

To the Specialized Academic Council
of Sumy State University

REVIEW

**by the official opponent, Doctor of Economic Sciences, Professor,
Vice-Rector for Research and International Activities of the
Sumy National Agrarian University,
Yuriy Danko
on the dissertation work**

Yang Yu

**performed for the Doctor of Philosophy degree in the field of study
07 "Management and Administration" Speciality (program subject area)
073 "Management" on the topic "The management of state financial resources
in China's higher education: Enhancing regional equity, efficiency, and
adequacy of financial provision."**

1. Relevance of the thesis topic

The management of state financial resources in China's higher education system is intricately linked to regional equity, efficiency, and the adequacy of financial provision, as well as to the broader goals of national educational equity and socio-economic development. A rational allocation of financial resources can ensure the balanced development of higher education institutions across different regions, thereby improving academic quality, fostering social mobility, and driving economic innovation. As educational equity constitutes a core aspect of social equity, its enhancement is essential for mitigating disparities and promoting a more inclusive society. Simultaneously, the advancement of educational quality serves as a critical driver of economic growth.

In the context of intensified global competition and the increasing prominence of the knowledge economy, China's higher education system faces the dual challenges of enhancing its competitiveness and cultivating high-quality talent. Regional imbalances in the allocation of educational resources not only impede the realisation of educational equity but also constrain the coordinated development of regional economies. Addressing these disparities by optimising the management of financial resources in higher education is crucial for narrowing regional gaps, promoting equity in education, and supporting the nation's socio-economic progress.

During this transformative period in China's socio-economic development, higher education is indispensable as a catalyst for cultivating innovative talent and advancing scientific and technological progress. This role is essential for strengthening the nation's core competitiveness and achieving sustainable development. International

experience underscores that a country's higher education quality is closely tied to the efficiency of financial resource allocation. In light of the continued expansion of China's higher education system and the growing demand for improved quality, it is imperative to conduct in-depth research on optimising the management of state financial resources to enhance regional equity, efficiency, and adequacy. This represents not only a significant frontier in theoretical exploration but also an urgent practical necessity.

The research presented in this thesis is highly pertinent to these pressing challenges and contributes valuable theoretical insights. It deepens the theoretical and methodological understanding of financial resource management in higher education. Employing empirical analysis and model-based approaches, the study proposes practical policy recommendations to improve the allocation and utilisation of financial resources in China's higher education system. These recommendations are designed to promote educational equity, support coordinated regional development, and provide a robust intellectual and human capital foundation for the country's long-term development goals.

2. Relationship of the dissertation to scientific plans, programmes, basic and applied research

Yang Yu's dissertation aligns closely with the scientific programs, foundational research, and applied studies conducted at Sumy State University under key research projects. First, "The Management of State Financial Resources in Higher Education: Enhancing Regional Equity, Efficiency, and Adequacy of Financial Provision" (state registration number 0121U114364) include the results of the Yang Yu's which focus on addressing socio-economic challenges arising from the digitalisation of social relations and their implications for managing state financial resources in higher education. Second, "Convergence of Economic and Educational Transformations in the Context of Digitalization" (state registration number 0121U114570) incorporates the author's findings considering optimising regional resource allocation processes in higher education. Third, "The Innovative Drivers of the Growth of the Country's Macroeconomic Stability" (state registration number 0121U114396) integrates the author's results on the relationship between the efficiency of state financial resource management in higher education and national macroeconomic stability. Fourth, "Transformation of the Financial System and Strategic Priorities of its Development" (state registration number 0121U114477) includes the author's investigation of the factors affecting investments in higher education and their influence on regional economic development. Yang Yu's dissertation utilises findings and insights from these research projects to deepen theoretical understanding, refine methodological approaches, and propose practical recommendations for improving financial resource

management in higher education. These contributions support the goal of achieving regional equity, efficiency, and adequacy in financial provision, fostering socio-economic development and educational innovation.

3. The degree of validity and reliability of the scientific positions, conclusions and recommendations formulated in the dissertation

The scientific positions, conclusions, and recommendations proposed by the applicant are logical, theoretically sound, and statistically robust. Notably, the thesis accurately defines the subject of study and the research topic and clearly delineates the research tasks. The thesis includes a profound and meaningful analysis of scientific and methodological sources and a substantial amount of statistical data, encompassing information from 31 provinces in China from 2007 to 2018. The reliability of the scientific outcomes, conclusions, and recommendations is corroborated by their presentation and favourable evaluation at four international scientific and practical conferences and through the list of the author's own scientific publications.

While writing the thesis, Yang Yu effectively combines general scientific methods (induction, deduction, analysis, synthesis, and scientific abstraction) with specialised research methodologies (bibliometric analysis using VOSviewer, logical-historical analysis, and the grouping method). The empirical computations and modelling in this study were carried out using a comprehensive suite of software tools and programming languages, including statistical analysis software, geographic information systems (GIS), data visualisation and graphics, data envelopment analysis (DEA) software, and structural equation modelling (SEM) software. The choice of these tools and technologies is motivated and logically aligned with the tasks set for the research.

Therefore, the research findings of Yang Yu's thesis enrich and advance the scientific methodology for assessing the impact of state financial resource management in higher education on regional equity, efficiency, and the adequacy of financial provision.

4. Novelty of the scientific provisions, conclusions and recommendations formulated in the thesis

The analysis of Yang Yu's thesis, particularly its hypotheses, results, conclusions, and recommendations, reveals a substantial contribution to advancing the theoretical and methodological foundations for assessing the impact of state financial resource management in higher education. The work is distinguished by several innovative elements that enhance understanding of regional equity, efficiency, and funding adequacy in educational finance. The most significant outcomes of the research, characterised by scientific novelty, are as follows:

For the first time, the thesis proposes a comprehensive approach to evaluating the effectiveness of state financial resource management in higher education regarding the equalisation of financial support. This approach integrates the calculation of σ -convergence, absolute β -convergence, and conditional β -convergence of per capita public funding for higher education. It facilitates the analysis of horizontal trends in higher education financial expenditures over time, the assessment of whether expenditures converge toward a steady-state equilibrium across regions, the estimation of convergence rates and the time required to reduce interregional disparities. This method evaluates trends in convergence and divergence over ten years at both national and sub-regional levels in China, providing a robust framework for measuring uniformity in financial support.

The thesis refines the methodological foundations for ensuring regional equity in higher education financial management by utilising Dagum's Gini coefficient to assess disparities. This innovative approach enables mapping regions based on the level of higher education funding, examining intra- and inter-regional disparities and their evolution over a decade, assessing the contributions of these disparities to overall inequality, and developing targeted strategies to promote regional equity in financial resource allocation.

The thesis introduces a modified three-stage DEA model combined with stochastic frontier analysis to exclude statistical noise and external environmental factors. Key features of this approach include utilising student numbers, full-time teaching staff, and new value-added fixed assets as output indicators, incorporating per capita GDP, university cluster environments, and government decentralisation as external indicators, and providing five-year interval analyses of financial efficiency across all Chinese provinces over a ten-year period. These enhancements support actionable recommendations to improve the management of financial resources in higher education.

The thesis advances the understanding of how educational investment stimulates economic growth by investigating both direct impacts (e.g., financial inputs into education) and indirect impacts through human and intellectual capital, measured by indicators such as the average duration of education and patent activity, employing a production function framework adjusted for urbanisation, trade dependency, and population growth, and utilising a panel regression model with fixed and random effects to provide nuanced insights into the economic returns of educational investment.

The thesis develops a refined strategy for optimising horizontal transfer payments for interregional resource distribution. Unlike existing practices in China, which rely on normative expenditure calculations, this approach introduces a financial sufficiency coefficient. This metric evaluates the ratio of optimal (region-specific) to

actual expenditures, enabling dynamic adjustments in resource allocation in response to changing socioeconomic conditions and a more equitable and efficient allocation system that considers provincial disparities and their developmental needs.

A novel methodology for evaluating funding adequacy is introduced based on calculating standard expenditures per student across regions. Key findings include an average adequacy level of 0.79 for higher education funding in China, highlighting systemic underfunding and significant regional disparities, with the central and northeastern regions experiencing the most critical gaps between actual and required expenditures. In contrast, the eastern regions benefit from higher adequacy levels and insights into regional funding imbalances, providing a basis for policy interventions to enhance adequacy and equity.

Yang Yu's thesis offers a comprehensive and innovative framework for managing state financial resources in higher education, addressing critical issues of regional equity, efficiency, and funding adequacy. By introducing novel theoretical perspectives and methodological tools, the research significantly advances the field of educational finance and resource management. The scientific provisions, conclusions, and recommendations represent a valuable contribution to improving higher education systems and promoting balanced socio-economic development.

5. Completeness of reflection of research results in published scientific works

The research findings of the thesis are fully reflected in the published scientific works. Based on the research outcomes of the thesis, Yang Yu has published 11 scientific works with a total volume of 11.01 printed pages, of which 8.85 pages are personally contributed by the author. These include 1 article in a scientific journal indexed by the international scientometric database Web of Science, six articles in specialised scientific journals of Ukraine of the "B" category, and four conference proceedings.

The thesis is logically structured, contains well-substantiated scientific positions, and provides a sufficient number of tables and figures in the main body and appendices of the thesis.

6. Compliance of the dissertation research with the established requirements

Yang Yu's doctoral dissertation comprises abstracts in two languages (English and Ukrainian), a list of published works, an introduction, three chapters, separate conclusions for each chapter, as well as overall conclusions for the entire work, a list of references, and appendices. The complete thesis spans 260 pages, including 213 pages of main text, 25 tables, 38 figures, five appendices, and a reference list of 240

entries. The dissertation is written in a scientific style and follows a precise, logical sequence in achieving its objectives.

7. Theoretical value and practical significance of scientific results

The practical value of the dissertation lies in its theoretical frameworks, methodological approaches, and practical recommendations, which can be utilised by Chinese state authorities to reform the organisational and economic structures of the higher education system. Local governments in China can apply these findings to improve financial management within their jurisdictions. At the same time, educational service providers can use them to develop internal strategies, prioritise key activities, and foster collaboration with stakeholders in the educational services market. These findings provide a robust theoretical foundation for national and local policymakers to design strategies for optimising the equitable allocation of national and regional higher education resources.

The recommendations can be implemented at various levels – national, local, and institutional – to enhance the efficiency of financial resource utilisation in higher education and promote a balanced resource allocation across regions.

A methodological approach for evaluating the efficiency of budgetary financial expenditures on higher education, using a modified three-stage DEA model combined with the BCC model and SFA method, has already been applied in the educational activities of Sumy State University (course “Budgetary Management” statement dated November 2024). Additionally, findings on international public management practices, focusing on regional equity, efficiency, and funding adequacy, were incorporated into the work of the European Marketing and Management Association (EUMMAS) (confirmation letter dated 19 September 2024).

Approaches related to regional clustering based on the alignment of economic and educational development, as well as strategies for designing local management systems to ensure consistency between the demand for skilled professionals and regional economic needs, were implemented by the NGO "Centre for Lifelong Education" (reference number 1-08, 15 August 2024). Proposals for optimising horizontal transfer payments to balance interregional resource distribution were applied by the Eastern European Association for Civic Education (EENCE) (reference number 1, 10 October 2024). Furthermore, recommendations for analysing educational inequality and disparities in resource distribution, using Dagum's Gini coefficient, were adopted by the Centre of Sociological Research, Poland (reference number 1/17/7/24, 17 July 2024).

Details of these implementations are provided in the Dissertation Appendix.

8. Absence (presence) of a violation of academic integrity

The scientific findings of the dissertation were obtained independently by the author. Only those ideas and provisions that were personally developed by the applicant from co-authored publications are included in the dissertation. Following a review of the thesis by Yang Yu for signs of academic plagiarism, the accuracy of specific references to the primary sources of textual and illustrative borrowings has been confirmed; no instances of deliberate distortion were found. Consequently, it can be concluded that there are no violations of academic integrity.

No violations of academic integrity were identified in Yang Yu's dissertation. The research preparation adhered to all ethical principles and norms as defined by the Law of Ukraine "On Education." The dissertation includes references to relevant information sources of both Ukrainian and international origin, provides accurate details about the methods and results of the study, and complies with copyright and related rights legislation. This allows for the conclusion that the applicant has fully met academic integrity requirements.

9. Discussion points and shortcomings of the thesis

In assessing the overall strengths of Yang Yu's doctoral dissertation, it is essential to address several key discussion points:

1. The dissertation establishes a strong theoretical foundation for managing state financial resources in higher education, focusing on regional equity, efficiency, and adequacy of financial provision. Using econometric models, convergence analysis, and Data Envelopment Analysis (DEA) demonstrates a robust methodological approach. However, expanding the range of input keywords during literature searches could further enrich the theoretical basis and provide a broader understanding of global trends and contexts.
2. A significant strength is a detailed examination of funding imbalances across China's eastern, central, western, and northeastern regions. Applying the Gini coefficient and convergence models effectively highlights these disparities and trends towards convergence. Nevertheless, a more thorough exploration of socio-economic and cultural factors underlying these disparities could deepen the analysis and offer additional insights.
3. The innovative application of the three-stage DEA model provides valuable insights into the mismatch between funding allocation and regional needs. However, the analysis could be enhanced by examining region-specific factors contributing to inefficiencies, such as variations in infrastructure, teacher quality, and regional economic policies. A more granular focus could yield actionable recommendations tailored to each region.

4. Introducing a methodology to assess funding adequacy based on standard expenditures per student across regions represents a significant contribution. The finding of a 0.79 adequacy level, indicating underfunding, is critical. Further research could examine the long-term effects of this underfunding on educational quality and regional development, along with strategies to mitigate these challenges.
5. The dissertation provides a range of practical recommendations to improve financial resource management in higher education. While these proposals are valuable, their impact could be enhanced by including a more detailed implementation plan. Additionally, addressing potential barriers to adoption within China's complex educational and fiscal systems would strengthen their applicability.
6. The comparative analysis of higher education resource allocation models in China, the United States, the United Kingdom, and Japan is a notable feature of the dissertation. This approach effectively identifies best practices and areas for improvement. However, a deeper examination of the cultural, political, and economic factors influencing these models would offer a richer perspective on their relevance to China's unique circumstances.

These discussion points aim to refine further and enhance the theoretical and practical contributions of the dissertation. They are intended to stimulate constructive dialogue and do not detract from the work's overall high quality and positive evaluation.

10. General assessment of the dissertation and its compliance with the established requirements

The doctoral dissertation by Yang Yu, titled "The Management of State Financial Resources in Higher Education: Enhancing Regional Equity, Efficiency, and Adequacy of Financial Provision," represents a thorough study conducted independently in alignment with the stated research objectives. The dissertation is supported by the author's scientific publications, which substantiate the theoretical and practical value of the research and reflect the novelty of its scientific contributions.

The study's main findings have been presented and validated at national and international scientific and practical conferences. Furthermore, they have been incorporated into the research initiatives at Sumy State University, demonstrating the practical applicability of the work. The content and structure of the dissertation are consistent with the stated topic, ensuring the successful attainment of the research goals and the resolution of the assigned tasks. The scientific novelty, practical recommendations, and conclusions presented for defence are clearly articulated and supported by evidence in the dissertation.

In light of these achievements, the dissertation complies with the standards outlined in the Order of the Cabinet of Ministers of Ukraine No. 44, dated January 12, 2022, "On Approval of the Procedure for the Award of the Degree of Doctor of Philosophy and Cancellation of the Decision of the Once-Established Specialized Academic Council of the Higher Education Institution, Scientific Institution on the Award of the Degree of Doctor of Philosophy." Therefore, Yang Yu deserves to be awarded the academic degree of Doctor of Philosophy in the field of study 07 "Management and Administration" Speciality (program subject area) 073 "Management".

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