

# On Urbanization Development Pattern and Determinants in Western China

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## Abstract

It is significant to reveal the development of urbanization pattern in western China and analyze its determinants for promoting the development of new urbanization in China. In this paper, based on the urbanization data of western China from 2005 to 2015 and the geographic detector model, the author analyses the development pattern and determinants of urbanization. The results show that the urbanization rate in western China has increased in the past 10 years, with Chengdu-Chongqing region changing greatly and Qinghai-Tibet Plateau changing minimally. In terms of determinants, economic factors tend to dominate, policies and natural factors are in the leading position, while population quality and spatial factors have relatively little influence. Then, this paper puts forward countermeasures, that is, we should not only develop urbanization, but also attach great importance to the differences in the spatial pattern of urbanization in the western region. China should follow a scientific path of urbanization development under the guidance of the government, and promote it with new industrialization and agricultural modernization, so as to realize their coordinated development. In short, a reasonable analysis of the development pattern and determinants of urbanization in the western region of China can guide the development of urbanization, so as to enhance the economic development in the western China.

## Keywords

Urbanization; Development pattern; Determinants; Western China.

## 1. INTRODUCTION

Urbanization is a systematic process where population, regional pattern, industrial structure and lifestyle and so on turn to urbanization with the development of regional social economy[1]. At present, in China, incomplete urbanization is gradually transiting to complete urbanization. This is not only the key for the further development of new urbanization, but also the decisive stage for building a moderately prosperous society in an all-round way [2]. According to relevant statistics, China's urbanization rate will reach 65% in 2030, but its rapidness will inevitably lead to problems such as changes in social structure, distribution of social benefits, transformation of industrial structure and renewal of political system. Therefore, how to use scientific methods to analyze the development pattern of urbanization and its determinants has theoretical and practical significance for improving the quality of urbanization and accelerating its development.

Urbanization has always been a hot spot in academic circles, especially since the 21st century, it has been a common concern to scholars from all walks of life in recent years. Foreign scholars

have mainly made theoretical researches on it. For example, theorists such as Marx [3], Hirschman [4] and Patrick Geddes [5] have continuously updated the connotation of urbanization development and put forward their own theoretical opinions. However, domestic scholars mainly analyze it from four aspects: urbanization measurement, pattern analysis, temporal and spatial changes and factor characteristics. For example, Hu Shougeng [6] took 80 counties in Hubei Province as examples to calculate the urbanization level; Yang Bin [7] took Jilin Province as an example, calculated the urbanization level of the old industrial base and analyzes its temporal and spatial changes, concluding that urbanization in Jilin Province shows extensive development. Yang Zhen [8] took Xinjiang as an example, analyzed the spatial pattern, and obtained the random development trend of urbanization in Xinjiang. Ma Xiaoxian [9] analyzed the key factors of China's urbanization development and its effect characteristics from many aspects, and concluded that urbanization development originated from endogenous power. In a word, compared with foreign studies which mainly focus on regional theoretical analysis, domestic studies are mostly microscopic empirical analysis.

In 2016, China's urbanization rate is 53%, while the average urbanization rate in the western region is only 47%. Although China has implemented plans to revitalize the western region, such as The Development of the Western Region in China, it still relies on low cost and cheap labor to develop urbanization, which is inefficient and low-quality. Moreover, due to various factors such as geographical environment and traffic conditions, the development of urbanization in the western region is difficult.

Based on these, with 12 western provinces as the research object, this paper analyzes the urbanization development pattern and its determinants from 2005 to 2015 with the geographic detector model, and provides policy basis for the future development of new urbanization in western China.

## **2. INTRODUCTION TO THE STUDIED REGIONS AND RESEARCH METHODS**

### **2.1. Introduction to the Studied Regions**

According to the China Statistical Yearbook, China is divided into three regions: eastern, central and western region. The western region includes 12 provinces, autonomous regions and municipalities directly under the central government, including Shanxi, Sichuan, Yunnan, Guizhou, Guangxi Zhuang Autonomous Region, Gansu, Qinghai, Ningxia, Tibet, Xinjiang, Inner Mongolia, Chongqing [10]. In addition, it can be divided into six regions: Qinghai-Tibet Plateau Region (Tibet), Loess Plateau Region (Shanxi Province), Qinghai-Xinjiang Region (Qinghai Province, Xinjiang), Yunnan-Kweichow Plateau Region (Yunnan Province, Guizhou Province), Gansu-Ningxia Region (Gansu Province, Ningxia Province), Cheng-Yu District (Sichuan Province, Chongqing city). Although China's western region has a vast territory, its economy is underdeveloped due to terrain, climate and historical factors. However, because of its rich resources, all of them have great potential for development. Therefore, it is necessary to study its urbanization pattern and its determinants.

### **2.2. Research Methods**

Previously, specific models and software [11] were mostly used to solve the local disease risk and its geographical location related determinants, but their effects were not significant due to too many hypothetical conditions. Later, geographic detectors were widely used because there were fewer constraints, especially factor detectors, which were very convenient to deal with determinants. Although things are always in specific positions, their determinants are different. If there is a significant spatial consistency between the changes of an environmental factor and a geographical thing, then it is of decisive significance to the thing. According to the characteristics of urbanization development in western China, this paper selects the

determinants shown in Table 1, and analyzes the determinants of urbanization development in western China from seven aspects: factor input, consumption demand, spatial agglomeration, population quality, governmental role, economic development and natural conditions. The calculation formula is as follows [12]:

$$P_{a,b} = 1 - \frac{1}{\sigma_n^2} \sum_a^m n_{a,i} \sigma_{a,i}^2$$

Where:  $P_{a,b}$  and  $B$  are detection force values of detection factor  $A$ ;  $m$  is the number of level-2 regions,  $n$  is the number of level-1 regions,  $n_{a,i}$  is the number of geographical things in secondary areas. The higher the values of  $P_{a,b}$ , the higher the degree of influence of their factors on geographical things.

**Table 1.** Indicators of Determinants

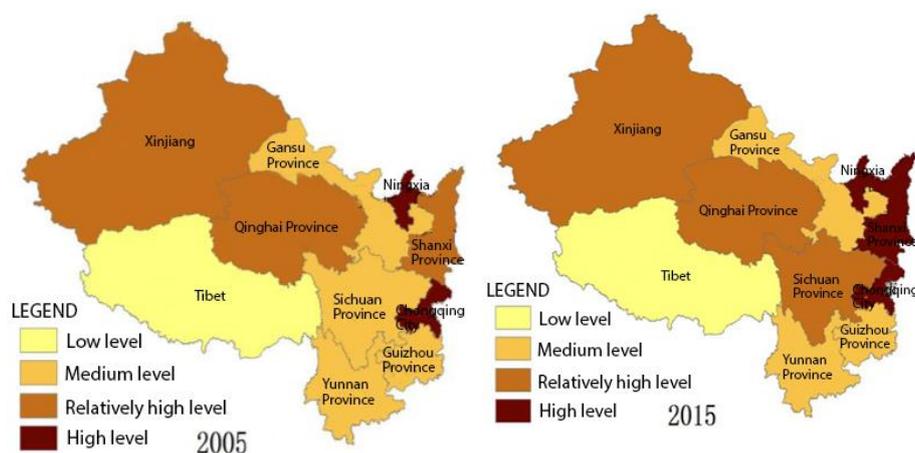
Indicator content number	Content	Number content number
Factor input	Area of built-up area (square kilometers)	f1
	Employed population of each urban household	f2
	Number of theaters	f3
Consumption demand	Number of Local Telephone Users at Year End (10,000)	f4
	Domestic Tourism Rate of Urban Residents	f5
Spatial agglomeration	Urban population density (per square kilometer)	f6
	Green space area (ha)	f7
	Per capita road area (m <sup>2</sup> )	f8
Population quality	Graduation rate of high school graduates (%)	f9
	The added value of education industry (billion yuan)	f10
Role of government	Local fiscal revenue (ten thousand yuan)	f11
	Local fiscal expenditure (ten thousand yuan)	f12
Economic development	GDP (billion yuan)	f13
	Per capita GDP (yuan)	f14
Natural conditions	Elevation	f15
	Temperature	f16
	Precipitation	f17

### 3. DATA ANALYSIS

#### 3.1. Changes in Urbanization Pattern in Western China

In order to further analyze the spatial difference of urbanization development in western China, based on the data of 2005 and 2015 and GIS 10.2 platform, the urbanization development level is divided into four levels by Nature Breaks (Figure 1): low level, medium level, relatively high level and high level. As can be seen from the figure, the urbanization rate of the Qinghai-Tibet Plateau region in western China continued to be at a low level in 2005 and 2015, while the Qinghai-Xinjiang Region (Qinghai province, Xinjiang) and the Yunnan-Kweichow Plateau Region (Yunnan Province, Guizhou Province) remained relatively stable, because the region in the Qinghai-Tibet plateau and the areas where mountains and basins alternate with each other have long been restricted by natural geographical conditions which are not conducive to the

development of human life. In addition, due to special historical reasons, there are a large number of ethnic minorities, living in backward remote areas for a long time, with inconvenient transportation and low education level, resulting in the backward ideology, low cultural level and professional skills of its residents, and weak awareness of cities and towns and commodity economy, which makes it difficult to adapt to the life in cities and towns. Further, these have hindered the urbanization development in the region. The Cheng-Yu District (Sichuan Province, Chongqing city) and the Loess Plateau Region (Shanxi Province) have changed significantly, with the urbanization rate rising from a medium-high level to a high level. Since the 18th National Congress of the Communist Party of China, the central government has expanded the overall strategy and level of regional development according to changes in the domestic and international situation, and re-examined the development of new urbanization in China based on a large regional spatial scale. Cheng-Yu District and Loess Plateau Region, as the key areas for the development of the western region, are important parts of China's new urbanization development strategy. However, the urbanization rate of provinces in western China increased from 2005 to 2015, with the urbanization rate of most provinces increasing by 20%-50%.



**Figure 1.** Development Pattern of Urbanization in Western China from 2005 to 2015

### 3.2. Determinants of Urbanization Development Pattern in Western Region

Urbanization is a geospatial process integrating economic, social, resource and environment factors, which essentially reflects the changes in social and economic development. In this paper, 17 indicators are selected as determinants from 7 aspects including factor input, consumption demand, spatial agglomeration, population quality, government role, economic development and natural conditions, as shown in Table 1. From 2005 to 2015, the indicator variables of geographical detection factor variables of urbanization development pattern in western China are divided into 5 levels. Through the geographical detector research method, the decisive power  $P$  values of each factor variable are calculated respectively. Among them, natural condition indicators are directly graded into 5 levels in ArcGIS, while other categories such as factor input, consumption demand and spatial agglomeration are obtained according to statistical data.

**Table 2.** Decisive Power of Determinants on Urbanization Layout in Western China from Geographical Survey Results

Indicator	f1	f2	f3	f4	f5	f6	f7	f8	f9	f10	f11	f12	f13	f14	f15	f16	f17
Level 1	<4.5	<1	<4	<2	<2	<1	<4.5	<4.5	<4	<5	<5	<5	<5	<5	<2	<3	<2
Level 2	4.5~5.5	1~2	4~4.5	2~4	2~4	1~2	4.5~5.5	4.5~5.5	4~4.5	5~6	5~6	5~6	5~6	5~6	2~4	3~8	2~4
Level 3	5.5~6.5	2~3	4.5~5	4~6	4~6	2~3	5.5~6.5	5.5~6.5	4.5~5	6~7	6~7	6~7	6~7	6~7	4~6	8~15	4~6
Level 4	6.5~8	3~4	5~5.5	6~8	6~8	3~4	6.5~8	6.5~8	5~5.5	7~8	7~8	7~8	7~8	7~8	6~8	15~25	6~8
Level 5	>8	>4	>5.5	>8	>8	>4	>8	>8	>5.5	>8	>8	>8	>8	>8	>8	>25	>8
P	0.029	0.022	0.046	0.039	0.041	0.031	0.027	0.028	0.047	0.051	0.099	0.097	0.103	0.163	0.055	0.059	0.063

According to the calculation results of the model, from high to low, the importance of determinants of urbanization development pattern in western China is economic development (0.266), government role (0.196), natural conditions (0.177), consumption demand (0.126), population quality (0.098), spatial agglomeration (0.086) and factor input (0.051). 1) Economic development dominates the pattern of urbanization in western China, and under certain conditions the two promote each other. With the advancement of urbanization in western China, the differences of economic development of western provinces has gradually widened. The slow development of economy restricts urbanization, resulting in different urbanization stages in the western provinces. Compared with the Qinghai-Tibet Plateau with relatively backward economic development, unreasonable industrial structure, and insufficient funds, Cheng-Yu District, an important area for the country to deepen the development of the western region, the key development of the country, and the comprehensive supporting reform of the country's overall planning of urban and rural areas, has seen a significant increase in its economic development level this year, so its decisive power in economic development is the greatest. 2) The role of the government, natural conditions and consumption demand have strong decisive power on the urbanization pattern in western China. The role of the government is mainly reflected in the regional strategic policies. The development of urbanization in Qinghai-Tibet Plateau and Yunnan-Guizhou Plateau is poor due to the obvious lack of strategic policies for urbanization and the obvious lag of comprehensive transportation network and basic public services. As for Cheng-Yu District, it is the focus of China's urbanization regional strategic policy this year, promoting the overall establishment of urbanization and population urbanization. The influence of natural conditions on the layout of urbanization in western China is mainly reflected in slope, elevation and precipitation. There are great differences in the natural geographical environment among provinces. Among them, Tibet, Yunnan and Guizhou are in plateau areas where the climate and natural conditions are not conducive to human habitation, so their urbanization is poor. Consumption level is mainly determined by economic development, which has a more important impact on the pattern of urbanization in western China. 3) Population quality, spatial agglomeration and factor input have less decisive power on urbanization development pattern in western China, because they depend on urbanization and economic development level.

### 3.3. Regional Division of Urbanization Development Types in Western Region

In view of the above analysis of urbanization development pattern and determinants in western China, the regional division of urbanization development types in western China (Table 3) is discussed. The western China is divided into 6 major types and 10 provinces. The development of different types is shown in Table 3: 1) Qinghai-Tibet Plateau Region mainly refers to Tibet autonomous region. Its urbanization development is relatively slow mainly with plateau as the main terrain. Therefore, in the future, urban infrastructure and traffic conditions

should be improved to promote the development of small towns. 2) The Loess Plateau Region includes Shanxi Province, with poor natural conditions, inadequate water resources and great social and economic differences. Therefore, the next step should be to improve the efficiency of water resources utilization, stabilize agricultural grain production and enhance the carrying capacity of the regional ecological environment. 3) Qinghai-Xinjiang Region mainly includes Qinghai Province and Xinjiang Uygur Autonomous Region. The urbanization level in this region is relatively low with agricultural production as the main. Therefore, in the future, it should further develop characteristic industries and strengthen ecological construction. 4) Yunnan-Kweichow Plateau Region mainly includes Yunnan Province and Guizhou Province. Because of the poor natural environment conditions, it is necessary to further volatilize its advantages in tourism resources and strengthen the regional environmental carrying capacity. 5) Gansu-Ningxia Region mainly includes Gansu Province and Ningxia Hui Autonomous Prefecture. The urbanization development in this region is relatively high, so in the future, it should develop characteristic industries, continuously strengthen the carrying capacity of urban resources and environment, and promote the development of small and medium-sized cities and towns. 6) Cheng-Yu District includes Sichuan Province and Chongqing city. The region is developing rapidly, so in the future, secondary and tertiary industries should be developed, industrial structure should be adjusted, industrial layout should be optimized, and the quality of urbanization and international influence should be further improved.

**Table 3.** Division of Urbanization Development Types in Western China

Name	Provinces included	Features	Development orientation
Qinghai-Tibet Plateau Region	Tibet	Low urbanization and economic development with plateau as the main terrain.	Improve urban infrastructure and traffic conditions to promote the development of small towns.
Loess Plateau Region	Shanxi Province	Relatively high proportion of primary industry with plateau and mountain as the main terrain.	Strengthen the carrying capacity of regional ecological environment, improve traffic conditions and stabilize agricultural grain production.
Qinghai-Xinjiang Region	Qinghai Province, Xinjiang	Lower urbanization rate with slow population density	Cultivate characteristic industries, coordinate the development between agriculture and secondary and tertiary industries, and improve the efficiency of water resources utilization.
Yunnan-Kweichow Plateau Region	Yunnan Province, Guizhou Province	Medium urbanization rate with general population mobility and plateau as the main terrain.	Developing tourism, strengthening regional ecological environment management, and promoting sustainable development of regional cities and towns.
Gansu-Ningxia Region	Gansu Province, Ningxia	Low urbanization rate and GDP per capita	Cultivate characteristic industries, improve the carrying capacity of urban resources and environment, and develop economically and intensively.
Cheng-Yu District	Sichuan Province, Chongqing City	Large population flow, low proportion of secondary and tertiary industries, high urbanization rate	Develop secondary and tertiary industries, adjust the industrial structure, optimize the industrial layout, and promote the comprehensive development capacity of cities and towns.

#### 4. COUNTERMEASURES FOR COORDINATED DEVELOPMENT OF URBANIZATION PATTERN IN WESTERN REGION

Based on the urbanization level and GIS in the western region from 2005 to 2015, this paper explores its spatial pattern changes from a macro perspective, and uses geographic detectors to explore its determinants after selecting a number of factors. It is concluded that the overall urbanization rate in the western China rose from 2005 to 2015, but both were lower than the average urbanization rate in China. Among them, the urbanization rate in Qinghai-Tibet Plateau Region is generally low, while that in Yunnan-Kweichow Plateau Region is relatively high. Compared with the urbanization level of the western region in 2005 and 2015, Sichuan Province, Shanxi Province and Chongqing City have changed greatly, while other regions have not changed significantly. Due to the improvement of spatial sense and levels of their overall regional development strategy, the government has attached great importance to the development of urbanization. There is no obvious change in Qinghai-Tibet Plateau Area, which is mainly limited by history and topography. The urbanization is affected by many factors, of which economic development is the dominant factor. The role of the government, natural conditions and consumer demand have a strong decisive power on the urbanization pattern in western China, while the population quality, spatial agglomeration and factor input have a small decisive power. Therefore, we put forward corresponding countermeasures:

(1) While developing urbanization, great attention should be paid to the difference in the spatial pattern of urbanization in the western region. On the premise of fully grasping the resource advantages of each province, adjust measures to local conditions, scientifically distribute, formulate effective industrial policies and infrastructure construction policies, and implement differentiated management, so as to promote diversified urbanization development. For example, the Qinghai-Tibet Plateau Region, Gansu-Ningxia Region and Yunnan-Kweichow Plateau Region should develop urbanization based on their own tourism resources, while the Loess Plateau Region should improve its ecological environment carrying capacity. At the same time, while developing its own urbanization, the western region should strengthen its ties with the eastern and central regions, develop urbanization together, so as to advance social and economic development.

(2) Promoting urbanization with new industrialization and agricultural modernization to realize their coordinated development. On the one hand, China should promote the high-quality development of urbanization with new industrialization; on the other hand, China should develop urbanization while promoting the development of agricultural modernization. The western region should grasp the advantage of the country's western development, actively study and implement the successful experience of the development of the information industry in the eastern coastal areas, and learn to improve the traditional industries with information, so as to promote the common development of industrialization, agricultural modernization and urbanization.

(3) Taking a scientific road to urbanization under the guidance of the government. Based on the coordinated and orderly development of regional social economy, the government guides the spatial structure of urbanization pattern and creates a good institutional environment for the development of urbanization in western China. The slow development of the western region results from its own regional defects. However, it is a prerequisite for the development of urbanization to increase investment in modern infrastructure construction and ecological environment protection in cities and towns. In particular, the Qinghai-Tibet Plateau, Gansu-Ningxia and Qinghai-Xinjiang regions should increase infrastructure investment with the support of the government to optimize the urban living environment and social service level so as to enhance regional competitiveness.

The level of urbanization in the western region is obviously lower than the average level of urbanization in China. It is an important indicator of the level of regional economic development, so how to improve it is the focus of promoting urban development. Based on the urbanization level and GIS in the western region from 2005 to 2015, this paper explores its spatial pattern changes from a macro perspective, and uses geographic detectors to explore its determinants after selecting a number of factors. Then, according to the characteristics of urbanization development in the western region, corresponding countermeasures and suggestions are put forward, which can accurately reveal the urbanization level and correctly guide the urbanization development in western China.

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