Research on Urbanization Rate Trend in China Various Regions

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Abstract: The urbanization rate serves as one of the key indicators for measuring a country's stage and level of development. Forecasting the urbanization prospects of China's provinces facilitates the formulation of national regional development strategies by relevant authorities, while also plays a significant role in promoting coordinated economic and social progress. This article uses Stata software and the relevant data released by the National Bureau of Statistics Data Center, selects the urbanization rate time series data of 31 provinces in country from 1990 to 2024, establishes an ARIMA model of urbanization rate and time, and predicts 2025 to 2040 the change trend of urbanization rate in various regions. The analysis categorizes provinces and municipalities into six major regions for examination. Data shows that, with the exception of a few regions, urbanization rates across most areas are projected to reach 70% around 2030 and exceed 80% by 2040. Overall, urbanization rates across all regions will continue to grow, but uneven development persists between regions, particularly in the western regions. Relevant departments should formulate development strategies based on the actual conditions of urbanization, ensuring sustainable and healthy development while promoting coordinated urban-rural growth.

Keywords: Urbanization Rate; Forecast; ARIMA Model; Policy; China

1. Introduction

The urbanization rate serves as one of the indicators measuring the development level of a country or region. Since the launch of reform and opening-up, China's urbanization rate has surged from 17.9% in 1978 to 67.0% in 2024, achieving an average annual growth rate of 1.03%. As China enters the new phase of this period, its urbanization has entered a stage of high-quality development. On one hand, it drives economic growth, stimulating domestic demand, absorbs surplus rural labor, optimizes regional industrial structures, and promotes technological advancement and cultural exchange across regions. However, it also poses certain risks with the migration of large numbers of young workers to cities. Urbanization rates in developed countries typically exceed 80%. According to 2024 World Bank statistics: the Netherlands has an urbanization rate of 93%, Japan 92%, the United States 84%, South Korea 81%, and Singapore has achieved a 100% urbanization rate, while developed nations such as the United States, Japan, and South Korea all maintain urbanization rates surpassing 80%. Most developed countries have urbanization rates exceeding 80%.International experience indicates that an urbanization rate between 30% and 70% represents a phase of rapid urban development, signifies that China has now entered a stage of high urbanization [1]. Although China's urbanization rate has grown rapidly—rising from 26% in 1990 to 66% in 2024—still falls short of the average urbanization rate among developed countries during the same period. Therefore, reaching an urbanization rate of 80% serves as a key indicator for measuring China's urbanization progress.

Some scholars conduct research on high-quality urbanization development. Pan and Yan reveal the significant role of new-type urbanization

from the perspective of new-type urbanization and the digital economy in promoting high-quality economic development [2]. Feng conducted a prospective study on three major shifts during the period: industrialization, urbanization, and demographic structure [3]. Other scholars also examine the impacts arising from the urbanization process. Wu studied the living conditions of farmers during urbanization [4]. Li et al. examined elderly health levels from the perspectives of China's urbanization and residential environments [5]. Li et al. examined the synergistic mechanisms between county-level urbanization and industrialization under integrated urban-rural development [6].

China's urbanization rate has drawn widespread attention, with some scholars conduct research on the forecast of it. Despite the substantial work undertaken by these scholars, consensus remains elusive regarding projections for urbanization levels. For instance, Pan et al. (2025) utilized census data released by the National Bureau of Statistics and United Nations methodology [7]. Ke et al. predict that by 2030, China's urban population share will continue to rise, with the urbanization rate reaching 69.37%, while the nation's demographic structure will undergo accelerated transformation [8]. Through multi-model screening, Hu (2023) projects China's urbanization rate to reach 73.41%–74.53% by 2035 [9]. Du and Zhang forecast that China's urbanization rate will maintain rapid growth from 2021 to 2035, increasing by approximately 1.05 percentage points annually on average. Economic variables are projected to contribute 0.43 percentage points annually, while institutional reforms will contribute 0.62 percentage points, resulting in an urbanization rate of about 77.29% by 2035 [10].

Based on existing research findings, some scholars have primarily focused on analyzing the urbanization rates of specific provinces, while fewer studies have examined urbanization rates across all provinces and municipalities nationwide. In terms of content, much recent literature has concentrated on forecasting urbanization trends around 10 years, with limited projections extending beyond 10 years. Therefore, this paper employs ARIMA regression analysis on urbanization rate data from 1990 to 2024 across all provinces and municipalities to forecast their urbanization levels from 2024 to 2040, which covers three aspects, which includes material and methods, results and discussion. This approach aims to identify the evolving trends in urbanization rates across regions, thereby providing insights to support the comprehensive building of a moderately prosperous society and accelerate rural revitalization.

2. Material and Methods

The time-series data on urbanization rates for China's 31 provinces and municipalities from 1990 to 2024, selected for this study, are derived from the urban and rural population data of the National Bureau of Statistics Data Center. The urbanization rate is calculated based on the ratio of the urban resident population to the total population of the region.

China's urbanization rate exhibits four trends: First, the overall urbanization rate has risen comprehensively, with cities nationwide showing an upward trend. Second, urbanization has advanced rapidly in eastern and central regions, where the overall urbanization rate remains relatively high. Third, growth varies across other regions: Northeast China's urbanization rate increases slowly but starts from a higher baseline, while Northwest China has seen a gradual rise in urbanization rates. Central China, Southern China and East China regions have developed relatively quickly. However, in the Southwest China, while Xizang has consistently maintained a low urbanization rate, other areas exhibit a pattern of low starting points but high growth rates. Several key cities, including Beijing, Tianjin, and Shanghai, have maintained high urbanization rates from the outset, surpassing other provinces and municipalities, with their urbanization levels continuing to rise. Despite Chongqing has a later start, it has also developed relatively rapidly.

2.1 Quantitative Analysis

This study proposes to employ the ARIMA model, a time series econometric model, to analyze time series samples of urbanization rates across regions from 1990 to 2024. By establishing this model, we aim to forecast changes over the next 16 years, extending to 2040. The ARIMA model is a classic framework for analyzing time series data. It identifies patterns within the data to predict future trends.

2.2 Model Description

The ARIMA model (Autoregressive Integrated Moving Average model) is an extension of the ARMA model. By applying d-order differencing to the variable component of the ARMA model, the ARIMA model is derived. The ARIMA (p,d,q) model is obtained by differencing the ARMA (p,q) model by order d and is a commonly used model for forecasting non-stationary time series. The ARIMA (p,d,q) modeling process is shown as follows.

1). First, ensure the time series is stationary. This can be assessed visually by examining the time series plot or by performing unit root tests on the variable. If the sample is non-stationary, apply differencing to transform it into a stationary series.

2). Determine the values of the three parameters p, d, and q in the ARIMA model. For parameters p and q, assess the order by examining the truncation behavior of the sample's autocorrelation function (ACF) and partial autocorrelation function (PACF) through ACF and PACF plots. Specific assessment methods are shown in Table 1. Then, combine the AIC criterion and BIC criterion to determine the specific order. When q=0, ARMA (p,q) simplifies to an AR(p) model; when p=0, ARMA (p,q) simplifies to an MA(q) model.

3). Test the fitted model. To verify whether the fitted model omits explanatory variables, conduct a white noise test. Examine whether the residual sequence is white noise. If confirmed as white noise, it indicates no relevant information in the residuals. If not white noise, consider increasing the model's lag order and perform the corresponding tests again.

Table 1. Method for Determining ARMA (p,q) Degree

Model	ACF	PACF
AR (p)	attenuation approaches zero	p-order truncated
MA (q)	q-order truncated	attenuation approaches zero
ARMA (p, q)	approaches zero at the qth order	approaches zero at the pth order

2.3 Inspection Process

2.3.1 ADF stationarity test

Observation of the line charts for time series data across regions reveals a pronounced temporal trend in annual urbanization rate data. Therefore, the urbanization rate time series data underwent differencing. After applying differencing to this time series using Stata software, an ADF test was conducted. The results indicate that the null hypothesis is rejected at least at the 10% significance level. Consequently, the original data is stationary after differencing and can be used to construct an ARIMA model, which is shown in Table 2.

Table 2. ADF Tests and ARIMA Model Estimation in China's Regions over Time

Province	ADF Test				ARIMA(p,d,q) Estimation										Forecast		
	Coefficient	T value	Order	Level	p	d	q	β_0	z	β_1	z	β_2	z	Wald	2025	2030	2040
Beijing	-0.8746	-4.91	I	***	1	1	0			0.3731	2.37			5.61	0.88	0.89	0.89
Tianjin	-1.1903	-6.76	I	***	1	1	0			-0.0829	0.29			0.08	0.86	0.86	0.86
Hebei	-1.0286	-5.75	I	***	1	1	0	0.0144	2.12	0.0278	0.07			0.00	0.65	0.71	0.86
Shanxi	-0.8784	-5.06	I	***	1	1	0	0.0110	6.85	0.1241	0.69			0.48	0.68	0.74	0.86
Inner Mongolia	-0.9434	-5.26	I	***	2	1	0	0.0103	3.43	0.0811	0.30	-0.4612	4.12	17.42	0.71	0.75	0.83
Liaoning	-1.1351	-6.39	I	***	1	1	0	0.0095	1.60	-0.1319	-0.43			0.19	0.75	0.79	0.88
Jilin	-1.0359	-5.78	I	***	1	1	0	0.0079	1.02	-0.0352	0.03			0.00	0.67	0.70	0.78
Heilongjiang	-0.6949	-4.07	I	***	1	1	0	0.0060	2.74	0.3000	1.72			2.94	0.69	0.73	0.82
Shanghai	-0.6857	-4.03	I	***	1	1	0			0.4213	7.20			51.78	0.90	0.90	0.90
Jiangsu	-1.0278	-5.70	I	***	1	1	0	0.0159	2.35	-0.0271	0.04			0.00	0.77	0.85	0.99
Zhejiang	-0.9884	-5.51	I	***	1	1	0	0.0173	0.30	0.0113	0.00			0.00	0.77	0.86	0.99
Anhui	-0.8252	-4.91	I	***	1	1	0	0.0130	6.99	0.1880	0.93			0.86	0.64	0.72	0.88
Fujian	-1.0596	-5.92	I	***	1	1	0	0.0163	0.52	-0.0582	0.03			0.00	0.73	0.81	0.96
Jiangxi	-0.6944	-4.12	I	***	1	1	0	0.0130	2.10	0.3100	0.46			0.21	0.65	0.75	0.93
Shandong	-0.9617	-5.37	I	***	1	1	0	0.0141	1.21	0.0375	0.05			0.00	0.69	0.76	0.91
Henan	-0.9548	-5.37	I	***	1	1	0	0.0128	3.51	0.0448	0.18			0.03	0.60	0.67	0.80
Hubei	-1.1268	-6.82	I	***	2	1	0	0.0114	4.35	-0.1621	-0.64	-0.3303	-1.34	2.25	0.67	0.71	0.79
Hunan	-0.9301	-5.18	I	***	1	1	0	0.0131	9.15	0.0680	0.40			0.16	0.63	0.70	0.85
Guangdong	-1.0394	-5.79	I	***	1	1	0	0.0154	0.42	-0.0383	-0.04			0.00	0.77	0.85	0.99

Guangxi	-1.1185	-6.27	I	***	1	1	0	0.0124	2.70	-0.1157	-0.22			0.05	0.59	0.64	0.75
Hainan	-0.9401	-5.26	I	***	1	1	0	0.0133	0.85	0.0588	0.11			0.01	0.64	0.71	0.86
Chongqing	-1.1556	-6.53	I	***	1	1	0	0.0176	0.97	-0.1528	-0.10			0.01	0.74	0.81	0.97
Sichuan	-1.0720	-6.01	I	***	1	1	0	0.0136	2.36	-0.0708	-0.07			0.00	0.61	0.38	0.80
Guizhou	-1.0269	-5.76	I	***	1	1	0	0.0131	2.32	-0.0264	-0.09			0.01	0.58	0.64	0.77
Yunnan	-0.9163	-5.18	I	***	2	1	0	0.0123	1.78	0.0862	0.15	-0.0464	-0.05	0.02	0.55	0.62	0.75
Xizang	-0.8528	-4.81	I	***	1	1	0	0.0063	0.69	0.1433	0.54			0.29	0.40	0.44	0.52
Shaanxi	-1.0283	-5.77	I	***	2	1	0	0.0140	1.53	0.0135	-0.02	-0.0082	-0.01	0.00	0.68	0.74	0.88
Gansu	-1.1031	-6.07	II	***	1	1	0			0.9650	25.28			638.92	0.58	0.64	0.73
Qinghai	-0.3347	-2.62	I	*	1	1	0	0.0083	2.56	0.6805	4.02			16.16	0.66	0.77	0.99
Ningxia	-0.8251	-4.77	I	***	2	1	0	0.0130	5.12	0.1858	1.21	-0.0509	-0.19	1.50	0.70	0.77	0.92
Xinjiang	-0.5648	-3.53	I	***	1	1	0	0.0079	3.19	0.4309	2.77			7.66	0.62	0.68	0.82

Note: *——Significant at the 10% level; **——Significant at the 5% level; ***——Significant at the 1% level.

2.3.2 Determining order and estimating coefficients

After applying differencing to the data, determine the order of the ARIMA model. Utilize autocorrelation function plots and partial autocorrelation plots, combined with the AIC criterion and BIC criterion, to fit the model to the time series sample and determine the model coefficients. Results are shown in Table 2.

Urbanization rates in developed countries typically exceed 80%. Therefore, in the forecasting process, reaching an urbanization rate of 80% serves as the core evaluation criterion in this paper, indicating that the region's urbanization level has preliminarily approached the average urbanization rate of developed regions. The national urbanization rate is calculated using the arithmetic mean method, summing the urbanization rates of all provinces in the same year and taking their average. The results show that China's urbanization rate exhibits a trend of steady annual growth, projected to exceed 80% for the first time in 2036.

3. Results

By region, the prediction results obtained through the model formula are shown in Table 2. To visually observe the trend of urbanization rates, the forecasted values and historical urbanization rate data were plotted as line charts for each region in Figure 1, and depicted in Figures (a) through Figure (f). The results indicate that the predicted urbanization rates exhibit distinct regional characteristics.

North China Region: As shown in Figure (a), the urbanization rates of Beijing, Tianjin, Hebei, Shanxi, and Inner Mongolia will all exceed 70% by 2030. Beijing and Tianjin will surpass 80% as early as 2025, but due to their large base populations, their urbanization growth rates will stabilize thereafter and cease to increase. By 2040, Hebei, Shanxi, and Inner Mongolia will all exceed 80% urbanization, exhibiting similar growth trajectories and maintaining stable expansion.

Northeast Region: As shown in Figure (b), overall, the three northeastern provinces exhibit relatively similar urbanization trends. Heilongjiang, Liaoning, and Jilin had high urbanization rates in 1990, ranking 4th, 5th, and 6th nationally. However, Jilin's urbanization progressed relatively slowly, reaching approximately 70% by 2030—below the national average. In contrast, Heilongjiang and Liaoning will exceed 80% urbanization by 2040, nearly matching the national average.

East China Region: By 2030, Shandong, Jiangsu, Zhejiang, Fujian, Jiangxi, and Anhui will all exceed 70% urbanization rates, with Jiangsu, Zhejiang, and Fujian surpassing 80%. By 2040, the vast majority of provinces in East China will exceed 80% urbanization, showing nearly identical trends. Shanghai's urbanization rate will stabilize after reaching 90%, with minimal fluctuation.

Central and Southern Region: By 2030, Guangdong's urbanization will advance rapidly, exceeding 80%. Hubei, Hunan, Henan, and Hainan will surpass 80% around 2040. Guangxi and Hubei will lag below the regional average.

Southwest Region: Chongqing will develop rapidly, exceeding 80% urbanization by 2030. By around 2040, Sichuan, Guizhou, and Yunnan will also surpass 80%. Xizang's urbanization rate, though rising annually, will remain notably low, reaching only about 52% by 2040.

Northwest Region: By 2040, Ningxia, Qinghai, and Xinjiang will all achieve urbanization rates exceeding 80%. Shaanxi's urbanization rate is

projected to surpass 73% after 2040.

It is evident that urbanization development across China's regions exhibits significant disparities. Compared to most areas in the central and eastern regions, the imbalance in urbanization development is particularly pronounced in the western regions.

Therefore, with results above, the conclusions drawn are as follows: First, urbanization rates across all regions show a consistent upward trajectory year by year. Overall, urbanization rates across all regions will maintain a steady upward trajectory. It is projected that by around 2035, most regions will achieve the target urbanization rate of 80%. Second, with the exception of a few regions, most areas will achieve an urbanization rate of 70% by around 2030. By 2040, the urbanization rate in the majority of provinces nationwide will exceed 80%, reaching levels comparable to developed countries. Third, from a national perspective, the eastern and southern regions exhibit rapid urbanization development and high urbanization levels. The western region shows significant disparities in urbanization, encompassing both relatively developed and relatively underdeveloped areas. Fourth, regionally, East China and North China generally exhibit higher urbanization rates. While Northeast China and Central-South China lag behind these regions, their urbanization growth remains relatively stable. Southwest and Northwest China contain provinces with slower urbanization development, resulting in uneven progress compared to other regions.

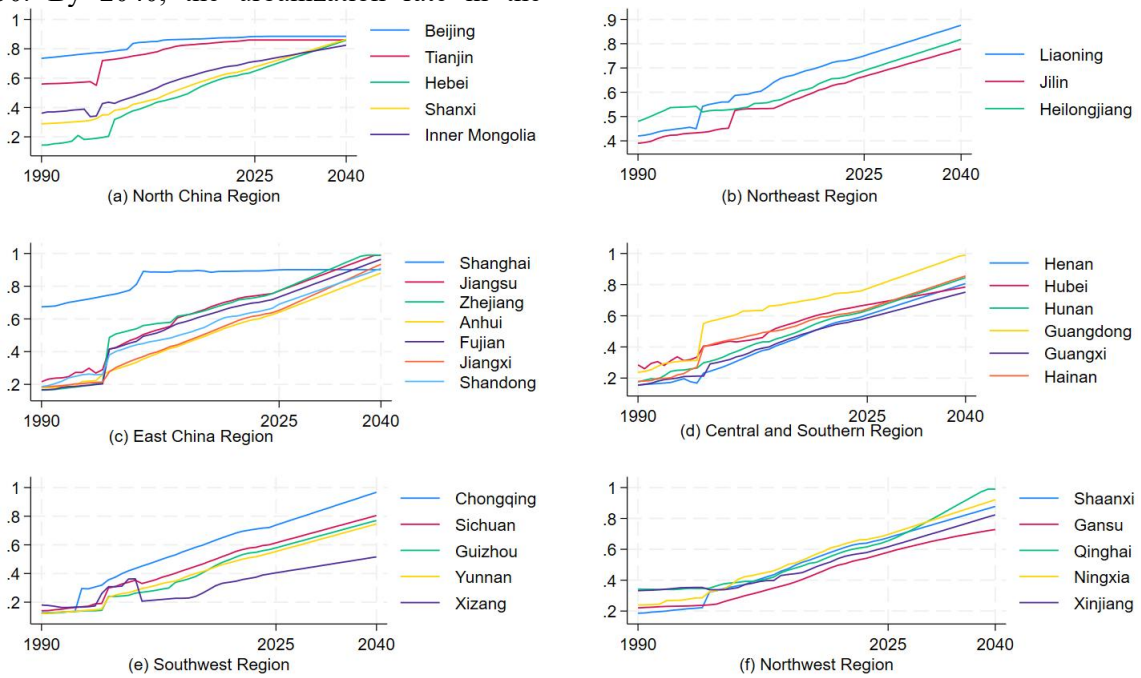

Figure 1. Urbanization Rate Development by Region, from 1990 to 2024 and Projected Values from 2025 to 2040

4. Discussion

This paper analyzes the trend of urbanization rates over time using relevant data released by the National Bureau of Statistics from 1990 to 2024. Overall, China's urbanization rate has developed at a relatively rapid pace, particularly in recent years, with most provinces experiencing a noticeable acceleration in urbanization. Taking North China as an example, the urbanization rate accelerated significantly during the five-year period from 2019 to 2024. This acceleration is primarily attributed to rapid technological advancements, high-speed economic growth, and large-scale population migration in recent years. Rapid technological advancements have boosted employment, accelerated the concentration of fixed-asset investment in urban areas, and stimulated urban economic growth. Meanwhile, residents' aspirations for a better life have further accelerated the migration of rural populations to cities.

Compared to other regions, urbanization in western China exhibits greater unevenness. Gansu and Xizang stand out for their notably low urbanization rates. Data indicates that despite some growth in Xizang's fixed-asset

investment in recent years, it remains the lowest nationwide. Since 2020, investment has declined annually due to the pandemic's impact, affecting Xizang's urbanization progress. While Gansu's fixed-asset investment is not as low as Xizang's, it has experienced a significant decline since 2016 and has yet to recover to its 2016 investment level. Therefore, among the western provinces, the generally low urbanization rates in Gansu and Xizang are a normal phenomenon. Therefore, the state should tailor policies to regional development characteristics, leverage comparative advantages, optimize industrial structures, and enhance policy support for areas lagging in urbanization rates to create favorable conditions for urbanization.

The paper also forecasts urbanization levels from 2025 to 2040. However, it should be noted that the trend projections for urbanization rates in this paper are derived solely from analyzing the inherent patterns within the selected time-series data samples. They cannot predict certain exogenous factors influencing urbanization rates, such as policy shifts or natural disasters. During the forecasting process, it is also noted that the trend in the raw data from 1990 to 2004 diverged from the trend observed starting in 2005. This discrepancy arose because, prior to 2005, data gaps necessitated calculating the urbanization rate as the ratio of the non-agricultural population to the total year-end population. This methodology included migrant workers in the calculation, leading to anomalous urbanization rates.

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