"Spatial Classification and Pattern Characteristics of County-Level Urbanization in China from the Perspective of Rural Group Organization"

Shen Mingrui, Li Yue, Sun Dongqi

Abstract: In recent years, the hierarchical scale structure of urban development in China has undergone dramatic restructuring, prominently characterized by metropolitan areas and urban agglomerations, centered around core cities, increasingly becoming the main forms of urbanization. This indicates that the changes in the urban system reflect a spatial concentration tendency favoring large cities. As the fundamental component of the new urbanization spatial pattern, county-level areas are vast and numerous but have not received sufficient research attention within the new development framework. This study selects 1,853 county-level areas as research objects, combining the scope of 19 urban agglomerations and 36 metropolitan areas outlined in existing plans and research. It analyzes the impact of core cities on counties in different locations, identifying three types: counties radiated by major cities, counties in potential areas of urban agglomerations, and counties in gaps within urban agglomerations. The study analyzes the urbanization patterns of Chinese counties through the perspective of urban agglomeration organization. Using data from the Seventh National Census and related public datasets, and applying weights determined by the entropy method, the study measures the comprehensive urbanization level of county-level areas in China based on four dimensions: population, economy, society, and land. It concludes by summarizing the current spatial pattern characteristics of county-level urbanization and provides policy recommendations for future county-level planning practices.

Keywords: County-level urbanization; Urbanization level measurement; Metropolitan areas; Urban agglomerations; Spatial patterns

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In recent years, the spatial structure of China's urban system has undergone drastic reorganization, presenting a significant trend of "urban agglomeration." Metropolitan areas and urban clusters, with core cities as their organizing centers, have become the main forms of urbanization. The organizational links of urban agglomerations create spatial frameworks that harness the radiating and driving effects of core cities, giving them a major advantage in enhancing national and regional competitiveness. County-level areas located in the confluence and complementary zones of major urban agglomerations, covering nearly 90% of the country's land area and hosting over 50% of the permanent population, form an important foundation for high-quality urbanization development, yet they have long been underappreciated. In May 2022, the General Office of the CPC Central Committee and the General Office of the State Council issued the "Opinions on Promoting Urbanization Construction with County Cities as Important Carriers," marking a renewed recognition by policymakers of the role counties should play in the urbanization landscape post-COVID-19. A series of supporting policies were proposed to promote urbanization construction with county cities as important carriers, address shortcomings, and enhance public services, industrial support, and other infrastructure [1-2]. Achieving these new urbanization goals requires strengthening national research at the county level [3].

Reviewing existing literature on county-level urbanization patterns [4-7], the research perspectives and analysis units primarily focus on administrative districts, functional zones, specific policy areas, and natural geographical divisions. However, within the context of the "urban agglomeration" spatial organization in the new development framework, analyzing county-level urbanization in China must consider factors such as the distance from core cities, the intensity of connections, and even the development level of the core cities themselves [8-9]. Current research lacks a comprehensive socioeconomic analysis within the new development framework.

Influenced by factors such as geographical location, natural endowments, and the level of industrialization, county-level areas of different types exhibit significant differences in urbanization levels, driving mechanisms, and development directions [10-12]. It is important to clarify the current development stage and national conditions of county-level urbanization in China. Due to the decennial nature of population censuses and the availability of county-level data, there are relatively few studies on the urbanization levels of county-level areas nationwide [13-14], most of which use the fifth or sixth population census years as baseline years, leading to a significant decrease in the timeliness of measurement results. Existing measurement systems tend to focus on single dimensions such as population, land urbanization, and economic development levels [15-17]. With the deepening understanding of urbanization's connotations across society, composite measurement methods using multiple indicators have emerged [18-20].

Based on the above overview of the research perspectives and measurement methods for county-level urbanization, this study is grounded in the current economic and social context of the new urbanization development framework. It closely aligns with the spatial organization perspective of metropolitan areas and urban agglomerations centered around core cities. By delineating the subordinate relationships within urban agglomeration organizations, the study classifies county-level areas and conducts a nationwide measurement of their comprehensive urbanization levels. This foundational work summarizes the current spatial pattern characteristics

of county-level urbanization in China and provides policy recommendations for future county-level planning practices, offering guidance on spatial classification strategies and promoting multidimensional balanced development.

1. County Classification from the Perspective of Urban Agglomeration Organization

1.1 Spatial Division of Metropolitan Areas and Urban Agglomerations

Metropolitan areas and urban agglomerations are the primary spatial forms that currently support the development of key factors in China. Within these regions, the core cities interact with surrounding areas through a mutually reinforcing process of concentration and radiation. Once the core city becomes a growth pole due to the agglomeration of factors, it radiates its influence to surrounding areas, driving further development [21]. Therefore, the spatial relationship between metropolitan areas, urban agglomerations, and their surrounding counties plays a crucial role in determining the development level of county-level areas.

The classification of spatial subordinate relationships within urban agglomerations in this study is based on the 19 urban agglomerations outlined in the "14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035 of the People's Republic of China" [Figure 1(a)]. The spatial scope is determined according to the urban agglomeration planning published by the National Development and Reform Commission and local authorities, as well as related research, including the "Atlas of Chinese Urban Agglomerations" edited by Fang Chuanglin [22] and other relevant studies.

Currently, the number of metropolitan areas in China is not explicitly stated in official documents. Referring to relevant academic studies [23-26], the core city of a metropolitan area should have a permanent population of over 3 million in its urban districts and be responsible for important administrative functions within the region. In areas such as the western and northeastern regions, which have significant strategic importance for national security, the population size standard can be relaxed. In addition to the threshold requirements for core cities, the construction of metropolitan areas should also be closely integrated with urban agglomerations to jointly build a new development framework of "circles supporting clusters and clusters supporting circles" [27]. Therefore, based on metropolitan area planning documents issued by various regions, the Seventh National Population Census data, and related research outcomes, this study has identified a total of 36 metropolitan areas across the country [Figure 1(b)]. The spatial scope is mainly based on the 10 metropolitan area development plans approved by the National Development and Reform Commission and other local "14th Five-Year" and related planning documents.

1.2 Three Types of County-Level Areas from the Perspective of Urban Agglomeration Organization

By synthesizing the spatial scope of the 19 urban agglomerations and 36 metropolitan areas, it can be observed that the spatial subordinate relationships within urban agglomerations can be categorized into four types: within the circle and within the cluster, within the circle and outside the cluster, outside the circle and within the cluster, and outside the circle and outside the cluster. As a functional regional concept based on industrial economic links [28], the essence of a metropolitan area means that the core city has a more direct radiating and driving effect on surrounding counties compared to urban agglomerations. Counties located within the

metropolitan area have significant locational advantages in terms of economic and social development, with the opportunity to benefit directly from the core city's radiating influence. Larger urban agglomerations, on the other hand, may not provide direct coverage of this driving effect. However, considering factors such as policy support and regional coordinated development, counties located only within urban agglomerations will represent potential areas for future development of urban agglomeration organizations.Counties located in the gaps of urban agglomeration organizations, despite having weaker urbanization foundations and somewhat insufficient driving forces, more clearly represent the most common county areas in China. These counties, which are more "closely linked to daily life" [29], support the basic structure of urbanization and require urgent attention from all sectors.Therefore, based on the four spatial subordinate relationships, and further considering the influence of metropolitan core cities on county development, counties are classified into three types: metropolitan radiated counties, urban agglomeration potential counties, and urban agglomeration gap counties (see Table 1).

According to data from the Ministry of Civil Affairs, as of the end of 2020, there were a total of 2,844 county-level administrative units in China. Based on the 1,871 county-level units excluding 973 municipal districts, and after excluding 11 county-level cities from the Xinjiang Production and Construction Corps as well as a small number of counties with missing data, 1,853 county-level areas were ultimately selected as the research subjects. Their spatial distribution also represents a new county-level pattern from the perspective of urban agglomeration organization (Figure 2). Among these, 27% of the counties belong to metropolitan radiated counties, nearly 33% belong to urban agglomeration potential counties, and 40% belong to urban agglomeration gap counties (Table 2).It can be seen that, despite the recent focus on metropolitan area and urban agglomeration development as important measures for regional coordination and the improvement of new urbanization strategies, the majority of counties have not been directly involved in the core construction of these urban agglomerations. Instead, they are located on the periphery and in the gap areas of the new spatial system, which is centered around core cities and supported by the radiation of urban agglomerations.

East of the Hu Huanyong Line (hereinafter referred to as the Hu Line), except for border regions such as the Yun-Gui-Gui-Xiang, Chuan-Shan-Hubei, and the Three Rivers Plain in the northeast, urban agglomeration development is relatively dense. The majority of counties in these regions are metropolitan radiated counties and urban agglomeration potential counties. However, urban agglomeration gap counties in these areas face issues such as dense agricultural populations, loss of resource factors, and the need for autonomous development of county functions. Typical examples include northern Jiangsu, northern Anhui, and southern Zhejiang.To the west of the Hu Line, due to geographical constraints, economic development and population aggregation are lower, and these areas are not core regions for urban agglomeration development. The focus for many urban agglomeration gap counties in this region is on supporting ecological security and the national spatial strategy.
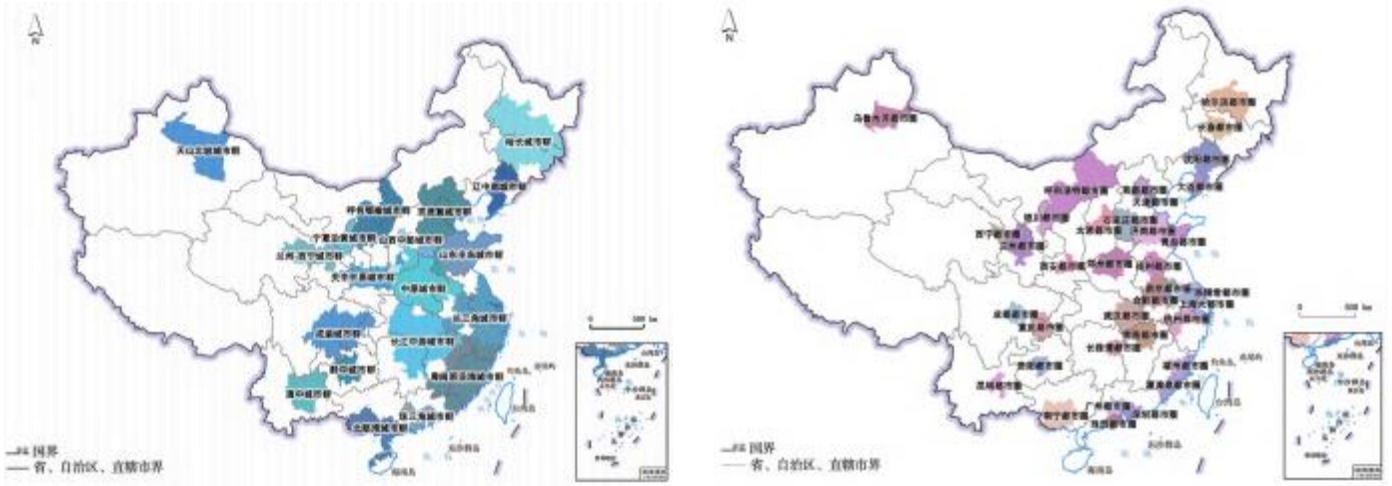
(a) Spatial Division of Urban Agglomerations

(b) Spatial Division of Metropolitan Areas

Fig.1　The spatial layout of 19 urban agglomerations and 30 metropolitan regions in China

Tab.1　Three types of counties based on spatial relations with metropolitan regions and city agglomerations

都市圈范围 / 城市群范围	圈内	圈外
群内	大都市辐射县域 （圈内群内、圈内群外）	圈群潜力地区县域 （圈外群内）
群外		圈群空隙地区县域 （圈外群外）

Tab.2　Number of counties

县域类型	胡线以东 / 个	胡线以西 / 个	总计 / 个	占比 / %
大都市辐射县域	442	59	501	27.04
圈群潜力地区县域	580	26	606	32.70
圈群空隙地区县域	476	270	746	40.26
总计	1498	355	1853	100.00

1.3 Basic Characteristics of the Three Types of County-Level Areas

The broad coverage and large population size are fundamental characteristics of county-level urbanization in China. The total land area of the 1,853 counties reaches 8.5928 million square kilometers, accounting for nearly 90% of the country's total land area, making up the essential geographic framework of China. Among these, metropolitan radiated counties only account for 10%, while the remaining 80% are urban agglomeration potential counties and urban agglomeration gap counties. According to the Seventh National Population Census data, in 2020, the total registered population of the 1,853 counties was 890 million, representing 61.5% of the national total, while the total permanent population was 740 million, accounting for 52.5% of the national total—1.5 million less than the registered population. This discrepancy highlights the critical importance of addressing the urbanization challenges in county-level areas and properly

resolving the issue of rural-to-urban migration.

Specifically, between 2010 and 2020, the total registered population of counties nationwide increased by 22.82 million, with 1,192 counties experiencing growth in registered population, accounting for about two-thirds of the total. All three types of counties generally experienced growth in registered population, but their proportion of the national total registered population slightly declined, indicating that the trend of rural populations directly settling in urban areas still outweighs the growth in county-level urbanization. The overall change in permanent population of counties is in stark contrast to that of the registered population, showing an absolute outflow, with a decrease of 35.06 million people. The number of counties with a net population outflow reached 1,244, also about two-thirds of the total, with population loss in county-level areas becoming a pressing issue. Among these, urban agglomeration potential counties saw the most significant population outflow, with a net loss of 19.36 million people. In contrast, urban agglomeration gap counties, generally located farther from core cities, were less affected by the siphoning effect, and the decline in their share of the total population was the smallest among the three types of counties. The contrast between the increase in registered population and the decrease in permanent population further confirms the position and role of county-level areas as an important variable in the construction of the national urban system and proximity urbanization process [30-31].In the coming period, the phenomenon of separation between registered and permanent populations, with people "living between" counties and core cities, will likely persist for a long time and can be seen as an important potential for county-level urbanization.

Fig.2　　Layout of counties in relation to metropolitan regions and urban agglomerations
Note: Map review number GS(2024)2320

Although county-level areas account for nearly 90% of the country's land area, 62% of the registered population, and 52% of the permanent population, their economic and social development lags far behind the national average, and improving the quality and efficiency of urbanization in the future remains a significant challenge. In 2020, the total GDP of China's counties was approximately 38.5 trillion yuan, accounting for only 37.87% of the national total. Economic development and productivity are still primarily concentrated in urban districts,

represented by city jurisdictions. Driven by the radiation effect of core cities, the economic development level of metropolitan radiated counties is generally higher than that of urban agglomeration potential counties and urban agglomeration gap counties. The gap, especially between the first and third types, is substantial: the average GDP of counties in the first type is 3.6 times that of the third type, and their per capita GDP is 1.7 times higher, highlighting the issue of regional economic imbalance.Statistics show that county-level areas host more than 50% of the country's primary and secondary school students, but the educational resources available to them are far inferior to those in urban districts, where the other 50% of students reside. Urban agglomeration gap counties host 15% of the country's students, and the quality of the educational resources they have access to urgently needs improvement [32-33]. According to data from the National Health Commission, in 2020, the national average number of hospital beds per 1,000 people was 6.46, but in county-level areas, the figure was only 5.72. The number of hospital beds per 1,000 people declines significantly from metropolitan radiated counties to urban agglomeration gap counties, although the average number of beds per county has increased, reflecting that the configuration of medical facilities still has room for optimization. In terms of urbanization, the overall urbanization rate in county-level areas was 48.6% in 2020, an increase of 13.82% compared to 2010. However, this still lags significantly behind the national urbanization rate of over 60% for the permanent population, as published by the National Bureau of Statistics. The urbanization rate in metropolitan radiated counties is higher than in the other two types of counties and is growing faster. About 9.5% of counties have an urbanization rate below 30%, still in the early stages of urbanization, with most of them located in urban agglomeration gap counties, particularly in southwestern Tibetan regions and southern Xinjiang. Additionally, 5.5% of counties have urbanization rates exceeding 70%, entering the stage of mature urbanization, mostly in the southeastern coastal and northern border regions. Unlike the high urbanization rates driven by high economic development in the southeastern coastal regions, the high urbanization rates in northern border counties represent "statistical-type urbanization," which is heavily influenced by factors such as the system and statistical standards, and the quality of urbanization still needs improvement. It is clear that the single metric of permanent population urbanization rate is no longer sufficient to meet the needs of accurately reflecting real urbanization levels in an era focused on high-quality development.

2. Comprehensive Urbanization Level Measurement of County Areas

2.1 Indicator System
In order to more comprehensively measure the comprehensive urbanization level of county areas, this study selects four primary indicators—population, economy, society, and land—from existing research outcomes. These indicators reflect the degree of non-agriculturalization, economic structure, quality of life, and construction land use in county areas. Considering the representativeness and accessibility of data at the national scale, as well as the importance of social issues such as educational urbanization and equal access to healthcare services, 16 secondary indicators were further identified (Table 3). Although agricultural and ecological patterns are also key aspects of county urbanization, due to their applicability at the national scale, they were not included in this study's indicator system. Future work may refine this system at more suitable scales, such as watershed or provincial levels. The data sources primarily include

the China County Statistical Yearbook (County and City Volume) 2021, 2020 China Population Census by County, China 2010 Population Census by County, and China Multi-period Land Use Remote Sensing Monitoring Dataset. For missing data, supplementation was made from the China County Statistical Yearbook (County and City Volume) 2020, as well as statistics from provincial, municipal, and county-level yearbooks and the National Economic and Social Development Statistical Bulletin.

2.2 Entropy Method for Determining Weights

The entropy method is a classic objective weighting method for determining indicator weights. It adheres to the objective nature of data, and compared to subjective methods like expert scoring or the Analytic Hierarchy Process (AHP), it eliminates human bias, thus increasing the credibility of the conclusions [35]. Based on the calculations, the weights of the primary indicators, from highest to lowest, are economic urbanization, land urbanization, population urbanization, and social urbanization (Table 3). The top three secondary indicators with the highest weights are large-scale industrial enterprises, added value of the secondary industry, and urban construction land, which together account for over one-third of the total weight. This suggests that, at the national level, economic and land factors have surpassed population as key indicators for measuring the urbanization level of county areas, with the secondary industry, represented by manufacturing, continuing to make a significant contribution to the county economy and urban development.Interestingly, per capita data such as per capita GDP, per capita public budget expenditure, and per capita savings deposits, which are often emphasized in conventional thinking, have relatively smaller weights. According to the principle of the entropy method, this indicates that the disparities in these indicators across counties are narrowing, leading to increasing regional balance. The indicator with the smallest weight is the urbanization rate, which is less than 1%, suggesting that after the overall national urbanization rate surpasses 65% and enters the mid-to-late stage, the gap in urbanization rates between counties continues to shrink. As a result, a single population-based indicator is no longer sufficient to truly reflect the urbanization level and development quality of counties. The comprehensive measurement indicator system thus holds more practical significance.

Table 3: Comprehensive Measurement Indicator System for County Urbanization Level

一级指标	二级指标 / 单位	权重系数 / %	总权重系数 / %
		城镇化率 / %	0.67	
	人口城镇化水平	建成区常住人口密度 / (人/km2)	10.35	
		第二产业从业人员 / 人	8.49	25.63
		第三产业从业人员 / 人	6.12	
综合城镇化水平		人均 GDP / 元	2.25	
	经济城镇化水平	第二产业增加值 / 万元	11.30	
		第三产业增加值 / 万元	7.47	32.74
		规模以上工业企业 / 个	11.72	
		人均公共预算支出 / 元	2.77	

社会城镇化水平	人均储蓄存款余额 ／ 元	5.07	13.77
	中小学在校学生 ／ 人	4.41	
	医疗卫生机构床位 ／ 个	1.52	
土地城镇化水平	城镇建设用地 ／ km2	11.14	27.86
	人均城镇建设用地 ／ m2	7.28	
	城镇建设用地占比 ／ %	3.30	
	建设用地地均 GDP ／（万元/km2）	6.14	

Note:Urbanization rate is the proportion of urban resident population to the total resident population.The population density of the built-up area is the ratio of urban resident population to urban construction land area, reflecting the concentration of population in the county seat.The proportion of urban construction land is the ratio of urban construction land area to total construction land area, reflecting the concentration of construction land.Per capita data indicators are based on the resident population.
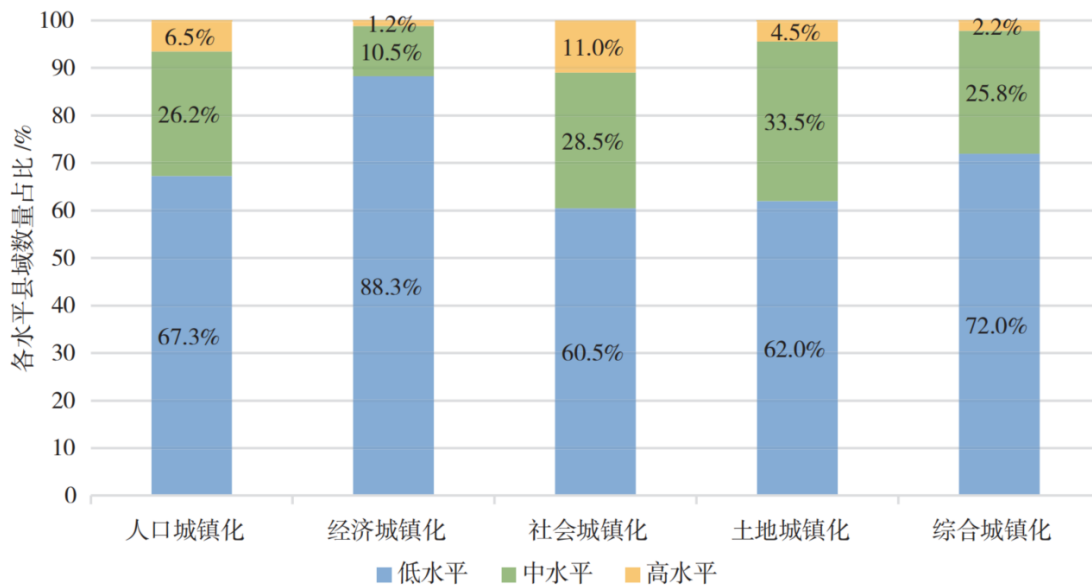

Figure 3: County Urbanization Level Statistics (Low, Medium, High)
Note: The measurement results are categorized into three levels—"low level, medium level, and high level"—using the natural breakpoint classification method to summarize the urbanization pattern characteristics of counties across the nation.

3. County Urbanization Pattern Characteristics

3.1 The Current Urbanization Level and the Gap with High-Quality Development Requirements

Based on the comprehensive measurement results covering four dimensions—population, economy, society, and land—it can be seen that the overall urbanization level of counties in China is still dominated by low and medium levels (Figures 3 and 4). Counties near and west of the Hu Line, due to factors such as mountainous terrain, high altitude, and poor climatic suitability, mostly exhibit low urbanization levels. In addition, there is a notable concentration of counties with low comprehensive urbanization levels in the northeast and the border areas between

Guangdong, Guangxi, and Hunan. High-level urbanization counties account for only 2.2% of the total, mainly concentrated in the southeastern coastal areas, such as the Yangtze River Delta to the east of the Hu Line, with scattered occurrences in coastal Shandong and eastern Hunan. In the western region, the only high-comprehensive urbanization level county is Korla City in Bayingol Mongol Autonomous Prefecture, Xinjiang.

In terms of single-dimensional indicators, 67.3% of counties nationwide still have low population urbanization levels. The population urbanization level gap on both sides of the Hu Line is clearly evident, which aligns with existing understanding. High population urbanization level counties are mainly concentrated in areas with higher economic development or larger populations, such as southern Jiangsu, northern Zhejiang, northern Anhui, and eastern Henan, as well as in the southeast coastal areas and the North China Plain. The economic urbanization level is generally low, with significant regional disparities. The proportion of counties with low economic urbanization levels is as high as 88.3%, while high-level counties account for only 1.2%, mostly concentrated in the southeastern coastal regions. The number of leading counties is limited, and the advantages are highly polarized, with a clear long-tail effect. The only high-economic urbanization counties in central China are Changsha County, Liuyang City in Hunan Province, and Nanchang County in Jiangxi Province. These three counties rank 10th, 19th, and 39th, respectively, in the list of top 100 counties[36].

In terms of county-level social urbanization, the overall level is relatively high across the country, and its spatial distribution is more uniform. This aligns with the basic layout principles for public service facilities, and it confirms the effectiveness of China's efforts in promoting public service equalization since the 21st century. Compared to the population, economic, and social dimensions, the county-level land urbanization level does not show significant differences on either side of the Hu Line. The number of high-level land urbanization counties to the east of the Hu Line is only five more than those to the west. Additionally, there is no obvious clustering around central cities, and there is a clear mismatch with other dimensions and the spatial organization of urban agglomerations.High land urbanization counties are mainly concentrated in the northeast, Tibet, and the southeastern coastal regions. Unlike the southeastern coastal areas, where high population density and economic development have promoted intensive land urbanization, the northeast region, despite its early industrialization advantage, is currently experiencing significant population loss and economic decline due to issues such as resource depletion and challenges in enterprise restructuring. The contradiction between land urbanization and these problems has become more pronounced. In Tibet, high land urbanization levels are influenced by factors such as border security and ethnic region development policies, which have led to faster land development. However, due to a small population base and weak economic foundation, the issue of coordinated development across dimensions requires particular attention.
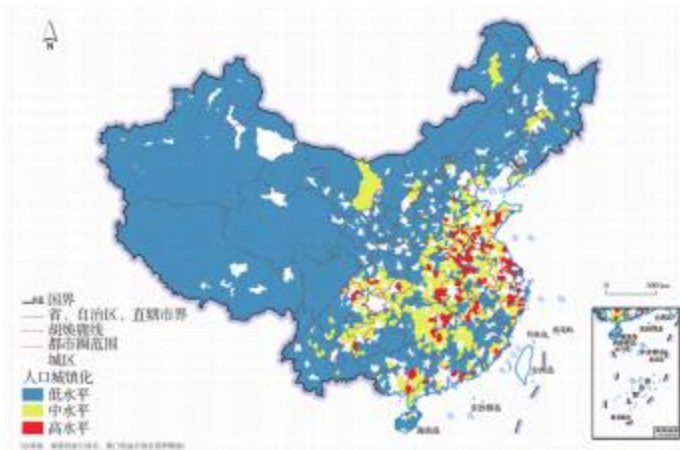
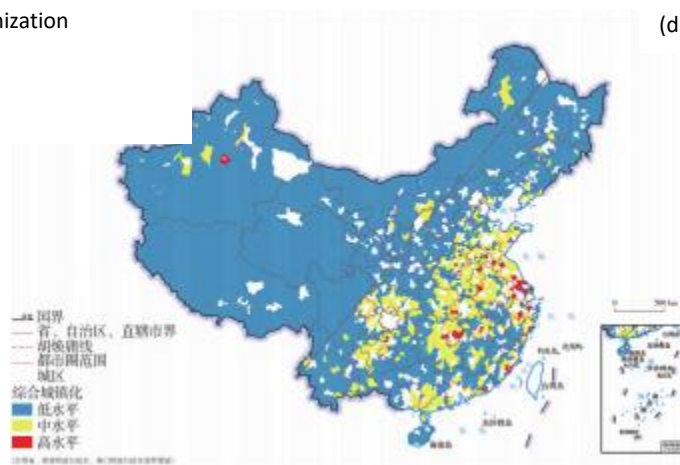(a) Population Urbanization
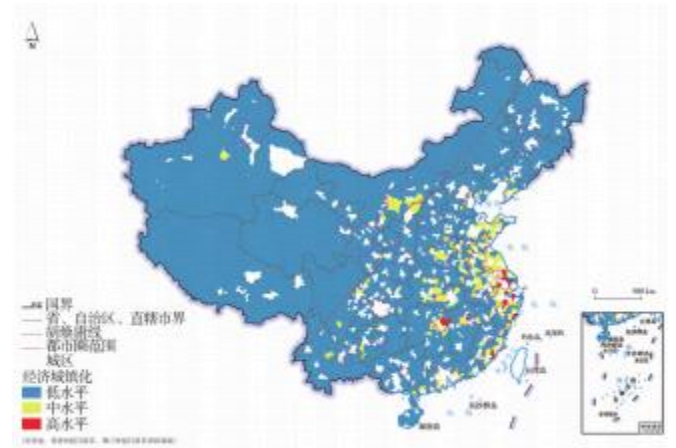
(b) Economic Urbanization

(c) Social Urbanization

(d) Land Urbanization

(e) Comprehensive Urbanization

Figure 4: County-Level Population, Economic, Social, Land, and Comprehensive Urbanization Levels

Note: The map review number is GS (2024) 2320.

3.2 The Coordination Between Dimensions Needs Improvement

The coupling coordination degree model is an important tool for evaluating the overall balanced development level of multiple indicators [37]. The results show that, in terms of balanced urbanization development, the coordination between various urbanization dimensions in county

areas still needs improvement (Figures 5 and 6). The coordination of urbanization dimensions in counties east of the Hu Line is significantly better than those west of the Hu Line, and the coordination in urban agglomeration gap counties is noticeably lower than in the other two types of counties.

Specifically, the coordination of indicators across the four dimensions—population, economy, society, and land—remains dominated by disequilibrium and transitional development categories, with only five counties reaching coordinated development overall. These counties are: Kunshan City, Jiangyin City, Jinjiang City, Changshu City, and Zhangjiagang City, all of which are metropolitan radiated counties. A total of 71.9% of counties exhibit disequilibrium in the population-economic dimension, with more than half of them located in urban agglomeration gap counties. These counties generally lag in economic development compared to those influenced by urban agglomeration, yet still carry a large population. Improving the industrial capacity of county areas, particularly in basic manufacturing, is an urgent task.

The coordination of the population-social indicators is relatively high, with 73.2% of counties in a transitional or coordinated development phase, and the distribution is more balanced spatially. This also reflects the great achievements of China in equalizing public service facilities between urban and rural areas, and in spatial equity. The disequilibrium in the economic-social dimension reflects the growing balance in county-level social urbanization under the fiscal transfer payment system, with public service facilities being a key feature. In contrast, economic urbanization shows significant imbalance. Many county governments have increased social urbanization levels through transferred fiscal input, but this development model is not sustainable.

The coordination of economic-land indicators is the lowest, with more than 88.5% of counties falling into the disequilibrium or decline category, nearly half of which are urban agglomeration gap counties. The coordination of population-land indicators is also low, with 60% of counties in the disequilibrium or decline category. The disorderly expansion of construction land during the expansive development phase has caused many counties' land urbanization progress to outpace that of population and economic dimensions, leading to severe land resource wastage.
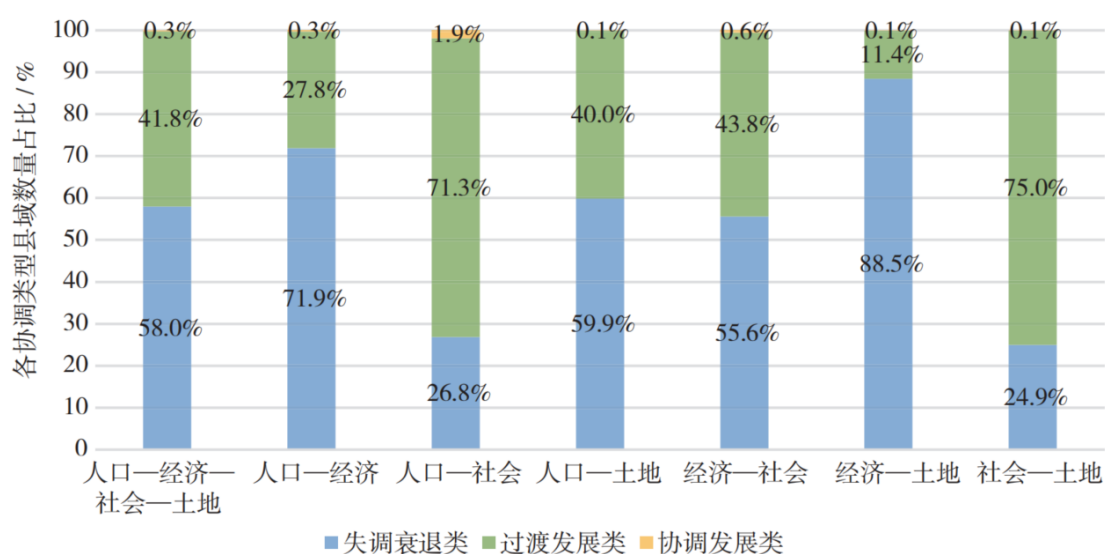

Fig.5   Proportion of three types of counties classified by coordination degree

3.3 The Significant Impact of Urban Agglomeration Spatial Organization on County Urbanization Levels

Overall, the spatial pattern of county-level urbanization aligns closely with the distribution of urban agglomeration organizations. Except for the land dimension, the trend of urbanization levels gradually decreasing from metropolitan radiated counties to urban agglomeration gap counties is also quite evident (Table 4). By calculating the Spearman correlation coefficients between county-level urbanization levels across various dimensions and the spatial subordination of urban agglomerations, it is clear that population, economy, society, and comprehensive urbanization levels are positively correlated with whether they are influenced by urban agglomeration organizations (Table 5). Specifically, the population, economy, and comprehensive urbanization dimensions show a strong positive correlation, while the social urbanization level, due to the overall equalization trend across counties, shows a moderate positive correlation. No correlation exists between land urbanization levels and urban agglomeration influences. Metropolitan radiated counties generally exhibit higher urbanization levels, and they perform better than the other two types of counties in the population, economy, and social dimensions. Among the counties with high comprehensive urbanization levels, 70% are metropolitan radiated counties, confirming the attractiveness and carrying capacity of core cities for surrounding areas. These counties, however, have lower land urbanization levels, and to some extent, they show phenomena such as overdevelopment and land resource waste.

Urban agglomeration potential counties, although less influenced by the radiation of core cities, still demonstrate clear advantages in population, economy, and social urbanization levels compared to counties in urban agglomeration gap areas that are not covered by metropolitan areas and urban agglomerations. In terms of the social dimension, these counties are nearly on par with metropolitan radiated counties. The economic dimension of these counties is slightly weaker, and improvements are needed in terms of total economic output and industrial chain organization.

Urban agglomeration gap counties, due to their distance from core cities, population loss, and natural constraints, exhibit lower urbanization levels, with a significant gap compared to counties influenced by urban agglomerations. 91% of these counties have a low level of comprehensive urbanization, with only 0.03% at a high level. Their economic urbanization has not reached a high level, only about one-quarter of the average level seen in metropolitan radiated counties. The social dimension shows only a small gap compared to the other two types of counties, but these counties face a dual challenge of sustained population loss and difficulty in improving public service levels. How to reasonably allocate public service facilities across various types of counties from a supply-demand balance perspective is a critical issue in promoting a people-centered new type of urbanization. Land urbanization in these counties has the highest average level, with land development and utilization progressing more reasonably.

Table 4: Statistical Summary of Urbanization Average Levels for the Three Types of Counties

县域分类	人口城镇化	经济城镇化	社会城镇化	土地城镇化	综合城镇化
大都市辐射县域	0.023 365	0.024 004	0.026 259	0.012 984	0.086 613
圈群潜力地区县域	0.020 050	0.015 335	0.025 316	0.013 283	0.073 984
圈群空隙地区县域	0.009 526	0.005 849	0.017 128	0.014 476	0.046 979

Table 5: Correlation Analysis of County Urbanization Levels and Spatial Subordination Relationships of Urban Agglomerations

指标	Spearman 系数
人口城镇化水平	0.490**
经济城镇化水平	0.549**
社会城镇化水平	0.383**
土地城镇化水平	-0.027
综合城镇化水平	0.429**

Note: The four types of spatial subordination relationships—within the circle and within the cluster, within the circle and outside the cluster, outside the circle and within the cluster, and outside the circle and outside the cluster—were assigned values of 4, 3, 2, and 1, respectively, for the correlation analysis between urbanization levels and urban agglomeration organizations. ** indicates $p < 0.01$, and the results are highly significant. The S coefficient is interpreted as follows: Above 0.7 indicates a very strong correlation, 0.4–0.7 indicates a strong correlation, 0.2–0.4 indicates a moderate correlation, and below 0.2 indicates a weak correlation.

Figure 6: Coordination Types of County Urbanization Indicators
Note: The map review number is GS (2024) 2320.

3.4 Urbanization Levels in Counties within Major Urban Agglomerations Show Regional Differentiation

Further statistics on the average urbanization levels across various dimensions within the urban agglomerations and metropolitan areas provide a more intuitive comparison of the regional characteristics of county-level urbanization from the perspective of urban agglomeration organizations (Figure 7). The results show that the counties within the Yangtze River Delta urban agglomeration have the highest urbanization levels, with metropolitan areas like the Shanghai Metropolitan Area, Suzhou-Xuzhou Metropolitan Area, and Nanjing Metropolitan Area also ranking highly, aligning with the urban agglomeration tier classification in the country's 14th Five-Year Plan. In the Beijing-Tianjin-Hebei and Pearl River Delta urban agglomerations,

influenced by the full urbanization of their main cities, the advantages of county-level comprehensive urbanization levels are not fully apparent, and the rankings of the Capital Metropolitan Area and Guangzhou Metropolitan Area are relatively low. The "metropolitan shadow zone" caused by the polarization effect of large cities has resulted in significant lag in economic levels of surrounding counties compared to core cities [38], indicating that the radiation and driving ability of core cities and the industrial connections with nearby peripheral areas need to be further enhanced. The Shandong Peninsula Urban Agglomeration, Central Plains Urban Agglomeration, and Beibu Gulf Urban Agglomeration have relatively high social urbanization levels, boosting their overall rankings, but their economic urbanization levels have not reached the corresponding standards. This is partly related to the large scope of these three urban agglomerations, which cover a significant number of agricultural counties. The Guanzhong Plain Urban Agglomeration, which is categorized as a second-tier urban agglomeration to be "developed and strengthened" in the 14th Five-Year Plan, ranks lower overall, indicating that the development of its core cities is still in the stage of resource absorption, and their radiation and driving capabilities need further enhancement. The Lanzhou-Xining Urban Agglomeration ranks lowest overall, with its comprehensive urbanization level even lower than that of counties outside the 19 urban agglomeration areas, reflecting that the simplistic approach of forming urban agglomerations solely based on provincial capitals requires more detailed consideration.

4. Planning and Policy Guidance

4.1 Differentiated Evaluation Systems Based on Regional Resource Endowments

China is vast, with significant differences in resource endowments and development stages across regions. The measurement results indicate that, compared to a single urbanization rate, the comprehensive urbanization level measurement system is better at distinguishing urbanization level differences between different regions and different types of counties within the same region, showcasing the spatial pattern of county-level urbanization across the country (Figure 8). However, due to the limitations in the availability and representativeness of county-level data at the national scale, the personalized resource endowment characteristics of specific counties cannot be fully reflected within the national overall indicator system. Therefore, based on strengthening statistical surveys, targeted urbanization evaluation systems should be established for different regions and types of counties. This will avoid a "one-size-fits-all" approach that solely pursues fiscal revenue, ensuring that regional characteristics are truly reflected in planning and construction efforts and achieving local development goals. For example, for shrinking counties represented by regions like Northeast China, emphasis should be placed on the smart restructuring of the overall pattern, focusing on revitalizing and repairing idle land resources, as well as evaluating the capacity for public welfare and assistance [39-40]. In counties in Henan Province, where agriculture is vital to both farmers' livelihoods and national agricultural production, the weights of indicators related to the secondary and tertiary industries, and construction land can be reduced, while increasing the focus on agricultural space scale and quality, and agricultural product security. Similarly, in key ecological function zones, additional indicators related to ecological space protection and ecological product supply capacity can be incorporated.
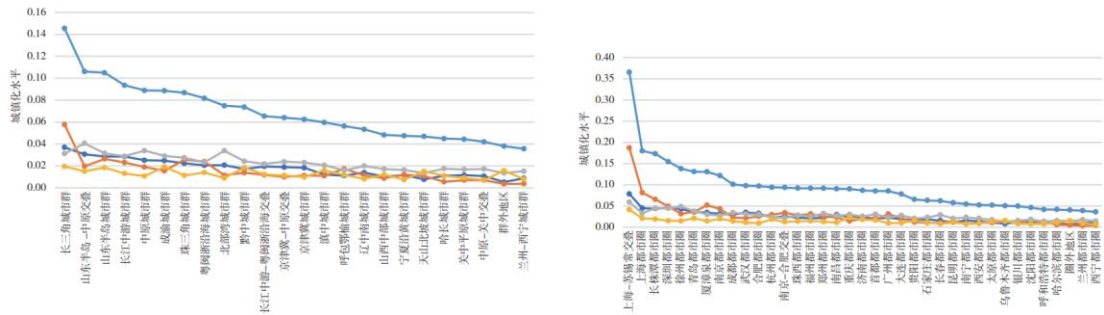
(a) County Urbanization Levels by Urban Agglomeration Classification

(b) County Urbanization Levels by Metropolitan Area Classification

Fig.7   County urbanization level categorized by urban agglomerations and metropolitan regions
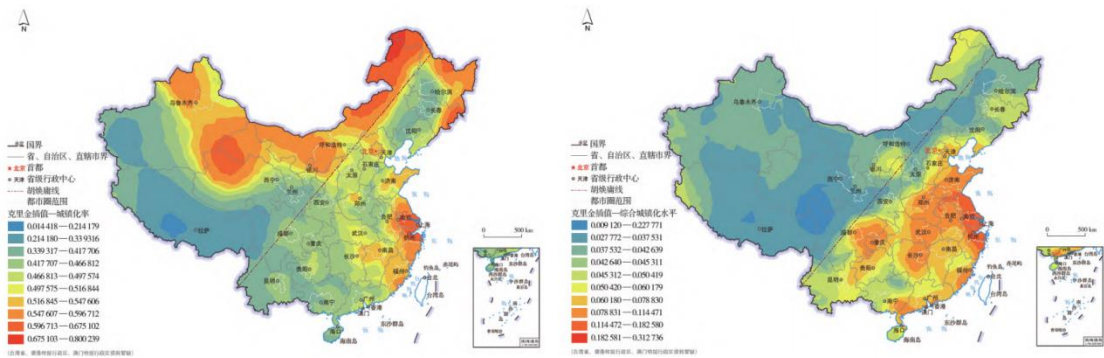
(a) Urbanization Rate Kriging Interpolation

(b) Comprehensive Urbanization Level Kriging Interpolation

Fig.8   Comparison of Kriging interpolation results of urbanization rate and comprehensive urbanization level

Note: The map review number is GS (2024) 2320.

4.3 Policy Guidance for County Classification Based on the Urban Agglomeration Perspective

After clarifying the county classification under the urban agglomeration perspective and understanding the urbanization levels and mechanisms of different types of counties, it is necessary to further propose differentiated policy guidance for the three types of counties in aspects such as urbanization paths and public service facility construction. This will enable more precise public policy deployment to serve the high-quality development of urbanization (Figure 10). Based on county case studies conducted through planning and research in recent years, it is clear that counties of different types, based on their unique urban agglomeration conditions, have exhibited distinct urbanization paths.

Metropolitan radiated counties have a solid foundation in population, economy, and social urbanization, and are located close to core cities. Their planning should actively embrace the development of metropolitan areas or even urban agglomerations, proactively aligning with the needs of core cities to amplify their locational advantages, positioning themselves as important functional nodes in a multi-center metropolitan layout. For example, Yixing City in Jiangsu Province, leveraging its natural resource endowments, actively connected with the cultural and tourism consumption markets of large cities, driving the transformation of its existing manufacturing industry and integrating the primary, secondary, and tertiary sectors. It has

become an important all-region tourism destination in the Yangtze River Delta, with its county-level comprehensive urbanization ranking 7th nationwide in this study.

Urban agglomeration potential counties are situated within a dense urban system but lack a clear core city driving force. These counties, with relatively large populations, form the basic foundation for county development. In the future, they should be more closely integrated into the urban agglomeration network, enhancing their capabilities in industrial chain organization and public services. Taking Caoxian County in Shandong Province as an example, despite a weak driving force from core cities like Jinan and Zhengzhou, it has embraced the internet age and adopted a diversified, low-barrier, decentralized model driven by the digital economy. It has fostered industries such as Hanfu (traditional Chinese clothing) and performance costumes, becoming one of the leading areas in these sectors and injecting new vitality into county development through industrial revitalization [42].

Urban agglomeration gap counties are neither within metropolitan areas nor urban agglomerations and lack clear spatial connections. Many of these counties are located in major agricultural production areas or ecological function zones, and improvements in urbanization levels across various dimensions need to be pursued simultaneously. These counties are key supports in China's overall urbanization framework and should focus on promoting urban-rural integration and positioning themselves as basic units of rural revitalization [43]. They should continue to play a role in ensuring national food security, ecological security, and border security. For example, Arxan City in Hinggan League, Inner Mongolia, after implementing a complete logging ban in its forest areas, launched a series of environmental governance projects. It has become an ecological barrier and an important ecological security area in northern China and an emerging popular tourist city along the border in recent years [44].
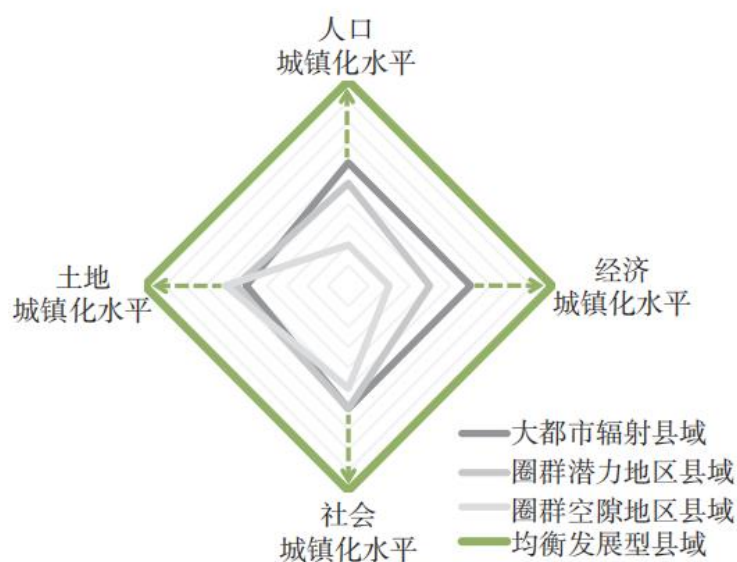

Fig.9   Balanced development model of county urbanization

5. Conclusion

"Governance at the county level ensures peace throughout the nation." County-level areas

account for nearly 90% of the country's land area, contribute nearly 40% of the GDP, and are home to over 50% of the permanent population and more than 60% of the registered population. Over the past decade, the registered population has continued to grow. The vast and numerous county-level areas have always been the fundamental spatial unit for governance in large countries and an important foundation for promoting people-centered new urbanization and establishing a new development pattern. Although policies have relaxed the household registration restrictions for medium and large cities with populations under 3 million, county towns remain an important destination for rural residents seeking proximity to urbanization. Moreover, county towns serve and connect most rural areas in China, playing an irreplaceable role in coordinating urban-rural development, ensuring food and ecological security, and preserving local culture. They are a vital part of the process of achieving Chinese-style modernization [45].As China's urbanization enters a new phase of slowing growth and improving quality, the construction of county-level urbanization aligns with social development trends and population migration patterns, influencing the nation's ecological, economic, social development, and even national security. Therefore, timely foundational research on this issue is crucial. A spatially oriented approach to identifying and effectively planning for the dynamic challenges of current county development is essential.

In the context of the new development pattern, this study integrates the concept of urban agglomeration organizations, which were originally part of regional planning, with county-level development at the grassroots level within the same research framework. It scientifically explores the current urbanization and urban system in China, aiming to serve the high-quality development of urbanization. By selecting 1,853 counties nationwide as the research subjects and combining the spatial scope of urban agglomerations and metropolitan areas in existing planning, the study identifies three types of counties: metropolitan radiated counties, urban agglomeration potential counties, and urban agglomeration gap counties. Using the weights determined by the entropy method, an indicator system was constructed across four dimensions—population, economy, society, and land—to conduct a preliminary exploration of the basic urbanization pattern of county-level areas nationwide, aiming to assess and improve current spatial policies.
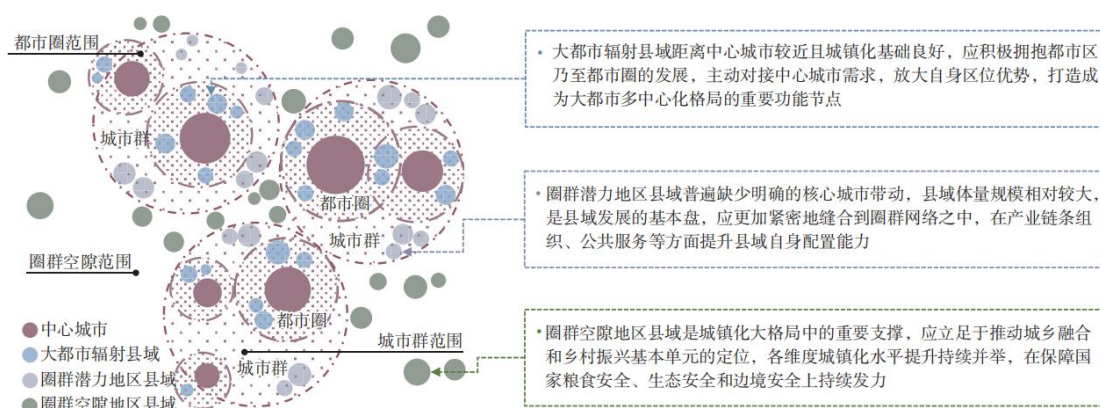

Fig.10   Spatial system of counties in relation to metropolitan regions and urban agglomerations and planning policies

As a foundational study on the county-level urbanization pattern based on the 2020 census data,

this large-scale, multi-dimensional research framework provides the main content of the study. However, due to the difficulty of obtaining and organizing comprehensive county-level data at the national scale, the research primarily focuses on characterizing the county urbanization levels, the degree of coupling coordination among indicators, and the overall development levels of counties within regions, with brief explanations of underlying causes and driving mechanisms. Future research should integrate effective county-level model data using multi-data platforms to quantitatively infer causal relationships and further refine the mechanisms. More typical case studies are needed for qualitative analysis, and micro-level insights into county development will help guide future reform paths.

References

[1] Su Hongjian. The foundation, trends, and promotion strategies of county-level urbanization in China. Economist, 2021(5): 110-119.

[1] 苏红键.中国县域城镇化的基础、趋势与推进思路[J].经济学家, 2021(5): 110-119.

[2] Huang Zhenhua. County areas, county towns, and rural revitalization. Theory and Reform, 2022(4): 156-165.

[2]黄振华.县域、县城与乡村振兴[J].理论与改革, 2022(4): 156-165.

[3] Hu Xuwei. Promoting nearby urbanization within counties in the "14th Five-Year Plan" and national spatial planning. [EB/OL]. 2020-08-18 [2023-07-08]. http://www.planning.org.cn/news/view?id=10869.

[3]胡序威.“十四五”规划和国土空间规划编制中要推进县域内就近城镇化[EB/ OL]. 2020-08-18[2023-07-08]. http:// www . planning. org. cn/news/view?id= 10869.

[4] Peng Chong, Chang Lili. Spatio-temporal patterns of county urbanization in Hunan Province and their correlation with economic development. Economic Geography, 2013, 33(8): 73-78.

[4]彭翀,常黎丽.湖南省县域城镇化时空格局及其经济发展相关性研究[J].经济地理, 2013, 33(8): 73-78.

[5] Zhang Yue, Zhang Hang. Research on county development classification and distribution from the perspective of the new national land spatial structure. Small Town Construction, 2022, 40(1): 5-11.

[5]张悦,张航.国土空间新格局视角下的县域发展建设分类与分布研究[J].小城镇建设, 2022, 40(1): 5-11.

[6] Huang Yaping, Lin Xiaoru. Exploration of the driving mechanisms of new-type urbanization in underdeveloped mountainous counties: A case study of Hubei Province. Urban Planning Journal, 2012(4): 44-50.

[6]黄亚平,林小如.欠发达山区县域新型城镇化动力机制探讨:以湖北省为例[J].城市规划学刊, 2012(4): 44-50.

[7] Song Yongyong, Xue Dongqian, Ma Beibei, et al. Urbanization processes and their ecological and environmental response patterns in the Loess Plateau. Economic Geography, 2020, 40(6): 174-184.

[7]宋永永,薛东前,马蓓蓓,等.黄土高原城镇化过程及其生态环境响应格局[J].经济地理,2020,40(6): 174-184.

[8] Zhang Yiwen, Ma Yuqi. Development ideas for county town construction in China. Macro

Economic Management, 2022(4): 20-25.

[8]张蔚文,麻玉琦.我国县城分类建设发展思路[J].宏观经济管理,2022(4): 20-25.

[9] Zhang Ying, Zhuo Xian. New driving forces and characteristics of Urbanization 2.0: Analysis based on big data of mobile phone users. Reform, 2021(1): 146-155.

[9]张颖,卓贤.城镇化 2.0 的新动力与新特征:基于手机用户大数据的分析[J].改革, 2021(1): 146-155.

[10] Liu Hang, Zhang Juan. Characteristics, dilemmas, and countermeasures of county urbanization in the new era. Small Town Construction, 2021, 39(5): 81-86.

[10]刘航,张娟.新时期县域城镇化的特征、困境与对策探讨[J].小城镇建设,2021,39(5): 81-86.

[11] He Xuefeng. The "feet" of big cities or the "brain" of rural areas? The logic of county economy and urbanization in central and western China. Social Sciences Journal, 2022(5): 55-62.

[11]贺雪峰.大城市的"脚"还是乡村的"脑"？中西部县域经济与县域城镇化的逻辑[J].社会科学辑刊, 2022(5): 55-62.

[12] Yuan Meng, Yang Hua. The practical logic and social risks of rural county urbanization. Urban Issues, 2022(7): 24-32.

[12]袁梦,杨华.农民县域城镇化的实践逻辑与社会风险[J].城市问题, 2022(7): 24-32.

[13] Wang Jing, Li Yurui. The development pattern and influencing factors of county urbanization in China: Based on county-level data from the 2000 and 2010 national population censuses. Acta Geographica Sinica, 2016, 71(4): 621-636.

[13]王婧,李裕瑞.中国县域城镇化发展格局及其影响因素:基于 2000 和 2010 年全国人口普查分县数据[J].地理学报, 2016, 71(4): 621-636.

[14] Liu Yansui, Yang Ren, Lin Yuancheng. Evolution and optimization path of county-level urbanization patterns in China. Acta Geographica Sinica, 2022, 77(12): 2937-2953.

[14]刘彦随,杨忍,林元城.中国县域城镇化格局演化与优化路径[J].地理学报, 2022, 77(12): 2937-2953.

[15] Gao Jinlong, Bao Jingwei, Liu Yansui, et al. Regional differences and influencing factors of county-level land urbanization in China. Acta Geographica Sinica, 2018, 73(12): 2329-2344.

[15]高金龙,包菁薇,刘彦随,等.中国县域土地城镇化的区域差异及其影响因素[J].地理学报, 2018, 73(12): 2329-2344.

[16] Guo Yuanzhi, Zhou Yang, Cheng Tianchan, et al. Deconstruction and classification of county-level population urbanization in Zhejiang Province. Economic Geography, 2018, 38(10): 63-71.

[16]郭远智,周扬,成天婵,等.浙江省县域人口城镇化解构及其类型划分[J].经济地理, 2018, 38(10): 63-71.

[17] Cao Xiaoshu, Xu Jianbin. Spatial heterogeneity of county-level economic patterns and influencing factors along China's provincial borders. Acta Geographica Sinica, 2018, 73(6): 1065-1075.

[17]曹小曙,徐建斌.中国省际边界区县域经济格局及影响因素的空间异质性[J].地理学报, 2018, 73(6): 1065-1075.

[18] Chen Mingxing, Lu Dadao, Zhang Hua. Comprehensive measurement and driving factor analysis of urbanization levels in China. Acta Geographica Sinica, 2009, 64(4): 387-398.

[18]陈明星,陆大道,张华.中国城市化水平的综合测度及其动力因子分析[J].地理学报, 2009, 64(4): 387-398.

[19] Wang Yang, Fang Chuanglin, Wang Zhenbo. Comprehensive evaluation of county-level

urbanization levels and regional classification in China. Geographical Research, 2012, 31(7): 1305-1316.

[19]王洋,方创琳,王振波.中国县域城镇化水平的综合评价及类型区划分[J].地理研究, 2012, 31(7): 1305-1316.

[20] Ling Xiaoshu, Wang Li, Xue Desheng. Measurement and differentiation of county urbanization levels in Jiangxi Province. Human Geography, 2014, 29(3): 89-94.

[20]凌筱舒,王立,薛德升.江西省县域城镇化水平测度及其分异研究[J].人文地理, 2014, 29(3): 89-94.

[21] Deng Zhituan. Deep understanding of the characteristics of Chinese cities to build a new urban development pattern. Shanghai Urban Management, 2020, 29(2): 2-3.

[21]邓智团.深刻认识中国城市特色构建城市发展新格局[J].上海城市管理, 2020, 29 (2): 2-3.

[22] Fang Chuanglin. Atlas of Chinese Urban Agglomerations. Beijing: Science Press, 2020.

[22]方创琳.中国城市群地图集[M].北京：科学出版社, 2020.

[23] Hirotsugu U, Andrew N. Agglomeration index: Towards a new measure of urban concentration. Washington, D.C.: UNU-Wider, 2010.

[23] HIROTSUGU U, ANDREW N. Agglomeration index: towards a new measure of urban concentration[M]. Washington,D C: UNU-Wider, 2010.

[24] An Shuwei, Sun Wenqian. Function and enhancement strategies of small and medium-sized cities within metropolitan areas. Reform, 2019(5): 48-59.

[24]安树伟,孙文迁.都市圈内中小城市功能及其提升策略[J].改革, 2019(5): 48-59.

[25] Xiao Jincheng. Formation mechanisms of metropolitan areas and urban agglomerations. Today's Land, 2022(12): 13-16.

[25]肖金成.都市圈与城市群的形成机理[J].今日国土, 2022(12): 13-16.

[26] Zhang Tinglin, Sun Bindong. Discussion on the spatial range delineation of current metropolitan area planning in China. Urban Planning Journal, 2023(4): 104-109.

[26]张婷麟,孙斌栋.关于当前我国都市圈规划空间范围划定的探讨[J].城市规划学刊, 2023(4): 104-109.

[27] Fang Chuanglin. Construction of Chinese urban agglomerations and metropolitan areas under the new development pattern. Economic Geography, 2021, 41(4): 1-7.

[27]方创琳.新发展格局下的中国城市群与都市圈建设[J].经济地理, 2021, 41(4): 1-7.

[28] Shen Mingrui, Wang Ziqing, Cui Gonghao. Metropolitan areas in China: Theoretical origins and planning practices. Urban Planning Journal, 2023(2): 57-66.

[28]申明锐,王紫晴,崔功豪.都市圈在中国:理论源流与规划实践[J].城市规划学刊, 2023(2): 57-66.

[29] Robinson J. Ordinary Cities: Between Modernity and Development. London: Routledge, 2006.

[29]ROBINSON J.Ordinary cities: between modernity and development[M]. London: Routledge, 2006.

[30] Zhao Yi, Zheng Jun, Xu Chen, et al. Key issues in the preparation of county-level land spatial plans. Urban Planning Journal, 2022(2): 54-61.

[30]赵毅,郑俊,徐辰,等.县级国土空间总体规划编制关键问题[J].城市规划学刊, 2022 (2): 54-61.

[31] Niu Xinyi, Liu Sihan, Zhu Yi. Research on the spatial characteristics of urbanization in China

from the perspective of interregional migration. Urban Planning Journal, 2021(1): 82-89.

[31]钮心毅,刘思涵,朱艺.地区间人员流动视角下的中国城镇化空间特征研究[J].城市规划学刊, 2021(1): 82-89.

[32] Lin Xiaoying. Children in Counties. Shanghai: Shanghai People's Publishing House, 2023.

[32]林小英.县中的孩子[M].上海:上海人民出版社, 2023.

[33] Shen Mingrui, Jiang Yuyang, Zhang Jingxiang. Education-driven county urbanization and policy reflections. Urban Development Studies, 2021, 28(11): 8-15.

[33]申明锐, 蒋宇阳,张京祥.教育驱动的县域城镇化与规划政策反思[J].城市发展研究, 2021, 28(11): 8-15.

[34] Liu Yansui, Yang Ren. Spatial characteristics and formation mechanisms of county-level urbanization in China. Acta Geographica Sinica, 2012, 67(8): 1011-1020.

[34]刘彦随,杨忍.中国县域城镇化的空间特征与形成机理[J].地理学报, 2012, 67(8): 1011-1020.

[35] Wang Bin. Entropy and Information. Xi'an: Northwestern Polytechnical University Press, 1994.

[35]王彬.熵与信息[M].西安:西北工业大学出版社, 1994.

[36] CCID Consulting. 2023 Research on China's Top 100 County Economies. Beijing: CCID Consulting, 2023.

[36]赛迪顾问.2023 中国县域经济百强研究[M].北京:赛迪顾问, 2023.

[37] Wang Shujia, Kong Wei, Ren Liang, et al. Misunderstandings and corrections of the coupling coordination degree model in China. Journal of Natural Resources, 2021, 36(3): 793-810.

[37]王淑佳,孔伟,任亮,等.国内耦合协调度模型的误区及修正[J].自然资源学报, 2021, 36(3): 793-810.

[38] Sun Dongqi, Zhang Jingxiang, Hu Yi, et al. Mechanism analysis of the "metropolitan shadow zone" formation based on industrial spatial connections: A comparative study of the Yangtze River Delta and Beijing-Tianjin-Hebei urban agglomerations. Geographical Sciences, 2013, 33(9): 1043-1050.

[38]孙东琪,张京祥,胡毅,等.基于产业空间联系的"大都市阴影区"形成机制解析:长 三角城市群与京津冀城市群的比较研究[J].地理科学, 2013, 33(9): 1043-1050.

[39] Wu Kang, Hong Hui. Population loss in county towns: Current status and governance priorities. National Governance, 2023(5): 61-66.

[39]吴康,洪辉.县城人口流失:现状分析与治理重点[J].国家治理, 2023(5): 61-66.

[40] Yi Xiaoxiang, Wang Shuyu, Zhang Haoping, et al. Challenges and solutions for urban construction land under the background of population shrinkage: A case study of Northeast China. Urban Planning Journal, 2023(6): 68-78.

[40]衣霄翔,王淑钰,张郝萍,等. 人口收缩背景下城镇建设用地的挑战与出路:以我国东北三省为例[J].城市规划学刊, 2023(6): 68-78.

[41] Wang Fang, Yan Hong. Fiscal transfer payment policies and poverty governance: Basic logic and ideological transformation. Financial and Economic Research, 2022, 48(8): 18-32.

[41]王昉,燕洪.财政转移支付政策与贫困治理:基本逻辑与思想转型[J]. 财经研究, 2022, 48(8): 18-32.

[42] Gu Luyan, Shen Mingrui. Observations on human settlements in the wave of Cao County's costume industry. Human Settlements, 2024(1): 46-47.

[42] 顾璐艳, 申明锐. 曹县华服产业浪潮中的人居观察[J].人类居住, 2024(1): 46-47.

[43] Li Wenqi, Zhang Li, Zhang Shangwu. Topics, review, and outlook of rural-urban integration

research in China. Urban Planning Journal, 2022(6): 36-43.

[43]李雯骐, 张立, 张尚武. 中国城乡融合研究的议题、评述及展望[J]. 城市规划学刊, 2022(6): 36-43.

[44] Ministry of Ecology and Environment of the People＇s Republic of China. Arxan: Holding the "golden rice bowl" of ecological protection. [EB/OL]. 2019-09-25 [2024-03-03]. https://www.mee.gov.cn/xxgk2018/xxgk/xxgk15/201909/t20190925_735518.html.

[44]中华人民共和国生态环境部. 阿尔山：捧好生态环境的"金饭碗 "[EB/OL].2019-09-25[2024-03-03]. https://www . mee. gov. cn/xxgk2018/xxgk/xxgk15/201909/t20190925_735518.html.

[45] Duan Jin, Zhang Tingwei, Yin Zhi, et al. "Chinese-style Urban-Rural Modernization: Connotations, Characteristics, and Development Paths" Academic Discussion. Urban Planning Journal, 2023(1): 1-10.

[45]段进, 张庭伟, 尹稚, 等. "中国式城乡现代化：内涵、特征与发展路径"学术笔谈[J].城市规划学刊, 2023(1): 1-10.