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INTEGRAL ASSESSMENT OF FINANCIAL SUPPORT FOR THE DEVELOPMENT OF MUNICIPAL EDUCATION: A METHODOLOGICAL APPROACH AND EMPIRICAL APPROBATION

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ABSTRACT

The aim of the study is to develop a methodological approach to the integral assessment of financial support for municipal education development and to verify its applicability through an empirical assessment of territorial communities in the Ternopil region. The relevance of the study is determined by the need to establish an objective analytical framework capable of comprehensively assessing the financial support of municipal education by integrating indicators of the financial capacity of territorial communities, intergovernmental educational transfers, and financial resources allocated to different levels of education.

The empirical analysis relies on official statistical and financial data for 55 territorial communities of the Ternopil region for 2024. The integral index was constructed using eight indicators grouped into three analytical blocks: financial capacity of territorial communities, intergovernmental financial support for education, and per capita expenditures on different levels of education.

The article confirms the absence of critical multicollinearity among the selected indicators, supporting their suitability for constructing an integral index. The empirical assessment revealed substantial differentiation in the level of financial support for municipal education among territorial communities. The highest-ranked communities combine strong fiscal capacity, high personal income tax revenues, efficient utilization of educational subventions, and sufficient per-student financing of educational services. The study also demonstrates the advantages of using per capita indicators, which provide an objective comparison of territorial communities regardless of their population size or budget scale.

The practical significance of the proposed approach consists in the possibility of applying the integral index for monitoring municipal education financing, identifying intermunicipal disparities, ranking territorial communities, conducting their subsequent clustering, and supporting evidence-based decision-making in educational financial policy under conditions of decentralization and post-war recovery.

Keywords: municipal education, financial support, integral assessment, territorial communities, financial capacity, educational subvention, local budgets, fiscal decentralization, intergovernmental transfers, integral index

JEL Classification: H72, H75, H77, I22, I28

INTRODUCTION

The current stage of the development of Ukraine's municipal education system is characterized by profound transformational processes driven by the decentralization reform, wartime challenges, and the necessity to ensure the sustainable development of territorial communities. The transfer of substantial managerial powers and financial responsibility for the operation of educational institutions to local self-government authorities has fundamentally reshaped the architecture of financial support for the education sector. Under these conditions, the financial capacity of territorial communities has become the key determinant of their ability to maintain the quality of educational services, modernize educational infrastructure, promote the digital transformation of the educational environment, ensure inclusive education, and foster human capital development.

At the same time, the expansion of the financial autonomy of territorial communities has been accompanied by considerable disparities in their resource capacity. Uneven local economic development, differences in tax bases, varying dependence on intergovernmental transfers, demographic changes, and the consequences of the full-scale war have generated significant imbalances in the financial support for municipal education. Under such circumstances, conventional analyses based on individual budgetary indicators are insufficient to provide a comprehensive assessment of the actual level of financial support for the education sector, as they capture only isolated aspects of the financial mechanism without considering their interrelationships and cumulative effects.

The assessment of education financing has attracted considerable attention in both national and international academic literature. Existing studies primarily focus on public financing of education, fiscal decentralization, intergovernmental fiscal relations, the assessment of the financial capacity of territorial communities, and the efficiency of public resource allocation. However, most available methodological approaches are limited either to evaluating the financial condition of local budgets or to analyzing individual indicators of educational system performance. Consequently, a comprehensive integral assessment of the financial support for municipal education development as an integrated socio-economic system remains insufficiently developed.

Particular importance is therefore attached to the development of a universal methodological framework capable of simultaneously incorporating the financial capacity of territorial communities, the level of state financial support, the intensity of financing across different levels of education, and the efficiency of resource allocation for educational services. The exclusive use of absolute budgetary indicators complicates comparisons among territorial communities of different sizes, whereas the application of per capita indicators combined with integral assessment methods provides an opportunity to obtain an objective and comprehensive evaluation of the financial support for municipal education regardless of population size or the number of education service recipients.

LITERATURE REVIEW

The issue of the integral assessment of the financial support for municipal education development lies at the intersection of public finance theory, fiscal decentralization, the economics of education, and multidimensional analytical methods. The theoretical foundations of this research are rooted in the classical theory of public finance developed by Musgrave (1959), who identified the allocation, distribution, and stabilization functions of public finance. Within the context of municipal education, the allocation function is of particular importance, as the budgetary mechanism serves as the principal instrument for allocating financial resources to the provision of educational services at the local level.

The theoretical rationale for transferring financial powers to local governments is provided by Oates (1999) in his theory of fiscal federalism. Oates argues that fiscal decentralization can improve the efficiency of public service delivery when local authorities are better positioned to respond to the needs and preferences of residents. However, the effectiveness of decentralization depends on the quality of intergovernmental fiscal relations, the degree of local fiscal autonomy, and the institutional capacity of local governments to manage public resources efficiently. Similarly, Martinez-Vazquez & McNab (2003) consider fiscal decentralization an important driver of economic development while emphasizing that its positive outcomes are not automatic but require an appropriate institutional framework, sound fiscal governance, and effective equalization mechanisms.

Busemeyer (2011) investigates the impact of fiscal decentralization on education and other categories of public social expenditure. His findings indicate that decentralization may contribute to increased investment in education; however, the magnitude of this effect largely depends on political, fiscal, and institutional conditions. These conclusions are particularly relevant to Ukraine, where the decentralization reform has significantly expanded the financial responsibilities of territorial communities in managing educational institutions while simultaneously exposing substantial disparities in their fiscal capacity.

Issues related to the equitable allocation of educational resources are comprehensively examined by Duncombe & Yinger (1998). The authors demonstrate that school finance systems should account not only for the overall volume of financial resources but also for differences in educational needs, the cost of providing educational services, and disparities in the fiscal capacity of local jurisdictions. This approach provides an important methodological basis for integral assessment because it prevents comparisons based solely on absolute budgetary indicators. Likewise & Bray (1996) analyzes educational decentralization from the perspective of community participation in education financing, emphasizing the importance of local responsibility, stakeholder partnership, and community engagement in ensuring equitable access to quality education.

From the perspective of the economics of education, the work of Hanushek & Woessmann (2015) is of particular significance, as it demonstrates the strong relationship between educational quality, human capital formation, and long-term economic growth. Their findings support the view that financing municipal education should be regarded not merely as current public expenditure but as a strategic investment in the future socio-economic development of territorial communities. Accordingly, the assessment of financial support for education should consider not only the volume of financial resources but also their capacity to sustain high-quality educational services and contribute to long-term development outcomes.

OECD reports (2018; 2021; 2022) emphasize that effective fiscal decentralization requires a clear distribution of responsibilities among levels of government, transparent intergovernmental transfer mechanisms, robust performance monitoring systems, and an education financing model focused on improving the quality and efficiency of public service delivery. The OECD report *Fiscal Decentralisation and Inclusive Growth* (2018) argues that decentralisation can foster inclusive economic development; however, insufficient fiscal equalization may exacerbate territorial disparities. Likewise, *Value for Money in School Education* (2022) stresses that the effectiveness of education financing should be evaluated not only in terms of the adequacy of financial resources but also with regard to the efficiency of resource utilization and educational outcomes. Furthermore, *Fiscal Federalism 2022* (2021) examines contemporary intergovernmental fiscal arrangements and provides valuable insights into the relationship between fiscal decentralization and the financial autonomy of local governments.

Recent empirical studies on education finance further confirm the importance of budgetary reforms in reducing educational inequalities. Choi (2023) investigates the effects of school finance centralization on educational revenues and demonstrates that changes in the architecture of education finance can substantially influence the availability and distribution of financial resources. Chung (2013) analyzes the education finance reform implemented in the state of Maryland and concludes that increasing financial resources, when accompanied by targeted allocation mechanisms, can significantly improve students' educational outcomes. Similarly, Lafortune, Rothstein & Schanzenbach (2018) provide empirical evidence that school finance reforms in the United States increased educational expenditures in previously underfunded districts and contributed to reducing inequalities in educational opportunities. Collectively, these studies substantiate the necessity of employing comprehensive composite indicators to identify territorial disparities in education financing.

The Ukrainian context of education financing under fiscal decentralization is examined by Londar et al. (2022). Their research analyzes the financial mechanism of school education in Ukraine and highlights the educational subvention as the principal intergovernmental transfer supporting general secondary education. At the same time, the authors demonstrate that the actual financial capacity of educational institutions depends not only on state support but also on the fiscal capacity of local budgets. These findings directly justify the inclusion of both intergovernmental financial support indicators and indicators of the own-source fiscal capacity of territorial communities in the proposed integral index.

A substantial contribution to the assessment of the financial self-sufficiency of territorial communities has been made by Voznyak, Stasyshyn & Koval (2022). The authors propose an integral approach to evaluating fiscal self-sufficiency that combines both revenue and expenditure components. Although their methodology is conceptually close to the framework proposed in this study, it focuses on the overall financial sustainability of territorial communities rather than specifically on the financial support for municipal education. In addition, Storonyanska et al. (2020) investigate spatial disparities in the development of territorial communities under conditions of administrative and fiscal decentralization. Their findings demonstrate that fiscal decentralization does not automatically eliminate regional inequalities and, under certain circumstances, may even intensify disparities in the socio-economic development and financial capacity of territorial communities.

The study conducted by Shkolnyk, Mershchii & Melnyk (2018) focuses on assessing the quality of financial support for local social development in Ukraine. The authors emphasize the importance of applying quantitative indicators to evaluate the capacity of local budgets to finance socially significant sectors. This approach is highly relevant to municipal education, as education represents one of the fundamental components of the social development of territorial communities. Likewise, Sodoma et al. (2023) examine the development of territorial communities in Ukraine under conditions of fiscal decentralization and demonstrate that fiscal capacity is one of the key determinants of a favorable investment climate and improvements in the population's well-being.

Issues related to the administrative and financial capacity of territorial communities are further explored by Nepomnyashchyy et al. (2022). Their study systematizes the defining characteristics of amalgamated territorial communities as the

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institutional foundation of decentralization reform in Ukraine. This research contributes to a better understanding of the institutional role of territorial communities as key actors responsible for financing municipal education. Krawchenko & Tomaney (2023) analyze Ukraine's decentralization reform from the perspective of post-war recovery. They conclude that while decentralization has strengthened local governance and institutional capacity, the full-scale war has created new fiscal risks that threaten the financial sustainability of municipal budgets.

Romanova & Umland (2019) examine the achievements and remaining challenges of Ukraine's decentralization reform since 2014. The authors argue that the transfer of responsibilities to local governments must be accompanied by adequate financial resources; otherwise, decentralization risks becoming largely formal rather than effective. This conclusion provides an important rationale for evaluating not only the legal competences of territorial communities in the education sector but also their actual financial capacity to ensure the sustainable provision of educational services.

The international perspective on education financing is presented in the joint World Bank and UNESCO report *Education Finance Watch* (2022), which demonstrates that low-income countries allocate substantially lower public expenditure per student than higher-income economies. These findings support the use of per capita indicators as a more accurate measure of the actual level of financial support for educational services. Furthermore, the World Bank report on support for Ukraine during the war (2022) highlights the necessity of maintaining the continuity of essential public services, particularly the financing of educational personnel at the local level. These findings emphasize the strategic importance of ensuring stable financial support for municipal education under wartime conditions.

Petrukha et al. (2024) investigate the financing of education and science in Ukraine during the period of martial law. Their findings indicate that the war has substantially altered public expenditure priorities, increased the dependence of the education sector on state and international financial assistance, and intensified the need for adaptive financial management mechanisms. Similarly, Totska (2023) analyzes the financing of the Ukrainian education system from budgets at different government levels during the wartime period and concludes that the full-scale invasion has caused significant losses to educational infrastructure while considerably complicating budget planning and resource allocation. Collectively, these studies provide valuable insights into the contemporary financial challenges facing Ukraine's education system.

Despite the substantial body of research devoted to education finance, fiscal decentralization, and the financial capacity of territorial communities, insufficient attention has been paid to the development of integral assessment methodologies that simultaneously combine indicators of local fiscal capacity, intergovernmental financial support, and actual educational expenditures within a unified analytical framework. Existing approaches primarily focus either on evaluating the financial condition of local budgets or on analyzing individual indicators of educational financing. Methodological frameworks enabling comparative assessment of territorial communities based on standardized per capita indicators and supporting the development of differentiated regional education policies remain largely underdeveloped. This research gap determines the necessity of developing a comprehensive methodological approach to the integral assessment of the financial support for municipal education development.

AIMS AND OBJECTIVES

The aim of this study is to develop a methodological approach to the integral assessment of the financial support for municipal education development and to validate its applicability through an empirical assessment of territorial communities in the Ternopil region.

To achieve this aim, the following research objectives were formulated:

1. To substantiate a system of indicators that comprehensively characterizes the financial support for municipal education development by incorporating the fiscal capacity of territorial communities, intergovernmental financial support for education, and actual education expenditures.
2. To develop a methodological framework for constructing an integral index of the financial support for municipal education development based on the normalization and aggregation of heterogeneous financial indicators.
3. To determine the methodological principles for incorporating both stimulative and destimulative indicators into the integral assessment of the financial support for municipal education.
4. To conduct an integral assessment of the financial support for municipal education development across the territorial communities of the Ternopil region and rank them according to the calculated values of the integral index.

5. To identify disparities among territorial communities in terms of the level of financial support for municipal education development and provide an analytical basis for their further typology and comparative analysis.

METHODS

The methodological framework of this study is based on a systems approach to assessing the financial support for municipal education development. This approach considers the financial resources of territorial communities as an integrated system shaped by the interaction of own-source revenues, intergovernmental fiscal regulation, and public financing of the education sector. Such a framework enables a comprehensive analysis of the relationships between the fiscal capacity of territorial communities and the level of financial support for municipal education.

The study employs a combination of general scientific and specialized research methods. Systems analysis was used to examine the structure of the financial support for municipal education and to identify the interrelationships among its key components. The method of logical generalization was applied to develop the system of indicators and to substantiate the proposed methodological framework for integral assessment. Comparative analysis was employed to compare the financial characteristics of territorial communities and to identify differences in their financial capacity and educational financing.

Statistical methods were applied during the preliminary analysis of the empirical dataset. In particular, correlation analysis was conducted to examine the relationships among the selected indicators and to verify the absence of critical multicollinearity, thereby confirming the appropriateness of including the selected variables in the integral assessment model. The correlation matrix also made it possible to evaluate the economic consistency of the proposed indicator system and to justify the classification of indicators into stimulative and destimulative variables.

The core analytical instrument of the study is the integral assessment method, which enables the aggregation of heterogeneous financial indicators into a single composite index. To ensure comparability, all indicators were standardized using the min–max normalization procedure, which transforms variables measured in different units into a common dimensionless scale. To minimize subjectivity in determining indicator weights, the principle of equal weighting was adopted, according to which each indicator contributes equally to the formation of the integral index of the financial support for municipal education development.

The resulting integral index was subsequently used to rank territorial communities according to the level of financial support for municipal education and to classify them into groups with different levels of financial development. To facilitate the interpretation of the results, the quintile classification method was applied, allowing the territorial communities to be divided into five homogeneous groups representing very high, high, medium, low, and very low levels of financial support.

The proposed methodological framework ensures the objectivity, reproducibility, and practical applicability of the research findings. Furthermore, the integral index can serve as an analytical tool for monitoring the financial support for municipal education, assessing intermunicipal disparities, and supporting evidence-based decision-making in local public financial management.

The empirical analysis is based on official statistical and financial data covering 55 territorial communities of the Ternopil region for the year 2024. The dataset includes indicators of local budget execution, the fiscal capacity of territorial communities, intergovernmental educational transfers, and actual expenditures on different levels of education. To ensure comparability across communities, all absolute financial indicators were transformed into per capita measures calculated per resident, per student, or per preschool child. This approach minimizes the effects of differences in the size of territorial communities, population, and the number of education service recipients, thereby enabling objective comparisons among communities regardless of their demographic or territorial scale.

RESULTS

The empirical validation of the proposed methodological framework is based on the construction of an integral index of the financial support for municipal education development, which provides a comprehensive assessment of the financial capacity of territorial communities to ensure the functioning and sustainable development of the education sector. Unlike the analysis of individual budgetary indicators, the integral assessment approach synthesizes heterogeneous dimensions of financial support into a single composite indicator, thereby enabling objective comparisons among territorial communities, identifying intermunicipal disparities, and establishing an analytical basis for evidence-based decision-making in the field of municipal education finance.

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The development of the integral index followed a sequential methodological procedure consisting of several stages: the selection of the indicator system, verification of its statistical consistency, normalization of the data, determination of indicator weights, calculation of the integral index, and subsequent ranking of territorial communities. This stepwise approach ensures the methodological robustness of the obtained results and is consistent with contemporary approaches to the multidimensional assessment of socio-economic systems.

The Ternopil region was selected as the study area because it comprises territorial communities that differ substantially in terms of population size, fiscal capacity, revenue structure, and the scale of their educational networks. Such diversity provides a representative basis for testing the proposed methodological framework and evaluating its applicability under varying socio-economic conditions.

The construction of the integral index is based on a system of interrelated indicators reflecting the key dimensions of the financial support for municipal education development. The selection of indicators was guided by the principles of comprehensiveness, representativeness, statistical availability, and the feasibility of intermunicipal comparisons. The proposed system comprises three complementary analytical blocks.

The first block characterizes the fiscal capacity of territorial communities and includes:

- local budget revenues per capita;
- personal income tax (PIT) revenues per capita.

The second block reflects the level of intergovernmental financial support for education and consists of:

- educational subvention per student;
- basic equalization grant per capita.

The third block characterizes the actual financing of the education sector and includes:

- preschool education expenditure per preschool child;
- general secondary education expenditure per student;
- extracurricular education expenditure per student;
- expenditure on other educational institutions and educational activities per student.

Most of the selected indicators are classified as stimulative indicators, meaning that higher values correspond to a higher level of financial support for municipal education development. This category includes indicators of the own fiscal capacity of territorial communities, educational subventions, and per capita expenditures across all levels of education.

By contrast, the basic equalization grant per capita is treated as a destimulative indicator, since its increase reflects a greater dependence of a territorial community on the fiscal equalization mechanism and a lower capacity to generate its own financial resources. This classification is consistent with the economic nature of intergovernmental fiscal transfers and provides a more objective assessment of the fiscal potential of territorial communities to support the sustainable development of municipal education.

For the subsequent presentation of the methodological framework, all indicators are denoted by the corresponding variables presented in Table 1.

Table 1. System of indicators for assessing the financial support for municipal education development and their notation.

Variable	Indicator
X1	Community revenues per capita, UAH thousand
X2	Personal income tax (PIT) revenues per capita, UAH thousand
X3	Education subvention per student, UAH thousand
X4	Basic grant per capita, UAH thousand
X5	Preschool education expenditure per child, UAH thousand
X6	General secondary education expenditure per student, UAH thousand
X7	Extracurricular education expenditure per student, UAH thousand
X8	Other educational expenditures per student, UAH thousand

The application of an integral assessment approach is necessitated by the multidimensional nature of the financial support for municipal education development, which is shaped by the combined influence of the fiscal capacity of territorial communities, intergovernmental financial support, and financing across different levels of education. The use of individual financial indicators alone does not provide a comprehensive assessment of the resource potential of territorial communities, thereby justifying the application of an integral approach. The construction of the integral index followed a sequential procedure comprising the development of the information base, verification of the statistical consistency of the selected indicators, indicator normalization, determination of weight coefficients, aggregation of standardized values, and interpretation of the obtained results. The sequence of these methodological stages is presented in Figure 1.

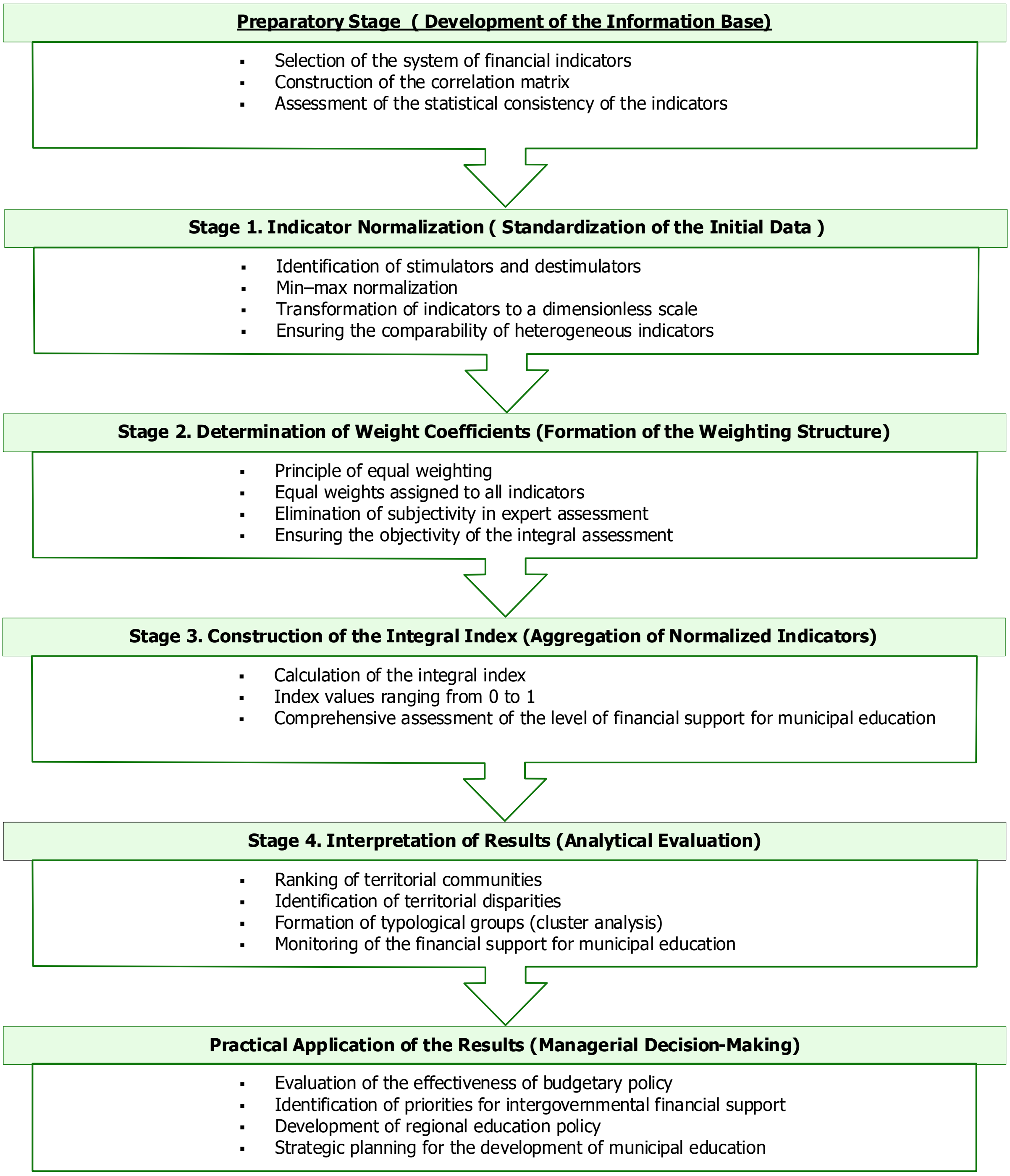

Figure 1. Stages of the integral assessment of the financial support for municipal education development.

An important component of the preparatory stage is the verification of the statistical consistency of the selected system of indicators. For this purpose, prior to constructing the integral index, the relationships among the selected indicators were

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examined using a correlation matrix. The primary objective of this stage was to assess the statistical consistency of the indicators, identify potential multicollinearity, and verify the appropriateness of their simultaneous inclusion in the integral assessment process. Analysis of the correlation structure constitutes an essential prerequisite for constructing the integral index, as excessive interdependence among individual indicators may lead to information redundancy, aggregation bias, and reduced analytical robustness of the resulting integral index. To assess the strength and direction of the relationships among the indicators of financial support for municipal education development, a correlation matrix was constructed. The matrix elements were calculated using Pearson's pairwise correlation coefficient:

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i-\bar{x})\,(y_i-\bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i-\bar{x})^{2}}\sqrt{\sum_{i=1}^{n}(y-\bar{y})^{2}}},$$

where r_{xy} *– the correlation coefficient between variables* x *and* y*;* x_i*,* y_i *– the values of the corresponding indicators for the i-th territorial community;* $\bar{x}$ *,* $\bar{y}$ *– the mean values of the indicators;* n *– the number of territorial communities.*

The results of the correlation analysis are presented in Table 2.

Table 2. Correlation matrix of indicators of the financial support for municipal education development. *(Source: calculated by the author based on State Web Portal for Citizens).*

	X1	X2	X3	X4	X5	X6	X7	X8
X1	1							
X2	0.904	1						
X3	0.035	0.018	1					
X4	–0.602	–0.636	0.015	1				
X5	–0.099	–0.013	–0.303	0.015	1			
X6	0.260	0.158	0.827	–0.275	–0.262	1		
X7	–0.276	–0.143	–0.277	–0.052	0.196	–0.273	1	
X8	0.247	0.199	–0.169	–0.414	–0.067	0.040	0.140	1

The results of the correlation analysis indicate the absence of critical multicollinearity among the majority of the selected indicators, confirming the representativeness of the proposed indicator system and its suitability for subsequent integral assessment.

The strongest positive correlation was identified between local budget revenues per capita and personal income tax (PIT) revenues per capita (r = 0.904). This finding is expected, given that personal income tax constitutes the primary revenue source of local budgets in Ukraine. The high correlation coefficient confirms the decisive role of PIT revenues in shaping the fiscal capacity of territorial communities and provides economic justification for including both indicators in the integral assessment framework.

A strong positive relationship was also observed between the educational subvention per student and general secondary education expenditure per student (r = 0.827). This result confirms that the educational subvention remains the principal instrument of state financial support for general secondary education and largely determines the level of financial provision of educational institutions at the local level. At the same time, the correlation coefficient does not reach a critical threshold, indicating the existence of additional sources of financing for general secondary education, primarily through the own-source revenues of local budgets.

Moderate negative correlations were identified between the indicators of the fiscal capacity of territorial communities and the basic equalization grant. Specifically, the correlation coefficient between local budget revenues per capita and the basic equalization grant per capita was r = –0.602, while the correlation between personal income tax (PIT) revenues per capita and the basic equalization grant per capita reached r = –0.636. These findings are fully consistent with the economic rationale of the horizontal fiscal equalization mechanism. As the own-source revenue base of a territorial community increases, its dependence on state financial support decreases accordingly. This relationship provides strong justification for treating the basic equalization grant as a destimulative indicator in the construction of the integral index of the financial support for municipal education development.

The remaining correlation coefficients generally fall within the range of weak to moderate statistical relationships, indicating the absence of substantial information redundancy among the selected indicators. This pattern of interrelationships confirms that each indicator captures a distinct dimension of the financial support for municipal education, including the fiscal capacity of territorial communities, the level of state financial support, and the intensity of financing across different levels of education.

Overall, the results of the correlation analysis confirm the statistical consistency and internal coherence of the proposed indicator system, demonstrating its suitability for constructing the integral index. The absence of critical multicollinearity minimizes the risk of disproportionate influence of individual variables during the aggregation process and enhances the robustness and objectivity of the subsequent integral assessment. Furthermore, the correlation analysis provides a sound methodological foundation for the subsequent stages of the study, including indicator normalization, calculation of the integral index, and the ranking of territorial communities according to the level of financial support for municipal education development.

The results of the correlation analysis confirmed the statistical consistency of the proposed system of indicators, the absence of critical multicollinearity, and the feasibility of aggregating the selected variables into a single composite indicator. This provides a sound methodological basis for constructing an integral index that enables a comprehensive assessment of the financial support for municipal education development and facilitates an objective comparison of territorial communities based on a set of interrelated financial characteristics.

The application of an integral assessment approach is justified by the fact that the financial support for municipal education represents a multidimensional socio-economic system shaped by multiple sources of financing, intergovernmental fiscal arrangements, and public expenditures allocated across different levels of education. The analysis of individual financial indicators alone is insufficient to provide a comprehensive understanding of the resource provision of territorial communities, as each indicator reflects only a particular dimension of their fiscal potential. Therefore, the application of an integral approach is appropriate because it enables the synthesis of heterogeneous indicators into a single composite measure while preserving their underlying economic meaning.

The construction of the integral index followed a sequential procedure that included the normalization of the original indicators, the determination of weighting coefficients, the aggregation of standardized values, and the calculation of the integral index for each territorial community. This methodological sequence is consistent with widely accepted approaches to the multidimensional assessment of socio-economic systems and ensures the comparability of indicators measured in different units and representing different economic dimensions.

The first stage of the integral assessment involves the normalization of indicators, the purpose of which is to transform all variables onto a common dimensionless scale and eliminate the influence of different units of measurement on the subsequent aggregation process since the proposed system includes both stimulative indicators, whose higher values indicate an improvement in the financial support for municipal education development, and destimulative indicators, whose increase reflects a deterioration in the fiscal capacity of territorial communities, the min–max normalization method was employed using separate transformation formulas for each category of indicators.

For stimulative indicators, where higher values correspond to a higher level of financial support for municipal education development, normalization was performed using the following formula:

$$z_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}}$$

where x_{ij} is the value of the j-th indicator for the i-th territorial community; x_j^{min} – the minimum value of the j-th indicator among all territorial communities; x_j^{max} – the maximum value of the j-th indicator among all territorial communities; z_{ij} – the normalized value of the indicator.

For destimulative indicators, whose increasing values have a negative effect on the level of financial support for municipal education development, normalization was performed using the following formula:

$$z_{ij} = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}}$$

As a result of the normalization procedure, all indicators are transformed into values ranging from 0 to 1, where 0 corresponds to the lowest observed performance, and 1 represents the highest.

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The integral index of financial support for municipal education is calculated using the following formula:

$$I_i = \sum_{j=1}^{m} w_j \, z_{ij}$$

where (I_i) is the integral index of financial provision of the i-th territorial community; w_j is the weighting coefficient of the j-th indicator; z_{ij} is the normalized value of the j-th indicator for the i-th territorial community.

At the second stage, the weighting coefficients of the indicators are determined. In this study, the equal-weighting approach was adopted, according to which all components of the financial support for municipal education development are assigned identical weights. This approach eliminates the subjectivity associated with expert-based weighting schemes and ensures the objectivity and transparency of the integral assessment process. Moreover, equal weighting is widely applied in the construction of composite indicators when there are no sufficient theoretical or empirical grounds for assigning different levels of importance to individual variables.

For a system comprising m indicators, the weighting coefficient is determined as follows:

$$w_j = \frac{1}{m}$$

where w_j is the weight of the j-th indicator.

Since the integral index includes eight indicators, the weighting coefficient for each of them is as follows:

$$w_j = \frac{1}{8} = 0{,}125$$

At the next stage, the calculated integral index takes values within the range from 0 to 1, where higher values indicate a higher level of financial support for municipal education development in a territorial community. The use of a dimensionless scale enables direct comparisons among territorial communities regardless of the size of their financial resources, population, or the number of education service recipients.

The final stage of the integral assessment involves ranking territorial communities according to the values of the integral index. The resulting rankings make it possible to determine the relative level of financial support for municipal education development, identify intermunicipal disparities, distinguish communities with high and low levels of fiscal capacity, and provide an analytical basis for evidence-based decision-making aimed at improving financial policy in the education sector.

Furthermore, the use of the integral index as a classification criterion enables the identification of groups of territorial communities with similar characteristics of financial support for municipal education development. This creates a methodological foundation for designing differentiated fiscal regulation mechanisms and targeted financial support policies tailored to the specific needs and financial capacities of individual communities.

The proposed methodological framework was empirically validated using data from 55 territorial communities of the Ternopil region for 2024. The integral index was calculated on the basis of eight indicators that comprehensively characterize the fiscal capacity of territorial communities, the level of intergovernmental financial support, and the resource provision of different levels of municipal education. Prior to the calculation of the integral index, all indicators were standardized using the min–max normalization method and subsequently aggregated by applying equal weighting coefficients in accordance with the proposed methodological framework.

The results of the integral assessment are presented in Table 3. The calculations performed revealed significant differentiation of territorial communities in terms of the level of financial provision for municipal education development. The values of the integral index range from 0.103 to 0.627, indicating substantial differences in the financial potential of communities to ensure the functioning and development of the education sector.

Table 3. Ranking of the territorial communities of the Ternopil region by the integral index of the financial support for municipal education development.

Rank	Territorial community	Ii	№	Territorial community	Ii
1	Baikovetska	0.627	29	Terebovlianska	0.382
2	Skorykivska	0.627	30	Ternopilska	0.371
3	Trybukhivska	0.611	31	Tovstenska	0.364
4	Zolotnykivska	0.586	32	Chortkivska	0.363
5	Husiatynska	0.575	33	Borshchivska	0.363
6	Hrymailivska	0.556	34	Vasylkovetska	0.360
7	Pidhaietska	0.552	35	Mykulynetska	0.359
8	Velykohaiivska	0.533	36	Buchatska	0.356
9	Velykoberezovytska	0.511	37	Skala-Podilska	0.355
10	Kozivska	0.506	38	Zalozetska	0.351
11	Kupchynetska	0.503	39	Kremenetska	0.341
12	Zavodska	0.499	40	Nahirianska	0.341
13	Pidvolochyska	0.492	41	Skalatska	0.339
14	Velykodederkalska	0.487	42	Kolyndianska	0.339
15	Velykobirkivska	0.477	43	Ozernianska	0.333
16	Zalishchytska	0.470	44	Berezhanska	0.328
17	Zborivska	0.468	45	Kozlivska	0.324
18	Biletska	0.458	46	Borsukivska	0.315
19	Lanovetska	0.456	47	Kopychynetska	0.315
20	Khorostkivska	0.450	48	Lopushnenska	0.309
21	Zbarazka	0.434	49	Narayivska	0.302
22	Bilobozhnytska	0.432	50	Saranchukivska	0.296
23	Bilche-Zolotetska	0.428	51	Vyshnivetska	0.273
24	Ivanivska	0.420	52	Ivane-Pustenska	0.269
25	Koropetska	0.414	53	Melnytse-Podilska	0.219
26	Monastyryska	0.408	54	Pochaivska	0.214
27	Shumska	0.400	55	Zolotopotitska	0.175
28	Pidhorodnianska	0.384			

The obtained range of integral index values confirms the heterogeneity of the financial capacities of territorial communities and the different levels of their ability to provide adequate resource support for municipal education. The identified differences are determined by the combined influence of the local budget revenue base, the volume of intergovernmental transfers, the specific features of education network formation, and the level of financing of particular types of educational services. Thus, the integral index enables not only a comparative assessment of territorial communities but also the identification of directions for further analysis of the factors shaping the level of financial provision for municipal education development.

The ranking of territorial communities based on the values of the integral index (Table 3) reveals substantial heterogeneity in the level of financial support for municipal education development. The calculated index values reflect the combined influence of the fiscal capacity of territorial communities, the volume of intergovernmental financial support, and the intensity of education financing, thereby providing an objective assessment of their ability to ensure the sustainable functioning and development of municipal education.

The highest values of the integral index were recorded for the Baikovetska (0.627), Skorykivska (0.627), Trybukhivska (0.611), Zolotnykivska (0.586), and Husiatynska (0.575) territorial communities. The leading positions of these communities are explained by a balanced combination of strong fiscal capacity, high personal income tax (PIT) revenues, substantial educational subventions, and high per capita expenditures across different levels of education. These findings indicate that the combination of a robust own-source revenue base and the effective utilization of intergovernmental financial support creates favorable conditions for the sustainable development of municipal education.

Particular attention should be paid to the Baikovetska and Skorykivska territorial communities, which achieved the highest integral index value. Their leading positions are attributable not to exceptionally high performance in a single indicator but rather to the balanced development of all key components of financial support. This reflects a strong local economic base, high fiscal capacity, and the efficient allocation of budgetary resources to the education sector. Similarly, the high integral index values observed for the Trybukhivska, Zolotnykivska, and Husiatynska territorial communities demonstrate their capacity to provide adequate financial support for municipal education through an effective combination of own-source revenues and state financial assistance.

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At the opposite end of the ranking are the Zolotopotitska (0.175), Pochaivska (0.214), Melnytse-Podilska (0.219), Ivane-Pustenska (0.269), and Vyshnivetska (0.273) territorial communities. Their relatively low integral index values indicate limited fiscal potential and a lower level of financial support for municipal education. These communities are characterized by a relatively weak own-source revenue base, lower personal income tax revenues, greater dependence on intergovernmental transfers, and limited financial capacity to support the development of educational infrastructure. Overall, these findings confirm that the observed intermunicipal disparities are largely determined by differences in local economic development and the fiscal capacity of local budgets.

Particular attention should be given to the performance of the Ternopilska territorial community, which ranked 30th with an integral index value of 0.371. At first glance, this position may appear unexpected given the substantial absolute size of its local budget. However, the proposed methodology is based on the use of per capita indicators, calculated per resident, per student, or per preschool child. Under this approach, larger communities with extensive educational networks and larger populations do not receive artificial advantages based solely on the absolute size of their budgets. Consequently, the integral index reflects not the total volume of educational expenditures but rather the efficiency of financial resource provision per recipient of educational services.

These findings further confirm the appropriateness of using per capita indicators in intermunicipal comparative analysis. The application of absolute budgetary indicators would inevitably lead to the systematic dominance of large urban communities, whereas the proposed methodology provides a more accurate assessment of the actual level of financial support for educational services regardless of the size of a territorial community. This enhances the objectivity of the integral assessment and improves the reliability of comparative evaluations. Overall, the empirical results reveal substantial differentiation among the territorial communities of the Ternopil region in terms of the financial support for municipal education development, confirming significant disparities in their fiscal capacity and the structure of their financial resources.

To facilitate a more in-depth interpretation of the empirical findings, the territorial communities were subsequently classified according to the quintile distribution of the integral index. This approach ensures an even distribution of the sample into five groups representing very high, high, medium, low, and very low levels of financial support for municipal education development. Since the study covers 55 territorial communities, each quintile comprises 11 communities, ranked in descending order according to the value of the integral index. Unlike the use of predefined normative thresholds, the boundaries of the quintile groups were determined empirically based on the ranked distribution of the integral index values. This approach ensures an equal number of territorial communities within each group and enables an objective representation of the internal differentiation of the study sample, regardless of the absolute range of the integral index values.

According to the obtained results, the group with a very high level of financial support for municipal education includes territorial communities with integral index values ranging from 0.503 to 0.627; the high level ranges from 0.432 to 0.499; the medium level from 0.363 to 0.428; the low level from 0.324 to 0.360; and the very low level from 0.175 to 0.315. These thresholds should not be interpreted as universal normative benchmarks; rather, they reflect the empirical distribution of the integral index across the territorial communities of the Ternopil region examined in this study. Accordingly, the classification of territorial communities into the respective quintile groups is based on their relative position in the overall ranking, thereby ensuring the validity of inter-municipal comparisons and providing a sound basis for subsequent typological and cluster analyses.

Table 4. Distribution of the territorial communities of the Ternopil region by the level of the integral index of the financial support for municipal education development.

Level	Territorial community
Very high	Baikovetska, Skorykivska, Trybukhivska, Zolotnykivska, Husiatynska, Hrymailivska, Pidhaietska, Velykohaiivska, Velykoberezovytska, Kozivska, Kupchynetska.
High	Zavodska, Pidvolochyska, Velykodederkalska, Velykobirkivska, Zalishchytska, Zborivska, Biletska, Lanovetska, Khorostkivska, Zbarazka, Bilobozhnytska.
Medium	Bilche-Zolotetska, Ivanivska, Koropetska, Monastyryska, Shumska, Pidhorodnianska, Terebovlianska, Ternopilska, Tovstenska, Chortkivska, Borshchivska.
Low	Vasylkovetska, Mykulynetska, Buchatska, Skala-Podilska, Zalozetska, Kremenetska, Nahirianska, Skalatska, Kolyndianska, Ozernianska, Berezhanska.
Very low	Kozlivska, Borsukivska, Kopychynetska, Lopushnenska, Narayivska, Saranchukivska, Vyshnivetska, Ivane-Pustenska, Melnytse-Podilska, Pochaivska, Zolotopotitska.

Overall, the results of the integral assessment confirm the existence of substantial disparities among the territorial communities of the Ternopil region in terms of the level of financial support for municipal education development. The identified differences reflect the heterogeneity of the fiscal capacity of territorial communities, variations in the availability of budgetary resources allocated to the education sector, and unequal opportunities to finance the development of municipal education. The proposed integral index successfully integrates indicators of fiscal capacity, intergovernmental financial support, and per capita educational expenditures into a single composite measure, thereby providing an objective comparative assessment of territorial communities regardless of their size or population.

The findings have not only analytical but also practical significance. The proposed methodological framework and the resulting integral index can be employed by local self-government authorities and public policymakers to monitor the financial support for municipal education, evaluate the effectiveness of budgetary policy, identify intermunicipal disparities, and determine priority areas for targeted financial support. Furthermore, the developed integral index provides an analytical basis for strategic planning, the optimization of intergovernmental fiscal relations, and the design of evidence-based policies aimed at improving the efficiency and equity of municipal education financing under conditions of fiscal decentralization.

DISCUSSION

The findings of the study confirm that the level of financial support for municipal education development is determined by the combined influence of several interrelated factors, among which the fiscal capacity of territorial communities, the volume of intergovernmental financial support, and the level of actual educational expenditures play the most significant roles. Unlike conventional analyses based on individual budgetary indicators, the proposed integral approach provides a comprehensive assessment of the financial resources supporting municipal education and makes it possible to identify actual intermunicipal disparities regardless of the size of a territorial community. Unlike the approach proposed by Voznyak, Stasyshyn and Koval (2022), which focuses on assessing the overall financial self-sufficiency of territorial communities, the integral index developed in this study is specifically designed to evaluate the financial support for municipal education. This approach makes it possible to move beyond the assessment of the general fiscal capacity of territorial communities toward the analysis of the resource potential of a specific public service sector, thereby substantially enhancing the analytical value of the obtained results.

The empirical findings are generally consistent with the principles of the theory of fiscal federalism, which argues that greater fiscal autonomy of local governments creates favorable conditions for improving the provision of public services, provided that territorial communities possess an adequate fiscal resource base. At the same time, the empirical validation demonstrates that substantial disparities in the financial support for municipal education persist even under the operation of the horizontal fiscal equalization mechanism. These results support the conclusions of previous international studies indicating that fiscal decentralization alone is insufficient to eliminate territorial inequalities and should be complemented by an effective combination of local fiscal autonomy, adequate state support, and efficient mechanisms for the allocation of public financial resources. At the same time, the findings of this study extend the conclusions of Oates (1999) and Martinez-Vazquez and McNab (2003). While these authors primarily conceptualize fiscal decentralization as an institutional mechanism for improving the efficiency of local governance, the present study demonstrates that, even in the presence of well-developed intergovernmental fiscal equalization mechanisms, the level of financial support for municipal education is determined by the combined interaction of the communities' own-source revenue capacity, the structure of intergovernmental transfers, and per capita educational expenditures.

The correlation analysis further confirms the economic validity of the proposed system of indicators. The strong positive relationship between personal income tax revenues and the overall revenue base of territorial communities highlights the decisive role of own-source revenues in strengthening the fiscal capacity of local governments. Conversely, the negative relationship between community revenues and the volume of the basic equalization grant confirms the effectiveness of the fiscal equalization mechanism and provides additional methodological justification for treating this indicator as a destimulative variable in the construction of the integral index. Unlike the study by Londar et al. (2022), which primarily focuses on analyzing the role of the educational subvention, the findings of the present study indicate that intergovernmental transfers cannot be regarded as the sole determinant of the financial support for education. Rather, the combination of communities' own-source budget revenues and state support mechanisms exerts a substantially greater influence, as confirmed by the results of the correlation analysis and the integral assessment.

The results of the integral assessment reveal considerable differentiation among the territorial communities of the Ternopil region. These disparities are explained not only by differences in fiscal capacity but also by variations in the structure of education financing, the intensity of educational subvention utilization, demographic characteristics, and the scale of local educational networks. This indicates that the effectiveness of the financial support for municipal education depends not on individual budgetary indicators in isolation but rather on the balanced interaction of all components of the municipal education financing system. The findings of this study further develop the conclusions of Storonyanska et al. (2020), who emphasized the spatial disparities in the development of territorial communities. The results demonstrate that spatial inequality is reflected not only in the overall fiscal characteristics of territories but also in the structure of financial support for the education sector.

The use of per capita indicators, calculated per resident, per student, or per preschool child, minimized the influence of differences in the size of territorial communities and ensured the objectivity of intermunicipal comparisons. Unlike absolute budgetary indicators, which primarily reflect the overall size of local budgets, the proposed approach captures the actual level of resource provision for educational services and provides a more reliable basis for evaluating the efficiency of municipal education financing.

The scientific novelty of this study lies in the development of a comprehensive methodological framework for the integral assessment of the financial support for municipal education development. The proposed approach integrates indicators of the fiscal capacity of territorial communities, intergovernmental financial support, and per capita educational expenditures into a unified assessment system. The proposed approach enables comprehensive monitoring of the financial support for municipal education, objective ranking of territorial communities, and the establishment of an information base for managerial decision-making. Unlike most previous studies, which focused either on individual dimensions of the financial capacity of territorial communities or on specific mechanisms of educational budget financing, the present study proposes a comprehensive integral framework that combines fiscal autonomy, intergovernmental fiscal equalization, and the intensity of educational financing within a unified methodological approach. This integration makes it possible to generate novel analytical insights that cannot be obtained using conventional one-dimensional financial indicators.

The practical significance of the obtained results lies in the possibility of applying the proposed integral index by national and local public authorities to monitor the financial support for municipal education, evaluate the effectiveness of budgetary policy, identify priority areas for intergovernmental financial support, and develop regional education development programmes. Furthermore, the proposed methodological framework can be adapted for assessing the financial support for municipal education in other regions of Ukraine and may serve as an analytical tool for strategic planning under the conditions of post-war recovery.

Despite its contributions, the study has several limitations. First, the empirical validation was conducted using data from territorial communities of only one region and covers a single fiscal year, which limits the possibility of evaluating long-term trends in the financial support for municipal education. Second, the proposed integral index is primarily based on financial indicators and does not directly incorporate qualitative measures of educational performance or learning outcomes. Future research should therefore focus on expanding the empirical database, incorporating socio-economic and educational quality indicators, applying advanced multivariate statistical techniques to determine indicator weights, and conducting cluster analysis of territorial communities in order to develop a typology of financial support models for municipal education development.

CONCLUSIONS

The study developed and empirically validated a methodological framework for the integral assessment of the financial support for municipal education development based on a careful consideration of the fiscal capacity of territorial communities, intergovernmental financial support for the education sector, and actual per capita expenditures across different levels of education. The proposed approach enables a transition from the analysis of individual financial indicators to a comprehensive assessment of the resource provision for municipal education.

A system comprising eight interrelated indicators grouped into three functional blocks was substantiated to characterize the own fiscal capacity of territorial communities, state financial support, and the intensity of education financing. The correlation analysis confirmed the statistical consistency of the proposed indicator system and the absence of critical multicollinearity, thereby providing a robust methodological basis for constructing the integral index.

Using the min–max normalization procedure and subsequent aggregation based on the equal-weighting principle, an integral assessment was conducted for 55 territorial communities of the Ternopil region. The calculated integral index ranged from 0.103 to 0.627, demonstrating substantial disparities in the financial capacity of territorial communities and their ability to provide adequate financial support for municipal education development.

The findings demonstrate that the use of per capita indicators, calculated per resident, per student, or per preschool child, provides a more objective basis for comparing territorial communities than the use of absolute budgetary indicators. This approach eliminates the influence of community size and enables a more accurate assessment of the actual level of financial resources available for educational service provision.

The proposed integral index can serve as a universal analytical tool for monitoring the financial support for municipal education, assessing intermunicipal disparities, supporting evidence-based decisions on the allocation of public financial resources, and identifying priorities for national and regional education policy under conditions of fiscal decentralization and Ukraine's post-war recovery.

Future research should focus on expanding both the temporal and geographical scope of the analysis, improving the methodology for determining indicator weights through the application of advanced multivariate statistical techniques, incorporating indicators of educational quality and learning outcomes into the integral assessment model, and conducting cluster analysis of territorial communities to develop differentiated models of financial support for municipal education development.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ІНТЕГРАЛЬНЕ ОЦІНЮВАННЯ ФІНАНСОВОГО ЗАБЕЗПЕЧЕННЯ РОЗВИТКУ МУНІЦИПАЛЬНОЇ ОСВІТИ: МЕТОДИЧНИЙ ПІДХІД ТА ЕМПІРИЧНА АПРОБАЦІЯ

Метою дослідження є розробка методичного підходу до інтегрального оцінювання фінансового забезпечення розвитку муніципальної освіти та його емпірична апробація на матеріалах територіальних громад Тернопільської області. Актуальність дослідження зумовлена необхідністю формування об'єктивного інструментарію оцінювання фінансового забезпечення муніципальної освіти, який дозволяє комплексно враховувати фінансову спроможність територіальних громад, рівень міжбюджетної підтримки та ресурсне забезпечення різних рівнів освіти.

Інформаційною базою дослідження стали офіційні статистичні й фінансові дані щодо діяльності 55 територіальних громад Тернопільської області за 2024 рік. Інтегральний індекс сформовано на основі восьми показників, згрупованих у три блоки: фінансова спроможність територіальних громад, міжбюджетна підтримка освітньої галузі та питомі видатки на різні рівні освіти.

У статті підтверджено відсутність критичної мультиколінеарності між сформованими показниками та обґрунтовано їх придатність для побудови інтегрального індексу. Проведене інтегральне оцінювання засвідчило значну диференціацію територіальних громад за рівнем фінансового забезпечення розвитку муніципальної освіти. Установлено, що найбільш високі позиції посідають громади, які поєднують високий рівень власної фінансової спроможності, значні надходження податку на доходи фізичних осіб, ефективне використання освітньої субвенції та достатній рівень фінансування освітніх послуг у розрахунку на одного здобувача освіти. Обґрунтовано доцільність використання питомих показників, що забезпечує коректне міжмуніципальне порівняння незалежно від масштабів територіальної громади.

Практичне значення отриманих результатів полягає в можливості використання інтегрального індексу для моніторингу фінансового забезпечення муніципальної освіти, оцінювання міжмуніципальних диспропорцій, ранжування територіальних громад, проведення їх подальшої кластеризації та обґрунтування управлінських рішень щодо вдосконалення фінансової політики в царині освіти.

Ключові слова: муніципальна освіта, фінансове забезпечення, інтегральне оцінювання, територіальні громади, фінансова спроможність, освітня субвенція, місцеві бюджети, децентралізація, міжбюджетні трансферти, інтегральний індекс

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