TRACK 11: TURBULENT URBAN FUTURES: UNCERTAINTY AND ADAPTABILITY

THE DISTRIBUTION, CAUSES AND GOVERNANCE OF URBAN SHRINKAGE IN CHINA (1060)

Qian ZHAO

College of Architecture and Urban Planning, Tongji University, Shanghai, China; 594081886@qq.com

Abstract: The spatial distribution of shrinking cities shows a trend of spreading from local to global, and shrinking has gradually become the new normal of urban spatial evolution. From 2000-2010 to 2010-2020, the agglomeration area of urban shrinking in China migrates from the central region to the northeast, and the population spilover of shrinking towns decreases in a circular pattern. By collecting the data of the last three population censuses and using qualitative, quantitative and questionnaire interview methods, we find out the factors closely related to the phenomenon of urban shrinking, such as geographical location, population structure, urban industrial power, employment positions, public service supply, etc. In response to geographical location and population structure factors, governance strategies are put forward from the perspective of rational formulation of population development policies.

Keywords: Urban Shrinking, Shrinking City, Population Forecast, Distribution Mechanism.

1. Introduction

Since the 1960s, the spatial distribution of shrinking cities has shown an evolution trend from local regions to global expansion (Wu and Sun, 2017). By referring to relevant literature and summarizing the development process of shrinking cities, it can be roughly divided into three development stages: from 1960-1990, the phenomenon of urban shrinking began to appear in the old industrialised cities of developed industrialised countries (Oswalt, 2005); From 1990-2000, the transformation of regional social system accelerated the process of urban shrinking, and the global shrinking urban agglomeration spread to the former socialist countries in Eastern Europe (Mykhnenko and Turok, 2008; Haase, Grossmann and Rink, 2013). In 2000, more than one-sixth of

the cities in the world were experiencing population loss to varying degrees (Wiechmann and Bontje, 2015; Howe, Bier and Allor et al., 1998; Wiechmann and Pallagst, 2012), and urban shrinking gradually became the new normal of urban spatial structure evolution. In the context of global urban shrinking, a number of Chinese scholars have carried out empirical studies on shrinking cities from different levels and perspectives in recent years. According to the data of two population censuses, MAO, Long and Wu (2015) found that the urban population of different sizes in China has decreased significantly (Mao, Long and Wu, 2015). Scholars such as Long and Yang (2015) put forward the paradox of local shrinking between population loss and spatial growth. They found that under the background of rapid urbanisation, a large number of urban population decreased while construction land increased (Long and Yang, 2015). Many scholars investigated urban shrinkage in the Pearl River Delta, Beijing-Tianjin-Hebei Region, Yangtze River Delta, Wuhan metropolitan area and Hunan Province (Li, Du and Li, 2015; Wu, Long and Yang, 2015; Liu and Zhang, 2017; Zhou, Qian and Yan, 2017). Most of the relevant researches focus on the law of population loss in China's cities and towns, but lack of in-depth analysis of the causes of population loss. Therefore, based on the data of the fifth national population census, the sixth national population census and the seventh national population census, this paper observes the spatial distribution characteristics of shrinking cities in China, analyzes the main causes of urban shrinking, and provides corresponding governance measures for different causes of shrinking cities.

2. The Distribution Of Urban Shrinking In China

A number of international scholars have defined the concept of shrinking city. As far as cities are concerned, there are two schools of thought. Martinez proposed that the urban region should include the whole and part of the city, metropolitan areas or towns, and the International Shrinkage Network research Institute in Germany proposed that a city could be defined as an area with more than 10,000 people. In terms of " shrinking ", relevant researchers have different definitions of the duration of population loss and the proportion of population loss. The duration of population loss is mostly defined as 2 years, 5 years and 40 years, and the proportion of population loss is mostly defined as 2 percent, 10 percent and 25 percent of the total population (Li, 2017). On the basis of previous studies, the concept of shrinking cities in this study is defined, that is, cities with population growth rate less than or equal to -10 percent during the decade of census. Due to the limitation of research conditions, only the prefecture-level city level can be grasped in the seventh census data, so the prefecture-level city is selected as the research object of the current distribution of urban shrinking in China.

2.1 China's Shrinking Urban Areas Migrate To The Northeast

By comparing the spatial distribution differences of population shrinking zones from 2000-2010 and from 2010-2020 (Figure 1), the agglomeration areas of shrinking cities

spread from Sichuan Province, Ningxia Hui Autonomous Region and Hubei Province to northeast China, and spread around the original shrinking cities. The number of shrinking cities has expanded from 11 prefecture-level cities and 3 provinces a decade ago to 45 prefecture-level cities and 12 provinces. Currently, shrinking cities are concentrated in Heilongjiang, Jilin, Liaoning, Sichuan, Gansu, Shaanxi and Inner Mongolia Autonomous Region, with sporadic distribution in Anhui, Hebei, Shanxi, Hunan and Hubei provinces.

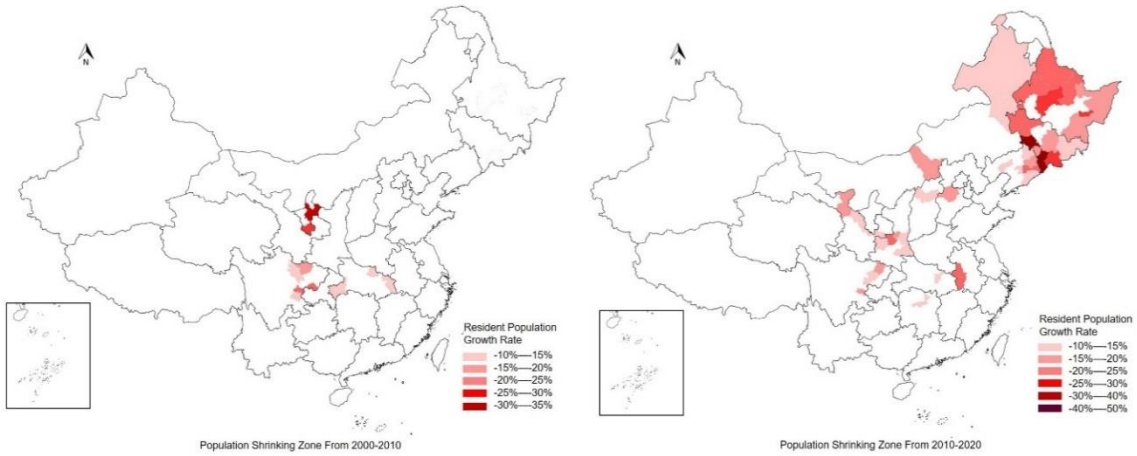

Figure 1. Spatial distribution evolution of two decadal population shrinking zones, China's resident population growth rate ≤ minus10 percent of prefecture-level cities

Sources: Fifth National Census of China, Sixth National Census of China, Seventh National Census of China

2.2 The Population Migration Of Shrinking Towns Is Decreasing In Different Levels

This paper selects xiuyan County, Anshan city, a typical shrinking town in Liaoning province, to observe the change of permanent population in Xiuyan County from 2010 - 2020 (Figure 2), and calculates that the shrinkage rate of permanent population in Xiuyan County is about minus13 percent in ten years. In ten years, the total resident population of Xiuyan County continued to decline, showing a typical urban shrinking characteristics.

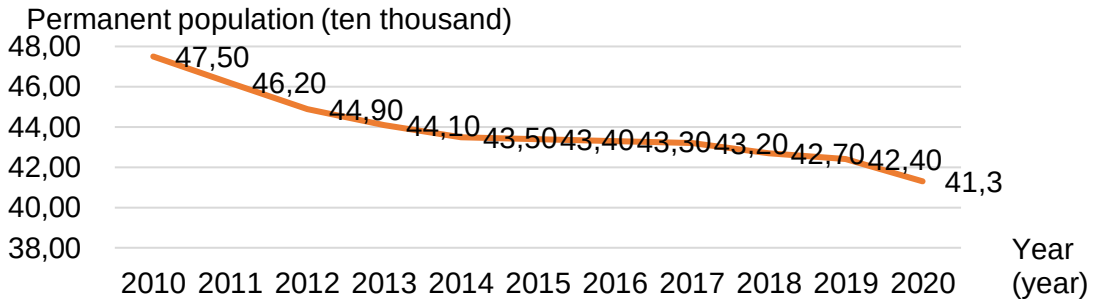

Figure 2. Xiuyan county resident population change rule

Source: Permanent Resident Population data of Anshan Territorial Space Planning, Seventh Population Census of China

In order to analyze the outflow data of permanent resident population in Xiuyan County in 2019, a questionnaire on population migration in Xiuyan County with a total sample size of 2,127 was issued to collect the destination and main reasons of population migration. The research subjects included urban and rural populations, covering a diverse group of people. After the data of the starting and ending points of population flow fall into space, it presents the distribution characteristics of three echelons, and the total number of people decreases by layers. The first echelon is the urban areas in Liaoning Province. The population flowing to this region accounts for 70 percent of the total outflow, mainly concentrated in Dalian, Shenyang and Anshan. The second tier is the developed cities in Beijing-Tianjin-Hebei city cluster and Jiangsu, Zhejiang and Shanghai metropolitan circle, and the population flowing to these developed cities accounts for 20 percent of the total outflow. The third tier is the more peripheral provincial capital cities or coastal cities, such as Haikou, Jinan, Weihai, Urumqi, Panjin, etc., only accounting for 10 percent of the total outflow population scattered in the above cities. In general, people tend to migrate to nearby developed cities.

3. The Main Cause Of Urban Shrinking In China

3.1 Location: Steep Terrain And Extreme Climate

China's population growth slowed down in regions where the growth difference of permanent population was less than minus 10 percent between 2000-2010 and 2010-2020 (Figure 3). China's population growth slowdown zone is far larger than the urban shrinking zone, indicating that China is changing from the development mode of "urban growth as the main body" to the development mode of "urban shrinking as the normal" (Wu and Li, 2019). By analyzing the distribution characteristics of the slowdown zones of population growth, it is found that the slowdown zones are highly correlated with the

topography and geomorphology distribution of China (Figure 3). Slowing population growth zone distribution in an average elevation of 4000 meters above the first rung area, the first step and the second step and the second step, linking to the third step is relatively steep terrain along the line, as well as the northeast and northwest northern cold area, steep terrain and extreme weather is one of the key factors that led to the shrinking of the city.

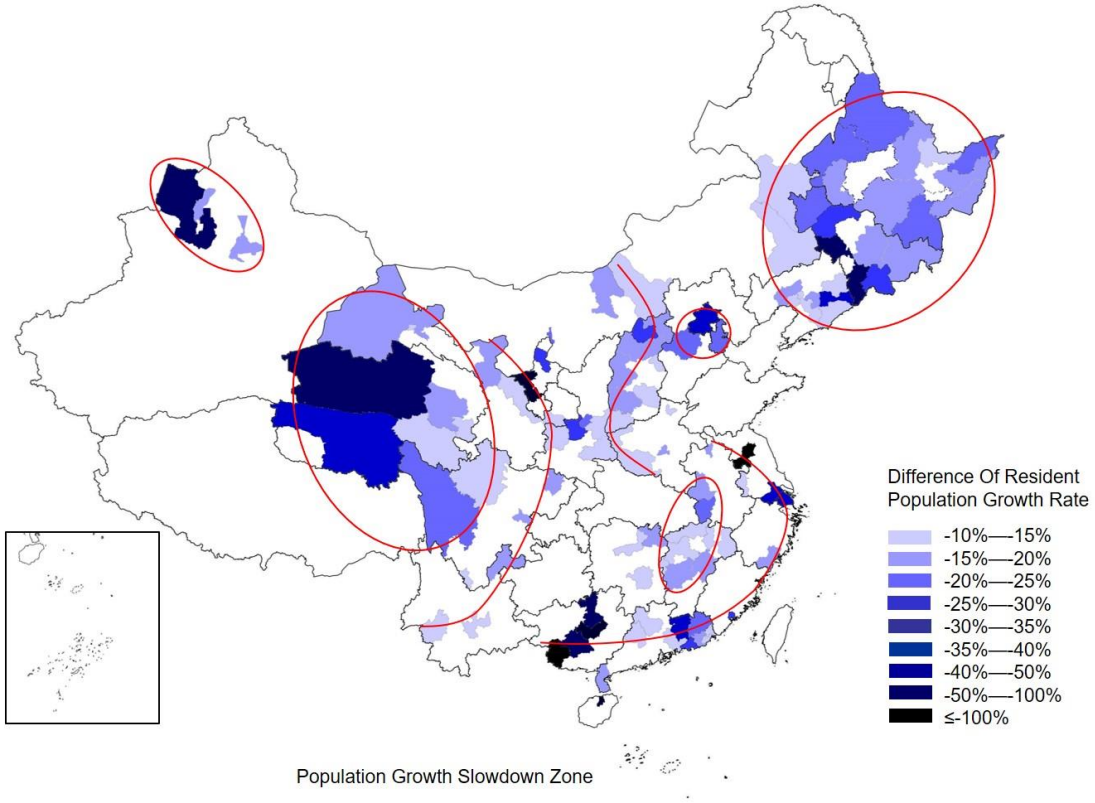

Figure 3. Population growth slowdown zone, Comparison of the last decade and the last decade, China's resident population growth rate ≤minus 10 percent of prefecture-level cities

Sources: Fifth National Census of China, Sixth National Census of China, Seventh National Census of China

3.2 Population Structure: Fewer Children And Aging

The level of natural population growth depends on birth rate and death rate, reflecting the degree and trend of natural population growth. In cities with a negative natural population growth rate, the number of urban births is less than the number of deaths, the fertility rate is generally low, the population aging degree is high, and the problem of aging with fewer children appears. Cities with negative natural population growth

rate in China in 2020 are mainly concentrated in the three northeastern provinces, Sichuan province and Jiangsu, Zhejiang and Shanghai (Figure 4). Except for Jiangsu, Zhejiang and Shanghai, the areas with negative natural population growth rate basically coincide with the areas with urban shrinking, indicating that negative population growth is an important factor affecting urban shrinking. Some cities in northeast China and Sichuan province, affected by mechanical migration of population and negative natural growth, are bound to show obvious urban shrinking at the earliest. Jiangsu, Zhejiang and Shanghai are affected by population migration, and the gap caused by natural negative population growth is filled by floating population (Li and Liu, 2020), which is also the reason why the natural growth rate of cities is negative but there is no shrinking phenomenon.

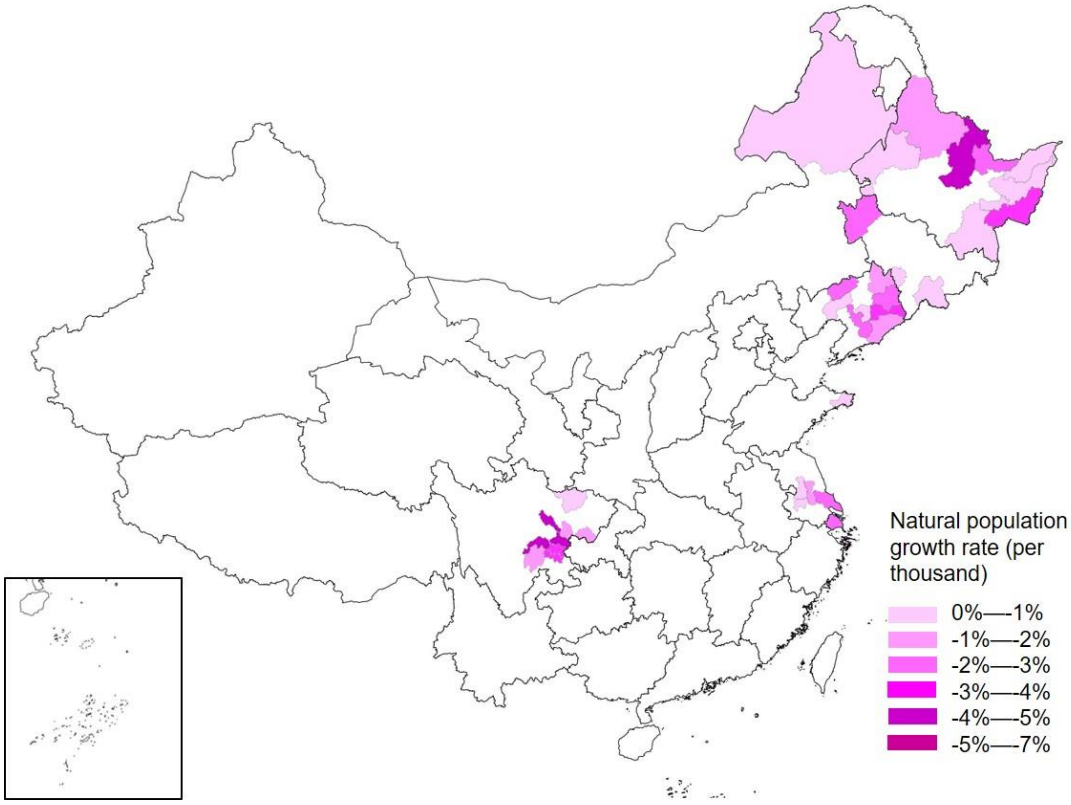

Figure 4. Spatial distribution of cities with negative natural population growth rate in 2020 and the proportion of cities by province

Source: Seventh National Census of China

3.3 Urban Industrial Power: Traditional Industry And Resource Depletion

Based on the spatial distribution of shrinking cities in China, this paper analyzes the leading industrial types of these cities to explore the internal causes of urban shrinking. It is found that guyuan and Wuzhong cities of Ningxia Hui Autonomous Region suffered

the most severe shrinking from 2000-2010, mainly producing traditional manufacturing industries such as food industry, chemical manufacturing and textile. The province with the largest number of shrinking cities was Sichuan province, where resource-based industries such as coal mining and energy and heavy industries such as chemical fiber manufacturing are the main industries. The shrinking urban agglomeration zone from 2010-2020 has shifted to the three northeastern provinces, where the leading industries are mainly traditional industries such as equipment manufacturing and chemical industry and resource-based industries such as energy and steel. There is no exception in other agglomeration areas, and the leading industries are all traditional manufacturing and mineral resource-exhausted industries. The urban shrinking in China is the shrinking of traditional industrial-type cities and resource-exhausted cities. Firstly, under the background of globalisation, global financial flow and production organisation process lead to deindustrialisation, and the proportion of traditional manufacturing industry continues to decline, leading to the shrinking of traditional industrial cities. The other is that the development of some mineral resource-based cities has entered the later stage, and the cumulative amount of urban mineral resources has reached more than 70 percent of the recoverable amount, and the resources are about to be exhausted, leading to urban shrinking.

3.4 Employment: Driven By External Innovation And Entrepreneurship

Since the dominant industrial type of a city is a key factor leading to urban shrinking, several industrial factors are selected to analyze which other industrial factors are associated with population loss in addition to industrial types. Based on the principle of convenient data collection, the factors selected by cities and counties nationwide include number of enterprises, number of urban jobs, number of R&D personnel, number of patent authorisation, GDP, proportion of secondary industry, etc. The correlation analysis between the above industrial factor variables and the urban resident population data shows that the resident population is correlated with the number of enterprises, the number of urban jobs, the number of R&D personnel and the number of patent authorisation, but not with other factors (Table 1). The correlation coefficient between the number of resident population and the number of enterprises, R&D personnel and patent authorisation is 0.5-0.8, showing a strong correlation. The correlation coefficient between the number of permanent residents and the number of jobs is 0.8-1, showing a high correlation. The ability to provide urban employment is highly correlated with the number of permanent urban residents, and the pull of innovation and entrepreneurship outside the city leads to the migration of urban population.

Table 1. Correlation analysis between industrial factors and resident population of 2020 prefecture-level cities in China

	Number of enterprises	Number of employment positions	Number of R&D personnel	Number of patents granted	Proportion of secondary production	GDP
Population of permanent residents	0.59	0.87	0.65	0.79	-0.1	-0.05

Source: China County-level Statistical Yearbook 2020

3.5 Public Service Provision: Lack Of Educational Facilities

According to the data of Xiuyan County's Population Migration Questionnaire, the family members of migrant workers were asked about their reasons for going out. The main reason was to seek employment opportunities and the second reason was to seek better educational resources (Figure 5). Therefore, to cope with urban shrinking, we should increase local diversified employment opportunities and provide better quality and perfect education. The reasons for the return of migrants were mainly the need to return home to take care of the elderly and the lack of suitable employment opportunities in other places (Figure 6). Therefore, in addition to replenishing education facilities, improving supporting facilities for the elderly is also a key measure to attract people to return.

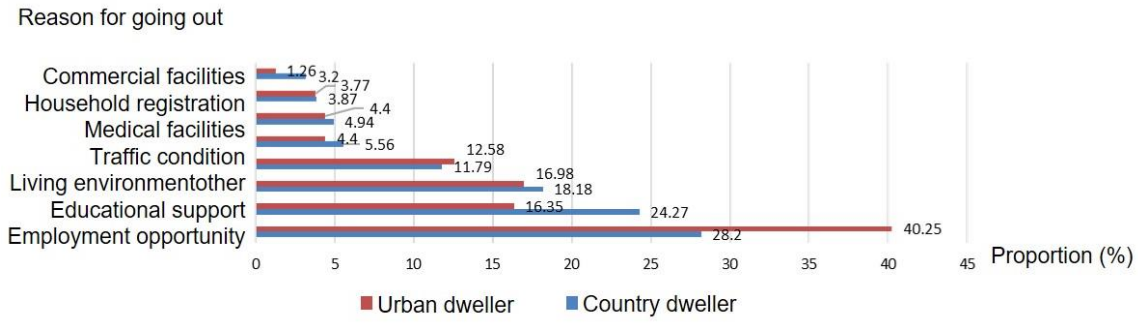

Figure 5. Reasons for migrant workers to go out
Source: population migration survey data of China

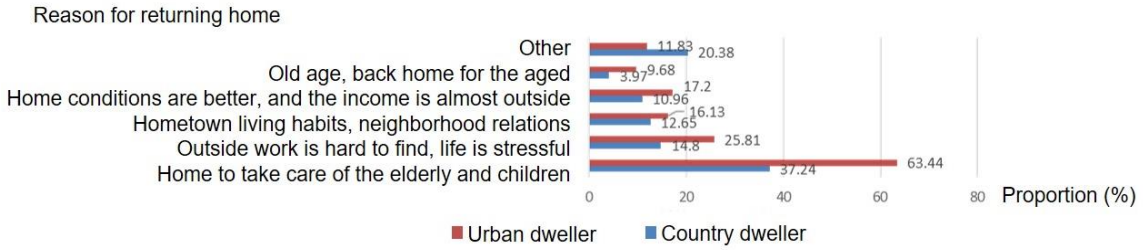

Figure 6 Reasons for migrant workers to return to local areas
Source: population migration survey data of China

3.6 Summary

Urban shrinking is a social process that occurs in different categories and functions on different levels. It is sorted out from two perspectives of composition category and spatial attribute (Table 2). Composition category includes economy, society and space, and spatial attribute is divided into four dimensions: global, national, urban and community. In the economic sphere, the main causes are the continuous flow of financial capital around the world, the deindustrialisation of countries, the depletion of urban resources and the push and pull of employment between cities; Low fertility rate and increasingly serious aging problem are the main factors in the social dimension; At the spatial level, extremely dangerous geographical location and insufficient supply of public facilities are the main causes of urban shrinking.

Table 2 Main causes of urban shrinking in China

	Economic	Social	Space
The Global	Global financial flows		
Countries	De-industrialisation		
Urban	Resource depletion The employment of push-pull	Decreases aging	The rugged Extreme weather
Community			Lack of public facilities

Source: self-drawn by author

4. Governance Of Urban Shrinking In China

4.1 Policies For Population Development Were Properly Formulated

Formulate rational policies for population development within the economic and social scope at the national and city levels. In the past decade, serious urban shrinking has occurred in northeast China, and the government has adopted positive policies to deal with it, such as the formulation of the Liaoning Province Population Development Plan

(2016-2030) and anshan City Population Development Plan (2016-2030). According to the Population Development Plan, Liaoning will implement the new development concept continuously, carry out the revitalisation strategy of the old industrial base deeply, speed up the construction of China (Liaoning) pilot Free Trade zone, and maintain the sustained, steady and healthy economic development together with the whole country. The future economic situation indicates whether Liaoning can gather population. It is clear in the plan that the total fertility rate will be raised to the level of population generation replacement (1.8) by 2030, and the total population will be kept at a reasonable scale commensurate with the overall revitalisation of liaoning's old industrial base. The formulation of population development policies provides a strong guarantee for talent and population agglomeration (People's Government of Liaoning Province, 2018).

In the traditional urban overall planning and the present territorial space planning, the population growth of shrinking cities depends on the main causes of urban shrinking. When we predict the population size of shrinking cities, we do not simply judge the future by the current growth rate, nor do we deny the fact of shrinking and plan incrementally. It is necessary to take into account all factors that affect urban shrinking, and form a more scientific method of population prediction and distribution through multi-dimensional correction of impact factors, so as to help improve the rationality of population development policy making.

4.2 Inner Urban Regeneration To Absorb Innovative Talent

In the economic and spatial categories at the urban level, the governance strategy of absorbing innovative talents through regeneration in inner cities is adopted. In Europe and America, where cities shrank earlier, governments have often reacted in one of two ways. An attitude, a receiving U.S. city of Pittsburgh iron and steel industry, for example, the government in the face of the urban population of negative growth, claiming the slow to adapt to the population fluctuation, through the renovation of the ecological environment, strengthening infrastructure construction, focus on reforming the sub-centres city to enhance the inner urban vitality, enable people to live here(Yang and Hua, 2009), slow down the trend of population outflow. , with against another in the German city of leipzig, for example, the government's response to the shrinking of urban governance strategy is divided into two phases: the first phase of "urban growth" strategy is put forward, a lot of investment in the areas of housing, employment, stimulate urban growth again, but these actions caused the government to make ends meet, produce the debt crisis, the economic downturn into state, and increased population shrinkage; In the second stage, the government puts forward the urban island strategy to make the city livable by transforming old urban areas, reusing abandoned factories, holding cultural exhibitions and sports events, improving urban living environment and optimizing urban layout, etc., so as to attract young innovative population to move in and promote economic development (Xu, 2015). The successful

transformation experience of these traditional resource-based cities under government governance measures provides a governance approach for Chinese government to deal with urban shrinking.

4.3 Education And Elderly Care Facilities Will Be Provided With Precision

At the social and spatial level of the community, education and elderly care facilities are precisely allocated. Under the influence of various factors, in the past general planning and the present territorial space planning, the government usually adopts the attitude of continuous growth to predict the total population of shrinking cities in the future. The allocation of educational facilities is based on the result of population prediction. The predicted population increases while the actual population decreases, which leads to the overallocation of educational service facilities, resulting in some idle educational space and low efficiency. Since 2005, Japan has stepped into an era of population shrinking (Shen, Zhu, Liu and Mu, 2020), with 70 percent of the country's cities experiencing varying degrees of population shrinking. In order to cope with the reduction of school-age children in shrinking cities, the Japanese government adopted regulation strategies to reduce the number of educational facilities, such as the "primary and secondary school system" and "the introduction of day school to improve commuting" (Dong, Zeng, Li and Wang, 2021). Under the condition of the reduction of students, class size and teacher allocation were guaranteed to be economical and reasonable, and precise allocation of supply and demand was realised. At the same time, in order to cope with the small number of children and aging in shrinking cities, the Japanese government has taken a series of measures to improve the parenting system, such as increasing the number of kindergartens, carrying out childcare, extending childcare hours and reissuing childcare subsidies (Shen, Zhu, Liu and Mu, 2020), to relieve the pressure of social parenting. To construct a three-tier system of home care, community care and captive living for the elderly, improve the social support system for population aging (Shen, Zhu, Liu and Mu, 2020), deal with the serious aging phenomenon in shrinking cities, and also provide governance ideas for the Chinese government to deal with urban shrinking.

5. Summary

The shrinkage of cities is due to the change of urban population, which not only follows the law of natural evolution, but also is guided by policies and embodies the value orientation. On the one hand, the natural changes of population follow the natural evolution law of population system, birth, death and other natural changes have strong regularity, which can be judged by the trend extrapolation. On the other hand, the mechanical change (migration) of population is greatly influenced by policy guidance and industrial development (Zhou and Qian, 2015). The formulation of population goals and the distribution of total population should also consider the impact of multiple

factors on population development. This paper analyzes the distribution characteristics of urban shrinking in China, analyzes the main causes of urban shrinking and the feasible governance strategies of the government, so as to help China's urban development better cope with the "new normal of shrinking ".

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