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Urbanization of Chongqing Municipality: Regional Contributions and Influencing Mechanisms

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Abstract: Enhancing the level and quality of urbanization and embarking on a new path toward the sustainable development of urbanization are the forces that are driving the achievement of stable and healthy economic and social development. Based on data from three population censuses and official statistics spanning from 1997 to 2021, this study decomposed the changes in the urbanization rates in Chongqing during this period. We employed a fixed-effects model to conduct a regression analysis on the factors influencing the regional contributions of urbanization and provide a comprehensive analysis of their mechanisms. The study findings are as follows: 1. The central urban area has been the primary region driving the urbanization in Chongqing since the establishment of the Chongqing municipality; however, since 2017, the new urban area has gradually become the new "main force" driving the urbanization in Chongqing. In different stages, dynamic regions have exhibited a pattern of "diversification—centralization—diversification". 2. Local urbanization is the main factor promoting the urbanization development in Chongqing, whereas remote urbanization has only played a supplementary role. The overall urbanization pattern in Chongqing is characterized by "local urbanization and population inflow". The central urban area has primarily propelled the urbanization of Chongqing through remote urbanization, whereas the new urban area, as well as the northeastern Chongqing area and southeastern Chongqing area, have predominantly driven the urbanization of Chongqing through local urbanization. In the four major regions and 38 counties, the predominant urbanization type was often "local urbanization and population outflow". 3. The level of the contribution of different regions to the urbanization development in Chongqing is the combined result of factors such as economic development, local administrative capacity, improvement in public services, and enhancement in transportation infrastructure.

Keywords: sustainable urbanization; regional contribution; local urbanization; remote urbanization; development disparities

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1. Introduction

Urbanization is a comprehensive transformation process that occurs with economic and social development, involving the continuous migration of rural populations to urban areas, the aggregation of secondary and tertiary industries in urban areas, and the diffusion of urban production and lifestyle to rural areas [1,2]. Since the reform and opening up, urbanization development in China has been rapid, with the urbanization rate increasing from 17.92% in 1978 to 64.72% in 2021. The average annual increase rate is 1.09%, and the permanent urban population has grown from 172 million to 914 million in this time frame. On average, 17.25 million people move to urban areas each year. The scale of this phenomenon has attracted widespread attention from domestic and international scholars, who have conducted numerous beneficial explorations into the reasons for its rapid development.

Scholars have conducted research at various scales, including the national [3,4], regional [5–7], provincial [8,9], municipal [10], and county [11] levels, employing methods such as stepwise regression [12], principal component analysis [13,14], geographic weighted regression [15], grey relational analysis [16], and geographic detectors [17], starting from the factors and driving mechanisms driving urbanization. Ning studied the characteristics of urbanization in China in the 1990s and its driving mechanisms, finding the emergence of a new trend of urbanization that is characterized by multiple dynamics, replacing the previous single or binary dynamics [3]. Cao supported this viewpoint and found that economic factors play a central role in urbanization, as do natural historical background, changes in urbanization patterns, and institutional reforms, which also have significant impacts [18]. Additionally, factors such as population density [4], household registration and land systems [19], foreign investment and export-led economic development [20], urban–rural income disparity [21], and technological progress [22] also exert varying degrees of influence on urbanization. The rich body of research has laid a suitable foundation for understanding the rapid urbanization development in China, including in its internal regions and provinces.

Some scholars have approached this field of study from the perspective of contributions, investigating the sources of urban population growth [23], the regional origins of permanent or registered household populations [24,25], changes in urban and rural populations [1], driving factors [26], and the degree of influence of different spatial regions [5,27] on urbanization, enriching the research from various angles. Wang divided the sources of urban population growth in China into natural growth, migration growth, and administrative division change growth. They found that, from 1991 to 2000, the cumulative contributions of these three growth types to urbanization were roughly in a ratio of 2:4:4, respectively [23]. Guo studied Zhejiang province at the county level, decomposing the sources of permanent residents into local household registered population, provincial urban permanent population, and urban permanent population from other provinces. The results showed that, from 2000 to 2010, migrants were the main driving force for urbanization development in the counties in Zhejiang province, whereas contributions from local household registered populations were limited [24]. Based on the household registration location, Zhao categorized this population into three groups: urban residents with household registration within the province, within the county, or within the town. From 2000 to 2015, the contribution of urban residents with household registration within the towns most strongly impacted the development of nearby urbanization in the central and western regions [25]. Zhang divided the permanent population into urban permanent residents and rural permanent residents. They calculated the urban contribution and rural contribution to the change in the urbanization rate in each county in the Beijing–Tianjin–Hebei region from 2000 to 2010 [1]. Lin divided the driving factors driving urbanization into economic factors and reform factors, finding that, from 1990 to 2020, both economic factors and institutional reform factors were important drivers of the increase in China's urbanization rate, with the contribution of reform factors being most prominent [26]. Cao decomposed the changes in China's urbanization rate by region, finding that, from 1982 to 2008, the eastern coastal areas were the main contributors to China's urbanization, with a cumulative contribution rate of 49%. However, since the beginning of the 21st century, the contribution rate of the eastern provinces to urbanization has generally declined, and the regions driving China's urbanization have gradually diversified and become more homogeneous, transitioning from individual coastal provinces to joint promotion by provinces in the east, center, and west [5].

A review of the literature shows that, although a mature and extensive body of research exists on the influencing factors and driving mechanisms driving urbanization, studies analyzing urbanization development from the perspective of contribution are relatively scarce. The existing studies have tended to focus on the composition of population sources, with fewer systematic explorations conducted from a geographical perspective, particularly regarding the urbanization process, characteristics, and regional contributions of

central cities in the western regions in China, which are experiencing population outflows and rapid urbanization. Furthermore, there have been relatively limited comprehensive explorations of the underlying mechanisms influencing these dynamics. Therefore, this study focused on the period of 1997 to 2021, first decomposing the changes in urbanization levels in Chongqing on a regional basis, extensively examining the contributions and modes of operation of the four major regions and 38 counties to the urbanization in Chongqing, and summarizing the urbanization types in the different regions based on this analysis. Second, based on the characteristics of Chongqing's urbanization development, this study explored the dynamic changes in the various factors affecting this urbanization of Chongqing from the perspective of spatial patterns, delving into the underlying mechanisms behind these impacts. Finally, the conclusions of this study are compared with those of relevant studies. Building on the validation of previous study conclusions, new features of Chongqing's urbanization in the new era are summarized, and future research directions are proposed, aiming to provide a basis for the future high-level and sustainable development of urbanization in Chongqing.

2. Materials and Methods

2.1. Study Area

The pattern of the development of the urban system in Chongqing is coordinated, with one core area and two groups. The "one core area" consists of the central urban area and the new urban areas, and the "two groups" include the northeastern and southeastern Chongqing areas (Figure 1). The central urban area and the new urban areas are economically developed, and they are the primary areas experiencing urbanization. Currently, the central urban area is a super-large city, playing a leading role in Chongqing's urbanization. The new urban area is experiencing accelerated urbanization, continuously attracting people and industries relocating from the central urban area. The northeastern and southeastern Chongqing areas are still in a phase of rapid urbanization, with people continuously aggregating in certain counties that are suitable for development.

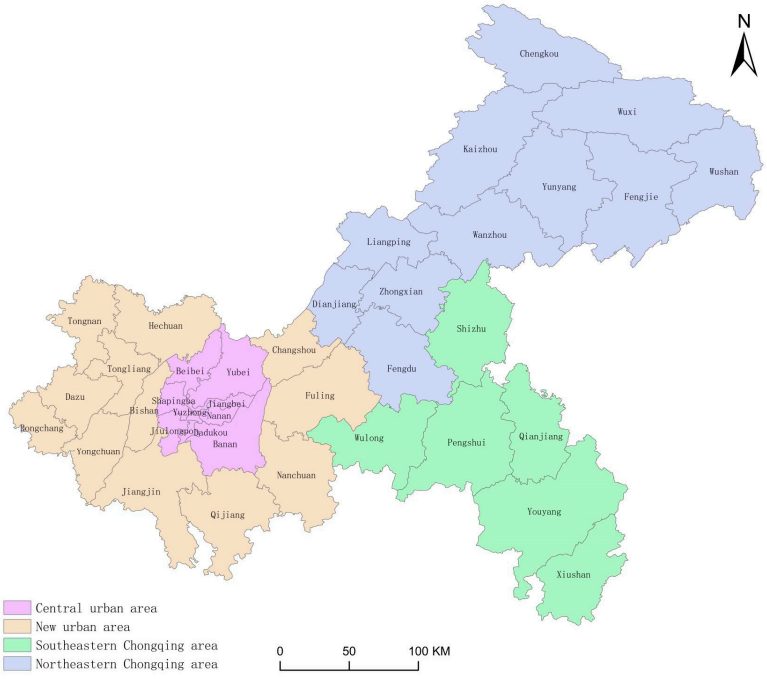

Figure 1. Urban system of Chongqing.

2.2. Data Source

The data on total population, urbanization rate, gross domestic product (GDP), nonagricultural employment, total fixed asset investment, total retail sales of consumer goods, export volume, road mileage, number of teachers, and number of hospital beds in Chongqing and its internal districts were sourced from the corresponding years of the "Chongqing Statistical Yearbook" [28] and the fifth, sixth, and seventh population censuses of Chongqing. For missing data, interpolation methods were applied as supplementation. To ensure administrative continuity, this study adhered to the administrative divisions published in the 2022 "Chongqing Statistical Yearbook" for the classification and summary of past data.

2.3. Study Methodology

2.3.1. Regional Decomposition Model of Urbanization Changes

Given the differences in local development conditions, wide differences exist in population size, the ability to attract external populations, and the capacity to mitigate local population outflows. These differences will have varying degrees of impact on the overall urbanization. Drawing from Cao et al.'s method for regional decomposition of urbanization level changes [27], this study decomposed the changes in the overall urbanization rate by region and explored the contribution modes of each region to advancing the overall urbanization process.

Consider the initial total population and final total population of the entire region, denoted as P and P*, respectively. The urban population is represented by C and C*, while the urbanization rates are denoted by U and U*, correspondingly. i signifies the region code, and $G = \sum_i (U_i^* - U_i)\frac{P_i^*}{P^*} = \sum_i G_i$, $M = \sum_i U_i\left(\frac{P_i^*}{P^*} - \frac{P_i}{P}\right) = \sum_i M_i$. The local contribution rate of each region to the overall urbanization level is articulated as $GR_i = \frac{G_i}{U_i^* - U_i}$; the remote contribution rate of each region to the overall urbanization level is articulated as $MR_i = \frac{M_i}{U_i^* - U_i}$; and the total contribution rate is designated as $TR_i = GR_i + MR_i$. For the population outflow region, $MR_i < 0$ and $TR_i < GR_i$. For the population inflow region, $MR_i > 0$ and $TR_i > GR_i$.

The local contribution rate reflects the role of local rural residents transitioning to being local urban residents in driving the overall urbanization of a region, essentially, the driving force of local urbanization. The remote contribution rate describes the impact of population migration from outside the region to internal urban areas within the established urban–rural structure on the overall urbanization development of the entire region, essentially, the driving force of remote urbanization (Figure 2).

2.3.2. Selection of Indicators of Influencing Factors

Building upon the characteristics of urbanization in Chongqing, this study established a panel data model focusing on the effects of economic development, industrial structure upgrade, regional preferential policies, export-led economic development [25], and improvements in transportation conditions and medical and educational resources [29–31], as well as changes in administrative region types [32,33], on the contribution to urbanization of various districts and counties of Chongqing. The model was set as follows:

$$GR_{it} = \beta_0 + \beta_1 PGDPG_{it} + \beta_2 NARC_{it} + \beta_3 TFAI_{it} + \beta_4 HM_{it} + \beta_5 TRSCG_{it} + \beta_6 MDV_{it} + \beta_7 EXP_{it} + \beta_8 PP_{it} + \beta_9 PTEA_{it} + \beta_{10} PHOS_{it} + \mu_i + \varepsilon_{it}$$

$$MR_{it} = \beta_0 + \beta_1 PGDPG_{it} + \beta_2 NARC_{it} + \beta_3 TFAI_{it} + \beta_4 HM_{it} + \beta_5 TRSCG_{it} + \beta_6 MDV_{it} + \beta_7 EXP_{it} + \beta_8 PP_{it} + \beta_9 PTEA_{it} + \beta_{10} PHOS_{it} + \mu_i + \varepsilon_{it}$$

where the dependent variable GR_{it} represents the local contribution rate of district i, and MR_{it} represents the migration contribution rate of district i to the urbanization of Chongqing during the study period. The direction of its numerical value reflects the direction of interregional population flow. To ensure the readability and research viability of the regression results, this study added 10% to all numerical values of the dependent variable MR_{it} to

ensure that they were positive before conducting regression analysis. Therefore, the results can only reflect the extent to which the independent variables influence the dependent variable, without indicating whether the effect is positive or negative. $PGDPG_{it}$ represents the ratio of per capita GDP at the end of the study period to that at the beginning of the study period for district i, reflecting the rate of regional economic development. $NARC_{it}$ represents the ratio of the proportion of those employed in nonagricultural jobs at the end of the study period to that at the beginning of the study period for district i, reflecting changes in industrial structure. $TFAI_{it}$ represents the ratio of the total fixed asset investment at the end of the study period to that at the beginning of the study period for district i, reflecting changes in the level of government investment in urbanization construction. HM_{it} represents the ratio of the total road mileage at the end of the study period to that at the beginning of the study period for district i, reflecting changes in regional transportation conditions. $TRSCG_{it}$ represents the ratio of the total retail sales of social consumer goods at the end of the study period to that at the beginning of the study period for district i, reflecting changes in the market. EXP_{it} represents the ratio of the total export volume at the end of the study period to that at the beginning of the study period for district i, reflecting the development speed of an export-oriented economy. $PTEA_{it}$ represents the ratio of the number of teachers per 10,000 people at the end of the study period to that at the beginning of the study period for district i, reflecting changes in educational resources. $PHOS_{it}$ represents the ratio of the number of hospital beds per 10,000 people at the end of the study period to that at the beginning of the study period for district i, reflecting changes in medical resources. MDV_{it} represents the product of the administrative region type value assigned to district i and the number of years in the study period, reflecting the influence of different county-level administrative region types on the contribution to urbanization in the region. PP_{it} represents the product of the value assigned to regional preferential policies obtained by district i and the number of years in the study period, reflecting the preferential treatment the region receives in urban and economic development. The specific values are shown in Table 1. μ_i represents individual unobservable factors, and ε_{it} represents the residual term.

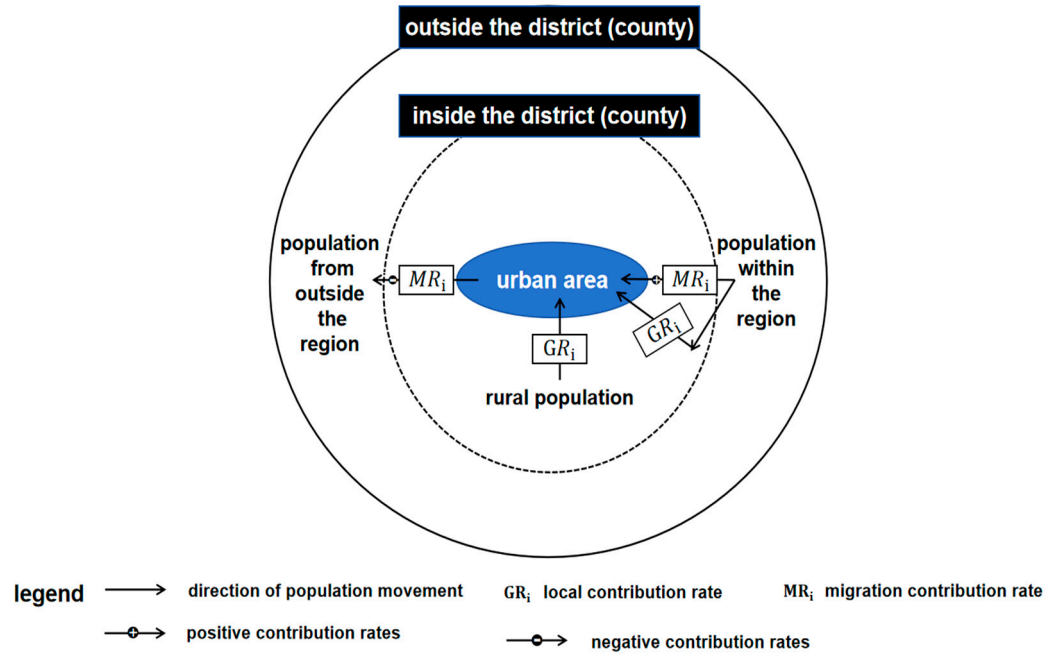

Figure 2. Schematic representation of local contribution rate and migration contribution rate.

Table 1. Assignment table of administrative region types and regional preferential policies.

Independent Variable	Type	Assignment
MDV	Urban Districts	2
	County-Level Cities	1
	Counties and Autonomous Counties	0
PP	Free-Trade Zone	4
	National-Level New Area	3
	National-Level Development Zone	2
	Municipally Managed Development Zone	1
	The Remaining Districts and Counties	0

3. Analysis of Regional Contributions to Urbanization Development in Chongqing

(1) The central urban area has been the primary driver of urbanization in Chongqing. However, since 2017, the new urban area has gradually emerged as a new "main force" propelling urbanization in Chongqing. Different stages of dynamic areas have exhibited a pattern of "diversification—centralization—diversification". From 1997 to 2021, the central urban area was the strongest driving force for urbanization in Chongqing, with a total contribution rate of 42.86%. The new urban area, northeastern Chongqing area, and southeastern Chongqing areas had total contribution rates of 27.89%, 20.03%, and 9.22%, respectively (Table 2). When examined in stages, during the initial period of direct administration, the contributions of the four regions to urbanization in Chongqing were relatively balanced, with various areas showing characteristics of diversification and homogenization. From 2002 to 2016, the total contribution rate of the central urban area was substantially higher than that of the other three major regions. During this stage, the driving areas for promoting urbanization in Chongqing gradually became more concentrated. From 2017 to 2021, the new urban area, northeastern Chongqing area, and the central urban areas jointly drove urbanization. The new urban area has emerged as the new "main driving force" driving urbanization in Chongqing (Figure 3);

Table 2. Contribution rates of urbanization development in Chongqing from 1997 to 2021.

Region	Total Contribution Rate	Local Contribution Rate	Remote Contribution Rate
Central Urban Area	42.86%	19.53%	23.33%
New Urban Area	27.89%	31.10%	−3.21%
Northeastern Chongqing Area	20.03%	22.74%	−2.71%
Southeastern Chongqing Area	9.22%	9.42%	−0.20%
Chongqing	100%	82.19%	17.81%

(2) Local urbanization was the primary mode driving urbanization in Chongqing, whereas remote urbanization played a supportive role. Among the four major considered regions, the central urban area mainly contributed through remote urbanization by attracting the remote population, whereas the new urban area, northeastern Chongqing area, and southeastern Chongqing areas primarily promoted urbanization through local urbanization. From 1997 to 2021, the total contribution rate to urbanization in Chongqing was dominated by the local contribution rate, accounting for as much as 82.19% of the total, whereas the remote contribution rate only accounted for 17.81%. This indicates that, during the study period, the migration of the rural population within Chongqing to local urban areas was the primary driver of urbanization, whereas the influx of people from outside the region played a secondary role. Among the four major regions, the remote contribution rate of the central urban area was higher than its local contribution rate, indicating that the central urban area

mainly contributed through remote urbanization by attracting the rural population. However, over time, its contribution through remote urbanization has weakened. The local contribution rates of the new urban area, northeastern Chongqing area, and southeastern Chongqing areas were all higher than their remote contribution rates, indicating that these three regions mainly promoted urbanization through local urbanization. Between 1997 and 2016, the new urban area exhibited the strongest local urbanization, which was followed by the northeastern Chongqing area, whose local contribution rate surpassed that of the new urban area (Figure 4);

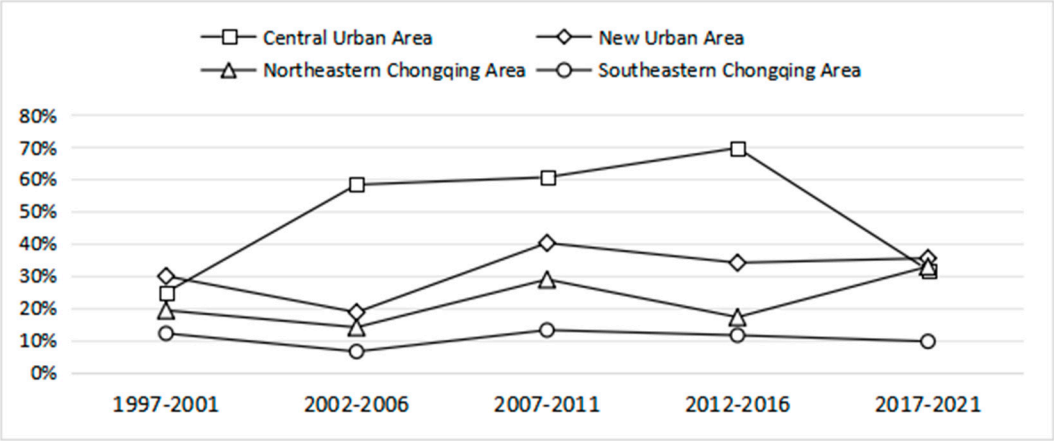

Figure 3. Total contribution rates of various regions promoting urbanization development in Chongqing in different periods.

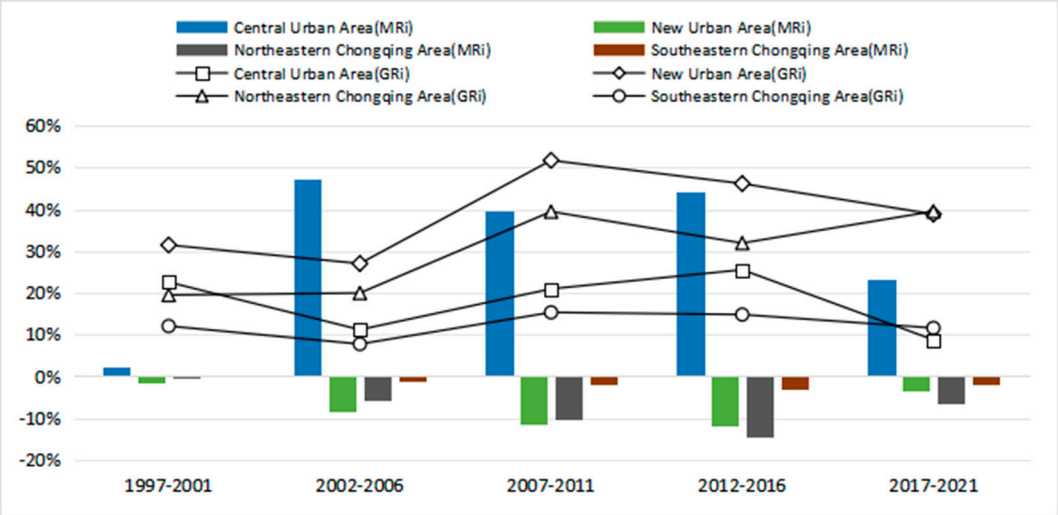

Figure 4. Local and remote contribution rates of various regions promoting urbanization development in Chongqing in different periods.

(3) The urbanization pattern in Chongqing was predominantly driven by "local urbanization and population inflow". In the four major regions and 38 counties, the urbanization pattern was largely shaped by "local urbanization and population outflow". To further explore the characteristics of urbanization in Chongqing, this study categorized the four major regions and 38 counties into four different types based on the primary mode of urbanization and the contribution characteristics of the contribution of population migration to urbanization effects. The results indicated that Chongqing, as a whole, was mainly experiencing "local urbanization and population inflow". As a central city in western China, Chongqing is strongly attractive to those in surrounding

cities. In addition to the phenomenon of population inflow from eastern regions to the central and western regions, interprovincial influx is positively contributing to the urbanization in Chongqing. However, the scale of net interprovincial migration is relatively small, and Chongqing's urbanization is still primarily driven by local urbanization. Among the four regions, only the central urban area exhibits an urbanization mode dominated by "remote urbanization and population inflow", whereas the new urban area, as well as the northeastern Chongqing area and southeastern Chongqing areas, is characterized by "local urbanization and population outflow". The central urban area, as the advantageous region experiencing economic development in Chongqing, is continuously attracting an inflow of people from outside the region. In contrast, the new urban area, as well as the northeastern Chongqing area and southeastern Chongqing areas, is mainly attractive to local rural residents. Disparities in the levels of economic development contribute to the differences in urbanization characteristics among the regions. At the county level, most counties (26) were experiencing local urbanization and population outflow. These counties demonstrate certain strength in local urban development but have relatively weak population aggregation capabilities and are not as attractive to those from other counties. Only one county, Yuzhong, was experiencing "remote urbanization and population outflow". This suggests a weakening of population aggregation capacity in this area compared to that in the past (Figure 5).

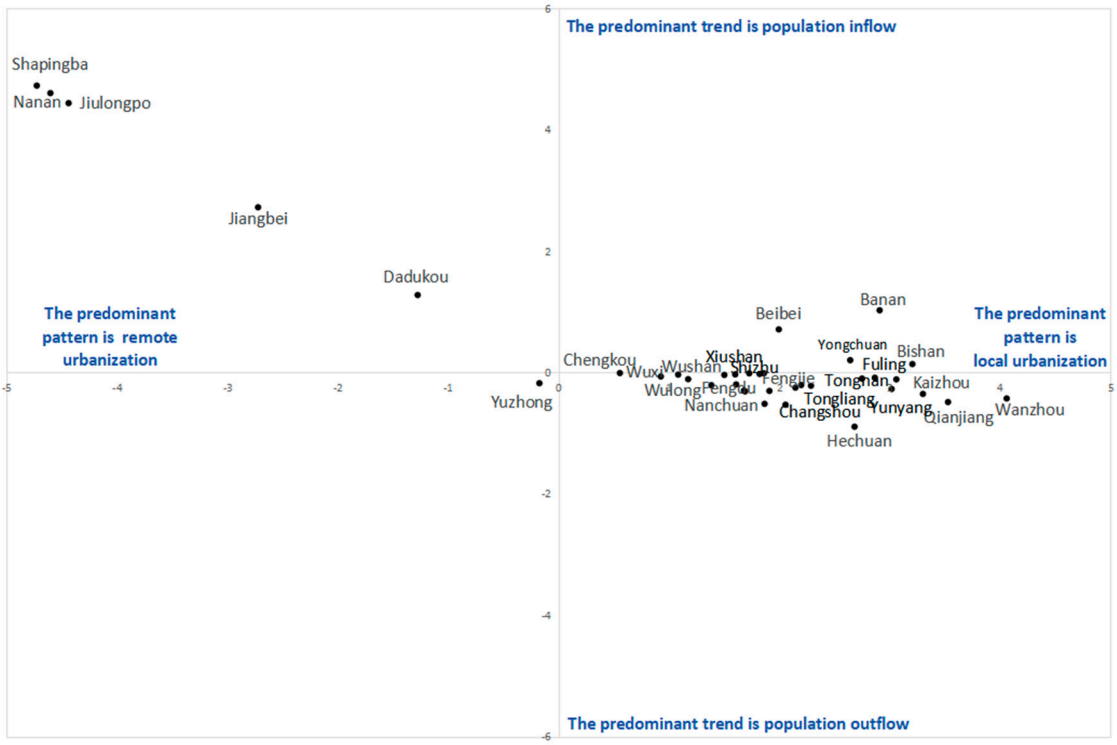

Figure 5. Urbanization types of districts in Chongqing.

4. The Mechanisms of Contribution to Urbanization in Chongqing

4.1. Descriptive Statistic

Descriptive statistical analysis was performed on the independent variables for both 1997 and 2021. It was observed that there were significant differences in the data (Table 3). To eliminate the dimensional differences, logarithmic transformation was applied to all variables except for the dummy variables.

Table 3. Descriptive statistics of variables in 1997 and 2021.

Proxy Variable Name	1997				2021			
	Maximum Value	Minimum Value	Mean Value	Standard Deviation	Maximum Value	Minimum Value	Mean Value	Standard Deviation
PGDPG	16,458	1323	4640	3697	229,588	27,979	74,444	35,444
NARC	99.81	16.49	43.22	21.06	100	29.16	76.52	20.29
TFAI	768,886,000	7221	96,259	127,618	16,011,391	693,594	5,558,576	3,515,934
HM	891	14	308	223	9265	164	4886	2277
TRSCG	656,808	14,060	119,444	111,304	12,752,400	247,300	3,047,105	2,536,319
MDV	2	0	1	1	50	0	26	16
EXP	172,328	16	18,567	44,528	20,310,000	200	1,101,992	3,641,615
PP	2	0	1	1	33	4	17	6
PTEA	289	81	134	36	632	70	183	96
PHOS	97	9	22	19	277	20	68	42

4.2. Unit Root Test and Cointegration Test

To avoid spurious regression issues, unit root tests were conducted on all variables before we conducted regression analysis on the panel data. The results indicated that the variables TFAI, HM, TRSCG, MDV, PP, PTEA, and PHOS did not pass the significance level test of 5% (Table 4), indicating the presence of unit roots. However, all statistics for the first-order-differenced series passed the significance level test of 5%, indicating that all variables became stationary after first-order differencing, i.e., all variables were first-order integrated. Subsequently, cointegration tests were conducted using the Kao method, and the *p* values were found to be less than 0.05 (Table 5), indicating cointegration between the independent and dependent variables. This implies the existence of a long-term, stable equilibrium relationship among the variables, allowing for parameter estimation using panel models.

Table 4. Unit root test results.

Variables	Original Values (With Time Trend)			First-Order Difference (Without Time Trend)		
	Statistic	z	*p* Value	Statistic	z	*p* Value
GR_i	0.1707	−18.3942	0.0000	−0.3758	−35.2929	0.0000
MR_i	0.1221	−20.0477	0.0000	−0.4258	−36.9350	0.0000
PGDPG	−0.0278	−25.1468	0.0000	−0.4359	−37.2658	0.0000
NARC	0.0186	−23.5671	0.0000	−0.3984	−36.0344	0.0000
TFAI	0.6982	−0.4552	0.3245	0.2177	−15.8221	0.0000
HM	0.8074	3.2595	0.9994	0.4000	−9.8417	0.0000
TRSCG	0.6997	−0.4034	0.3433	0.1019	−19.6219	0.0000
MDV	0.7152	0.1241	0.5494	−0.0185	−23.5712	0.0000
EXP	0.4317	−9.5186	0.0000	−0.2271	−30.4162	0.0000
PP	0.7191	0.2575	0.6016	−0.0561	−24.8065	0.0000
PTEA	0.6525	−2.0085	0.0223	0.2768	−13.8829	0.0000
PHOS	0.6705	−1.3942	0.0816	0.1123	−19.2809	0.0000

Table 5. Cointegration test—Kao test ADF values.

Dependent Variable	t-Statistic	Prob.
GR_i	−16.3647	0.0000
MR_i	4.8495	0.0000

4.3. Model Selection and Regression Results

Using Stata17 software, F-tests, LM tests, and Hausman tests were conducted on the panel data. Regardless of whether the dependent variable was the local contribution rate or the remote contribution rate, the *p* values were less than 0.05. Thus, the null hypothesis

was rejected in favor of the alternative hypothesis, indicating the selection of a fixed-effects model. Subsequently, it was observed that the panel data also exhibited heteroscedasticity and serial correlation issues. Therefore, cluster processing was performed at the county level for the standard errors of all the regression coefficients.

The results indicated that the per capita GDP, the proportion of nonagricultural employment, the road mileage, the administrative district type, the export volume, the regional preferential policies, and the number of teachers per thousand people had a significant and positive impact on the regional local contribution rate, attracting rural populations to migrate to local urban areas. In addition, the per capita GDP, the road mileage, the administrative district type, the export volume, and the number of hospital beds per thousand people had a significant and positive impact on the regional remote contribution rate, attracting remote populations to migrate to local urban areas and local populations to migrate outside the region (Table 6).

Table 6. Panel model regression results.

Dependent Variable		Local Contribution Rate		Remote Contribution Rate	
		Unprocessed	Cluster Processing	Unprocessed	Cluster Processing
Independent variable	PGDPG	0.171 ***	0.172 **	0.084 ***	0.060 **
		(0.042)	(3.29)	(0.071)	(0.52)
	NARC	0.023 *	0.028 *	0.027	0.026
		(0.013)	(2.35)	(0.022)	(1.42)
	TFAI	0.394 *	0.372	−0.094	0.349
		(0.219)	(1.30)	(0.362)	(0.56)
	HM	0.445 **	0.437 **	0.041	0.692 **
		(0.196)	(2.72)	(0.326)	(2.87)
	TRSCG	−0.027	−0.058	−0.443	0.018
		(0.302)	(−0.19)	(0.504)	(0.02)
	MDV	0.459 ***	0.431 **	0.073 **	0.371 **
		(0.137)	(1.86)	(0.229)	(0.89)
	EXP	0.020	0.019 *	0.161 ***	0.337 ***
		(0.021)	(0.52)	(0.034)	(8.69)
	PP	0.229 **	0.216 *	−0.266	−0.345
		(0.113)	(2.06)	(0.188)	(−0.64)
	PTEA	0.314 *	0.308 *	0.538 *	0.554
		(0.171)	(2.31)	(0.519)	(1.35)
	PHOS	0.121	0.134	0.519	0.867 *
		(0.207)	(1.00)	(0.345)	(2.22)
	_cons	3.039 ***	3.061 ***	5.390 ***	1.553
		(0.472)	(4.42)	(0.743)	(1.87)
	N	874	874	874	874

Note: *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

4.4. Mechanisms of Regional Contribution

According to the results of the regression model regarding the factors influencing regional contribution to urbanization, the regional contribution to urbanization in Chongqing is the result of the combined effect of factors such as economic development, local administrative capacity, the provision of public services, and improvement in transportation conditions (Figure 6). We then analyzed the specific mechanisms of action of each influencing factor.

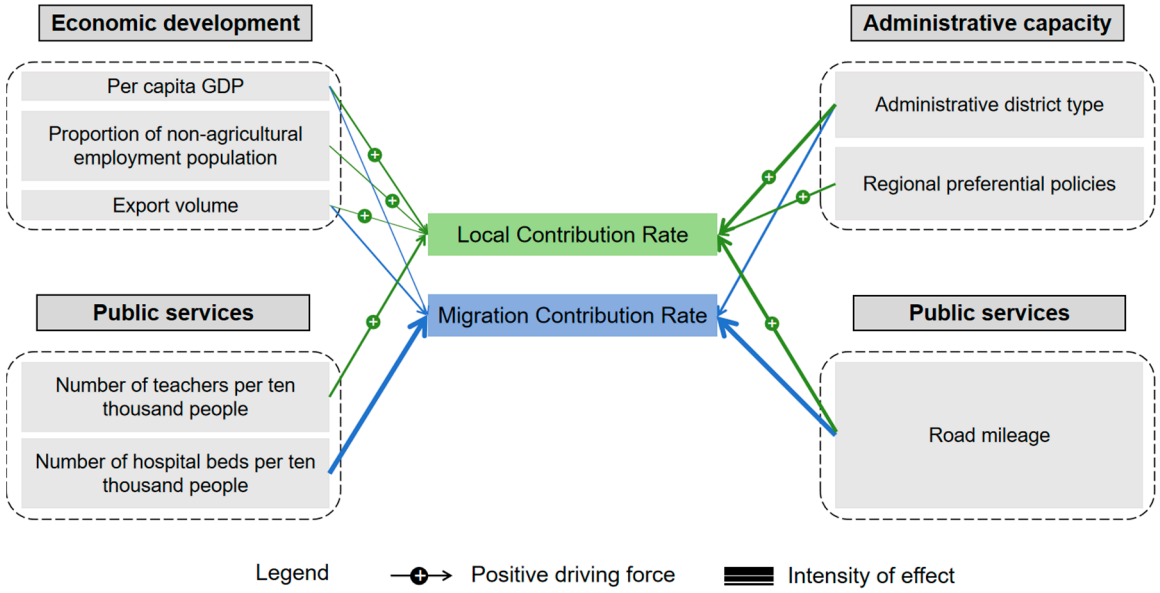

Figure 6. The impact mechanisms of regional contribution to urbanization in Chongqing.

(1) The level of economic development and the development of an export-oriented economy are important factors driving population migration to urban areas as the upgrading of the industrial structure attracts rural populations to migrate to local urban areas. Regional economic growth is the core driving force behind urbanization [25], attracting people from both within and outside the region to continuously migrate to urban areas. As a central city in western China, Chongqing has a relatively high level of economic development, which is strongly attractive to those from surrounding cities. The central urban area, which has the highest level of economic development in Chongqing, is similarly strongly attractive to populations from surrounding counties, both of which are predominantly experiencing population inflow. Chongqing focuses on labor-intensive industries such as electronic information and automobile manufacturing as its main export industries, creating many nonagricultural employment opportunities. This has fostered the development of local and remote urbanization. Among the 38 counties, Shapingba experienced a substantial increase in export value, adding up to CNY 201.377 billion in the study period. Additionally, Yubei, Jiangjin, Jiangbei, Jiulongpo, Bishan, and Beibei all experienced export value increases exceeding CNY 100 billion in the same period. Under the multifaceted impacts of economic development, the central urban area has strongly contributed to the development of urbanization in Chongqing. Economic development not only promotes continuous population influx into urban areas but also drives the development of urban secondary and tertiary industries, increasing nonagricultural employment opportunities in the region. Although some people shifted from agriculture to nonagricultural employment, the increase in the proportion of nonagricultural employment has predominantly promoted the urbanization in Chongqing through local urbanization, with no notable impact on remote urbanization. Yubei, Hechuan, Tongnan, Yongchuan, Wulong, Yunyang, and Fengjie all experienced considerable increases in the proportion of nonagricultural employment, all exceeding 55%, in the study period. In these counties, the local contribution rate was larger than the remote contribution rate, indicating that their urbanization types were predominantly local urbanization;

(2) Administrative power endows regions with institutional and policy advantages, indirectly changing the distribution and direction of urban population flow and shaping the spatial pattern of regional contributions. Governments tend to allocate resources with administrative and urban biases. Regions with higher administrative levels can more effectively concentrate various resources, attracting population inflow

and migration [32,34,35]. These biases are the fundamental reason for the polarized growth of the urban population in different regions [36]. The central urban area, with its high level of urbanization and concentration of resources, continuously attracts migrants, leading to its urbanization type being "local urbanization and population inflow". Over the 24 years, its urbanization rate increased by 22.03%, with a total contribution rate of 43.59%, making it the primary driving force behind urbanization in Chongqing. The new urban area, as well as the northeastern Chongqing area and southeastern Chongqing areas, had slightly lower levels of urbanization and resource concentration, with its urbanization type being "local urbanization and population outflow". The frequent adjustments in administrative divisions, such as county-level upgrades and downgrades, have mainly occurred in central and western regions, influencing the bias of resource allocation by the government and market, thus contributing to the continuous enhancement of the contribution of the new urban area. Additionally, as the only municipality in the central and western regions, Chongqing enjoys a series of preferential policies from the central and local governments. These include the establishment of the first national-level development and opening-up pilot zone in the inland area, the Liangjiang New Area, and the first national-level economic and technological development zone in the western region, the Chongqing Economic and Technological Development Zone, as well as the China (Chongqing) Pilot Free Trade Zone and the support of the "Belt and Road" initiative. These initiatives have propelled Chongqing's economic marketization and internationalization, accelerating local economic development and the upgrade of the industrial structure, enhancing the region's capacity to absorb nonagricultural industry populations and accelerating the contribution from local urbanization;

(3) Public services are important factors in attracting people to move into urban areas. High-quality education resources are attractive to rural populations within the region, whereas superior medical resources appeal to populations outside the region. With social development, the driving force behind population migration has shifted from a singular economic objective to a diverse pursuit of a better life, with well-developed education and medical services becoming one of the main driving forces behind population migration [25]. High-quality education resources are important attractions for rural populations within the region. Districts with a notable increase in the number of teachers per capita are mostly located in the central and eastern regions of Chongqing. Their impact on the urbanization development of Chongqing is stronger, and the urbanization in these districts is mostly local urbanization. Moreover, superior medical resources appeal to populations outside the region. Regions experiencing a large increase in the number of hospital beds per capita are mostly distributed in the western region of Chongqing. Their impact on the urbanization in Chongqing is stronger, and the urbanization in these counties is mostly remote. They play an important role in promoting the urbanization of Chongqing;

(4) The improvement in transportation conditions has facilitated the migration of rural populations within the region to local urban areas as well as inter-regional population migration. The transportation network serves as the fundamental carrier enabling the movement of social material elements [37]. The enhancement in transportation accessibility can substantially promote social population mobility and accelerate the urbanization process. The transportation accessibility in cities in the central and western regions is generally lower, producing a notable bottleneck constraining their development [25]. In recent years, with the continuous improvement of transportation conditions in various districts and counties in Chongqing, on the one hand, the compression of spatial-temporal distances between urban and rural areas has promoted the migration of the rural population to local urban areas, thereby driving the development of local urbanization. On the other hand, the economic development level in the central and eastern regions in Chongqing is relatively low, and they provide limited employment opportunities. The improvement in transportation conditions

has also accelerated population outflow to some extent. Therefore, the urbanization types of counties in the central and eastern regions of Chongqing are mostly "local urbanization and population outflow".

5. Conclusions and Discussion

5.1. Conclusions

(1) The central urban area emerged as the primary driver of urbanization in Chongqing, contributing to a total contribution rate of 42.86% to urbanization. When examined in stages, during the initial period of establishment of the Chongqing municipality, the contributions of the four major regions to urbanization in Chongqing were relatively balanced, with certain areas demonstrating diversified and homogeneous characteristics. From 2002 to 2016, the central urban area played a pivotal role in driving urbanization in Chongqing, marking a phase wherein the homogenous areas gradually became more singular in focus. From 2017 to 2021, the new urban area, northeastern Chongqing area, and the central urban areas jointly facilitated urbanization in Chongqing, with the new urban area emerging as the new "main force" driving urbanization development in Chongqing;

(2) Local urbanization emerged as the primary driver of urbanization in Chongqing, with remote urbanization playing a supplementary role. The overall urbanization pattern in Chongqing was characterized by "local urbanization and population inflow". Among the four major regions, the central urban area primarily contributed to urbanization through remote urbanization, whereas the new urban area, northeastern Chongqing area, and southeastern Chongqing areas mainly drove urbanization in Chongqing through local urbanization. The four major regions and the 38 counties were predominantly characterized by "local urbanization and population outflow";

(3) The improvement in transportation conditions facilitated both intra-regional and inter-regional population migration, serving as a core factor influencing regional contribution to urbanization. Public services played a crucial role in these regional contributions; high-quality education resources attracted rural populations from within the region to urban areas, whereas the superior medical resources drew populations from outside of the region. Economic development levels and the development of an export-oriented economy drove population migration to urban areas, whereas the upgrading of the industrial structure attracted rural populations to urban areas. Administrative power has endowed regions with institutional and policy advantages, indirectly altering the distribution and flow direction of urban populations by influencing other factors, thereby shaping the spatial pattern of the regional contributions to urbanization.

5.2. Discussion

In September 2014, the Chongqing Urban Planning Bureau proposed the construction of a "one core area, two groups" urban spatial pattern at the "Chongqing Urban and Rural Overall Planning (2007–2020) 2014 Deepening Achievements Press Conference". This pattern aimed to establish a metropolitan area led by the central urban area and the new urban area, driving the development of the northeastern and southeastern Chongqing areas through circular and axial linkages. Under this plan, the urban system of Chongqing was further highlighted, forming a spatial mechanism for urbanization where the central urban area drives the metropolitan area, which, in turn, leads to the development of the northeastern and southeastern Chongqing areas. As the urbanization level of the central urban area continues to increase, the subsequent urbanization development space continues to shrink. The shift in the main driving force for urbanization in Chongqing from the central urban area to the new urban area signifies a transition in the spatial development pattern of urbanization, gradually shifting from being centered around the central urban area to being led by the urban new area. The increasing diversification and the homogenization of various regions indicate the importance of focusing on the contribution of the new urban

area, as well as the northeastern Chongqing area and southeastern Chongqing area, in driving future urbanization.

Comparison with existing studies reveals that, from 1982 to 2021 [27], local urbanization has consistently been the primary driver of urbanization development in Chongqing. However, the characteristics of remote urbanization effects and urbanization types vary among periods. From 1982 to 2010, remote urbanization in Chongqing was primarily driven by interprovincial population outflow. During this period, Chongqing experienced substantial net outmigration and population loss, with the predominant urbanization type being "local urbanization with population outflow". During this stage, the urbanization development of Chongqing exhibited a unique phenomenon where the higher the population outflow was, the faster the urbanization process. However, after 2010, Chongqing transitioned from being a region experiencing net outmigration to a region with future net in-migration of permanent residents. External urbanization shifted toward being driven by interprovincial population inflow, which was accompanied by a corresponding change in urbanization type to "local urbanization with population inflow" as the main characteristic.

From the perspective of influencing factors, the improvement of transportation infrastructure is a core factor influencing regional contributions. Compared to other western provinces such as Gansu and Yunnan, the improvement in the transportation conditions in Chongqing has had a relatively higher impact on the contribution of urbanization in the region. In the future, efforts to promote urbanization in Chongqing should focus on strengthening transportation infrastructure to facilitate the flow of people and resources. Unlike the industrialization-driven urbanization in eastern regions, urbanization in western regions, including Chongqing, is predominantly driven by consumption, with rural–urban migration motivated mainly by lifestyle and educational opportunities rather than employment. The pursuit of high-quality public services significantly promotes urbanization in Chongqing, while economic development and industrialization play a relatively minor role in regional contributions. In the future, Chongqing should enhance the supply capacity of high-quality public services in urban areas and county towns to meet the needs of the urbanizing population. Additionally, efforts should be made to explore the endogenous drivers of economic growth at the county level, vigorously promote industrial and economic development, and provide employment opportunities and material foundations for rural residents to urbanize locally [38,39].

This study used a spatial perspective to decompose the changes in urbanization levels in Chongqing from 1997 to 2021, focusing on the effects of various factors on the urbanization contributions of different districts and counties. Specifically, it examined the impact of factors such as the urban population size, economic development and upgrading of the industrial structure, regional preferential policies and export-oriented economic development, and the improvement in transportation conditions and medical and educational resources, as well as changes in administrative district types. This study supplemented the factors influencing the migration contribution rates. However, it is undeniable that the regional disparities in urbanization contributions are the result of the comprehensive interactions of various factors. External factors have played a large role in the urbanization process in the eastern region and open cities. However, this study was limited by the difficulty in obtaining data and did not consider external factors such as foreign direct investment. In the future, a more in-depth and comprehensive exploration of the influence of these factors could be conducted.

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