Inter-provincial Disparities in Public Expenditure on Primary Education in China: Evidence from Panel Data of 31 Provinces (2021-2025)

Ya-nan Jin*
Faculty of Education, East China Normal University, Shanghai 200062, China
*Corresponding email: amberknightley@163.com

Abstract

Educational equity serves as the cornerstone for building a powerful nation in education. Focusing on the foundational stage of compulsory education, this study comprehensively analyzes the inter-provincial disparities, spatio-temporal dynamic distributions, and equity characteristics of per-student public budgetary expenditure in primary education across 31 provinces in China from 2021 to 2025. By employing statistical methods such as the range, Gini coefficient, and Lorenz curve, the study reveals several key findings. First, during the research period, although the total funding for primary education in China experienced continuous growth, the spatial non-equilibrium of resource allocation remained prominent. The range of total inter-provincial fiscal investment exhibited an expanding trend, indicating that the regional agglomeration of incremental funds and the "Matthew effect" have not been fundamentally reversed. Second, leveraging its robust fiscal foundation and strong capacity to absorb social capital, the eastern region consistently occupied a high position in resource agglomeration, whereas the central and western regions (particularly the west) faced a rigid financing structure heavily dependent on central transfer payments. Furthermore, a significant "center-periphery" disparity was observed within the eastern region itself. Third, the Gini coefficient of per-student public budgetary expenditure in primary education demonstrated an "initially decreasing and subsequently increasing" fluctuating trend, with values in all years far exceeding the relatively equitable interval of 0.2-0.3. This highlights profound spatial inequalities and resource dislocations. On this basis, this paper proposes policy recommendations. These include optimizing the structure of transfer payments to implement "precision irrigation", advancing the standardized construction of urban-rural integration, and deepening the "county-managed and school-hired" system for cross-regional teacher sharing. Additionally, it suggests constructing digital governance and dynamic adjustment mechanisms, and innovating diversified financing channels to leverage social capital. These recommendations aim to provide empirical evidence and policy references for the high-quality and balanced development of compulsory education in China.

Keywords

Primary education, Per-student public budgetary expenditure, Gini coefficient, Educational equity

Introduction

Educational equity serves as the cornerstone for building an educational powerhouse, and it is particularly critical for fostering social mobility and enhancing the overall quality of the population during the compulsory education stage [1]. Since the promulgation of the Compulsory Education Law in 1986 and the introduction of the "urban-rural integration mechanism" in the National Outline for Medium and Long-Term Education Reform and Development Plan in 2010, China has achieved remarkable progress in the universalization and equalization of compulsory education. These achievements have laid a solid foundation.

However, against the backdrop of economic transformation and the diversification of educational demands, the pursuit of educational equity is currently confronting new and intricate challenges.

From the perspective of spatial distribution, regional

imbalances in fiscal input remain prominent. Leveraging its economic advantages, the eastern region has realized resource agglomeration. The central and western regions, especially rural areas, suffer from a relative scarcity of resources due to constraints in local fiscal capacity and policy bottlenecks. Although policies such as the *Reform Plan for the Compulsory Education Funding Guarantee Mechanism* have attempted to mitigate these disparities through central transfer payments, their practical efficacy remains limited. To this end, the government should introduce formula-based funding strategies to ensure the precision of educational resource allocation [2].

As China's compulsory education enters the stage of high-quality and balanced development, the connotation of educational equity has shifted from "basic provision" to "high-quality equity". This transition highlights current deficiencies in the synergy between "adequacy" and "equity" regarding fiscal input. Furthermore, the central region has long been trapped in a "central collapse" (or *sagging*) dilemma regarding the allocation of fiscal resources. This is owing to constrained local financial capacity and insufficient support from central transfer payments. Even though national policies are continuously improved and the equity of compulsory education in China has advanced along the temporal dimension, a pronounced regional gap in educational equity persists. Between 2011 and 2022, educational resources in eastern China exhibited a "Low-Low" spatial clustering pattern, while the western region concurrently witnessed high-inequality clusters and potential radiation centers. Such significant positive spatial autocorrelation indicates that the spatial convergence effect of fiscal input diverges markedly across the eastern, central, and western regions.

In summary, existing literature predominantly focuses on the macro-dimension of compulsory education as a whole. However, research specifically targeting inter-provincial disparities in fiscal input during the "primary education stage" and their underlying causes remains relatively scarce. As the starting point of compulsory education, primary education performs an irreplaceable bottom-line safeguarding function. Therefore, this study focuses on the primary school stage. It utilizes fiscal data on primary education across 31 provinces in China from 2021 to 2025 to comprehensively analyze the overall landscape of primary education fiscal input and the factors influencing inter-provincial variations. This study aims to reveal the actual status of primary education resource allocation by calculating the range of per-pupil expenditure, spatiotemporal dynamic distributions, and equity indicators. It thereby provides empirical evidence to optimize the structure of educational fiscal investment and refine the policy framework for high-quality and balanced development [3].

Research design

Data sources

The relevant data for this study are sourced from the *Educational Statistics Yearbook of China* and the *China Educational Finance Statistical Yearbook*. Considering data availability and completeness, the dataset covers 31 provinces, municipalities, and autonomous regions in China (excluding Hong Kong, Macao, and Taiwan) spanning from 2021 to 2025 [4]. Specifically, data regarding primary education expenditure and per-pupil budgetary educational expenditure are obtained from the *China Educational Finance Statistical Yearbook*. The number of enrolled students is derived from the Educational Statistics Yearbook of China.

Indicator selection

In China, state financial educational funding currently constitutes the primary source of primary education expenditure, with budgetary educational funding acting as its principal component. The per-pupil budgetary educational expenditure accurately reflects the level of financial investment allocated to each student within the annual budgets across varying levels of government. Therefore, this study adopts per-pupil budgetary educational expenditure as the core indicator for measurement [5].

Regional division

This study adopts the current regional classification standards established by the National Bureau of Statistics, categorizing regions into eastern, central, and western China. The eastern region encompasses Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. The central region includes Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan. The western region comprises Inner Mongolia, Guangxi, Chongqing,

Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang. The educational contexts and economic development trajectories of Hong Kong, Macao, and Taiwan are not entirely synchronous or uniform with those of the Chinese mainland. Therefore, a comparative analysis yields limited significance. Consequently, this regional division excludes the regions of Hong Kong, Macao, and Taiwan.

Research Methods

To accurately reflect the evolution of primary education fiscal input and its inter-provincial disparities in China between 2021 and 2025, this study utilizes the range and the Gini coefficient for quantitative measurement and analysis.

(1) Range

The range is a statistical indicator that intuitively reflects the variation scope of a dataset (the difference between the maximum and minimum values). In educational studies, it is frequently employed to measure the gap in educational resources between regions or demographic groups. However, the range is highly sensitive to extreme values and neglects overall distributional characteristics. Thus, it must be utilized in conjunction with indicators such as the Gini coefficient and standard deviation when evaluating educational equity. Only through such a comprehensive approach can the actual state of educational resource allocation be accurately assessed [6].

(2) Gini coefficient

The Gini coefficient is an indicator used to measure the degree of distributional inequality, with values ranging from 0 to 1; a higher value signifies greater imbalance. Its core mechanism involves evaluating the deviation of the actual distribution from the line of absolute equality via the Lorenz curve. Within the realm of educational equity research, this indicator is commonly utilized to calculate allocation gaps in per-pupil funding and educational opportunities across regions or schools. It intuitively reveals the disequilibrium in resource distribution, thereby providing quantitative support for educational policy adjustments and equity evaluations.

This paper adopts the empirical formula for the educational Gini coefficient derived by the Urban Survey Department, National Bureau of Statistics of China., expressed as follows:

$$G=1-\sum_{i=1}^{n} P_i(2Q_i-W_i) \quad (1)$$

The calculation process for the Gini coefficient is detailed as follows: First, the per-pupil budgetary expenditures for primary schools across the 31 provinces are sorted in ascending order. Then, the proportion of local primary school enrollment to the national total (P_i), the proportion of primary school budgetary expenditure to the national total (W_i), and the cumulative proportion (Q_i) are calculated for each province, respectively. Finally, the Gini coefficient (G) is computed based on these variables.

Discussion

Overview of fiscal input in primary education

As illustrated in the Figure 1 and 2, from 2021 to 2025, the total expenditure on primary education across various regions in China exhibited a steady year-on-year growth trend. This continuous rise in overall educational investment reflects the national government's sustained efforts to promote educational equity and enhance educational quality. Despite the increase in total funding, apparent gaps between different regions persist. Specifically, the eastern region maintains a commanding lead in educational expenditure, whereas the central and western regions - particularly the west - remain at relatively low expenditure levels. This indicates that China still faces substantial challenges in advancing educational equity.

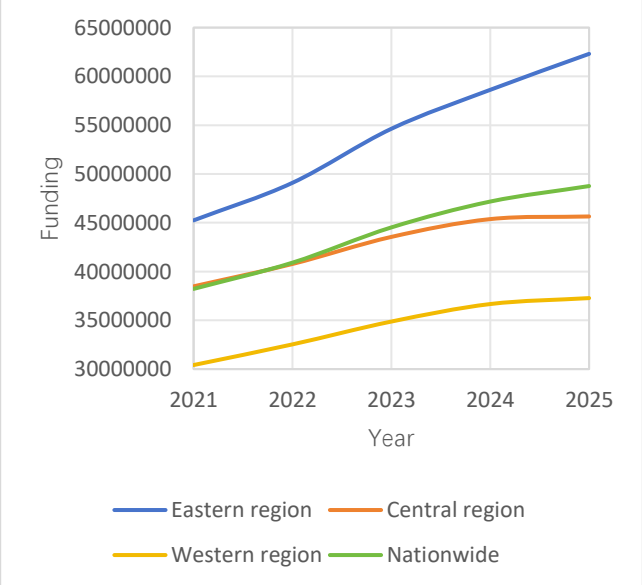

Figure 1. Total local primary education funding by region (unit: thousands of RMB).

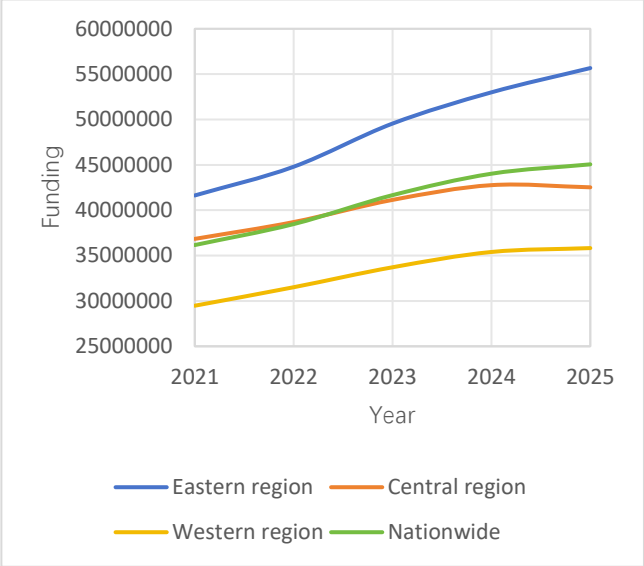

Figure 2. Local primary education state financial funding by region (unit: thousands of RMB).

(1) Inter-regional analysis

Based on the data in Figure 3, the total primary education funding in China from 2021 to 2025 displayed significant regional disequilibrium. This disparity is being further amplified by differences in regional financing structures. In the eastern region, both the total expenditure and its growth rate maintain an absolute dominant position. This is not only supported by a robust local fiscal foundation but also driven by a strong capacity to absorb social capital (e.g., a high proportion of off-budget funding such as donations and sponsorships). However, the sustained high-level growth of funding in the east objectively accentuates the polarization trend of national educational resources.

In the central region, although total funding has maintained steady growth, the growth rate flattened after 2024, and the overall level remains significantly lower than that of the east [7]. Constrained by limited regional economic and fiscal capacity, the central region struggles to form a competitive advantage in resource allocation, facing immense pressure to improve educational quality. In the western region, expenditure has long hovered at a low level with sluggish growth. The western region is highly dependent on central financial transfer payments; due to lagging overall economic development, it is exceptionally difficult to attract non-governmental funds such as social capital. This monolithic financing structure makes it difficult to achieve a fundamental breakthrough in its educational resource shortage dilemma in the short term.

Overall, the stark contrast in non-governmental funding (off-budget capital) is a direct reflection of regional economic strength. This contrast further widens the educational funding gap originally dominated by local fiscal capacity. It exacerbates the inequality of educational resource allocation across regions.

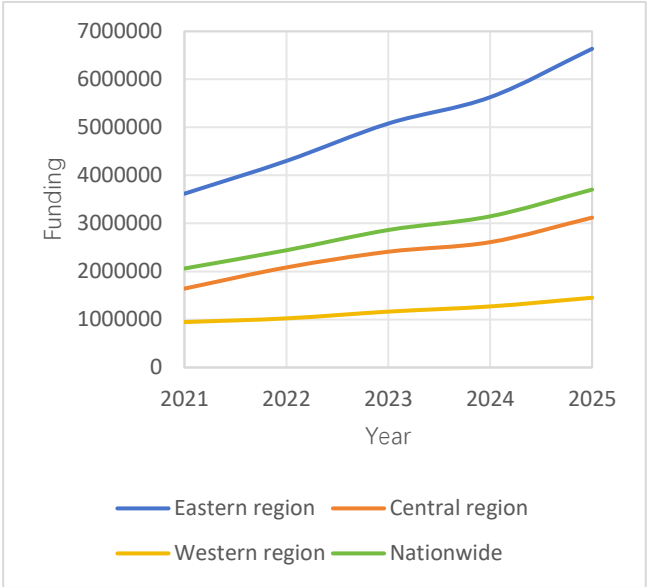

Figure 3. Local primary education funding (excluding fiscal funding) by region (unit: thousands of RMB).

(2) Summary of the current status

a) Exacerbation of regional gaps

Judging from the distribution of total funding, government financial funding, and non-governmental funding, the fiscal input in the eastern region is significantly higher than that in the central and western regions. This disparity exacerbates the uneven development of education across regions. Although the central region has experienced growth, it remains unable to catch up with the east, while the gap in the western region is even more pronounced. Regional disparities intensify the differences in educational resources available to students in various areas, thereby impeding the realization of educational equity.

b) Disparities in educational quality

The educational financial input in the eastern region is significantly higher, especially with the support of non-governmental funding. The region can provide more comprehensive educational services and resources, which in turn elevates local educational quality. Conversely, due to a severe lack of non-governmental funding, the central and western regions, particularly the west, struggle to match the educational quality of

the east. Such qualitative disparities may lead to inequalities in educational opportunities and future development prospects for students across different regions.

c) Imbalance in non-governmental funding

The relative abundance of non-governmental funding in the eastern region provides it with greater flexibility and options. The scarcity of such funding in the central and western regions restricts the diversification of their educational funding sources. If this gap persists, it may further widen the inequality of educational resources and opportunities between regions [8].

Analysis of inter-provincial disparities

(1) Range

Figure 4 reveals the evolutionary trend of the absolute disparities in primary education funding among 31 provinces nationwide from 2021 to 2025. Regarding the "The range of national fiscal funds" (orange line), the gap in total inter-provincial financial input shows a continuous widening trend. This indicates obvious regional agglomeration characteristics in the incremental educational financial funds. Concurrently, the "The range of per capita expenditure" (blue bars) surged sharply from 2021 to 2023, peaking in 2023, which reflects an extreme disequilibrium in fund allocation during this period. Although the per-pupil range slightly retreated after 2024, it generally remained at a high level. The trajectories of these two indicators suggest that the "Matthew effect" has not been fundamentally reversed, despite the increase in total educational financial input at the national level. The "Matthew effect" refers to incremental funds leaning toward economically robust or policy-prioritized regions. The minor pullback in the per-pupil expenditure range after 2024 did not alter the basic reality of a continuously expanding gap in total funding. This long-term inter-provincial funding divide severely restricts the overall advancement of national educational equity. Therefore, future funding guarantee mechanisms must focus not only on "aggregate growth" but also on the structural optimization of resource allocation. This will effectively narrow the absolute inter-provincial gaps through precise transfer payment systems [9].

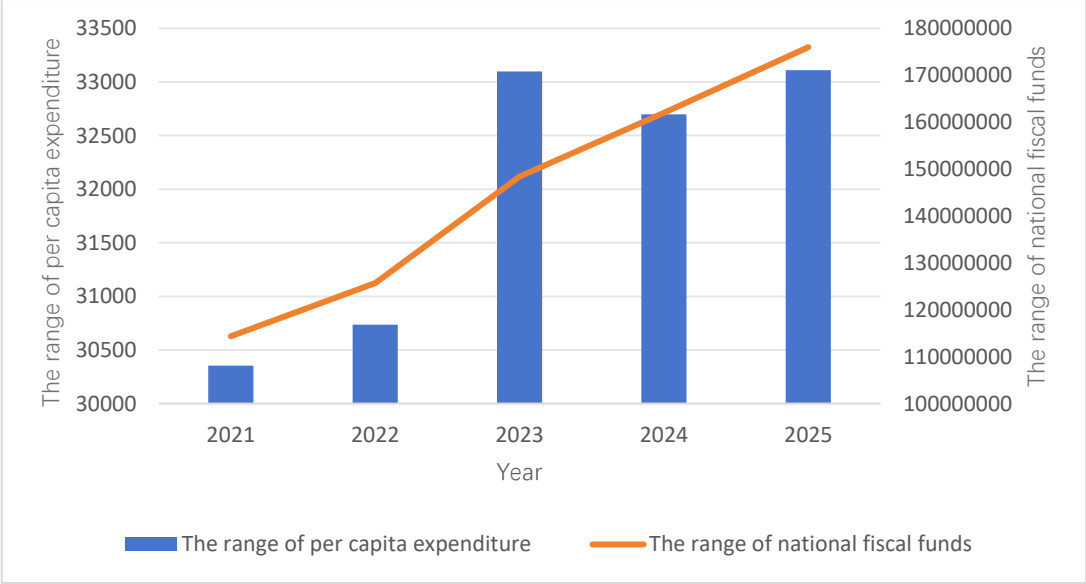

Figure 4. Range of per-pupil expenditure and range of state financial educational funding for primary education in 31 provinces (2021-2025).

(2) Gini coefficient

Utilizing the practical calculation formula, the Gini coefficients of the per-pupil budgetary educational expenditure for primary schools in China from 2021 to 2025 were calculated and are presented in Figure 5.

During this period, the Gini coefficient exhibited a fluctuating "decrease-then-increase" trend. The coefficient steadily declined from 0.479 in 2021 to 0.447 in 2024, indicating a mitigation of the regional disequilibrium in previous educational resource allocations.

However, it rebounded slightly to 0.455 in 2025, which may be correlated with macroeconomic fluctuations and structural adjustments in fiscal expenditure. Overall, the

Gini coefficients for all years far exceed the relative equity threshold of 0.2-0.3, underscoring that profound spatial inequalities persist in the allocation of primary education resources in China. This disequilibrium is particularly drastic at the inter-provincial level. Taking 2024 as an example, core cities in the eastern region (e.g., Beijing, with a per-pupil expenditure of 41,649.21 RMB) far surpass central and western provinces (e.g., Henan at 8,952.23 RMB). A significant "center-periphery" gap also exists within the eastern region itself, as Hebei, within the same Beijing-Tianjin-Hebei cluster, recorded only 10,341.06 RMB. This indicates a high degree of resource agglomeration in advantaged areas with extremely limited "spillover effects" on geographically adjacent regions, forming a stark resource fracture. This is corroborated by the evolutionary trend of the Lorenz curve, which demonstrates that a large proportion of educational expenditure continues to be concentrated in a few advantaged regions. This solidified structure, which deviates from the line of absolute equality, suggests that the inter-regional gap in educational opportunities remains the core pain point restricting the realization of educational equity [10].

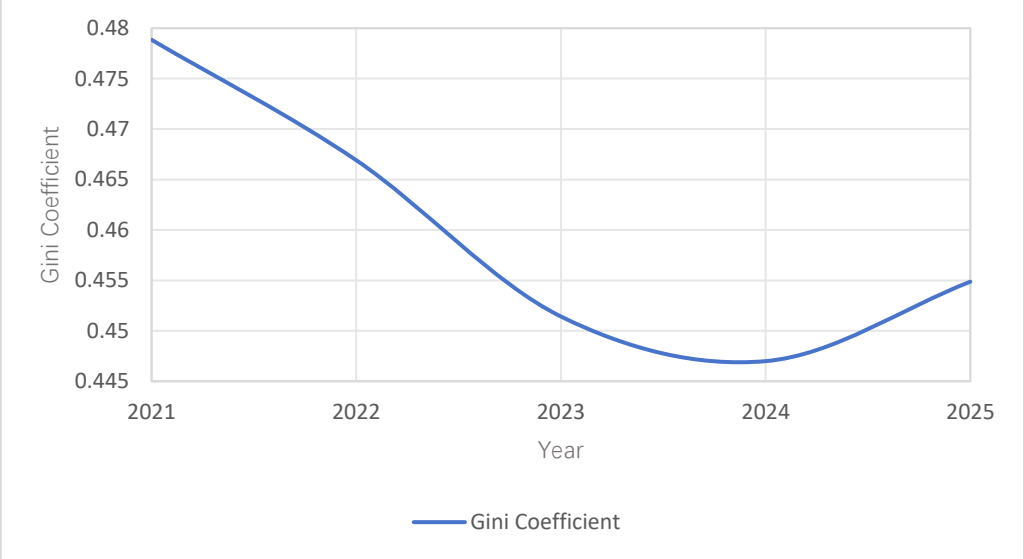

Figure 5. Gini coefficients of per-pupil budgetary educational expenditure for primary schools in China (2021-2025).

Based on the above data analysis, this study summarizes the current situation into the following points.

a) Imbalance in fiscal input

Observations of the per-pupil expenditure and Gini coefficients of local primary schools reveal that educational expenditures and revenues are higher in the eastern region. For instance, provinces and municipalities such as Beijing, Shanghai, Jiangsu, and Zhejiang exhibit higher educational expenditures than the central and western regions. Benefiting from rapid economic development and ample fiscal revenues, these regions can provide more financial support for the education sector. In contrast, lower fiscal expenditures in the western and central regions result in a scarcity of educational resources, limiting students' equality of opportunity in accessing education.

b) Gaps in government financial support

The fluctuations in the Gini coefficient reflect the government's efforts to promote educational fiscal equity. Financial expenditures have increased in recent years, and the government has adopted measures to foster regional educational equity. However, disparities in local fiscal revenues - especially the poorer financial conditions in the central and western regions - lead to inadequate educational expenditure. Consequently, the gap in educational resource allocation between the eastern and western regions remains prominent, directly impacting educational equity.

c) Concentration of educational resource allocation

According to Figure 6, a high concentration of educational resources is evident. Particularly in the eastern region, the proportion of educational expenditure and revenue is relatively high, whereas it is lower in the western and central regions. This uneven resource distribution means that students in economically developed areas can enjoy abundant educational resources. Those in underdeveloped areas

face a shortage. This adversely affects educational quality and students' developmental opportunities.

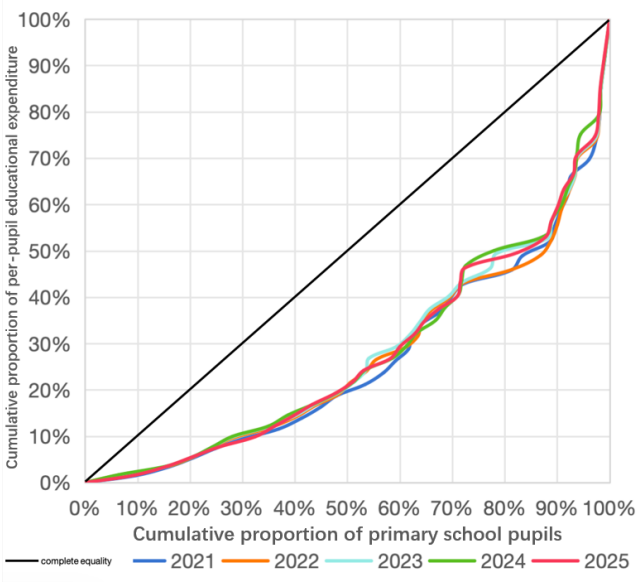

Figure 6. Lorenz curves of per-pupil budgetary educational expenditure for primary schools in China (2021-2025).

d) Impact of the pandemic and other factors

The rebound of the Gini coefficient may be linked to post-pandemic fiscal adjustments. Due to the economic pressures brought about by the pandemic, some regions may have faced reductions in educational funding, leading to a widening gap in the distribution of educational resources. Other socioeconomic factors, such as the fiscal pressures on local governments and the advancement of educational reforms, may have also influenced resource allocation.

e) The driving role of fiscal input on educational equity

In recent years, the Chinese government has continuously increased its fiscal investment in education. Notably, more resources have been directed to the central and western regions, improving educational conditions in certain areas. However, to achieve genuine educational equity, it is imperative to further strengthen financial support for economically underdeveloped regions. This support should be particularly focused on the critical areas of infrastructure construction, teaching staff enhancement, and the implementation of educational equity policies.

Comprehensive inter-provincial analysis

The detailed revenue and expenditure data for local primary schools in China from 2021 to 2025 highlight significant spatial disequilibrium in the allocation of educational resources. Relying on the apparent early-mover advantage of regional economies, the per-pupil funding guarantee levels in the eastern region (such as Beijing, Shanghai, Jiangsu, and Zhejiang) considerably far exceed those in the central and western regions. For example, the annual per-pupil expenditure in Beijing reached an impressive 41,743.93 RMB, while in the western provinces of Qinghai and Tibet, it was merely 19,855.69 RMB and 29,062.44 RMB, respectively. This disparity in existing economic baselines objectively widens the educational quality gap across regions. Analyzing the temporal fluctuation trajectory of the Gini coefficient, it is evident that China has achieved certain preliminary results in promoting the equalization of resource allocation. However, the overall process of narrowing regional gaps remains complex and repetitive. Constrained by weak local finances, funding shortages in central and western provinces directly restrict the improvement of local educational quality.

Moreover, they also limit students' fair opportunities to access equally high-quality education. Therefore, resolving regional financial imbalances remains the top priority in deepening educational equity. Moving forward, educational fiscal policies urgently need to tilt further toward the central and western regions, implementing precise support through an optimized transfer payment system. The government should focus on increasing investment in key areas such as the upgrading of educational infrastructure and the cultivation of high-quality teaching staff. This will bridge the resource allocation shortfall caused by economic backwardness and fundamentally guarantee substantial equity in educational opportunities for students across all regions [11].

Conclusion

Optimizing the structure of fiscal input and strengthening support for underdeveloped regions

To achieve educational equity, the precision of fiscal support policies must be deepened. The state should continuously increase financial transfer payments to the central and western regions, particularly the west. It should shift from a broad-brush approach (akin to "flood irrigation") to targeted support ("precision drip irrigation"). To this end, a dynamic calculation mechanism based on regional educational development

levels and per-pupil resource shortfalls should be established. This mechanism should ensure that incremental funds flow precisely into disadvantaged provinces. Especially for rural areas in the central and western regions, it is necessary to further raise the per-capita financial allocation standards. Financial resources should also be pooled to bridge the gaps in infrastructure and teaching staff.

Promoting urban-rural integration and facilitating the balanced allocation of educational resources

The integration of urban and rural compulsory education serves as the pathway to dismantling the dual-structure of resource allocation. The efficient flow of high-quality educational resources should be promoted through regional resource consolidation and urban-rural cooperation models. On the one hand, policy and regulatory frameworks for integrated urban-rural development should be perfected. This will deepen "pairing assistance" (twinning programs) and resource sharing between rural primary schools and high-quality urban schools. On the other hand, unified equalization standards for the operating conditions of rural schools should be formulated to ensure that hardware facilities gradually align with urban benchmarks. Concurrently, end-to-end comprehensive oversight regarding the utilization of educational funds in the central and western regions must be strengthened to fully enhance the efficiency of fund utilization.

Enhancing the quality of the teaching workforce and implementing inter-regional teacher-sharing policies

High-quality teaching staff are the core to realizing educational equity. In response to the severe shortage and brain drain of high-quality teachers in the central, western, and rural areas, inter-provincial and inter-school teacher deployment should be strengthened at the macro level. Mechanisms such as the "county-management and school-employment" system and regular cross-regional teacher rotations should be comprehensively implemented. This should facilitate the flow of premium teaching personnel down to disadvantaged schools. Simultaneously, it is imperative to fundamentally attract and retain outstanding talent at the grassroots level. This requires establishing special allowances for rural teachers, refining preferential professional title evaluation systems, and improving professional growth support frameworks.

Improving the spatial allocation of educational resources and narrowing inter-school gaps

The uneven allocation of resources exists not only across macro-regions but also microscopically among schools. To this end, the standardized construction of compulsory education schools should be comprehensively strengthened, and a dynamic monitoring mechanism for teaching conditions should be established. In the process of advancing the high-quality and balanced development of compulsory education, the traditional hierarchical differentiation of schools must be resolutely broken down. Public educational resources must be equitably tilted from "key" (elite) schools toward ordinary and disadvantaged schools, ensuring that all school-aged children enjoy an equal educational starting point.

Exploring dynamic policy adjustment mechanisms based on data analysis

Rely on the dynamic evolutionary trends of the per-pupil educational funding range, Gini coefficient, and Lorenz curve. It is recommended to construct a data-driven policy decision-making and adjustment mechanism. Utilizing big data analysis, real-time monitoring and precise profiling of educational resource shortfalls across the 31 provinces should be conducted. The evolutionary patterns of funding ranges among the eastern, central, and western regions serve as a scientific basis. The volume and structure of central fiscal transfer payments to local governments should be dynamically adjusted accordingly. Priority targeted injections should be implemented for provinces with widening ranges and significant funding gaps. This would enhance the flexibility and regulatory efficacy of educational policies.

Deepening diversified funding mechanisms and guiding social capital to support basic education

Under the premise of expanding the primary channel of government fiscal input, the supplementary role of social capital should be activated through institutional innovation. The central and western regions face a practical bottleneck of weak absorption capacity for non-governmental funding. The state should introduce a combination of policies such as tax exemptions and honorary incentives. These policies should guide donations and sponsorships from enterprises, non-governmental organizations, and societal leaders

toward the central and western regions and disadvantaged schools. Concurrently, market-oriented educational behaviors must be legally regulated to prevent the excessive concentration of non-public resources from further widening regional and inter-school gaps.

Funding

This work was not supported by any funds.

Acknowledgements

The author would like to show sincere thanks to those techniques who have contributed to this research.

Conflicts of Interest

The author declares no conflict of interest.

References

[1] Luo, G., Zeng, S., Baležentis, T. (2022) Multidimensional measurement and comparison of China's educational inequality. *Social Indicators Research*, 163, 857-874.

[2] Wang, Y., Cai, Q. (2025) Education fiscal expenditure, digital inclusive finance, and urban-rural education returns. *Finance Research Letters*, 86, 108916.

[3] Guo, D. (2025) Urban-rural school-age population changes and compulsory education resource allocation. *Frontiers in Education*, 10, 1695386.

[4] Xu, C., Shi, B. (2026) Spatial inequality in school physical education resources in Shaanxi, China (2021-2024): patterns, determinants, and policy implications. *Scientific Reports,* 16 (1), 8647.

[5] Villena-Taranilla, R., Tirado-Olivares, S., Cózar-Gutiérrez, R., González-Calero, J. A. (2022) Effects of virtual reality on learning outcomes in K-6 education: a meta-analysis. *Educational Research Review*, 35, 100434.

[6] Hu, Y., Zhou, W. (2024) Adequacy and fairness: an empirical study of financial investment in compulsory education in China under the guidance of quality and balance. *Education & Economy*, 40(03), 69-78.

[7] Gao, Z., Shi, T., Shang, L. (2026) Forecasting educational inequality in China for sustainable development: a hybrid framework of GM(1,1) and CS-SVR. *Sustainability*, 18(9), 4284.

[8] Zeng, S., Xia, F., Yang, P. (2018) The equalization gap of basic public services supply in China: an empirical study on education, health care and social security. *China Finance and Economic Review*, 7(3), 24-51.

[9] Gao, L., Li, B. (2025) Development of inclusive finance, digital infrastructure, and the urban-rural education gap. Finance Research Letters, 86, 108814.

[10] Zhou, W., Fu, W. (2022) Can transfer payment reduce the inequality of compulsory education in poor areas? An empirical study based on the data from 18 counties in 6 provinces in China. *Best Evidence in Chinese Education*, 10(2), 1405-1413.

[11] Han, T., Fan, J., Guo, R. (2023) Spatial equity of basic education resources and coordinated regional development in Xinjiang, China. *Chinese Geographical Science*, 33, 441-457.