation does not correspond to previously described quality criteria (the equation is statistically insignificant, as parameter B1).

Table 2

Calculation results by cluster S1

	X2		X3		X4		X5	
	B0	B1	B0	B1	B0	B1	B0	B1
Equation	6479508.49+20.26x		2454806.8+3.84x		1969322+12.73x		26666922.1+25.05x	
Correlation coefficient	0.07		0.85		0.64		0.91	
Determination coefficient	0.01		0.72		0.41		0.83	
F significance	0.78		8.36E-06		0.004		1.43E-07	
P-value	0.00	0.78	0.01	8.36E-06	0.22	0.004	0.000	1.43E-07

Source: created by the authors

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The connection “y – x3” is straight and rather tight. The determination coefficient is 0.72 which means that 72% variation in local budget revenues is due to the variation in fees and charges for the use of natural resources. The regression equation in general and its individual parameters are statistically significant.

The connection “y – x4” is straight but not very tight ($r = 0.64$). The determination coefficient is 0.41 which means that only 41% variation in local budget revenues is due to variation in local taxes. Consequently, this regression equation is of improper quality.

The connection “y – x5” is quite tight and straight. Moreover, 83% variation in local budget revenues can be explained by the variation of other taxes. The regression equation in general and its individual parameters are statistically significant.

Table 3

Calculation results by cluster S2

	X2		X3		X4		X5	
	B0	B1	B0	B1	B0	B1	B0	B1
Equation	6479508.49+20.26x		2454806.8+3.84x		1969322+12.73x		26666922.1+25.05x	
Correlation coefficient	0.07		0.85		0.64		0.91	
Determination coefficient	0.01		0.72		0.41		0.83	
F significance	0.78		8.36E-06		0.004		1.43E-07	
P-value	0.00	0.78	0.01	8.36E-06	0.22	0.004	0.000	1.43E-07

Source: created by the authors

According to Tab. 3, for cluster S2, revenues from property tax and from other taxes and fees influence insignificantly the formation of the general income of the regional budget. The regression equations obtained for other types of taxes are qualitative and can be used in further research.

According to Tab. 3, the calculation results for S3 cluster and S2 cluster show the insignificant effect on the formation of the total income of the regional budget from the tax on property and revenues from other taxes and fees. The regression equations obtained for other types of taxes are qualitative and can be used in further research.

Table 4

Calculation results by cluster S3

	X2		X3		X4		X5	
	B0	B1	B0	B1	B0	B1	B0	B1
Equation	6479508.49+20.26x		2454806.8+3.84x		1969322+12.73x		26666922.1+25.05x	
Correlation coefficient	0.07		0.85		0.64		0.91	
Determination coefficient	0.01		0.72		0.41		0.83	
F significance	0.78		8.36E-06		0.004		1.43E-07	
P-value	0.00	0.78	0.01	8.36E-06	0.22	0.004	0.000	1.43E-07

Source: created by the authors

Conclusions. According to the results of the statistical modeling of the impact of individual taxes on revenues of regional budgets, the following conclusions can be formulated.

In regions of cluster S1 (Dnipropetrovsk, Donetsk, Zaporizhzhia, Kyiv, Lugansk, Odesa, Poltava and Kharkiv) we should pay attention to the increase in revenues from taxes on personal income, profits; from fees and charges for special use of natural resources and from other taxes and fees.

In regions of cluster S2 (Vinnytsia, Zhytomyr, Kirovograd, Lviv, Mykolaiv, Sumy, Kherson, Khmelnytsky, Chernivtsi and Cherkasy) revenues from personal income tax and profit tax carry out a special contribution to the increase of income of regional budgets; from fees and charges for special use of natural resources and from local taxes and fees.

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For regions of cluster S3 (Volyn, Transcarpathian, Ivano-Frankivsk, Rivne, Ternopil and Chernigiv) a significant contribution of income from taxes on individual incomes, income tax and from fees and charges for special use of natural resources in general budget revenue is characteristic.

This means that it is desirable for the relevant state authorities to take measures to increase revenues from the above types of taxes. At the same time, raising tax rates may be too risky and lead to a negative outcome.

Almost all regional budgets are characterized by a low impact of property tax revenues. This result shows the need to revise the legislative framework for the appropriate tax type.

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