

Региональные диспропорции в управлении профессиональным образованием в Китае: количественный анализ ресурсной обеспеченности

Regional Disparities in Vocational Education Governance in China: a Quantitative Analysis from the Perspective of Educational Resource Supply

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Аннотация

В Китае профессиональное образование играет ключевую роль в развитии кадрового потенциала и национальной конкурентоспособности. В данном исследовании с помощью энтропийного метода построена система индикаторов и проведена количественная оценка региональных диспропорций в обеспеченности ресурсами профессионального образования в 31 провинции Китая (2024–2025 гг.). Результаты выявляют существенные пространственные дисбалансы: западные регионы лидируют по обеспеченности ресурсами, за ними следуют восточные, тогда как центральные регионы отстают. Наиболее выражены диспропорции в материально-технических ресурсах, тогда как разрывы в кампусной инфраструктуре и преподавательском составе носят умеренный характер. Полученные результаты имеют важное значение для государственной политики, поскольку создают эмпирическую основу для адресного распределения ресурсов и региональных стратегий развития. Кроме того, они могут быть непосредственно применены в управлении проектами в сфере профессионального образования, предоставляя количественные ориентиры для разработки, мониторинга и оценки региональных проектов, направленных на сокращение образовательного неравенства. Исследование подтверждает необходимость скоординированных межведомственных решений для преодоления сохраняющихся ресурсных разрывов между восточными, центральными и западными регионами Китая.

Ключевые слова: управление в сфере профессионального образования, региональные диспропорции, ресурсная обеспеченность, энтропийный метод.

Abstract

In China, vocational education plays a crucial role in human resource development and national competitiveness. This study employs the entropy weight method to construct an indicator system and quantitatively assesses regional disparities in vocational education resource supply across 31 Chinese provinces (2024–2025). The findings reveal significant spatial imbalances: western regions lead in resource supply, followed by the east, with central regions lagging behind. Disparities are most pronounced in material resources, while gaps in campus infrastructure and teaching staff are moderate. These results carry substantial implications for public policy, as they provide an evidence base for targeted resource allocation and regional development strategies. Moreover, they are directly applicable to project management in the vocational education sector, offering quantitative benchmarks for designing, monitoring, and evaluating regional development projects aimed at reducing educational inequalities. The study underscores the need for coordinated intergovernmental interventions to address the persistent resource gaps between eastern, central, and western China.

Keywords: vocational education governance, regional disparities, resource supply, entropy weight method.

Introduction

Vocational education in China, once a highly attractive pathway under the planned economy, gradually lost its appeal after the abolition of job assignment and the expansion of higher education enrolment. Influenced by the senior high school entrance examination streamlining policy, a stratified education system has taken shape in China, widening the gap between vocational education and general education.

At present, China's rapidly expanding industries generate substantial demand for high-quality technical and skilled personnel, while the effective supply of higher education falls short. Meanwhile, higher vocational students have strong aspirations to pursue general undergraduate education, yet supportive further education policies remain insufficient. Promoting the integration of vocational and general education is critical to meeting industrial demand and expanding student career

pathways. This requires horizontal coordination across educational levels, increased enrolment quotas in applied institutions, and strengthened vertical articulation to ensure seamless progression from secondary to higher vocational education. Efforts should be made to share and optimally allocate educational resources including teachers, equipment and training bases, and facilitate exchanges and mutual learning in teaching management and pedagogical approaches.

The Outline of the 15th Five-Year Plan of China proposes optimizing the layout of vocational education that coordinates with regional development and connects with industrial distribution, and encouraging majors to closely match the demands of industrial and innovation chains. Given China's growing need for intermediate and senior skilled talents and the pressing requirement to improve the overall quality of the urban and rural workforce, vigorously developing vocational education has become an irresistible trend [1]. However, an analysis of the actual conditions across China's provinces and municipalities reveals significant disparities in student pool scale, available educational resources and intensity of macro-regulation. When expanding the scale of vocational education, all provincial-level regions must take local realities into account, identify weak links and adopt targeted measures. Only in this way can regions balance enrolment expansion and quality improvement, fully leverage the service functions of vocational education, and ultimately cultivate hundreds of millions of high-quality workers for society.

Literature Review

China constitutes the core research hub for measuring vocational education resource supply using the entropy weight method, covering secondary vocational schools, higher vocational colleges and technical schools.

Han Yong and other scholars adopted the entropy weight-TOPSIS model combined with kernel density estimation and GIS spatial visualization. They established an evaluation system consisting of 4 primary indicators (financial supply, human resource supply, material resource supply and opportunity supply) and 10 secondary indicators to specifically measure provincial-level higher vocational education resource supply in China [3]. Their research indicates that China's higher vocational education resource supply presents a stepped pattern of higher levels in the east and lower levels in the west, with the Yangtze River Delta, Pearl River Delta and Central Plains Urban Agglomeration forming core high-value zones. Fiscal funding and dual-qualified teachers con-

stitute the primary and secondary factors triggering regional supply disparities respectively. Zhu Dequan and Peng Hongli employed pure objective weighting with the entropy weight method to synthesize a comprehensive vocational education supply index for 31 provincial-level regions in China. Their findings demonstrate supply advantages in eastern regions, resource shortages in western regions, and sufficient scale but inadequate quality supply in central regions [4].

Other Chinese scholars have applied the entropy weight method to measure resource carrying capacity [5], evaluate informatization resource supply in higher vocational colleges [6], and assess the efficiency of resource transformation in vocational education [7], consistently confirming that fiscal and digital resources are primary drivers of regional disparities.

Distinct from the general inland vocational education evaluation framework, Meng Yuxin highlighted the international attributes of free trade ports and constructed a five-dimensional evaluation system covering basic school-running resource supply, faculty human resource supply, international school-running resource supply, industry-education integration supporting supply, and talent output matching supply. With objective weighting through the entropy weight method, he determined the contribution of various resources to the development of higher vocational education in Hainan according to the information entropy of each indicator [8]. Chen Song argued that although higher vocational education in China is undergoing rapid development, it generally follows an extensive development model relying on scale expansion rather than quality improvement. Uneven development exists across regions, and higher vocational colleges are confronted with an overall situation of "insufficient supply relative to demand". The coordination degree between "development scale" and "resource supply" serves as a reference criterion for the coordinated development of regional higher vocational education [9]. Ren Xiaoling and other scholars adopted the entropy weight method, Dagum Gini coefficient, kernel density estimation and Markov chain to explore regional disparities, evolutionary characteristics and trends in the allocation of secondary vocational education resources in China from 2010 to 2023 [10]. The results show that the spatial distribution of secondary vocational education resource allocation is unbalanced, featuring a typical pattern of "high in the east and low in the central and western regions". Disparities in resource allocation mainly stem from inter-regional gaps, with the largest divergence existing between eastern and

western regions. The resource allocation of secondary vocational education demonstrates obvious comprehensive agglomeration characteristics, and its absolute disparities show an upward trend. Resource allocation possesses certain stability, and spatial factors exert limited influence on the dynamic transition of resource allocation levels.

Foreign scholars rarely adopt the entropy weight method independently to investigate vocational education resource supply; instead, entropy weight techniques are mostly embedded into evaluation frameworks for sustainable education, lifelong skills training and equity in higher vocational education [2; 11].

Theoretical Foundation for the Construction of the Indicator System

This study develops an evaluation indicator system for regional vocational education resource supply in China by integrating interdisciplinary theories.

First, the theory of educational equity provides the value framework for this study, viewing regional disparities in vocational education resource supply as a manifestation of unequal distribution of funding, teaching staff, training facilities, and digital infrastructure across regions.

Second, the theory of optimal resource allocation provides the objective orientation. Scarce educational resources need to be optimally allocated across regions, institutions and majors to avoid the coexistence of resource surplus and supply shortage. The entropy weight method identifies critical scarce resources via information entropy of indicators and accurately pinpoints weaknesses in regional resource allocation.

Third, core indicator dimensions are defined based on national policy theories. China's Action Plan for the Implementation of the National Vocational Education Reform and the Vocational Education Law of the People's Republic of China (Revised in 2022) specify the core elements for high-quality vocational education development: dual-qualified teaching staff, training bases, industry-education integration, digital education and balanced regional development. These policies directly frame the core dimensions of the indicator system:

(1) Human resource supply: dual-qualified teachers, part-time teachers from industry, and teacher training resources;

(2) Material resource supply: training bases and virtual simulation training equipment;

(3) Financial supply: fiscal expenditure per student and special investment for industry-education integration;

(4) Emerging resources: digital vocational education resources, international school-running resources and industry-education integration platform resources.

Since national policies do not classify teaching quality, student satisfaction and graduate employment rate as core dimensions, these three items are excluded from the analytical scope of this research.

Regional economic development determines the capacity of local governments to invest in vocational education, while industrial structure shapes the demand for vocational education resources. National strategies for coordinated regional development require narrowing gaps in vocational education resources between provinces and cities. Coastal eastern regions of China are far more economically developed than inland central regions and remote western border areas, with incomparable economic disparities. In Xizang, fiscal revenue is centrally coordinated by the state; therefore, financial supply is also excluded from the analysis.

Finally, grounded on Shannon's information entropy theory, this study selects quantifiable indicators with strong differentiation capacity to reflect regional resource gaps and eliminates homogeneous indicators lacking discriminatory power. All indicators adopt objective and statistically accessible quantitative data to avoid interference from subjective qualitative indicators. This provides a mathematical foundation for objective weighting of multi-dimensional indicators and the synthesis of a comprehensive index of regional vocational education resource supply.

Determination of the Indicator System

Based on the above theoretical interpretation and dimensional design of the evaluation system for regional vocational education resource supply, aligned with the high-quality development targets for vocational education stated in China's 15th Five-Year Plan, this study draws on relevant indicators in the Statistical Indicator System for China's Education Monitoring and Evaluation (2020 Edition) issued by the Ministry of Education, as well as requirements laid out in the Action Plan for Improving the Quality of Vocational Education (2020–2030) jointly released by the Ministry of Education and nine other departments. Learning from research frameworks and measurement methods adopted in studies such as the educational balanced development index, and considering data accessibility of measurable indicators, this paper takes 31 provincial-level regions in Chinese mainland (excluding Hong Kong, Macao and Tai-

wan) as research objects from the perspective of regional disparity analysis.

With the aid of principal component analysis, three primary indicators are identified: campus facility conditions, material resource conditions and teaching staff conditions. Ten secondary indicators are established: per capita reading room area (X1) [12, p.656-660], per capita indoor sports room area (X2) [12, p.661-665], per capita psychological counseling room area (X3) [12, p. 666–671], per capita dormitory area (X4) [12, p.672-680], per capita sports venue area (X5) [13, p.100-108], per capita book holdings (X6) [13, p.109-117], per capita digital terminal equipment (X 7) [14], student-teacher ratio in vocational education (X8) [15], proportion of teachers with senior professional titles (X9) [16], and proportion of teachers with advanced academic degrees (X10) [16]. An evaluation indicator system for regional vocational education resource supply in China is thereby constructed. The selected observational indicators are presented in table 1.

Methods

This study mainly adopts the entropy weight method to construct the evaluation indicator system for regional resource supply in vocational education governance in China. The entropy weight method leverages entropy, a measure of uncertainty, to judge the validity and value of selected indicators. For a given system, the greater the amount of information and the more stable the system, the smaller the entropy; conversely, the less information available and the more chaotic the system, the larger the entropy. Generally speaking, the entropy weight method can reflect the utility value of the information entropy of indicators and determine the weight of each indicator, and the weights it generates tend to be more credible than those obtained by the analytic hierarchy process (AHP). Nevertheless, it has limitations such as the lack of horizontal comparison among indicators. By contrast, principal component analysis or factor analysis may yield negative weights during calculation. Therefore, it is more reasonable to adopt the entropy weight method to establish an integrated evaluation indicator system for regional resource supply in vocational education governance in China. Calculations based on the entropy weight method enable a comprehensive comparison of the status of vocational education resource supply across China's 31 provincial-level regions from 2024 to 2025.

Existing methods for weight determination fall into two categories: subjective weighting methods and objec-

Table 1
Evaluation Indicator System for Regional Vocational Education Resource Supply Management in China

Primary Indicators	Secondary Indicators	Indicator Description	Unit	Indicator Attribute
Campus Facilities	Per capita area of reading rooms	Floor area of reading rooms available per student	Square meter	Positive indicator
	Per capita area of indoor sports rooms	Floor area of indoor sports rooms available per student	Square meter	Positive indicator
	Per capita area of psychological counseling rooms	Floor area of psychological counseling rooms available per student	Square meter	Positive indicator
	Per capita area of dormitories	Floor area of dormitories available per student	Square meter	Positive indicator
Material Resources	Per capita area of sports grounds	Area of sports grounds available per student	Square meter	Positive indicator
	Per capita number of books	Number of books available per student	Volume	Positive indicator
	Per capita number of digital terminals	Number of digital terminals available per student	Set	Positive indicator
Teaching Staff	Student-teacher ratio in vocational education	Ratio of teachers to students	%	Positive indicator
	Proportion of teachers with senior professional titles	Percentage of teachers holding senior professional titles	%	Positive indicator
	Proportion of teachers with advanced academic degrees	Percentage of teachers with advanced academic degrees	%	Positive indicator

tive weighting methods. Subjective weighting methods assign weights according to decision-makers' subjective judgments, mainly including the Delphi method, fuzzy pattern recognition and the analytic hierarchy process. Such methods are subject to substantial subjective arbitrariness and fail to fully exploit objective historical data. Objective weighting methods adopt mathematical approaches to assign weights based on inherent mathematical relationships within raw data, focusing on objective data. Representative approaches include the maximum deviation decision method, multi-objective programming and the entropy weight method. To avoid subjectivity in weight assignment and comply with rigorous mathematical principles, this study employs the entropy weight method for weighting. The basic principle of the entropy weight method is as follows: based on the degree of variation among indicators, the information entropy

of each indicator is calculated, and the resulting entropy values are used to revise indicator weights, so as to obtain more objective and accurate weights for the indicator system.

This study applies the entropy weight method to measure the level of regional resource supply in vocational education governance in China, following the analytical framework of dimensionless processing → weight assignment → comprehensive score calculation. On the one hand, the extreme value entropy method — an optimal improved form of the objective entropy weight method — is used to assign weights to indicators. On the other hand, the entropy weight method is adopted to quantify regional vocational education resource supply levels across 31 provincial-level regions of China during 2024–2025. Specifically, raw data are first standardized via the extreme value standardization method; weights are then determined using the entropy weight method; finally, comprehensive indicator scores and rankings are computed.

Results

(I) Data Sources and Processing

All data adopted in this study are derived from the China Statistical Yearbook and China Educational Statistical Yearbook released by the National Bureau of Statistics of China, as well as provincial, municipal and autonomous regional statistical yearbooks and educational statistical yearbooks for 2024–2025 published by statistical bureaus of 31 provincial-level administrative regions. Supplementary information was retrieved from the official website of the Ministry of Education of the People's Republic of China and the educational department websites of all provincial-level regions. Relevant indicator data concerning campus facilities, material resources and teaching staff are unavailable for Hong Kong, Macao and Taiwan; accordingly, the comprehensive scores are calculated only for the 31 provincial-level regions in Chinese mainland. For a small number of missing indicator values within 2024–2025, linear interpolation based on historical observations of corresponding indicators is applied for data supplementation.

Given inconsistent measurement units across indicators in the established system, dimensionless standardization is necessary. Different standardization approaches are selected according to data characteristics of each indicator. First, SPSSAU statistical software is used to conduct positive dimensionless processing on the ten secondary indicators. Afterwards, the entropy

weight method is implemented to calculate weights for the ten indicators including per capita reading room area. Table 2 presents the raw values of the ten indicators for each provincial-level region during 2024–2025 (vacant entries filled via interpolation), together with the corresponding weights generated by the entropy weight method. Among all indicators, per capita dormitory area (X4) achieves the highest weight of 0.423, which demonstrates its prominent influence.

The entropy weight method is adopted to calculate weights for the ten indicators from X1 to X10. As shown in the table, the corresponding weights are 0.044, 0.151, 0.082, 0.423, 0.052, 0.034, 0.050, 0.053, 0.028 and 0.084. Obvious discrepancies exist among indicator weights. X4 achieves the maximum weight of 0.423, while X9 has the minimum weight of 0.028. This phenomenon can be explained as follows: China possesses a population of 1.4 billion with a huge student population, forming a large base value for per capita dormitory area, which results in its highest weight. At present, the vocational education teaching workforce is relatively saturated. The evaluation of senior professional titles follows strict standards and faces fierce competition. In addition, quotas for senior professional titles are stringently controlled by local departments of human resources and social security each year, leading to a low proportion of teachers with senior titles and hence its low weight.

The eastern coastal regions of China enjoy relatively developed economy, attracting talents nationwide and hosting numerous universities. The state implements preferential policies allocating higher education resources to eastern coastal areas. In contrast, central and western regions are endowed with far fewer higher education resources, making investment in vocational education resources relatively concentrated within these inland areas.

(II) Overall Comparison of Comprehensive Scores

The overall level of comprehensive scores for regional vocational education governance resource supply across China remains relatively low, with prominent structural heterogeneity among sub-indicators. Guizhou ranks first with a comprehensive score of 3.862, followed by Hainan, Qinghai and Yunnan. Jiangxi achieves a score of 1.6022, ranking 13th nationwide, representing an upper-middle level in terms of vocational education resource supply.

According to China's four major economic zones:

Eastern region (Beijing, Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Hain-

Table 2

Raw Values of Ten Indicators for Provincial-Level Regions in China (2024–2025)

Regions	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Beijing	0.4868	0.2838	2.3147	0.4038	0.0937	0.0193	1.1938	10.82	0.3469	0.2619
Tianjin	0.7195	0.4016	2.5106	1.268	0.1649	0.0272	2.2047	14.98	0.3128	0.1797
Hebei	0.8521	1.3521	6.541	0.088	0.182	0.0316	3.1194	14.28	0.238	0.0691
Shanxi	0.7858	1.3782	4.5325	0.0921	0.1381	0.0275	2.8171	12.00	0.1909	0.0884
Inner Mongolia	0.6426	0.2438	2.4848	0.0944	0.1021	0.0326	2.8117	11.56	0.2499	0.1006
Liaoning	0.6263	0.4045	3.0582	0.206	0.1216	0.0298	2.2859	12.13	0.3423	0.0967
Jilin	0.415	0.3627	1.934	0.1189	0.1065	0.0223	2.0477	8.43	0.4018	0.0924
Heilongjiang	0.6137	0.3617	2.451	0.1493	0.0926	0.034	2.5845	11.94	0.3145	0.0658
Shanghai	0.2968	0.1216	1.4763	1.1356	0.1951	0.0237	1.352	14.93	0.2293	0.3161
Jiangsu	0.3193	0.2243	2.1844	0.1395	0.152	0.0257	2.1936	13.66	0.3384	0.1842
Zhejiang	0.4024	0.1858	1.905	0.0957	0.1238	0.0193	2.1359	12.29	0.3108	0.1234
Anhui	0.6265	0.6264	2.8995	0.1024	0.1645	0.0276	3.3543	20.29	0.2626	0.1048
Fujian	0.7294	0.5996	4.1924	0.1979	0.1797	0.0408	3.1029	18.82	0.2395	0.0859
Jiangxi	0.5539	0.5606	2.6022	0.094	0.1458	0.0272	2.9966	20.3	0.1296	0.0592
Shandong	0.4316	0.3566	2.9026	0.0919	0.1463	0.0276	2.9514	14.26	0.2142	0.1225
Henan	0.736	1.0496	3.5212	0.0584	0.2362	0.0416	4.2423	18.51	0.1966	0.0948
Hubei	0.5928	0.3014	2.7785	0.0731	0.1556	0.0323	3.0016	16.78	0.1991	0.0929
Hunan	0.6366	0.4276	3.303	0.0854	0.1774	0.0349	3.6147	16.83	0.1734	0.0712
Guangdong	0.4879	0.2183	2.7773	0.0808	0.2186	0.0365	2.6504	20.21	0.1815	0.1179
Guangxi	0.7692	0.7949	4.6485	0.0499	0.2442	0.0275	3.0648	22.26	0.1978	0.0755
Hainan	0.9473	1.2212	7.7628	0.1084	0.4352	0.0457	5.3487	31.3	0.2071	0.0656
Chongqing	1.3409	1.1535	6.5825	0.1217	0.2211	0.0414	3.4667	17.77	0.2116	0.0951
Sichuan	0.8445	0.9704	4.1755	0.1038	0.1893	0.0355	4.035	17.66	0.2292	0.0678
Guizhou	1.3932	2.1225	9.1479	0.0925	0.3533	0.0716	8.1306	42.61	0.1718	0.0683
Yunnan	0.649	1.3466	5.1743	0.0541	0.2137	0.0482	4.5644	21.51	0.3417	0.0505
Xizang	0.7596	0.3499	8.1455	0.0376	0.1453	0.02	2.5619	11.85	0.1535	0.0762
Shanxi	0.5504	0.6287	2.7427	0.099	0.1734	0.0258	3.5034	14.86	0.1754	0.1088
Gansu	0.3658	0.7334	1.799	0.0638	0.0994	0.0255	2.7791	10.95	0.2477	0.0652
Qinghai	0.6298	0.4671	4.1791	0.1255	0.2842	0.0524	5.2436	39.11	0.2041	0.0533
Ningxia	0.6048	0.5891	3.1354	0.0981	0.1385	0.027	2.6143	18.39	0.1826	0.0964
Xinjiang	0.4814	0.3367	2.2498	0.0546	0.1183	0.032	3.9957	18.25	0.1399	0.0649

an, Liaoning, Jilin, Heilongjiang): aggregate comprehensive score = 18.9275

Central region (Shanxi, Henan, Anhui, Jiangxi, Hubei, Hunan): aggregate comprehensive score = 9.3249

Western region (Chongqing, Sichuan, Shaanxi, Yunnan, Guizhou, Guangxi, Gansu, Qinghai, Ningxia, Xizang, Xinjiang, Inner Mongolia): aggregate comprehensive score = 22.4258

It can be concluded that although the western region lags behind the east in economic development, it attaches great importance to vocational education governance. Benefiting from prosperous economy, general

higher education is widely distributed in eastern regions and exerts strong guiding effects. By contrast, the supply of vocational education governance resources in central regions maintains steady development.

(III) Regional Comparison of Campus Facility Conditions

To examine regional disparities in campus infrastructure for vocational education resources, the entropy weight method is applied to calculate weights for four indicators (X1–X4), with weights of 0.063, 0.215, 0.118 and 0.604 respectively. Clear weight divergence exists:

Table 3

Comprehensive Scores of Regional Vocational Education Governance Resource Supply by Province (2024–2025)

Regions	Overall Comprehensive Score	Campus Facilities Score	Material Resources Score	Teaching Staff Score
Beijing	1.0940	0.6083	0.4790	3.6629
Tianjin	1.7696	1.1934	0.8795	4.9497
Hebei	1.7505	1.1685	1.2229	4.6561
Shanxi	1.4500	0.9358	1.0940	3.9266
Inner Mongolia	1.0824	0.4426	1.0794	3.8017
Liaoning	1.2074	0.6111	0.8932	3.9982
Jilin	0.8553	0.4038	0.7981	2.8193
Heilongjiang	1.1265	0.4953	0.9927	3.9168
Shanghai	1.5332	0.9048	0.5772	4.9890
Jiangsu	1.1516	0.4100	0.8700	4.5329
Zhejiang	1.0251	0.3475	0.8364	4.0578
Anhui	1.6691	0.5777	1.3014	6.6062
Fujian	1.7253	0.7884	1.2182	6.1212
Jiangxi	1.6021	0.5188	1.1628	6.5637
Shandong	1.2762	0.5014	1.1465	4.6728
Henan	1.7220	0.7223	1.6584	6.0190
Hubei	1.3901	0.4736	1.1697	5.4635
Hunan	1.4914	0.5728	1.4038	5.4641
Guangdong	1.5450	0.4536	1.0660	6.5735
Guangxi	1.9123	0.7973	1.2258	7.2122
Hainan	2.8673	1.3026	2.1422	10.1085
Chongqing	1.9652	1.1816	1.3679	5.7843
Sichuan	1.7287	0.8166	1.5628	5.7381
Guizhou	3.8622	1.6782	3.1382	13.7317
Yunnan	2.0713	0.9731	1.7696	6.9833
Xizang	1.5461	1.1055	1.0012	3.8659
Shanxi	1.3705	0.5529	1.3591	4.8517
Gansu	1.0373	0.4314	1.0647	3.5876
Qinghai	2.8503	0.7083	2.0471	12.6069
Ningxia	1.5385	0.5935	1.0196	5.9789
Xinjiang	1.4604	0.4007	1.5201	5.9107

X4 has the highest weight of 0.604, and X1 the lowest at 0.063. The weights of per capita indoor sports room area and per capita psychological counseling room area are 0.215 and 0.118, indicating insignificant regional gaps for these two indicators.

Further data interpretation shows that regional differences in per capita reading room area among eastern, central and western regions are limited, reaching approximately 6.3 square meters per 100 students on average. In terms of per capita indoor sports room area, eastern regions enjoy a noticeable lead over inland areas, with an average value 5.93% higher than the central region and 6.81% higher than the western region. The

pattern of per capita dormitory area resembles that of indoor sports space, yet central regions lag behind western regions. The average value of per capita psychological counseling room area in the east is 1.03 times that of central regions and 1.25 times that of western regions. To sum up, eastern regions outperform central and western counterparts only on partial indicators of campus infrastructure.

(IV) Regional Comparison of Material Resource Conditions

For regional disparities in material resource supply of vocational education governance, weights of three

indicators (X5, X6, X7) calculated via the entropy weight method are 0.385, 0.248 and 0.367. The weights are relatively balanced and approximate 0.333.

Data analysis reveals that the per capita book collection stands at roughly 2.03 volumes in the east, 1.79 volumes in central China and merely 1.49 volumes in western China, presenting a clear declining gradient. For per capita digital terminals, eastern regions possess around 3 sets per hundred students, central regions 2 sets, while western regions only reach half of the eastern level. Concerning per capita sports venue area, eastern regions exceed central regions by 25.53%, and central regions surpass western regions by 11.17%. Generally speaking, all indicators demonstrate a gradual east-to-west decline corresponding to unbalanced economic development.

(V) Regional Comparison of Teaching Staff Conditions

Weights for three teaching staff indicators (X8, X9, X10) derived from entropy weight estimation are 0.321, 0.170 and 0.510. Marked differences exist: X10 carries the largest weight (0.510), and X9 the smallest (0.170).

The student-to-full-time-teacher ratio in vocational schools is approximately 4.32:1 in eastern regions, 5.97:1 in central regions, and rises substantially to 8.96:1 in western regions, showing a distinct worsening trend from east to west. The proportion of teachers with senior professional titles in eastern, central and western regions is 0.24, 0.11 and 0.088 respectively; the gaps are moderate without obvious spatial regularity. The average proportion of teachers with advanced academic degrees reaches about 19.3% in eastern regions, 15.4% in central regions and 13.5% in western regions. Despite a mild decreasing trend, the disparities remain narrow. Overall, regional differentiation in teaching staff conditions is moderate, without a stark pattern of “superior east and inferior west”.

Conclusions

By constructing an indicator system for measuring the level of regional resource supply in vocational education governance in China, this study adopts the entropy weight method to calculate the overall and sub-indexes of vocational education resource supply across 31 provincial-level regions of China during 2024–2025. On the basis of characterizing spatial distribution patterns, analyzing regional disparity features and exploring the status of regional development, this paper identifies the underlying causes of unbalanced resource supply for vocational education governance in China.

(1) Regional disparities in vocational education resource supply. The results reveal an unbalanced spatial distribution of vocational education resource supply marked by a distinct pattern of high levels in western China, medium levels in eastern China and low levels in central China. The western region boasts the highest vocational education resource supply, followed by the eastern region, while the central region ranks the lowest. The western region features vast territory, sparse population and limited general higher education resources. Local governments attach great importance to vocational education, bringing about abundant total resource supply against a small population base and rapid growth momentum. Although vocational education resource supply in the central region grows rapidly, the starting foundation is weak and the population is densely concentrated, leading to modest per capita improvement. By contrast, the eastern region witnesses slower growth in vocational education resource supply yet enjoys a solid initial foundation, which keeps its vocational education resource supply index at a relatively high level.

(2) Gradient pattern of vocational education resource supply. The estimation results indicate that regional resource supply for vocational education governance presents a gradient spatial distribution. Despite a few central and western provinces outperforming eastern provinces and several western provinces catching up with eastern and central counterparts, the three-tier gradient spatial pattern remains stable. Provinces and municipalities are classified into three tiers.

The first tier includes Guizhou, Hainan, Qinghai, Yunnan, Chongqing, and Guangxi. These provinces vigorously develop the digital economy and new energy industries, generating enormous market demand for applied vocational and technical talents. The second tier covers Tianjin, Hebei, Sichuan, Fujian, Henan, Anhui, Jiangxi, Ningxia, Shanghai, Guangdong, Xizang, Xinjiang, Hunan and Shanxi. The third tier consists of Beijing, Jiangsu, Zhejiang, Shandong, Hubei, Shaanxi, Gansu, Inner Mongolia, Liaoning, Jilin and Heilongjiang.

(3) Sub-dimensional disparities in vocational education resource supply. Empirical evidence shows that regional disparities are prominent in material resource indicators, whereas gaps in campus infrastructure and teaching staff conditions are insignificant. Generally, relevant indicators exhibit a declining trend from the east to the center and then to the west. Differences in per capita reading room area among the eastern, central and western regions are trivial. In terms of per capita

indoor sports room area, the eastern region is far ahead of the central and western regions. The per capita dormitory area in the eastern and central regions is lower than that in the western region, while the per capita psychological counseling room area in the eastern region exceeds that in central and western regions. For per capita sports venue area, per capita book holdings and per capita digital terminal equipment, the eastern region outperforms the central and western regions. The proportion of teachers with senior professional titles shows minor inter-regional differences without obvious spatial

regularity. The share of teachers with advanced academic degrees in the eastern region is slightly higher than that in the central and western regions.

The results of this study carry significant implications for public policy, as they identify priority areas for resource allocation and regional interventions. Furthermore, they can be effectively employed in project management within the vocational education sector, providing quantitative benchmarks for designing targeted projects, monitoring their implementation, and evaluating their impact on reducing regional inequalities.

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