

Original Paper

The Impact of Urban Shrinkage on Public Service Provision

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Abstract

Against the backdrop of continuously declining global fertility rates and slowing population growth, urban shrinkage has become a significant trend in regional development, exerting profound impacts on the supply of public services, particularly in small and medium-sized cities and resource-based cities in China. Focusing on the impact of urban shrinkage on public service provision, this study constructs two-way fixed-effects models and mediation models for empirical testing based on panel data from 283 prefecture-level cities in China from 2011 to 2023. The findings reveal that: (1) urban shrinkage significantly suppresses the level of public service provision; (2) fiscal pressure plays a partial mediating role, meaning that urban shrinkage indirectly leads to reduced public service provision by intensifying local fiscal pressure; (3) heterogeneity analysis indicates that this negative effect is more pronounced in the central region, non-urban agglomeration areas, and non-resource-based cities. The study suggests that urban shrinkage should be viewed rationally, promoting "smart shrinkage" and refined governance, optimizing the structure of public service provision and fiscal expenditure efficiency, thereby enhancing urban resilience and residents' well-being. This research provides theoretical foundations and policy implications for the governance of public services in shrinking cities under the context of negative population growth.

Keywords

Urban shrinkage, Public service provision, Fiscal pressure

1. Introduction

In recent years, fertility rates have generally shown a declining trend worldwide. This trend not only covers European and American countries and regions that have long completed their demographic transitions but also extends to parts of Asia and North America (United N., 2018). The persistently low fertility levels have led to a continuous decline in global population growth rates. Relevant United Nations projections indicate that around 2050, the total global population will reach an inflection point and begin to shrink (Wolff M., 2018). At the regional level, the phenomenon of urban shrinkage is even

more pronounced. Taking Europe as an example, between 1990 and 2010, more than 20% of regions experienced varying degrees of urban shrinkage (Morland P., 2019). China's demographic trends are also facing major changes. In May 2023, the first meeting of the 20th Central Financial and Economic Affairs Commission pointed out: "At present, China's population development presents the trending characteristics of declining birthrates, aging population, and regional population increase and decrease differentiation. We must comprehensively understand and correctly view the new situation of China's population development." Urban shrinkage has become an important trend that cannot be ignored in current urban development. Data from the National Bureau of Statistics of China show that in 2022, the national total population decreased by 8.5 million people compared with the end of the previous year, marking the first negative growth (National Bureau of Statistics, 2023). The National Population Development Plan (2016–2030) states: "Accurately grasping the trending characteristics of population changes and deeply understanding the challenges these changes pose to population security and economic and social development are of great significance for planning long-term population development."

Against this backdrop, urban shrinkage has become an important topic of concern for scholars both domestically and internationally. To date, existing research has defined urban shrinkage from various perspectives, but a unified concept has yet to be formed. Since foreign countries experienced the process of urban shrinkage earlier, relevant research also started earlier. German scholars Häußermann and Siebel first coined the term "urban shrinkage" in 1988 to describe phenomena such as regional population loss, economic decline, and partial hollowing-out caused by various factors including low levels of industrialization, suburbanization, and aging population structures. P. Oswalt (2006) and others defined shrinking cities as those experiencing significant population outflows (including temporary or permanent migration), with a total population reduction of no less than one-tenth, or an average annual population loss rate of more than 1%. In 2004, the Shrinking Cities International Research Network (SCiRN) was established, which proposed that urban shrinking regions must meet three conditions: first, a population base of no less than 10,000; second, negative population growth for more than two consecutive years; and third, an economic transformation process deeply troubled by structural crises. In today's era of spreading urban shrinkage, the provision of urban public services has acquired added significance. China's urbanization development has entered its middle and late stages. After peaking, the total population has begun to decline, the spatial distribution pattern is being readjusted, and there is a clear differentiation phenomenon of simultaneous population growth and shrinkage across different regions. In this context, large cities and urban agglomerations continue to maintain strong population agglomeration capacities; the scale of public service demand not only continues to expand but also tends toward diversification and high quality. At the same time, many small and medium-sized cities, resource-based cities, traditional industrial cities, and cities with poor locational conditions are facing the challenge of continuous population loss, gradually evolving into shrinking cities (Ma Xuesong, 2025). Faced with the rigid demand for public services in large cities with large population inflows, local governments must strengthen their supply capacity to ensure urban operational efficiency—this is an inevitable requirement

for maintaining the normal functioning of large cities. The 14th Five-Year Plan for Public Service Development (2021) proposed accelerating the strengthening of basic public service shortcomings, focusing on enhancing non-basic public service weaknesses, and striving to improve the quality and level of public services. Citizens' sense of well-being, social cohesion, and regional competitive advantages all rely on high-quality public services to build a solid foundation and inject vitality (Wang Mingji et al., 2022). This structural shift from "universal growth" to "partial coexistence of shrinkage and growth" directly impacts the long-established public service allocation model based on the permanent resident population for resource distribution and facility layout. As population continues to outflow, the local tax base narrows, fiscal revenue growth becomes difficult or even declines. Meanwhile, the fixed costs required for the operation and maintenance of public service facilities lack flexibility. Moreover, the per capita demand for some services such as elderly care and medical care may further increase, exacerbating the contradiction between revenue and expenditure (Lu Daoping, 2017).

Although the academic community has extensively discussed the relationship between urban population changes (mainly growth and migration) and public service demand (e.g., Tiebout's "voting with their feet" theory, 1956), as well as local governments' incentives for public service provision under fiscal decentralization theory, research focusing specifically on how the particular dimension of sustained urban shrinkage systematically affects public service provision remains weak, with significant gaps. Existing literature focuses more on the pressure of public service demand expansion brought by population growth or urbanization and supply response strategies, or explores the impact of demographic structures (e.g., aging) on demand for specific services (e.g., elderly care, medical care). Research that specifically and systematically examines the structural challenges and reconfiguration demands posed by the unique context of sustained population decline to the public service provision system is relatively scarce. This study will help fill theoretical research gaps in the interdisciplinary field of urban shrinkage and public service provision, deepen understanding of the complexities of urban governance in the era of negative population growth, and provide scientific decision-making support for promoting equitable, resilient, and sustainable development of shrinking cities.

2. Literature Review

2.1 *The Impact of Urban Shrinkage on Urban Public Service Supply*

The core driving force of urban development stems from its capacity to agglomerate various factors of production. Among these, the level and quality of public service provision have been proven to be key variables influencing population migration decisions and shaping the spatial distribution patterns and development processes of urbanization (Liu Yubo, 2020). The relationship between shrinking cities and the level of public service provision has yet to reach a consensus in academia. Most scholars believe that shrinking cities are often accompanied by a decline in the level of public services. Population decline triggers a series of 连锁反应 (cascading effects): housing vacancy becomes prominent (Couch C, 2013), the labor market shrinks and employment declines (Reckien D, 2011), both of which constrain the level

and efficiency of public service provision. Continuous population outflows further lead to difficulties in maintaining urban infrastructure and sustaining services, thereby weakening urban amenity (Zhou Kai & Qian Fangfang, 2015). Deng Yanru (2020) argues that under conditions of labor force contraction in the industrial and service sectors, local governments tend to increase public service investment to maintain competitiveness and attract population, thereby enhancing the level of public services. Furthermore, different types and stages of urban shrinkage produce differentiated effects: the level of public services in growing cities is significantly higher than that in mildly shrinking, moderately shrinking, and severely shrinking cities (Liu Qianqian & Wu Xiangli, 2023). Scholars holding opposing views argue that urban shrinkage can actually promote the level of public services. Liu Ju (2020), through a study of the three northeastern provinces of China, found that all 15 shrinking cities exhibited a notable equalization contraction effect of basic public services, with the equalization score of basic public services gradually decreasing as the shrinkage development stage progressed. Other scholars suggest that the impact of urban shrinkage on public services is not unidirectionally positive or negative. Guoqiang Li et al. (2024), using an empirical study of 298 prefecture-level cities as a sample, demonstrate that the level of basic public service provision exhibits a distinct "inverted U-shaped" pattern as urban shrinkage progresses—being promoted in the early stage of shrinkage but suppressed in the later stage.

It is widely accepted in academia that improvements in public service quality have a significant positive promoting effect on regional economic growth and attracting population inflows, making it one of the important policy tools for local governments to promote economic development and urban expansion (Mao Hanying & Yu Danlin, 2001). Shi Yinghua (2025) demonstrates that enhancing the level of urban public service provision can significantly promote labor inflow into cities, and is particularly effective in attracting younger, more highly educated, and urban-registered labor forces. Yin Jinghua et al. (2025) argue that the higher the accessibility of urban public services, the longer the floating population's duration of stay, the stronger their willingness to obtain household registration (hukou), and the greater their sense of social integration in that city. Wang Nan et al. (2025) find that improvements in the level of basic public services can enhance migrant workers' willingness to become urban citizens through two pathways: strengthening their sense of urban identity and increasing their income. These studies indicate that high-quality and abundant public services, such as education, healthcare, transportation, and cultural facilities, can attract sustained inflows of migrant populations and encourage residents to settle, thereby driving urban population expansion. Residents choose to migrate to cities that provide public services better aligned with their preferences. Consequently, cities with high levels of public services often gain advantages in population competition, forming a positive feedback loop where population agglomeration and public service improvement reinforce each other (Wang Yu et al., 2025).

Based on this, this study proposes the first research hypothesis:

H1: Urban shrinkage inhibits the provision of public services.

2.2 *The Impact of Local Public Finance*

Urban shrinkage affects urban development in many aspects, including its impact on local public finance.

Bernt (2009), from the perspective of taxation, argues that urban shrinkage, accompanied by population decline and a reduction in the employed and consumer populations, leads to decreased regional enterprise income and lower government tax revenue, thereby negatively affecting local public finance. Wang Yubo et al. (2025), by reviewing the development trends of population and land finance in the three northeastern provinces, find that the trend of urban shrinkage reduces the demand for construction land, resulting in a decline in land fiscal revenue, causing a structural imbalance in the human–land relationship, and ultimately slowing the evolution of land finance. Wang Siqi (2024) demonstrates that urban shrinkage significantly inhibits local fiscal sustainability, and this inhibiting effect is stronger in resource-based cities. Other scholars hold that urban shrinkage has a positive association with public finance. Wang et al. (2025), studying a sample of Western cities, argue that under the operational mechanism of a "property-based government" primarily reliant on personal property tax, the core driver of fiscal growth comes from the increase in the employed population, based on property tax and personal income tax. Under this mechanism, industrial development brings an increase in the employed population, which in turn increases housing demand and government tax revenue. The government then invests more in public services, attracting more people and forming a positive cycle. Gert-Jan Hospers (2014) argues that when both the fiscal capacity and population of a city are shrinking, city governments will rely more on citizen support. After transforming governance concepts, urban shrinkage can instead become an opportunity to optimize the public service system and improve fiscal efficiency.

As the primary source of funding for public services, the scale and structure of local public finance influence the coverage and quality of public service provision. Good public services can also attract the agglomeration of population and industry, thereby broadening the tax base and enhancing fiscal self-sufficiency. Tiebout (1956) demonstrated that local government finance can effectively provide public services, and cities with higher levels of public service provision are more attractive to population inflows. Yamei Wang et al. (2024) argue that greater fiscal decentralization has a negative impact on the provision of basic public services in prefecture-level cities, and this effect is exacerbated by competition among local governments pursuing economic growth. Ye Chen (2024) finds that fiscal pressure reduces local governments' bias toward basic public service input while increasing basic public service expenditure. The extent of the impact of fiscal pressure exhibits significant heterogeneity across different regions and levels of pressure. Under fiscal pressure, local governments guarantee public service provision, but show heterogeneous performance in terms of fiscal decentralization, government competition environment, fiscal transparency, and population aging (Zhang Bin, 2024). Zhang Yuan and Liu Lijun (2025), based on the current situation of China's fiscal decentralization system, argue that vertical fiscal imbalance significantly inhibits local governments' public service provision, and the higher the fiscal autonomy enjoyed by local governments, the weaker this inhibitory effect. Xu Yingzhi and Zhao Yongping (2015) show that strengthening local fiscal capacity generally helps improve public service provision, but its impact mechanism differs significantly depending on the type of public service and the dimension of fiscal capacity. Fiscal control capacity exhibits an inverted U-shaped pattern—first promoting and then

inhibiting—on public transport infrastructure and healthcare services; for basic public education, its negative effect gradually weakens over time. Fan Bonai and Jin Jie (2016) point out that the development model characterized by expanding public input and the market-oriented reform dominated by government purchasing of services have not significantly improved public service quality. The reason may lie in the lack of improvement in public perception and recognition of service quality. Therefore, while continuously expanding the supply of public service resources, it is necessary to enhance citizens' sense of gain and satisfaction with public services by improving government credibility and broadening public participation channels.

As China's population structure undergoes changes, competition among major cities for talent and labor resources is becoming increasingly fierce. Using improved public services to attract population inflows has become an important strategy for local governments to agglomerate population and promote economic development, while also constituting a major area of local fiscal expenditure (Hou Huili, 2016). For regions experiencing sustained population outflows, local governments often tend to increase public service investment to mitigate the decline trend. This results in such regions facing the dual challenges of expanding public service demand and constrained fiscal capacity, trapping them in development difficulties. This gives rise to a series of questions worth exploring in depth: Does urban shrinkage inevitably have a negative impact on public service provision? How do local governments balance and choose between fiscal pressure constraints and public service responsibilities? These questions merit further investigation in this study. Based on this, this study proposes the second research hypothesis: H2: Local fiscal pressure plays a mediating role in the impact of urban shrinkage on the level of urban public service provision.

3. Method

3.1 Data Sources

Chinese prefecture-level cities were selected as the research objects, and cities with severe data missing were excluded, including Chizhou, Pingxiang, Haidong, Turpan, Hami, Shigatse, Qamdo, Nyingchi, Shannan, Yingtian, Hebi, Hainan Tibetan Autonomous Prefecture, Dongguan, Zhongshan, Qingyang, Zhangye, Laiwu, etc. Due to data availability issues, this study ultimately selected data from 283 prefecture-level and above cities in China from 2011 to 2023 as the research objects. The data were mainly sourced from the China City Statistical Yearbook, the China Urban-Rural Construction Statistical Yearbook, and the fifth and sixth national population censuses. All missing values have been excluded from this study.

3.2 Variable Selection

3.2.1 Dependent Variable – Public Service Provision

Public services refer to the basic services provided by the government through fiscal input and institutional arrangements to meet social public needs, characterized by non-excludability and non-rivalry. Referring to the studies of Liu Zishuo (2025) and other scholars, this paper classifies public

services into two categories: livelihood-oriented public services, which are subdivided into educational services, healthcare, social security, and ecological protection; and infrastructure public services, which are subdivided into urban transportation and digital networks. Due to the large number of relevant indicators, this paper applies the entropy method to measure the level of urban public service provision, facilitating cross-city comparisons and rankings of public service levels. Finally, through weighted summation, the comprehensive evaluation scores of public service provision levels for each city in different years are calculated and presented in the table below.

Table 1. Indicator System for Measuring Public Services

Level 1 Indicator	Level 2 Indicator	Level 3 Indicator	Attribute
Livelihood-oriented Public Services	Educational	Number of primary schools per 10,000 persons (schools/10,000 persons)	Positive
		Number of regular secondary schools per 10,000 persons (schools/10,000 persons)	Positive
		Teacher-student ratio in primary schools (persons/100 persons)	Positive
		Teacher-student ratio in regular secondary schools (persons/100 persons)	Positive
	Healthcare	Number of hospitals or health centers per 10,000 persons (units/10,000 persons)	Positive
		Number of hospital and health center beds per 10,000 persons (beds/10,000 persons)	Positive
		Number of doctors per 100 persons (persons/100 persons)	Positive
		Social Security	Number of participants in basic pension insurance for urban workers (persons)
	Number of participants in basic medical insurance for employees (persons)		Positive
	Number of participants in unemployment insurance (persons)		Positive
	Ecological Protection	Harmless treatment rate of domestic waste (%)	Positive
		Industrial sulfur dioxide emissions (tons)	Negative
		Centralized treatment rate of sewage treatment plants (%)	Positive
	Infrastructure Public Services	Urban Transportation	Highway passenger volume (10,000 persons)
Highway freight volume (10,000 tons)			Positive
Digital Networks		Civil aviation passenger volume (persons)	Positive
		Civil aviation cargo and mail volume (tons)	Positive
		Number of mobile phone subscribers at year-end (10,000)	Positive

subscribers)	
Telecommunications business revenue (10,000 yuan)	Positive
Number of internet users (subscribers)	Positive

3.2.2 Explanatory Variable – Urban Shrinkage

Urban shrinkage is a continuous process. This paper draws on the research method of Murdoch (2018) and uses annual household registration population data from the China City Statistical Yearbook to calculate urban shrinkage. Here, P_{it} represents the total household registration population at the end of year t for city i , and $P_{i(t-1)}$ represents the total household registration population at the end of the previous year for the same prefecture-level city. When $GPOP_{it} > 0$, it indicates that the population of city i has decreased in period t , meaning urban shrinkage has occurred; the larger the value of $GPOP_{it}$, the higher the degree of urban shrinkage. The specific formula is:

$$GPOP_{it} = -Ln\left(\frac{P_{it}}{P_{i(t-1)}}\right) * 100\%$$

3.2.3 Mediator – Fiscal Pressure

Fiscal pressure primarily stems from the gap between fiscal revenue and expenditure. Drawing on existing research, this paper adopts the following formula to measure fiscal pressure: (Local fiscal general budget expenditure – Local fiscal general budget revenue) / Local fiscal general budget revenue. When this ratio is positive, it indicates that the local government is in a fiscal situation where "expenditure exceeds revenue"; the larger the value, the higher the fiscal pressure it bears. According to the definitions in the China City Statistical Yearbook, local fiscal general budget revenue mainly includes tax revenue, non-tax revenue, and redistributive revenue from the central government. This indicator can, to some extent, reveal local governments' own fiscal capacity and their degree of dependence on intergovernmental transfers.

3.2.4 Control Variables

Drawing on the research of Fan Zhaoyuan and Du Weiyan (2025), this paper employs variables related to economic and social dimensions, including human capital level, industrial structure, and information infrastructure. The specific measurement methods for the variables are as follows: information infrastructure is measured as the ratio of total postal and telecommunications business to regional GDP; industrial structure is measured as the share of the secondary industry in the regional GDP; human capital level is measured as the ratio of the number of enrolled students in higher education institutions to the regional permanent resident population; the degree of openness is proxied by the ratio of actual utilized foreign direct investment (FDI) to GDP; urban consumption scale is measured by the logarithm of per capita total retail sales of consumer goods; and per capita economic level is measured by the logarithm of per capita GDP.

Table 2. Descriptive Statistics of Variables

Attribute	Variable Name	Sample Size	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable	Public Services	3669	0.0663	0.0103	0.0540	0.0814
Explanatory Variable	Urban Shrinkage Rate	3669	0.0023	0.0051	-0.0042	0.0092
Control Variables	Urban Information Infrastructure	3669	0.0039	0.0019	0.0017	0.0067
	Industrial Structure	3669	0.4454	0.0660	0.3567	0.5302
	Human Capital	3669	0.0141	0.0087	0.0050	0.0277
	Degree of Openness	3669	0.0086	0.0092	0.0000	0.0228
	Consumption Scale	3669	15.7026	1.0349	12.8410	19.0367
	Per Capita Economic Level	3669	10.8024	0.3744	10.3191	11.3039
Mediating Variable	Fiscal Pressure	3669	1.6485	0.9489	0.5524	3.0047

3.3 Model Specification

3.3.1 Baseline Regression Model

Considering the trend effects of individual city differences and time-varying factors, this paper adopts a two-way fixed-effects model. Following relevant literature, we construct the following model to examine the impact of urban shrinkage on the level of public service provision.

$$PS_{it} = \alpha_0 + \alpha_1 GPOP_{it} + \alpha_2 X_{it} + FE + u_{it}$$

Among them, PS_{it} represents the level of public service provision (urban public service level index) for city i in year t ; $GPOP_{it}$ represents urban shrinkage for city i in year t , measured by the annual population change fluctuation; X_{it} represents the control variables for city i in year t , including urban information infrastructure, industrial structure, human capital, and economic development level. FE denotes fixed effects, including individual fixed effects and time fixed effects, which can largely mitigate biases caused by omitted variables and partially address endogeneity issues in panel data; u_{it} is the random error term.

3.3.2 Mediation Effect Model

To further examine the role of fiscal pressure between urban shrinkage and public service provision, this paper draws on the mediation effect research of Wen Zhonglin et al. (2004) and constructs the following model to investigate the mediating effect of fiscal pressure on urban public service provision:

$$PS_{it} = \alpha_1 + \beta_1 GPOP_{it} + \gamma_1 X_{it} + FE + \varepsilon_{it}$$

$$FP_{it} = \alpha_2 + \beta_2 GPOP_{it} + \gamma_2 X_{it} + FE + \varepsilon_{it}$$

$$PS_{it} = \alpha_3 + \theta FP_{it} + \beta_3 GPOP_{it} + \gamma_3 X_{it} + FE + \varepsilon_{it}$$

Where FP_{it} is the mediating variable, which refers to fiscal pressure in this paper. The mediation effect focuses on the magnitude and significance levels of β_2 , β_3 , and θ . If β_2 and θ are significant but β_3 is not, this indicates a complete mediation effect, meaning that the impact of urban shrinkage on urban public service provision is fully mediated by the mediating variable, fiscal pressure. If β_2 , θ , and β_3 are all significant, but the absolute value of β_3 is smaller than that of β_1 , this indicates that the mediating variable has a partial mediation effect in the impact of urban shrinkage on urban public service provision.

4. Result

4.1 Baseline Regression Analysis

The baseline regression results of urban shrinkage on public service provision are shown in Table 3. Column (1) includes only urban shrinkage as the sole explanatory variable, and finds that the coefficient of the urban shrinkage indicator is significantly negative, allowing for a preliminary conclusion that urban shrinkage weakens the level of public service provision. Column (2) adds year and city fixed effects. Column (3) further incorporates control variables into the regression equation. The regression results indicate that, after controlling for the influence of other variables, the weakening effect of urban shrinkage on public service provision remains significant: for every one-unit increase in urban shrinkage, the level of public service provision decreases by 0.057 units. The baseline regression results show that urban shrinkage has a significant negative impact on the provision of public service outputs; the higher the degree of shrinkage, the greater the decline in the level of public service provision. These results validate Hypothesis 1.

Regarding the control variables, the effects of consumption scale and human capital level on urban public service provision are both significantly positive, indicating that cities with larger consumption scales and higher human capital levels tend to have more abundant public service provision, easier access to capital, and stronger public service supply capacity.

Table 3. Baseline Regression Model

	(1)	(2)	(3)
Urban shrinkage	-0.358 (0.033)	-0.070 (0.025)	-0.057 (0.025)
Trade openness			-0.002 (0.017)
Per capita GDP			0.000 (0.001)
Scale of consumption			0.001 (0.002)
Information infrastructure			0.049 (0.084)
Industrial structure			-0.005 (0.003)
Human capital level			0.106 (0.035)
Constant term	0.065 (0.000)	0.066 (0.000)	0.043 (0.008)

City fixed effects	NO	YES	YES
Year fixed effects	NO	YES	YES
Sample size	3669	3669	3669
R ²	0.031	0.811	0.812

Note. , , and indicate significance at the 10%, 5%, and 1% levels, respectively.

4.2 Robustness Analysis

Replacing the core explanatory variable. The urban shrinkage variable in this paper was originally calculated using the registered (household) population data from the China City Statistical Yearbook. Now, the urban shrinkage variable is recalculated using the average annual population with the same formula. The results are shown in column (1) of Table 4. Even after replacing the explanatory variable, the regression results remain significant: urban shrinkage weakens the provision of public services.

Excluding municipality samples. Drawing on the study by Fan Zhaoyuan and Du Weiyan (2025), and considering that data for municipalities are quite similar to provincial-level data, while prefectural-level city data differ significantly from provincial data, this study excludes the four municipalities from the regression analysis to reduce comparability issues arising from differences in administrative levels. The regression results are shown in column (2) of Table 4, and they are largely consistent with the benchmark regression.

Using pre-pandemic samples to account for the impact of the pandemic. To eliminate potential interference from special policies and circumstances during the COVID-19 pandemic on the provision of public services, this study excludes samples from 2021 and later in the robustness test, and re-runs the regression analysis using only pre-pandemic data (2020 and earlier). The regression results are shown in column (3) of Table 4. The direction and significance of the coefficients for the core variables remain largely consistent with the benchmark regression, indicating that the research conclusions are robust.

Table 4. Robustness Analysis

	(1)	(2)	(3)
Urban shrinkage	-0.046 (0.027)	-0.054 (0.025)	-0.049 (0.027)
Constant term	0.066 (0.000)	0.043 (0.008)	0.043 (0.011)
Control variables	YES	YES	YES
City fixed effects	YES	YES	YES
Year fixed effects	YES	YES	YES
Sample size	3699	3617	2823
R ²	0.753	0.808	0.837

Note. , , and indicate significance at the 10%, 5%, and 1% levels, respectively.

4.3 Mechanism Testing

To investigate whether urban shrinkage affects the provision of public services through fiscal pressure, this paper introduces fiscal pressure as a mediating variable into the baseline model. The mediation effect regression results are shown in Table 5.

The regression results in Model (1) of Table 5 show that the total effect of the urban shrinkage rate on public service provision is significantly negative: for each one percentage point increase in the shrinkage rate, the level of public services decreases by an average of 0.057 units. This indicates that urban shrinkage has a significant inhibitory effect on public service provision; that is, a decline in population size leads to a lower level of public service provision. Model (2) examines the effect of urban shrinkage on the mediating variable, fiscal pressure. In this regression, the coefficient of urban shrinkage is 7.713 and is significant at the 1% level. This suggests that urban shrinkage significantly exacerbates local fiscal pressure. This may be because population loss reduces the tax base and fiscal revenue, while rigid expenditures required to maintain a given scale of public services may not decrease simultaneously, thereby causing or intensifying urban fiscal pressure. Model (3) includes both urban shrinkage and fiscal pressure in the regression equation to examine whether the mediation path exists. The coefficient of fiscal pressure is -0.001 and is significant at the 1% level. This indicates that, after controlling for other factors, increased fiscal pressure has a negative effect on public service provision. Compared with Model (1), after introducing the mediating variable "fiscal pressure", the absolute value of the coefficient of urban shrinkage decreases from -0.057 to -0.051. This indicates that fiscal pressure partially mediates the negative effect of urban shrinkage on public service provision. This result may be because urban shrinkage not only directly weakens public service provision and urban tax revenues, but also indirectly reduces public service expenditures through fiscal tightening. Urban shrinkage leads to a simultaneous decline in tax revenues and transfer payments, while rigid expenditures on public services are difficult to compress. Faced with an imbalance between revenue and expenditure, local governments often prioritize cutting flexible public service programs. Regarding control variables, an expansion in the scale of consumption can alleviate fiscal pressure and improve service efficiency to some extent. An increase in the level of human capital also helps enhance local fiscal resilience, thereby mitigating the negative effects of urban shrinkage.

Table 5. Mediation Effect Test

	(1)	(2)	(3)
Urban shrinkage	-0.057 (0.025)	-7.713 (2.910)	-0.051 (0.025)
Fiscal pressure			-0.001 (0.000)
Trade openness	-0.002	1.697	-0.000

	(0.017)	(2.407)	(0.017)
Per capita GDP	0.000	-0.659	-0.000
	(0.001)	(0.100)	(0.001)
Scale of consumption	0.001	-0.282	0.001
	(0.000)	(0.068)	(0.000)
Information infrastructure	0.050	-12.281	0.042
	(0.084)	(8.838)	(0.084)
Industrial structure	-0.006	-1.229	-0.006
	(0.003)	(0.440)	(0.003)
Human capital level	0.106	7.365	0.111
	(0.036)	(5.248)	(0.036)
City fixed effects	YES	YES	YES
Year fixed effects	YES	YES	YES
Constant term	0.044	14.031	0.053
	(0.008)	(1.071)	(0.008)
N	3669	3669	3669
R ²	0.813	0.903	0.814

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

4.4 Heterogeneity Analysis

4.4.1 Regional Heterogeneity across Eastern, Central, and Western Areas

To examine whether the impact of urban shrinkage on public service provision varies due to regional development differences in China, this paper divides the sample into three major regions: eastern, central, and western. The regression results in Table 6 show that the impact of urban shrinkage on public service provision exhibits significant regional differences. In the eastern region, the coefficient of urban shrinkage is -0.158 and is significant at the 1% level, indicating that urban shrinkage has a significant inhibitory effect on public service provision, and this effect is strongest in the eastern region. The coefficients for the central and western regions are 0.001 and -0.001, respectively, neither of which passes the significance test, suggesting that in the central and western regions, urban shrinkage has no statistically significant negative impact on public service provision. This may be because the eastern region has a higher level of economic development and a more complete public service system, making it more sensitive to fiscal and demographic changes brought about by shrinkage. In contrast, due to differences in development stages and policy support in the central and western regions, the impact of shrinkage on public service provision has not yet fully materialized.

4.4.2 Heterogeneity Analysis by Urban Agglomeration

Given the strategic role of urban agglomerations in China's urbanization and regional development, the sample is further divided into four major urban agglomerations (the Yangtze River Delta, Pearl River

Delta, Beijing–Tianjin–Hebei, and Chengdu–Chongqing) and non-urban-agglomeration cities, in order to identify whether the effect of urban shrinkage varies by urban agglomeration status. According to the results in columns (4) and (5) of Table 6, the coefficient of urban shrinkage in the four major urban agglomerations is -0.108, significant at the 1% level; while the coefficient for non-urban-agglomeration cities is -0.023, which is not statistically significant. This indicates that the negative impact of urban shrinkage on public service provision is mainly concentrated in urban agglomeration areas. A possible reason is that within urban agglomerations, economic linkages are close and factor flows are frequent, making the negative effects of shrinkage more likely to manifest in the public service system. In contrast, cities outside urban agglomerations have relatively independent structures and are either less affected by the shocks of shrinkage or have not yet developed systemic pressures.

4.4.3 Urban Resource Endowment

Considering that resource dependence may affect urban fiscal structure and policy responsiveness, this paper divides the sample into resource-based cities and non-resource-based cities according to the National Plan for the Sustainable Development of Resource-Based Cities (2013–2020). The results in columns (6) and (7) of Table 6 show that for the sample of resource-based cities, the coefficient of urban shrinkage is -0.035 and is not statistically significant; while for non-resource-based cities, the coefficient is -0.070 and is significantly negative at the 5% level. This indicates that the negative impact of urban shrinkage on public service provision is mainly concentrated in non-resource-based cities. Resource-based cities typically receive more central transfer payments and policy support, so their public service provision has a certain degree of institutional resilience and fiscal buffers, making them relatively less sensitive to the shocks of shrinkage. In contrast, non-resource-based cities rely more on local fiscal revenue and economic development levels, so their public services are more vulnerable to the impacts of shrinkage.

Table 6. Heterogeneity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Eastern region	Central region	Western region	Four major urban agglomerations	Other cities	Resource-based cities	Non-resource-based cities
Urban shrinkage	-0.158 (0.036)	0.001 (0.041)	-0.001 (0.050)	-0.108 (0.040)	-0.023 (0.035)	-0.035 (0.041)	-0.070 (0.029)
Constant term	0.029 (0.013)	0.030 (0.013)	0.063 (0.018)	0.067 (0.014)	0.043 (0.036)	0.026 (0.012)	0.065 (0.010)
Control variables	YES	YES	YES	YES	YES	YES	YES
City fixed effects	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES

N	1300	1281	1088	1209	2460	1465	2204
R ²	0.889	0.782	0.752	0.873	0.787	0.743	0.846

Note. , , and indicate significance at the 10%, 5%, and 1% levels, respectively.

5. Discussion

5.1 Conclusion

Based on panel data of 283 prefecture-level and above cities in China from 2011 to 2023, this paper systematically investigates the impact of urban shrinkage on urban public services. The main conclusions are as follows:

Urban shrinkage significantly affects the level of urban public service provision. Urban shrinkage weakens the provision of urban public services. For every one-unit increase in urban shrinkage, the level of public service provision decreases by 0.057 units. This conclusion remains significant after robustness tests such as replacing the explanatory variable and excluding municipality data. This finding is consistent with the mechanism in shrinking cities theory, where population loss reduces demand for public services and lowers the efficiency of resource allocation, further supporting the theoretical expectation of a concomitant contraction of public services during urban decline.

Fiscal pressure is a key mechanism through which urban shrinkage affects changes in urban public service provision. The results show that urban shrinkage not only has a direct negative effect on public service provision but also indirectly reduces the level of public services by significantly exacerbating local fiscal pressure. After introducing the fiscal pressure variable, the absolute value of the direct effect coefficient of urban shrinkage decreases, while fiscal pressure itself also exhibits a significant negative effect. These results support the hypothesis that fiscal pressure plays a partial mediating role. This indicates that the fiscal difficulties faced by shrinking urban areas constitute an important transmission mechanism for the decline in public service provision.

There are regional differences in the impact of urban shrinkage on urban public service provision. The results show that the impact of urban shrinkage on public service provision exhibits clear heterogeneity. Specifically, the eastern region and cities in the four major urban agglomerations suffer more significant negative shocks, while non-resource-based cities also show obvious pressure on public service provision. In contrast, the effects in the central and western regions are relatively weak, and cities outside the four major urban agglomerations as well as resource-based cities show no statistically significant impact. These findings reveal that the effect of urban shrinkage on public service provision is not homogeneous; its magnitude is closely related to geographical location, urban agglomeration membership, and resource endowment type. This suggests that place-based policy strategies should be emphasized.

5.2 Implications

Against the backdrop of regional demographic divergence in China, many cities are facing a slowdown in economic and population growth, or even continuous shrinkage. At the same time, the new urbanization strategy has raised higher demands for the equalization of basic public services. Cities that

are shrinking or showing a tendency to shrink need to systematically address the decline in public service delivery capacity caused by population loss and alleviate the resulting intensification of local fiscal pressure. This requires local governments to adopt comprehensive policy measures, coordinating the optimal use of existing resources with the rational layout of incremental services, in order to achieve a balance between effective public service provision and fiscal sustainability.

Facing the pressure on public service provision caused by urban shrinkage, local governments should change their development philosophy, actively adapt to the new normal of population dynamics, implement a "smart shrinkage" strategy, and optimize the allocation of public service resources. Specifically, it is necessary to establish a dynamic monitoring and early warning mechanism for population mobility, identify the characteristics of different shrinkage types and stages, and take differentiated measures: for cities experiencing severe population loss, public service facilities should be consolidated and shared—for example, by merging smaller schools and medical institutions to improve resource use efficiency; for mildly shrinking cities that still retain some population attractiveness, reasonable public service investment should be maintained, with a focus on improving service quality to enhance urban competitiveness. In addition, cross-regional collaborative public service delivery models can be actively explored, such as inter-city service cooperation, telemedicine, and sharing of educational resources, to compensate for the lack of public service capacity in certain areas. In terms of infrastructure development, the focus should shift from previous expansion-oriented approaches to improving the efficiency and modernization level of existing facilities—for instance, through the construction of digital networks and smart public service platforms—so as to achieve broader coverage and higher service quality at lower cost, thereby alleviating resource idleness and fiscal burdens resulting from population decline.

The fact that urban shrinkage indirectly leads to a decline in public service provision by exacerbating local fiscal pressure suggests that fiscal system reform can play a role in mitigating the negative impact of urban shrinkage. It is recommended that governments pursue coordinated reforms on both the revenue and expenditure sides. On the revenue side, a fiscal transfer payment system that matches population mobility should be accelerated, increasing general transfer payments to shrinking cities, and exploring a dynamic adjustment mechanism based on changes in the resident population to prevent a decline in public service levels due to reduced tax revenues that would fail to meet residents' basic needs. At the same time, local governments should be supported to actively develop potential industries such as the digital economy and elderly care services, gradually reducing their dependence on traditional land-based finance. On the expenditure side, performance-based budget management can be fully implemented, fiscal transparency enhanced, cost-effectiveness assessments of public service expenditures strengthened, and inefficient and duplicative construction projects cut, so that limited financial resources are prioritized for education, healthcare, social security, and other areas vital to people's livelihoods. In addition, public-private partnerships should be encouraged, market mechanisms introduced into the public service sector, the scope of government purchase of services expanded, and supply efficiency and quality

improved, thereby forming a diversified, collaborative public service support system.

The extent to which urban shrinkage affects public service provision is closely related to local conditions, so policy-making must adhere to place-based principles and implement differentiated guidance. Different cities have significant differences in economic foundation, fiscal capacity, population structure, and development stage, so the same model cannot be applied uniformly to address urban shrinkage. Local governments can be encouraged to carry out policy innovations based on their specific circumstances, such as exploring public service delivery models integrated with community governance, giving play to the role of grassroots organizations and citizen participation, and improving the responsiveness and adaptability of services. At the top-down design level, central and provincial governments can establish classification guidance standards and support lists for different types of shrinking cities, leverage the regional coordination functions of mechanisms such as "one city, one policy" and fiscal transfers, and help all localities find a path to improving public services that suits their own characteristics in coping with urban shrinkage.

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