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Is the Urban Shrinkage Inhibits the Improvement of Public Service Level?

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ABSTRACT

Public services provide convenient conditions for urban residents to study, work and live, and have important significance for improving the life quality of residents and improving the level of welfare. However, while China's spatial economic is heading towards agglomeration development, a large number of cities have shrunk, which has made unbalanced supply of public services between regions increasingly prominent. Based on the existing literature and the development reality, this paper analyzes the impact of urban shrinkage on the public service level from the public service supply mechanism, and discusses the heterogeneous effects of different labor shrinkage on public services. The results of the study show that urban shrinkage will inhibit the improvement of public service level, but inter-governmental competition makes the labor shrinkage of industry and service industry promote the improvement of public service level. In addition, this paper takes economic development level as a moderating variable to study the moderating effect of economic development level in the impact of urban shrinkage on public service levels. It is found that the reduction of economic development level will promote government competition and provide more public services.

1. Introduction

Since the reform and opening up, China's economic development has made remarkable achievements. With the rapid economic growth, the population size and urban land use in large cities have expanded rapidly. Especially in the spatial distribution of economic activities, a large number of people gradually gather in a few central cities with rich life, perfect public services and convenient working and living. Population concentration in central cities will inevitably lead to population reduction in small and medium-sized cities. Existing research shows that the local shrinkage of China's ur-

ban pattern is increasingly obvious under the overall growth environment^[1]. Under such a background, the spatial pattern of population movement in China can be described as "ice and fire". On the one hand, the population is continuously flowing to the traditional first-tier big cities such as Beijing, Shanghai, Guangzhou and other first-tier cities, where housing prices are continuously pushed up, living pressure is increased, and urban roads are more crowded; On the other hand, second-and third-tier cities have joined in the "competition of attracting talent (people well educated) between cities" to make up for the lack of economic attraction of the cities themselves by lowering the household registration

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threshold and personal income tax. The spatial flow of population makes the unbalanced supply of urban public services in different regions more serious. Promoting the equalization of public services has become the basic focus of the government to improve people's livelihood and optimize the functions of the city as an important measure to coordinate regional development, improve the quality of life of residents and reform the public finance system. A large number of studies have confirmed that China's megacities, which are the places of population inflow, have the problem of insufficient supply of public services, resulting in "megacity disease", while relatively few studies have been conducted on the planning of small and medium-sized cities. However, the background of social and economic transformation has changed the focus of scholars from focusing only on the agglomeration effect brought by population inflow into large cities to starting to explore the benefits of "downsizing" cities. From the perspective of urban development, urban shrinkage is only a stage in the process of urbanization, which does not necessarily bring about economic recession, but also may bring new development opportunities to the shrinking cities^[2]. Leipzig and Liverpool are both classic cases from urban shrinkage to economic re-growth. How planners apply the concept of streamlining planning to urban planning in shrinking areas is of great significance for shrinking cities to attract the return of population and revive the local economy^[3].

Regarding the development trends of the shrinking area, although the streamlining strategy has been approved by some scholars, with the gradual deepening of research, scholars have found that the current concept of smart shrinkage is not flawless. The rational and streamlined planning concept has produced a series of new urban planning ideas. Promoting the redevelopment of shrinking areas has become the primary goal of the local government to restart economic vitality and move towards high-speed development. However, there are few discussions on what kind of reasonable smart shrinkage can conform to the current urban development law and effectively improve the level of regional economic development. The government will generally promote economic growth through infrastructure construction and high value-added economic activities^[4], but the outflow of population from small and medium-sized cities and the construction of a large number of useless public services will aggravate the problems of resource space mismatch and resource waste. For a long time, China's urbanization based on the growth model has led to an aggressive development trend in a large number of small and medium-sized cities. Most cities have problems such as excessive construction of

public services. Some scholars have proposed that there is a "shrinkage paradox" in many cities in China where the population size is declining, but the construction land is increasing instead^[5].

Many small and medium-sized cities have built a large number of public services in order to optimize the investment environment and attract the re-concentration of capital and labor elements, resulting in serious waste of resources. In recent years, the phenomenon of "ghost cities" and "empty cities" in China has aroused great concern in academic circles and society. *The Key Task of New Urbanization Construction in 2019* issued by the National Development and Reform Commission proposes that small and medium-sized shrinking cities should "lose weight and strengthen their bodies", change the inertia of incremental planning thinking, strictly control the increment and revitalize the stock. Smart shrinkage must be combined with regional practice in order to better promote the development of theory^[6]. To investigate what kind of development ideas can be suitable for the current development situation of our country's cities, we must think about this issue from the supply side of public services. This paper analyzes the motivation and influence mechanism of local governments to provide public services from the perspective of local government competition, which is commonly used in existing studies. It is found that urban shrinkage will inhibit the improvement of local government's public service level, but the impact of different types of labor shrinkage on the construction of public energy services is heterogeneous, and puts forward corresponding suggestions for the construction of public services in China.

2. Theoretical Analysis and Research Assumptions

2.1 Urban Shrinkage and Public Services

Research on the impact of population migration on public services generally believes that the provision of public services is dominated by government construction, with the satisfaction of local residents as the standard. Therefore, local governments will consider the size of local cities and the current situation of economic development when carrying out public service construction. The shrinkage of cities is generally manifested by the loss of urban population, which makes the government reduce the corresponding public service construction. This is particularly prominent in the field of education. Compulsory education for low-skilled labor in their hometown generates returns in the places where the population flows in, which makes

the cities where the population flows out lack incentives to invest in education^[7]. In addition, China's current urban shrinkage phenomenon usually occurs in economically underdeveloped areas. These cities generally have a relatively low level of urbanization, a relatively high proportion of rural population and relatively scattered residence, thus the economies of scale in the process of public service provision are limited by space and hard to accomplish. Moreover, the autonomy of choice enables the labor force with higher labor participation rate and education level to have higher initiative in the choice of living cities. Therefore, the loss of urban population has a negative impact on the quality of human capital in the shrinking areas while reducing the number of population in the areas. The decrease in population quality and technical level also further leads to the decrease in the efficiency of public service supply.

As mentioned above, the loss of population directly or indirectly reduces the local government's investment in the construction of public services and the construction efficiency of public services. Therefore, the level of public service construction closely related to people's lives will be reduced by the chain reaction of the shrinkage of the city. Based on the above analysis, this paper proposes assumption 1.

Assumption 1: Urban shrinkage inhibits the improvement of public service level, that is, the more serious the urban shrinkage, the lower the public service level.

2.2 Heterogeneity of Urban Shrinkage on Public Service Level

The traditional fiscal decentralization theory holds that the movement of population between regions will affect the competition of public service supply among local governments through the mechanism of "voting with feet". Therefore, local governments usually increase the supply of public services to attract the population to flow into the region and realize the supply of public products that are suitable for the residents' preferences in various regions^[8]. However, China's existing "voting with feet" mechanism is not perfect, and the distortion of public resource allocation mechanism makes the ideal public service supply theory not fully applicable in explaining China's phenomenon.

Wages in modern economic sectors are usually higher than those in traditional agricultural sectors, thus the agricultural labor force is continuously flowing from traditional agriculture to modern industrial sectors^[9]. Therefore, the decrease in the number of agricultural labor force in most cities in China is not the loss of agricultural labor force, but the transformation of agri-

cultural labor force among various industries within the region. In short, the decrease in the agricultural labor force in each city is not that the farmers in this city move to other cities to continue to engage in agricultural production, but that the agricultural labor force enters the urban areas of the cities to which the household registration belongs and engages in industries with higher labor returns such as construction, industry and domestic economics. Therefore, the decrease in the agricultural labor force population will not stimulate the competition for public services among governments. In addition, since agricultural production relies less on public services than industry and service industry, the government, after reducing the agricultural labor force, focuses more on adopting policies such as agricultural subsidies and tax relief, rather than improving the level of public services to enhance the city's attractiveness to agricultural capital and labor and other factors.

The promotion mechanism using GDP as the main assessment indicator for local officials strengthens the existing competition among local governments^[10]. Obviously, the shrinkage of industrial labor force can trigger the competition for public services of local governments. On the one hand, industry accounts for a relatively large proportion of the national economy, and the government is more willing to increase the level of public services to attract industrial enterprises, while more industrial enterprises can absorb more industrial labor force. On the other hand, due to the large amount of transportation and personnel exchanges required in the production process, industry is more dependent on the level of public services than other industries^[11]. The fiscal competition launched by the government to attract enterprises to settle down usually includes tax competition and public service competition^[12]. By providing better public goods and services, capital and labor factors can be attracted to flow into the local area, thus improving the local economic level. A large number of enterprises gathering in the region can better realize economies of scale and knowledge spillovers^[13,14], with the development of information technology and many outsourcing agencies, the service industry is gradually gathering in urban areas, and the current flow of Chinese labor force between cities enables the selection mechanism of officials who "vote with their feet" to promote the construction of regional public services^[15]. Based on the above analysis, this paper proposes assumption 2.

Assumption 2: The shrinkage of agricultural labor force inhibits the improvement of public service level, but the shrinkage of industrial and service labor force will promote the improvement of public service level.

2.3 Moderating Effect of Economic Development Level

At present, China's population flow is mainly dominated by labor force flow. Population outflow not only reduces the per capita GDP of the outflow area, but also usually causes the manufacturing industry in the outflow area to shrink, making the outflow area gradually marginalized^[16]. The decline of industries and the reduction of employment opportunities have led to the population flowing to regions with higher economic development level. As mentioned above, highly developed regions can provide better public services, job opportunities and living standards, thus labor force usually flows from backward regions to economically developed regions. For example, the collapse of a large number of state-owned economies in East Germany has led to the population flowing to West Germany regions with better employment conditions and better living conditions^[17]. At the same time, cities with low levels of economic development are restricted by the reduction of population and the decline of the quality of human capital. They are in a more disadvantageous position in the competition with economically developed regions and further restrict the development prospects of economically backward regions. However, under the pressure of promotion, local government officials must optimize the local economic development environment. The existing literature holds that the government generally promotes the concentration of capital and labor in the local area by reducing taxes and providing more public services, thus promoting the economic development of the region.

Compared with economically developed regions, cities with lower levels of economic development may provide more public services to revive the local economy after shrank. The game of political promotion urges local officials to pay more attention to their relative position with competitors^[18]. The government usually takes certain measures to attract industries to gather locally, and the agglomeration of industries in the region is based on the result of self-evolution of market mechanism. The government can only reduce the cost of agglomeration through public goods and policies to guide capital and labor elements to flow to the region. Due to the differences in geographical location and natural resources in different regions, the same policies will have different impacts on the economic development of different regions. In order to make up for the objective differences in development, the impact of public services is particularly important^[19]; At the same time, China's large-scale land finance has enabled local governments to have

abundant financial resources to support local financial expenditures. In areas with backward economic development, in order to attract the second return of labor force, local governments generally improve the attractiveness of cities to industries by providing better public services and lower tax rates. In the research on the relationship between intergovernmental competition and public service, most scholars believe that intergovernmental competition leads to excessive public service expenditure, which is manifested in the repeated construction of a large amount of infrastructure in cities with population outflow^[20]. Therefore, when shrinkage occurs in regions with low economic development level, the local government will promote the concentration of capital and labor in the region by improving the level of public services, thus slowing down the inhibitory effect of urban shrinkage on the level of public services. On the contrary, when there is a phenomenon of urban shrinkage in regions with high economic development level, there is relatively little incentive to optimize the local business environment by improving the level of public services. Therefore, the more developed the urban economy is, the more obvious the inhibitory effect of urban shrinkage on public services will be. Based on the above analysis, this paper proposes assumption 3.

Assumption 3: The level of economic development plays an important moderating effect in the inhibition of urban shrinkage on the improvement of public service level. The inhibitory effect of urban shrinkage on public services increases as the level of urban economic development increases, vice versa.

3. Research Design

3.1 Variable Description

3.1.1 Explained Variables

This paper is based on the relevant research^[21] and the availability of data, the measurement indicators of the selected public service level reflect as fully as possible the government guarantees the public services required by all citizens. These indicators can be divided into five categories with a total of 17 indicators: public healthcare and education are important factors to improve the basic living standards of residents; Environmental protection in the region affects the quality of life of residents. Basic cultural services provide a place for residents to relax and entertain. Infrastructure construction is the material basis for ensuring residents' travel and enterprises' production (Seen Table 1 for details).

Table 1. Evaluation Index System of Public Service Level

Target layer	Criterion layer	Indicator layer	Weight
Public service level	Public education	Schools per 1,000 students	0.0797
		Expenditure on education per student	0.0482
		Number of full-time teachers per 1,000 pupils	0.0124
		Number of full-time teachers per 1,000 middle school students	0.0042
	Public healthcare	Number of beds per 1,000 medical institutions	0.0181
		Number of health institutions per 1,000 population	0.0362
		Number of health technicians per 1,000 population	0.0249
	Environmental protection	Industrial wastewater compliance rate	0.0844
		Comprehensive utilization rate of industrial solid waste	0.0842
		Road cleaning rate	0.0246
	Infrastructure	Post and telecommunications business per capita	0.0931
		Road density	0.1014
		Length of water supply pipeline	0.0986
		Park green space coverage	0.1131
	Basic cultural services	Number of theaters and theaters	0.0913
		Number of public libraries	0.0225
		Book collection per 100 people in public library	0.0632

Based on the above five categories and 17 indexes, this paper uses entropy method to determine the weight of each index and constructs a public service level index. It should be noted that in order to avoid negative values and zero being meaningless when taking logarithms, in the process of calculating weights by entropy method, this paper adds 1 after standardization to carry out non-negative treatment, and adopts the following formula:

$$X'_{ij} = \frac{X_{ij} - \min(X_j)}{\max(X_j) - \min(X_j)} + 1 \quad (1)$$

Where X'_{ij} represents the normalized variable and X_{ij} represents the original variable.

3.1.2 Explanatory Variables

This paper mainly discusses the impact of urban shrinkage and its heterogeneity on the level of regional public services. At present, scholars mainly measure urban shrinkage by using indicators such as population change, social economy and geographical space^[22]. In this paper, referring to the study of Zhang et al.^[23], cities with negative population growth rates during the fifth census and sixth census are defined as shrinking cities. In order to discuss the impact of heterogeneity of urban shrinkage on public service level, the reduction of labor force in agriculture,

industry and service industry is used to express the heterogeneity of urban shrinkage.

3.1.3 Control Variables

In the empirical analysis of this paper, reference is made to the relevant domestic literature on the factors affecting the level of public services^[24], introduce other variables that can affect the regional public service level into the model, including: labor productivity (lab_pro), degree of openness (open_lev), urbanization level (urb_lev), financial self-sufficiency rate (fin_self), technological innovation level (tec_inn), and resident consumption capacity (total_sal).

3.1.4 Moderating Variables

Based on the above theoretical analysis, this paper selects the level of economic development as the moderating variable. Many documents use different indicators to measure the level of economic development according to different research purposes, of which GDP per capita is used more frequently. The higher the GDP per capita, the higher the economic development level of the region, so the GDP per capita can be used to better measure the economic development level of the region.

Table 2. Description of Main Variables

Type	Variable	Symbol	Variable description
Interpreted variable	Public service level	pub_serv	Public service level index
Explanatory variable	The total population of the city is shrinking.	shrink	Virtual variables, shrinking city value is 1, non-shrinking city value is 0
	Agricultural labor shrinkage	lab_agri	
	Industrial labor shrinkage	lab_indu	
	Labor shrinkage in service industry	lab_serv	
moderating variable	Level of economic development	per_gdp	Per capita GDP
Control variable	Technological innovation level	tec_inn	Number of patent licenses per million people
	Degree of opening to the outside world	open_lev	Foreign direct investment in cities/national foreign direct investment
	Urbanization level	urb_lev	Non-agricultural population/total urban population
	Financial self-sufficiency rate	fin_self	Fiscal revenue/expenditure
	Labor productivity	lab_pro	Gross national product/labor force
	Residents' consumption ability	total_sal	Total retail sales of social consumer goods per capita

3.2 Data Sources and Processing

The population data used in the paper are from the fifth and sixth censuses, the public service facilities and other data are from the 2001-2011 *China Urban Statistics Yearbook* and *China Urban Construction Statistics Yearbook*. In order to prevent the deviation that extreme values may bring to the regression results, this paper carries out 2.5% tail reduction processing, and at the same time carries out logarithmic processing on the data to remove the influence of different dimensions and heteroscedasticity. The descriptive statistical characteristics of variables are shown in Table 3. The average value of public service water is 0.2123 and the standard deviation is 0.0544, which indicates that the sample statistics are close to the values of the overall parameters and have certain representativeness. In addition, it can be seen that more than 26% of the cities in the sample selected in this paper have experienced shrinkage, of which more than 88.9% are cities with shrinking agricultural labor force and nearly 20% are cities with shrinking industrial and service labor force, indicating that the current problem of urban shrinkage in China is relatively serious (Seen Table 3 for details).

Table 3. Descriptive Statistics of Main Variables

Variable	Mean value	Standard deviation	Minimum value	Median	Maximum value
pub_serv	0.2123	0.0544	0.1016	0.2186	0.3161
shrink	0.2612	0.4394	0.0000	0.0000	1.0000
lab_agri	0.8892	0.3140	0.0000	1.0000	1.0000
lab_indu	0.1754	0.3804	0.0000	0.0000	1.0000
lab_serv	0.1934	0.3950	0.0000	0.0000	1.0000
per_gdp	0.9578	0.4743	0.3154	0.8433	2.2544
lab_pro	2.8879	0.5279	1.8019	2.9073	3.8955
open_lev	0.0009	0.0019	0.0000	0.0002	0.0088
urb_lev	0.2740	0.1648	0.0672	0.2301	0.6931
fin_self	1.1494	0.3144	0.6881	1.0987	1.9556
tec_inn	0.0601	0.1054	0.0007	0.0170	0.4988
total_sal	0.4428	0.2796	0.1097	0.3617	1.2720

3.3 Model Setting

In order to verify assumption 1, that is, urban shrinkage will inhibit the improvement of public service level; the basic econometric model set in this paper is shown as formula (2):

$$pub_serv_{it} = \beta_0 + \beta_1 shrink_{it} + \beta X_{it} + \varepsilon_{it} \quad (2)$$

Where pub_serv represents public service level, shrink represents urban shrinkage, and X represents control variable. If β_1 in formula (2) is negative, assumption 1 is verified. In addition, considering that different labor shrinkage will have different impacts on the level of public services,

the competition between local governments makes the shrinkage of labor in industry and service industry more conducive to the government's efforts to optimize the local business environment, thus promoting the improvement of the level of public services. The reduction of agricultural labor force will not stimulate the local government to strengthen the construction of public services. In order to test the impact of heterogeneous shrinkage on public service level and verify assumption 2, the following model is established in this paper:

$$pub_serv_{it} = \beta_0 + \beta_1 lab_agri_{it} + \beta X_{it} + \varepsilon_{it} \quad (3)$$

$$pub_serv_{it} = \beta_0 + \beta_1 lab_indu_{it} + \beta X_{it} + \varepsilon_{it} \quad (4)$$

$$pub_serv_{it} = \beta_0 + \beta_1 lab_serv_{it} + \beta X_{it} + \varepsilon_{it} \quad (5)$$

The level of economic development is an important factor that drives labor to flow across regions. In order to further discuss the moderating effect of economic development on urban shrinkage inhibiting the promotion of public services, thus testing assumption 3 and further studying the influence of economic development level on different shrinking cities, this paper introduces variables of "shrink*per_gdp", "lab_agri*per_gdp", "lab_indu*per_gdp", "lab_serv*per_gdp" to verify the moderating effect of economic development level. The specific setting of the model is as follows:

$$pub_serv_{it} = \beta_0 + \beta_1 shrink_{it} * per_gdp_{it} + \beta X_{it} + \varepsilon_{it} \quad (6)$$

$$pub_serv_{it} = \beta_0 + \beta_1 lab_agri_{it} * per_gdp_{it} + \beta X_{it} + \varepsilon_{it} \quad (7)$$

$$pub_serv_{it} = \beta_0 + \beta_1 lab_indu_{it} * per_gdp_{it} + \beta X_{it} + \varepsilon_{it} \quad (8)$$

$$pub_serv_{it} = \beta_0 + \beta_1 lab_serv_{it} * per_gdp_{it} + \beta X_{it} + \varepsilon_{it} \quad (9)$$

4. Empirical Analysis

4.1 Benchmark Regression Results

Table 4 reports the regression results for models 2-5. The regression results in column 1 show that the impact of urban shrinkage on public services is significantly negative at a 1% confidence level, indicating that urban shrinkage reduces the level of public services of local governments.

After the shrinkage of cities, local governments have reduced non-economic public services such as education. At the same time, the declines in the quality of human capital and the loss of economies of scale in the supply of public services have also reduced the level of public services. Naturally, the level of public services will decrease with the decrease of population. At the same time, urban shrinkage will reduce the quality of local human capital and per capita income, and intergovernmental competition will make local governments pay more attention to regional economic growth while ignoring environmental protection and the improvement of residents' cultural life. On the whole, the shrinkage of the city inhibits the improvement of the public service level in the region, and assumption 1 is verified.

4.2 Heterogeneous Regression Results

Considering the impact of heterogeneity of urban shrinkage on the level of public services, the previous analysis shows that the local government's public service supply mechanism has certain differences in response to the three kinds of labor shrinkage. The shrinkage of agricultural labor force will not cause competition in the supply of public services by local governments, so the competition in the supply of public services will not increase with the shrinkage of agricultural labor force, but the lower the level of public service supply with the shrinkage of agricultural labor force (column 2). On the contrary, the promotion mechanism of local government officials, in which city residents "vote with their feet", urges the government to actively respond to the shrinkage of industrial labor force and service labor force. Existing research shows that the government usually optimizes the regional business environment by building public service facilities, especially economic infrastructure (including transportation infrastructure, etc.), thus increasing the attractiveness of the region to enterprises. The shrinkage of industrial labor force and service labor force has prompted the shrinking cities to compete for public services. The regression model in this paper also confirms the existence of competitive behaviors of public services among governments (columns 3 and columns 4).

Judging from other variables in Table 4, the sign of labor productivity coefficient is negative, but it has not passed the significance test, indicating that the improvement of labor productivity has no significant impact on the level of public service. The coefficient of the level of foreign direct investment is significantly positive, indicating that foreign direct investment has a significant "enhancing effect" on the level of public services in the region. An increase in the level of foreign direct investment will increase the investment in the construction of public services by local governments [25]. The coefficient of regional

financial self-sufficiency rate is negative. The higher the financial self-sufficiency rate, the higher the economic development level of these regions, thus increases the regional tax revenue. According to the previous theoretical analysis, the improvement of economic development level can reduce the competition of public service supply. At the same time, the regression results show that the urbanization level and the level of opening to the outside world have a positive impact coefficient on the level of public services, and both pass the significance test, indicating that the improvement of the urbanization level and the level of opening to the outside world in each region has improved the level of public services in the region to a certain extent. Regional scientific and technological innovation is an important condition to promote the all-round development of the region, and also has a significant role in promoting the level of public services in the region. Areas with higher per capita social retail sales obviously have higher levels of economic development and more frequent production and transportation activities, so public services are significantly improved with the increase in per capita social retail sales.

Table 4. Regression Results of Impact of Urban Shrinkage and Its Heterogeneity on Public Service Level

Variable	Urban shrinkage	Agricultural labor shrinkage	Industrial labor shrinkage	Service industry labor shrinkage
shrink	-0.0079*** (-5.55)			
lab_pro	-0.0038 (-1.94)	-0.0040* (-2.05)	-0.0001 (-0.05)	-0.0037 (-1.87)
open_lev	1.4850*** (3.87)	1.4495*** (3.76)	1.5123*** (3.97)	1.4017*** (3.64)
urb_lev	0.0142** (3.03)	0.0140** (2.96)	0.0134** (2.88)	0.0176*** (3.73)
fin_self	-0.0070* (-2.52)	-0.0116*** (-4.24)	-0.0142*** (-5.22)	-0.0109*** (-4.02)
tec_inn	0.0163* (2.00)	0.0177* (2.16)	0.0263** (3.21)	0.0179* (2.19)
total_sal	0.0759*** (15.62)	0.0771*** (15.81)	0.0686*** (13.91)	0.0766*** (15.69)
lab_agri		-0.0063** (-3.26)		
lab_indu			0.0137*** (8.29)	
lab_serv				0.0043** (2.83)
_cons	0.1931*** (25.43)	0.2020*** (25.80)	0.1891*** (25.00)	0.1932*** (25.18)
N	2486	2486	2486	2486
R ²	0.4389	0.4344	0.4473	0.4338
F	275.8271	270.7531	285.3474	270.0911
p	0.0000	0.0000	0.0000	0.0000

Note: The values in brackets are T values, *, ** and *** respectively indicate the significance levels of 10%, 5% and 1%, the same below.

4.3 Moderating Effect

Table 5 reports the moderating effect of economic development level on the mechanism of urban shrinkage affecting public service level. The coefficient of interaction items in column 1 in table 5 is significantly positive at the 1% confidence level, indicating that the higher the level of economic development, the more obvious the inhibitory effect of urban shrinkage on the level of public services. According to the above analysis, in areas with high economic development level, the incentive for local governments to strengthen the construction of public services is relatively weak when urban shrank. Therefore, when the shrinkage occurs in cities with high economic development level, the decline in the level of public services will be more obvious, which shows that the inhibitory effect of urban shrinkage on public services will become more obvious with the improvement of economic level. The coefficient in column 2 is positive, which indicates that the degree of shrinkage of agricultural labor decreases with the increase of economic development level, thus weakening the supply competition of public goods by local governments.

Table 5. Moderating effect of Economic Development Level

Variable	Urban shrinkage	Agricultural labor shrinkage	Industrial labor shrinkage	Service industry labor shrinkage
shrink*per_gdp	0.0275*** (6.50)			
lab_pro	-0.0041* (-2.14)	-0.0099*** (-4.87)	0.0007 (0.34)	-0.0037 (-1.89)
open_lev	1.3557*** (3.57)	1.0476** (2.75)	1.4719*** (3.87)	1.4392*** (3.74)
urb_lev	0.0157*** (3.37)	0.0082 (1.73)	0.0145** (3.11)	0.0170*** (3.58)
fin_self	-0.0051 (-1.81)	-0.0066* (-2.38)	-0.0158*** (-5.73)	-0.0109*** (-3.96)
tec_inn	0.0244** (3.00)	0.0221** (2.74)	0.0234** (2.83)	0.0203* (2.45)
total_sal	0.0730*** (15.08)	0.0446*** (7.55)	0.0691*** (13.93)	0.0754*** (15.42)
lab_agri*per_gdp		0.0304*** (9.24)		
lab_indu*per_gdp			-0.0083* (-2.26)	
lab_serv*per_gdp				0.0084* (2.00)
_cons	0.1928*** (25.57)	0.2260*** (27.83)	0.1885*** (24.85)	0.1941*** (25.28)
N	2475	2475	2475	2475
R ²	0.4509	0.4555	0.4506	0.4368
F	252.0802	256.8319	251.7967	238.0805
p	0.0000	0.0000	0.0000	0.0000

The interaction item in the third column is negative, in-

dicating that with the development of economy, the effect of industrial labor shrinkage on the promotion of regional public services has weakened. The higher the level of economic development, the less the shrinkage of industrial labor force and the less the competition for public service supply generated by local governments to attract the secondary return of industrial labor force. Therefore, economic development has a negative moderating effect on the improvement of public service level. The interaction item in column 4 is positive, which shows that with the improvement of economic development level, the effect of labor shrinkage in service industry on the improvement of regional public service level is enhanced. Areas with higher levels of economic development have attracted more labor in the service industry, which will transmit the improvement of human capital and new technologies to the downstream manufacturing industry [26], and the improvement of technology can significantly promote the supply efficiency of public services.

4.4 Robustness Test

4.4.1 Adjust the Regional Samples

After many years of research by many natural geography experts, China's territory has been divided into seven major natural geographical divisions based on the characteristics of geographical location and human geography. There are great differences in shrinkage phenomenon and public service supply among different regions. This paper selects four geographical regions with different economic development levels from all samples for robustness test. The test results are placed in Table 6 and the first two columns of Table 7. The regression results show that the urban shrinkage in all regions has a restraining effect on the improvement of public service level, and the urban shrinkage in central, northwest and southwest regions has the most obvious restraining effect on public service level. The level of economic development also has a positive moderating effect on this inhibition. Although the sign and significance of individual control variables have changed, the test results are basically consistent with the benchmark regression results, which show that the conclusion of this paper is robust.

4.4.2 Adjust the Time Samples

After 2008, in order to cope with the financial crisis, China has made a large amount of investment in infrastructure construction. In order to avoid the error of regression results caused by policy reasons; this paper selects samples from 2000 to 2007 for robustness test. As shown in the regression results in columns 3 and 4 of Table 7, urban

shrinkage has a significant inhibitory effect on the level of public services at a 5% confidence level, and the moderating effect is significantly positive, thus avoiding the vigorous construction of the foundation due to government stimulus The impact of facilities on the regression results

has verified the validity of the research conclusions of this paper.

4.5 Endogenous Test

According to the previous theoretical analysis, there may

Table 6. Robustness Test

Variable	East China		Central China		Northwest region	
	No moderating variable	Add moderating variable	No moderating variable	Add moderating variable	No moderating variable	Add moderating variable
shrink	-0.0065** (-3.03)		-0.0117*** (-4.95)		-0.0170* (-2.57)	
lab_pro	0.0170*** (-5.37)	0.0163*** (-5.17)	0.0041 (-0.78)	0.0035 (-0.66)	0.0309** (-3.31)	0.0219* (-2.22)
lnopen_lev1	2.9607*** (-6.33)	2.7405*** (-5.81)	3.1048*** (-3.75)	3.3553*** (-4.04)	0.9616 (-0.29)	1.3236 (-0.40)
lnurb_lev1	0.0202** (-2.86)	0.0209** (-2.97)	0.0226* (-2.23)	0.0263* (-2.57)	0.0499* (-2.56)	0.0393* (-2.02)
lnfin_self1	-0.0215*** (-3.47)	-0.0138* (-2.05)	-0.0137* (-2.19)	-0.0147* (-2.35)	-0.0108 (-1.23)	-0.0064 (-0.71)
Intec_inn1	0.0209 (-1.85)	0.0270* (-2.37)	0.0802*** (-3.34)	0.1025*** (-3.98)	-0.0449 (-0.96)	-0.0495 (-1.08)
Intotal_sall	0.0553*** (-7.09)	0.0582*** (-7.44)	0.0118 (-0.76)	-0.0041 (-0.24)	0.0498** (-2.62)	0.0619** (-3.23)
shrink*per_gdp		0.0173** (-2.82)		0.0173* (-2.31)		0.0949** (-3.07)
_cons	0.1507*** (-11.89)	0.1436*** (-11.16)	0.1942*** (-9.90)	0.2008*** (-10.18)	0.1233*** (-3.77)	0.1412*** (-4.19)
N	746	746	420	420	197	193
R ²	0.6141	0.6183	0.4202	0.4278	0.4387	0.4663
F	165.4782	147.1779	41.6202	37.4754	19.9858	19.0011
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 7. Robustness Test and Endogenous Test

Variable	Southwest region		Adjusting time		Endogenous test	
	No moderating variable	Add moderating variable	No moderating variable	Add moderating variable	No moderating variable	Add moderating variable
shrink	-0.0103* (-2.35)		-0.0054** (-3.26)		-0.0293*** (-4.02)	
lnlab_pro1	0.0024 (-0.31)	0.0006 (-0.07)	-0.0084*** (-3.66)	-0.0083*** (-3.64)	-0.0019 (-0.88)	-0.0027 (-1.14)
lnopen_lev1	-6.1530 (-1.88)	-5.8165 (-1.76)	0.8600 (-1.79)	0.6608 (-1.40)	1.7398*** (-4.25)	1.4325** (-3.16)
lnurb_lev1	-0.0367 (-1.59)	-0.0368 (-1.58)	0.0072 (-1.26)	0.0101 (-1.80)	0.0084 (-1.60)	0.0097 (-1.72)
lnfin_self1	0.0020 (-0.25)	0.0019 (-0.23)	-0.0173*** (-5.22)	-0.0141*** (-4.17)	0.0026 (-0.61)	0.0146** (-2.94)
Intec_inn1	0.1090*** (-3.48)	0.1056*** (-3.34)	0.0137 (-1.17)	0.0251* (-2.17)	0.0164 (-1.93)	0.0424*** (-3.67)
Intotal_sall	0.1255*** (-6.04)	0.1234*** (-5.86)	0.1021*** (-16.02)	0.0972*** (-15.43)	0.0720*** (-13.71)	0.0624*** (-10.52)
shrink*per_gdp		0.0159 (-1.16)		0.0482*** (-7.07)		0.0892*** (-3.62)
_cons	0.1555*** (-5.6)	0.1619*** (-5.7)	0.2014*** (-23.53)	0.1984*** (-23.41)	0.1852*** (-22.17)	0.1796*** (-20.02)
N	256	254	1763	1752	2486	2475
R ²	0.4544	0.4574	0.4954	0.5136		
F	28.313	24.7666	245.187	229.1628		
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

be some endogenous between the urban shrinkage and the level of public services. In order to avoid the endogenous problems affecting the unbiased and effective regression results, This paper uses the decline in birth rate and the rise in mortality during the fifth and sixth censuses as instrumental variables for explanatory variables. Birth rate and death rate in each city are usually related to regional culture, conception of fertility and regional health level, and generally do not directly affect the regional public service level. However, birth rate and death rate have certain correlation with the increase or decrease of urban population, thus theoretically meeting the exogeneity and correlation requirements of instrumental variables. In this paper, the two-stage least square method is used to estimate the tool variable equation. According to the regression results of the first stage, the statistics of model F is much larger than 10, which refuses the assumption of weak tool variable problem. As shown in the regression results of the second stage in columns 5 and 6 of table 7, the results of regression using tool variables are basically consistent with those of benchmark regression. Urban shrinkage still plays a restraining role on the level of public services, while the reduction of economic development level intensifies the restraining effect of urban shrinkage on public services, further proving the conclusion of this paper.

5. Conclusions

This paper analyzes the impact of urban shrinkage and its heterogeneity on public service levels, as well as analyzes the moderating effects of economic development based on the data from 268 prefecture-level cities 2000-2010. The conclusions are as follows: First, urban shrinkage has inhibited the improvement of public service levels. The reduction in the total population of the city directly or indirectly reduces the input and efficiency of local governments in building public services, and the number of government-allocated public services decreases. Second, the shrinkage of different labor forces has different effects on the level of public services. The shrinkage of agricultural labor has inhibited the level of regional public services. The shrinkage of industrial labor and service labor will prompt local governments to increase the supply of public services due to local competition. Third, economic development plays a positive moderating effect in urban shrinkage inhibiting the improvement of public service levels. That is, the lower the level of economic development, the more serious the shrinkage of the city. In order to attract the second return of the population, the local government's motivation to provide public services has increased, and the level of public services has been improved. The shrinkage of agricultural labor force

will not cause competition for public services of local governments. Economic development plays a positive moderating effect in the shrinkage of agricultural labor force inhibiting the improvement of public service level. At the same time, the improvement of the level of economic development has alleviated the loss of industrial labor and has a negative moderating effect in industrial labor shrinkage promoting the level of public services. In addition, with the improvement of the economic level, the shrinkage of labor in the service industry has eased. The improvement of human capital and technology has made the supply of public services more efficient. Therefore, the level of economic development plays a positive moderating effect in service industry labor shrinkage promoting public services.

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