

# Urban Shrinkage and the Identification of China's Shrinking Cities. A study Based on Semi-Industrialized Semi-urbanized Structure

## Kurczenie się miast i ich identyfikacja w Chinach. Badanie oparte na strukturze częściowo-uprzemysłowionej i częściowo-zurbanizowanej

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### Abstract

Urban shrinkage has been a remarkable phenomenon in city development, both domestic and foreign, which cannot be convincingly explained by growth theory. This paper studies the theoretical foundation and connotation of urban shrinkage, as well as its internal dynamic mechanism and external spatial mechanism. Thereby reaches the conclusion that both shrinkage and expansion is a natural historical process of the urban development. Compared to the urban shrinkage in highly industrialized countries which features generalizability and regularity, the case in China is quite different due to the under-development of urbanization and industrialization. Therefore we referred to the regularity, and further used internal dynamic mechanism and external spatial mechanism to identify and classify China's shrinking cities, then discussed several patterns and drives, and finally proposed some policy suggestion and urban planning thoughts for sustainable development regarding various types of urban shrinkage.

**Key words:** Urban shrinkage, spatial structure, dynamics, urban planning, sustainable development

### Streszczenie

Kurczenie się miast jest niezwykłym zjawiskiem w historii rozwoju miast na całym świecie, którego nie da się przekonująco wytłumaczyć teorią wzrostu. Niniejszy artykuł analizuje teoretyczne podstawy i konotacje kurczenia się miast, a także mechanizmy ich wewnętrznej dynamiki i zewnętrznej przestrzeni. Na tej podstawie można postawić tezę, że zarówno kurczenie się, jak i rozszerzanie miast to naturalny proces historyczny rozwoju miast. Porównując kurczenie się miast w krajach silnie uprzemysłowionych, charakteryzujące się pewną regularnością, przypadek Chin jest odmienny, z uwagi na słabszy poziom urbanizacji i uprzemysłowienia. Dlatego też odnieśliśmy się do regularności i następnie zastosowaliśmy mechanizmy wewnętrznej dynamiki i zewnętrznej przestrzeni. W ten sposób zidentyfikowaliśmy i sklasyfikowaliśmy chińskie kurczące się miasta, aby następnie poddać dyskusji kilka wzorców. Przeprowadzona dyskusja pozwala na zaproponowanie sugestii politycznych i wskazówek dla urbanistyki w kontekście rozwoju zrównoważonego, uwzględniając różne typy kurczących się miast.

**Słowa kluczowe:** kurczenie się miast, struktura przestrzenna, dynamika, urbanistyka, zrównoważony rozwój

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### 1. Introduction

Urbanization in China is based on growth theory, increasing urbanization leads to great city expansion which has become a key drive of economic growth.

However, problems of urbanization emerge while China cities amass wealth and boost economy. One particular problem is polarization. Mega cities keep expanding but face increasing aging problems, small cities in contrast have less attractiveness suffer from

population loss and dire prospects. Although urbanization in China never stops its paces, issues like oversupply of real estates and shortage of land will lead to larger scale of urban shrinkage without proper intervention. In the present and foreseeable future, urban shrinkage will become a critical political subject. It is pivotal to consider whether urban shrinkage is long-term or short-term, which cities shrink in what mechanism, why does it happen, and how to cope with it, and so on.

## 2. Literature review

Cities are the core of modern society and economy, a city is a manmade vessel of social planning, economic development, technology innovation and cultural exchange. Both the shrinkage and expansion of a city is natural and inevitable, but it is curious that they fate distinctively in mainstream economic theories. Expansion is usually the direct or indirect consequences of urban planning, but shrinkage is not, it is a result beyond city planning. We will discuss the increasingly prominent urban shrinkage in terms of urban spatial structure and urban development theory, and then conclude a few patterns of shrinkage.

### (1) Urban spatial structure

Studies on urban spatial structure have evolved from the idealized one-centered concentric zone theory to sector theory embedded with actual social economic distribution (Burgess, 1925) as urbanization and industrialization advances. However, both theories are limited to single center and urban circles management, until Harris & Ullman (1945) pioneered the multi-nuclei theory of urban spatial structure transition. This theory holds that urban space will transit from one-centered economic gathering to multi-pole development. Given the social economic factors such as differential rentals, public facilities and geographic locations, by gathering more and more resources, these new centers could threaten and even take the old centers' places. Dickinson R.E (1947) and Shinzo Kiuchi (195) studied European and Japanese urban structures respectively, and developed concentric zone theory and three zones theory, suggesting that urban circles are composed of the central zone, the middle zone and the outer zone, which follows a cascade development pattern. Mann (1965) studied the structures of old industrial cities of UK, and further developed the theories above to concentric – sector theory.

In the peak times of quantitative modelling research on geography, Friedman (1966) proposed the theory of regional spatial structure evolution. This theory starts with industrial spatial dynamic mechanisms, and through utilizing the innovative theory (Schumpeter, 1911), constructing an inconsistent spatial polarization process where outer regions, only those with advantages, obtain development opportunities. Such unbalanced development evoked some deep

thoughts on factor relationship in regional development, thereby core-periphery theory was proposed. Regional urban structure theory (Russwurm, 1973) and Desakota (1991) pattern theory is based on the observation on underdeveloped Asian countries and developed western countries, they comprehensively studied the intertwined effects and development patterns of urban and rural regions.

The rise of humanism along with information networking compelled scholars to pay attention not only to products and services in urban structure function, but also to culture and interaction (Mumford, 1961). With the networking urban structure gradually came into being, information nodes became centers of regional flow. Enlightened by spatial expansion, Goldblatt & Muller (1981) further developed urban function, and formed a metropolitan pattern consisting of the urban fringe, the outer suburbs, the inner suburbs and the central city. Urban and regional structures are also influenced by global networking, resulting in reorganization and adjustment, thus forming a new urban structure built up of declining city center and small peripheral distinctive cities.

### (2) Theory of urban development

Marx concluded four reasons of city development. First is that a city is a fair or market for rural residents to trade their original products for industrial products, Second is industry development. The significant characteristics of capitalist industries are that *it builds modern large industrial cities (they grow like lightning quickly) instead of the cities that grew up from nature.* Third is foreign trade. *The real city is only in place where it is particularly suitable for foreign trade* Forth is military and political demand. Community militarization and residential concentration induced by war is an objective factor of city establishment. To enhance their power, rulers always set up state apparatus and set up a regime in a place, where cities were born. *The walls of the new fortified city are not invincible: their trenches are deep into the tombs of the clan system, and their towers are towering into the civilized era.*

Subsequently, Marx discussed the expansion of urban development theory, from the dialectical materialism critical point of view, stating that capitalist pattern of production and industrialization of urban development brings destruction to ecosystems and social systems: *capitalist production makes the population of the central city increasingly dominant, so that it gathers the historical power of society and, on the other hand, destroys the material transformation between man and land, that is, the natural part of land consumed in the forms of food and clothing cannot return to the land, thus undermining the natural conditions of the land's long-term fertility.* The destruction of natural ecological system in urban fringe area is accompanied by the uneven relationships between urban and rural areas and the unbalanced development of the dual structure. *Manchester and its*

*suburbs of 350,000 workers almost all live in the harsh, damp and dirty little house, and the streets holding these small house are mostly extremely bad and unclean, the construction did not take into account air circulation, but only the huge profits of the owners.* As city centers became crowded and messy, development problems like consumption and pollution became sharp. Marx's theory advocates sustainable development of social systems and economic systems, and the development of appropriate laws and regulations to guide and regulate people's behavior to optimize urban development.

The theory of urban decentralization begins with E.Howard's theory of pastoral city (1891), which advocates an idealized urban-rural coexistence structure so as to exert the advantages of the both and form the social structure of *urban-rural integration*. Taylor's satellite city theory (1966) is of great significance to the urban development of western countries, and also profoundly affects the urban development planning of developing countries nowadays. Satellite cities have their own urban facilities and core industries, but also social and economic complementarity with central cities, despite that they are geographically distant from main cities. Wide-scale city theory looks forward to the construction of a semi-farmland community, and fully rejects the collective development pattern of cities. Theory of organic evacuation expects to evacuate industries, population and infrastructure from the center to the outside and then form an organic integer, in regard with the fact that the city center is crowded enough to bring about serious problems such as *urban disease*. With the evolution of global informatization, the development of technology and the demand of urban functions, theories of modern urban development, such as information city, knowledge city, intelligent city and eco city, came into being. Urban development is extending to a much wider and deeper content.

### 3. Urban shrinkage patterns

The external spatial mechanism of urban shrinkage is characterized by the diversification of urban development, and economic factors, social factors, cultural factors and urban layout together shape different shrinking processes. On a global scale, we summarize the different types of shrinkage and arrive at the following urban shrinkage patterns.

#### (1) Concentric circles

This pattern is represented by London and northeastern American industrial cities. The internal mechanism of urban suburbanization influences urban shrinkage in such way: in the mid-20th century, *city hollow* emerged in some developed cities in Europe and US and spread outward in *circle effect*. With central function decline, environmental deteriora-

tion, and large migration of enterprises and population to suburbs, taxation and economy in city centers dropped, which further led to unattended facilities, high crime rate and low quality of life. High-income groups have fled city centers into suburbs for work and life. The phenomenon so called *white flight* and *eight miles and Wyoming wall* in US cities is the embodiment of such situation. The directional multi-axis guidance shrinkage of Copenhagen and radiation corridor combination shrinkage of Washington which is to improve urban structure is also based on concentric circle theory and organic evacuation theory.

#### (2) Anti-concentric circles

This pattern is the *post-suburbanization* sign of developed countries, Paris is a typical example. Urban shrinkage first occurs in the *suburban first ring* where manufacturing sectors and working-class residence concentrate. With deindustrialization and declining employment of manufacturing sectors, high living cost and inferior environmental conditions drive workers to even further outskirts, and suburban first ring begins to shrink, but the city center remains as central commercial and cultural area. This is the non-circle pattern that city center keeps thriving while the first ring around city declines.

#### (3) Anti-magnetic center

This pattern is a derivative from satellite city theory, sample cities are San Jose – San Francisco, Bridgeport – New York City, Keelung – Melbourne and so on. Anti-magnetic centers can effectively alleviate urban problems like population density, environmental pollution and traffic pressure caused by the lack of core spatial structure. They can also share some of the city functions, improve urban communication efficiency, and reduce living and development cost. The worldwide development of anti-magnetic satellite cities has proven the shrinkage of main cities. An anti-magnetic center can set a good example, as a satellite city it can individually spread to the surrounding areas. It is not only bound to the central city in close economic and social networks, but also through highways to other satellite cities in a cluster formation. Each satellite city has unique functions, appropriate scale and modern communication networks.

#### (4) Scatter

This pattern is represented by Detroit of US and Utashinai and Yubari of Japan. As mines went depleted in mining cities of Japan, unemployment soared, industrial structure totally collapsed, only aged and low-income groups stayed in scattered communities surrounded by large area of empty land and idle properties. Such area features low density and sporadic space, similar to suburbs.

#### (5) Perforation

This pattern is best illustrated by the transforming cities in socialism countries after the collapse of Soviet Union. During the planned economy, Ivanovo's urbanization and industrialization were developed, but then the heavy industry and manufacturing industry, which were scattered, were disintegrated with the decline of factories. The original population was automatically drained and the environmental damage was increasing. Some enterprises were in line with the needs of policy and industrial transition, and received full support from the government, resulting in an intertwined distribution of new thriving enterprises and old declining industrial areas, and finally a *petal* type of spatial structure of the city.

### 4. Connotation of urban shrinkage

The word *shrinkage* usually refers to the change that a matter gets smaller, shorter, or less. Most scholars understand *urban shrinkage* as all kinds of reduction under all sorts of reasons, such as permanent loss of population, decline of economic activities, and oblivion of society and culture, some even define shrinking cities as vertical cities. Qualitative analysis cannot determine the exact distribution of urban shrinkage, therefore we attempted to measure shrinkage by using average population density, which is relatively accepted internationally, as a quantitative indicator. Even so, the understanding from quantitative analysis can still be limited, thus we need to dig deep into the characteristics of urban shrinkage and fully understand the reasons and evolution paths that lie behind.

#### (1) Urban shrinkage is relatively chronologically stable

A city may switch from the initial expansion to the present shrinking, such as the cities on the *rust belt* of US which are all based on the economic prosperity, population growth, and urban expansion brought about by the first and second industrial revolution, like Detroit. However, due to the impact of suburbanization, Detroit urban population dropped more than 50% in nearly half a century. The development of a city, including expansion and shrinkage, has its characteristic stages, including budding, developing, maturity and decline. Also, urban shrinkage has time characteristics, cities will not shrink permanently, those drained of vitality will die, shrinkage will naturally end with their annihilation; some continued to shrink on different levels, of which extreme cases we call abandoned cities or dying cities; and some cities shrunk while some local areas revived due to new industries or new planning. Nevertheless, shrinkage is not a sudden change and usually occurs in a few decades or even several centuries of time. Urban shrinkage is relatively stable in a certain time range.

#### (2) Urban shrinkage coexists with urban expansion

In the process of modern urban development, the idea of growth has dominated, thus industrial goals were given to cities, but when the process of industrialization and urbanization reached its peak, urban shrinkage began. Therefore, urban expansion and growth is not immutable, shrinkage is born right in the cities based on growth theory, and rooted in the expansion expectation of modern society, and reflected in the economically and socially polarized geographical space. However, a city may also shrink while its regional economy develops. For example, the old industrial city of North England demonstrated some new vitality when they continued to shrink at the same time, part of them continued to decline, and the others achieved continuous improvement of employment rate and growth of urban vitality through structural adjustment and implementation of new industrial plans. Urban expansion and shrinkage can exist in the same time and the same place, which is the internal link between them. For example, there are two very different patterns of the development of US cities: one is a strong rapid suburbanization and urban spread, and the other is *re-urbanization* within the shrinking cities to revitalize them.

#### (3) Urban shrinkage means not full atrophy of society and economy

Urban shrinkage is not necessarily a path of contraction and decline, not simply a reduction in population of an area or a weakening of economic activities, although population reduction is an acknowledged sign of urban shrinkage. Shrinkage refers to the reduction in the use of urban space, meaning more idle or abandoned buildings and real estate, while the city is still spreading to periphery and scattering economic activities to more marginal areas. It is not a one-way contraction of space, but accompanied with the expansion and growth of mobile space. Urban shrinkage is actually a reorganization of urban spatial structure, which is to reshape the internal connection and intensity of all funds, technology, talent and information (Brenner, Neil, 1999a). Urban shrinkage includes not only the changes in the objective environment, but also the subtle changes of city functions and space that finally lead to fundamental changes. This can explain the unique paradox that population reduction and spatial expansion coexists in some regions of China. Urban shrinkage is not a displacement of a city as a center of economic activities and link to regional and global economics (Short, 2000), but relocation of space, economy, society, urban hierarchy and functions.

#### (3) Internal dynamic mechanisms of urban shrinkage

During the process of globalization, with accelerated communication frequency and efficiency, the system

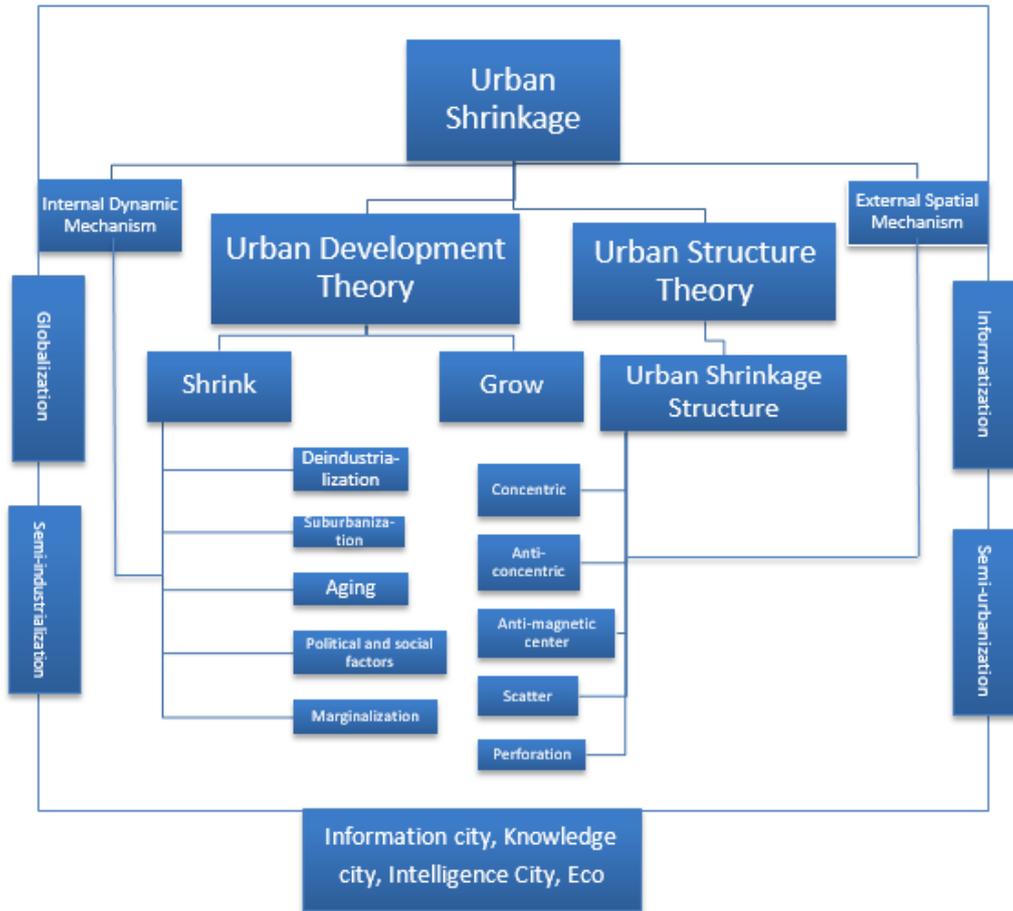


Figure 1. Relation chart of urban shrinkage system

function of time and space in administrative divisions is strengthened, and the advantages of city centers are narrowing comparing to marginal areas, so population and industry are naturally relocated to cheaper and wider land. The geographical distribution of economic activities on the periphery of cities is not limited to the *central-periphery* regional division, which brings about the reshaping and resetting of social spatial order, and ultimately resulting in *shrinking cities*, exactly as that discussed in new economic geography. The process of urban shrinkage not only changes urban space and population density, but also reconstructs the geographical distribution of authority in commercial areas, and essentially forms a new force that counterbalances old growth-driven cities and regionally supplements and replaces urbanization. Throughout the history of capitalist industrialization, the inherent dynamics of urban shrinkage can be summarized as follows: deindustrialization, marginalization, suburbanization, population aging, and political and social instability. The external spatial mechanism of urban shrinkage includes concentric circles pattern (Wallis), anti-concentric circles pattern, anti-magnetic center pattern, scatter pattern, and perforation pattern.

## 5. China's urban shrinkage analysis

Over the last few decades China's economy has boomed, urbanization and industrialization kept rising, the number of cities has increased from 190 in 1978 to 661 at the present time, the rate of urbanization surged from 17.92% to 56.1%, and the urban population has reached 749.16 million (National Bureau of statistics information network). According to the statistics in September 2016, China currently has 293 prefecture-level cities in total (China Statistics Database). The urbanization of China is similar to that of the cities of Germany, UK and US in early stage, which are all driven by industrialization and urbanization. However, China's urban shrinkage has its particularity, because it starts with incomplete industrialization, which also means incomplete urbanization. Such shrinkage carries the characteristics of the dual structure (urban and rural) and the economic system transformation. Despite the rapid economic development, urban problems like imperfect urbanization structure, shortage of resources, regional poverty and other urban shrinkage problems have emerged in the accelerated phase of China's urbanization, which has aroused our attention and thinking.

We used the demographic data from China’s 1994-2014 statistical yearbooks, and name resident population change rate as  $POP_p$ , household population change rate as  $POP_r$ , employed population change rate as  $POP_e$ , to measure the change of population density in city areas. In the following,  $t$  is time by year,  $P_0$  is the base population:

$$POP_p = \frac{P_{p0}}{P_{pt}}$$

$$POP_r = \frac{P_{r0}}{P_{rt}}$$

$$POP_e = \frac{P_{e0}}{P_{et}}$$

The ratio between resident population change rate and household population change rate is  $POP_{pr}$ , the ratio between employed population change rate and household population change rate is  $POP_{er}$ :

$$POP_{pr} = \frac{POP_p}{POP_r}$$

$$POP_{er} = \frac{POP_e}{POP_r}$$

If these indexes are all above 1, then urban population expansion is proven, if all below 1, then for shrinkage. By referring to urban population density index, we can determine population shrinkage of China cities, results are shown in appendix 1.

(1) Marginalized peripheral cities

Rapid urbanization has induced metropolitanization, in the Yangtze River Delta, the Pearl River Delta and Beijing-Tianjin-Hebei metropolitan city group, large urban population gathers. Regional difference due to unbalanced regional development policy and differential socio-economic system magnifies the economic and demographic attraction of metropolitans immensely. The progress of urbanization is based on expected growth rate, but not all cities in the region are growing. Of Beijing-Tianjin-Hebei metropolitan city group, only Beijing and Tianjin maintained a stable rise by a small margin in 2009 and 2014, the rest of the cities have seen fluctuated decrease and gradual dilution of population density, which in good chance will continue. The inter-provincial and inner-provincial population migration of China is mainly due to the unbalanced development of regional economy, which further leads to urban shrinkage of partial areas (Social Blue Book, 2014). We can see that cities in the Beijing-Tianjin-Hebei metropolitan area, other than Beijing and Tianjin, are all facing the lack of development momentum, the stagnant industrial productivity, and the decrease of population density. The difference of city sizes in several metropolitan areas of China keeps enlarging due to these reasons, thereby forming marginalized peripheral cities in concentric circles mode.

Some of the small and medium OEM cities in the Pearl River Delta region shrink because of the upgrade of global industry and the rise of labor prices in China. Some of the backward and labor-intensive

industries have been transferred to lower-priced Southeast Asian and inland China by international enterprise. Except for Shenzhen and some other large cities which have strong foundation and powerful resource concentration for industrial restructuring, industrial areas in smaller cities which rely on the *Three-plus-one* trading-mix (custom manufacturing with materials, designs or samples supplied and compensation trade) began to shrink. All prefecture-level cities shrunk in the Yangtze River Delta region, urban shrinkage also appeared in half of the cities of Anhui Province and Zhejiang Province.

Population, resources and wealth are not only concentrated in cities, but also relatively concentrated in greater urban area in a region. As shown in Fig. 2, the total annual population and land use of the four municipalities, the capital cities of all provinces and other prefecture-level cities, has changed a lot, but the rate of change varies among different types and levels of cities. The growth rate of land use and population density ranks in such order as municipalities, provincial capital cities and other prefecture-level cities. The Beijing-Tianjin-Hebei metropolitan area has a *double-center, polarized* geo-spatial structure, and very distinctive social development level of each city. Industries in the three cities are poorly related, factors of production flow in single way, so central cities keep enlarging while peripheral cities shrink.

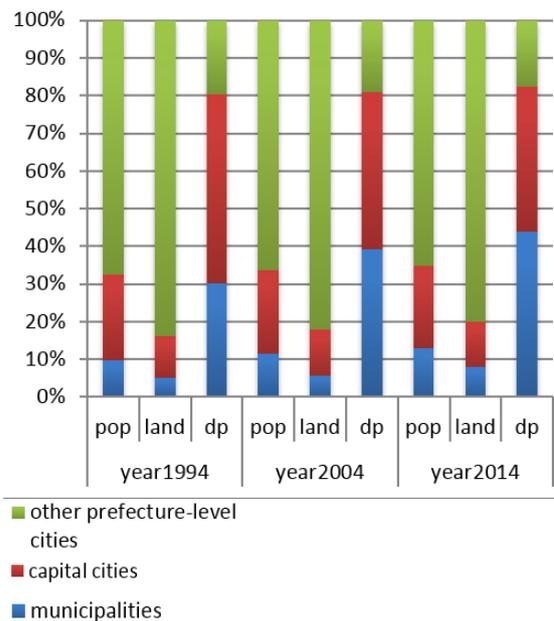


Figure 2. Changes in Population Structure of Prefecture – level Cities, Capital Cities and Municipalities in 1994 – 2014

(2) Deindustrialization of traditional industrial base

There are two types pf deindustrialization in China: first is industrial upgrading, second is industrial transformation. Northeast China used to be the most important manufacturing base in the planned economy period. It had a complete industrial system mainly composed of steel, machinery, petroleum and

chemical industry. However, since the market economy reform in the 1990s, the northeast base was devoured by the wave of globalization and informatization, causing stagnant development, weak growth, slow technological growth, low labor productivity and poor product competitiveness of local industries. Nevertheless, as a result of the revitalization of old industrial bases, new industries emerged in the old industrial layout of northeast China, thus a perforation pattern of staggered distribution of old and new industries appeared, just similar to that of Soviet Union and East Germany. The shrinkage of old industrial bases is essentially the structural and cyclical recession of their leading industries. The northeast must understand their own characteristics, and learn from shrinking cities with traditional industries worldwide, so as to successfully cope with deindustrialization and transform and optimize their industrial structures.

Cities like Liupanshui and Tongren of Guizhou Province, and most cities of Shanxi Province are resource-dependent and less urbanized. Therefore, these cities have not shown obvious shrinkage. However, it cannot be ignored that if they continue to adhere to the extensive production mode, they will suffer the same fate as the cities in northeastern region like Yichun, Daqing, Baishan, Liaoyuan, and Panjin which used to rely heavily on resources in their initial development stage. The shrinkage of resource-dependent cities is due to their single industrial structure, lack of adequate social security, and serious damage to the ecological environment. Finally, these cities declined with the resources depleted.

### (3) 'City village' and pseudo-urbanization phenomenon

Historical problems have caused the geographical division of urban and rural areas, and the expansion of urbanization have made lands more and more valuable. High land price raised the compensation of land acquisition, which has become an important source of income for rural residents or relocated households. Particularly, rural residents around large cities usually demand very high compensation which the government and developers cannot afford, so they are not willing to sell their land and finally surrounded by new high-rise buildings, thus forming a typical *city village*. Although this is a form of urban shrinkage, it is not a traditional shrinkage that happens in economic recession, neither the process of proactive population flow to suburbs, it is a unique reverse-urbanization of China, known as *pseudo-urbanization*. Additionally, some of the urban population, such as migrant workers or low-income groups and new immigrants with low labor skills, cannot be integrated into urban life. The result is that citizenization lags behind urbanization and the segregation of urban housing, causing restrictions on the development of surrounding areas, and leading to shrinkage of some city areas. Besides, flow of labor force

and other factors of production across regions are not sufficient in China, due to the economic and historical reasons labors cannot return to their original rural or underdeveloped areas, causing urban shrinkage in perforation pattern.

### (4) Population aging in backward areas

China's industrialization lagged behind the population aging, *aging before wealthy* has become a normal social problem. Compared to Europe and the US, China holds a huge population but a small number of legitimate immigrants. China has become an aging country since 1999 according to international standards, with a large number and rapid growth of elderly population. The population over 60 years of age will reach the double of the current number 20 years later, and in 40 years will account for one third of the whole population. Issues like disability and semi-disability, lack of companionship and attendance, and loss of only child, have become serious social problems. The allowance for elderly support rose rapidly, policies like *retirement insurance* and *delayed retirement policy* triggered fierce discussion. Based on the data of the population density of the prefecture-level cities in each province, the proportion of shrinking cities has reached about half of the whole nation. Among them, there are provincial cities such as Shijiazhuang and Urumqi, and more than 100 prefecture-level cities. Due to China's unbalanced regional economic development, talent drain and population loss in central and western China has become very normal, residents in these regions face severe aging problems, and also single-structured industries, bad ecological environment, and lack of vitality. Urban shrinkage in such regions is usually in scatter pattern.

In central China, cities in Hubei Province, Hunan Province and Henan Province shrink particularly fast. Similar situation happens to small and medium cities in southwest mountain regions and southeast coastal areas. Unbalanced regional economic development has accelerated the population loss in backward areas.

### (5) Macro-intervention by the government

Compared to the political factors causing urban shrinkage in other countries, China's influencing political factors are mainly from regional policy planning. Since the reforming and opening, the directional regional preferential policies have made the industrialization of China develop rapidly, but the regional gap has also been enlarged in the same way. In recent years, the rapid development of urbanization has made land price substantially higher, the price of real estate in a few developed areas becomes astronomical. Uneven distribution of land price and land value gains among regions, urban and rural areas, and social classes has become a critical reason of urban shrinkage. On one hand, urban and rural household registration system slows down the rate of

labor exchange, restricting the quantity and frequency of rural labor force flowing to cities. On the other hand, the rural land resources are difficult to trade and transfer, scale operation of agriculture is hard to achieve, which leads to the reality that urbanization fails to narrow the urban-rural income gap. In the marginal areas of Guangxi Province, Yunnan Province and Guizhou Province, the population density growth of some municipal districts is mainly brought about by border trade and national support for minority ethnic groups, but the provincial capital cities in these areas are shrinking due to the lack of mainstay industries and economic potential, and policy preference from the central government.

## 6. Reasons of urban shrinkage in China

### (1) Squeeze effect of central cities

The economic concentration power is still playing a leading role in China, with the development of the tertiary industry, not only the expansion of mega cities is unstoppable, large regional cities' role as a sub-centers is also strengthened. Central cities concentrate development momentum which is self-strengthening and produces locking effect. Large cities have mastered a lot of economic resources, and achieved scale effect under such unnatural factors as sharing, matching, and learning.

The expansion of large cities may be accompanied by the shrinkage of small cities around, because of the centrifugal force on urban shrinkage, namely the crowding effect. The excessive expansion of large cities has trenced on the opportunities of surrounding regional cities. Large, competitive cities will seize scarce resources and development space from smaller cities. In addition, with close adjacency, due to the significantly better infrastructure in large cities, industrial enterprises will choose to be placed in large cities rather than smaller ones, consumers will also choose to shop in large cities, all cultural activities, communication, and business will be carried out in large cities because they are anyway close.

### (2) Land finance

China's land finance began with the *Land Management Law* 1988 amendment, and was triggered by the 1994 tax system reform, which resulted in financial constraints of local governments and their fanatic behavior of land trade later. Farmers' land was then seriously encroached by governments and real estate developers driven by economic interests. Illegal use and acquisition of land remain incessant after repeated prohibition. But there is more than that, the urban housing prices rose irrationally fast, and income inequality increased along with it. The core position of large and mega cities has been fixed and consolidated by the development of land finance, which has further aggravated the social problems such as poverty and marginalization of marginal areas, as well as regional differences and dualization

of urban and rural areas. Real estate has already been preferably developed, but due to the lack of investment opportunities, local governments may even further favor real estate, draining capitals from industries to high-return real estate, finally causing inflation and twisted industrial structure which can severely undermine national economy.

Urban real estate price and land rent is the direct channel of land finance affecting national economy. On one hand, the rapid expansion of the real estate bubble exaggerated the real estate market value, and will increase the cost of real economy and living. On the other hand, since land finance has become the main source of revenue for local governments, and steadily tied to local finance, local governments continued to expand the scale of the cities for more land revenue, and ignored the corresponding inputs of infrastructure and public services, creating a large amount of urban operating costs and an increase of factor price. This has caused large debt for the governments, so they will have to sell more land to pay for the debt, and get caught in a vicious circle. Because if a city expands too fast, its expenditures on infrastructure and public service must increase continuously to meet the demand of the city function and its carrying capacity, but when a city expands without sufficient development of industrial enterprises, it is impossible to carry on. The unregulated flourish of land finance in some regions with weak industries and less development momentum has become a serious problem. The land finance is unsustainable, with its potential drained, the real estate goes into downturn, more and more empty cities and ghost towns have emerged to prove this. Such shrinkage is the retraction after blind urban expansion, but the environment becomes unrepairable after the shrinkage.

### (3) Industrial upgrade and transformation

The change of the global factor division has put forward new requirements to industries in China. A key point of changing China's position in international trade is industrial transformation and upgrade. Developed coastal areas have successfully completed the first stage of integration into the global factor division, the second stage is to keep traditional comparative advantages, and at the same time work better on existing technology and industrial added value. Industrial upgrade is a new round of competition and elimination among international and domestic enterprises, some cities of the coastal areas will certainly face recession in this process. As part of the enterprises and capitals move to inland, west China market will show scale advantages and cost advantages, but part of the coastal cities will experience population loss and temporary recession.

Currently, China's resource-dependent cities and single-structured industrial cities have been forced to undergo transformation because they have no ability to solve existing problems and contradictions through industrial upgrade which costs less than full

transformation. The reason of this kind of shrinkage is the depletion of resources that leads to business collapse and unemployment.

#### (4) *Dual economic structure*

There are a series of institutional and policy factors, such as household registration system, land system and other factors leading to the obstruction in the flow of factors of production. Unbalanced regional policies lead to the increase of non-productive consumption, which hinders the process of urbanization and the development of urban labor division. Because the labor force cannot flow freely and the land system is imperfect, the arable land resources are difficult to circulate, and the scale operation of agriculture is very difficult to realize, so a large number of rural surplus labor force continues to stay in the countryside. Besides, some peasants who have entered a city receive less income and public service than urban residents. There are a large number of non-local residents among city residents in China, the proportion of which keeps rising as urbanization expands. For a long time, the gap between urban and rural areas has resulted in a disparity between city residents and rural population, namely the gap of income and public service between household and non-household population, thus forming a new *dual* society which is a segregation of the relations among urban population. This kind of segregation is like a barrier that will lead to the weakening of a city's centripetal force, and the intensification of social contradictions.

Dual economic structure makes the population statistics of the urban shrinkage in China more complex and peculiar, leads to economic imbalance and constraints a city's development momentum and concentration power, ultimately causing negative economic growth and population outflow in certain areas perennially.

### 7. Conclusion and policy suggestion

The reasons of urban shrinkage are complex, some factors may be dominant in a given period, but most urban shrinkage is the result of a combination of factors in all aspects. The dynamics of shrinkage have evolved over time, but it is certain that urban shrinkage and expansion is both an inevitable trend in urban development. Shrinking cities require us to rethink on the traditional planning ideas and operation methods. Urban expansion does not last forever, lack of human resources, housing vacancies, and public service in some areas and cities is natural. We have to recognize that industrialization and urbanization can indeed improve living standards and promote modernization, but also in some way destructs living quality and future development. Therefore, in the future, we must not only actively deal with the process of urban shrinkage and take measures to promote sustainable urban development, but also understand

the characteristics of semi-industrialization and semi-urbanization in China to identify different types of shrinking cities, and to distinguish their dynamic mechanism and development patterns. Further work is to study the scientific shrinkage plan.

Mega urban group area needs to promote urban integration, balance public facilities and services, enhance supporting infrastructures, improve regional industrial chain relations, change backward traffic, and establish regional communication networks.

For resource-exhausted cities, the government needs to change the long-existed idea of disorderly urban expansion and plan for city transformation, adjust the nature and function of the city. Besides, the government needs to introduce all kinds of funds to restore urban ecosystem, clean up industrial pollution, build green network, and construct suitable commercial and residential density, so to increase environmental attraction and land value. The government needs to take into account the local consumption and ecology to build a diversified information network for industrial investment to upgrade the industry. Also land management and valuation must be considered, as well as the establishment of land banks. The government must gradually shrink the traditional backward production sector, at the same time of the transformation of traditional industrial technology, pay close attention to the introduction and cultivation of modern high-tech industries, then improve the industrial structure of old industrial bases and balance the light and heavy industries. Furthermore, the government must fundamentally improve the efficiency of resource use, gradually reduce the primary production scale of raw materials, adjust industrial layout, and guide enterprises to transfer outward.

For shrinking cities under the overall situation of large-scale urbanization, the government needs to develop a diversified economy, to take in potential small and medium enterprises from the eastern part of China to enhance the city's anti-risk ability. The government needs to do appropriate streamlining and transformation for the urban infrastructure with low utilization rate, and by considering the uncertainty of future development and taking into account the actual needs of local residents, to encourage the division of communities into several core areas, and achieve orderly distribution of economic activities and social life.

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Appendix 1 Population Trends of Municipal Districts in 1994 – 2014

Districts	Province	prefecture-level cities with population shrinkage	prefecture-level cities with population growth
North China	Hebei (11)	Shijiazhuang, Tangshan, Qinhuangdao, Handan, Xingtai, Baoding, Zhangjiakou, Chengde, Cangzhou, Langfang, Hengshui (11)	
	Shanxi (11)		Taiyuan, Datong, Yangquan, Changzhi, Jincheng, Shuozhou, Jinzhong, Yuncheng, Xinzhou, Linfen, Luliang (11)
	Inner Mongolia (9)	Baotou, Chifeng, Tongliao, Hulunbeier, Bayannaoer, Wulanchabu City (6)	Hohhot, Wuhai, Erdos City (3)
Northeast China	Liaoning (14)	Dalian, Anshan, Fushun, Benxi, Dandong, Jinzhou, Fuxin, Liaoyang, Tieling, Chaoyang, Huludao City (11)	Shenyang, Yingkou, Panjin City (3)
	Jilin (8)	Changchun, Jilin, Siping, Liaoyuan, Tonghua, Baishan, Songyuan, Baicheng City (8)	
	Heilongjiang (12)	Harbin, Qiqihar, Jixi, Hegang, Shuangyashan, Daqing, Yichun, Jiamusi, Qitaihe, Mudanjiang, Suihua City (11)	Heihe (1)
East China	Jiangsu (13)	Nanjing, Wuxi, Xuzhou, Changzhou, Suzhou, Nantong, Lianyungang, Huai'an, Yancheng, Yangzhou, Zhenjiang, Taizhou, Suqian City (13)	
	Zhejiang (11)	Hangzhou, Ningbo, Shaoxing, Jinhua, Quzhou City (5)	Wenzhou, Jiaying, Huzhou, Zhoushan, Taizhou, Lishui City (6)
	Anhui (16)	Hefei, Wuhu, Huainan, Ma On Shan, Huaibei, Tongling, Anqing, Chuzhou, Suzhou,	Bengbu, Huangshan, Fuyang, Lu'an, Xuancheng City (5)

		Bozhou, Chizhou City (11)	
	Fujian (9)	Fuzhou, Putian, Quanzhou, Longyan City (4)	Xiamen, Sanming, Zhangzhou, Nanping, Ningde City (5)
	Jiangxi (11)	Nanchang, Ganzhou, Ji'an, Shangrao City (4)	Jingdezhen, Pingxiang, Jiujiang, Xinyu, Yingtan, Yichun, Fuzhou City (7)
	Shandong (17)	Jinan, Qingdao, Dongying, Weifang, Jining, Weihai, Rizhao, Linyi, Dezhou, Liaocheng, Binzhou City (11)	Zibo, Zaozhuang, Yantai, Taian, Laiwu, Heze City (6)
Middle China	Henan (17)	Kaifeng, Luoyang, Xinyang, Jiaozuo, Xuchang, Luohe, Nanyang, Shangqiu, Zhoukou, Xinyang, Zhumadian City (12)	Zhengzhou, Pingdingshan, Hebi, Puyang, Sanmenxia City (5)
	Hubei (12)	Shiyan, Yichang, Xiangyang, Jingzhou, Jingmen, Ezhou, Xiaogan, Huanggang, Xianning, Suizhou City (10)	Wuhan, Huangshi City (2)
	Hunan (13)	Changsha, Zhuzhou, Xiangtan, Hengyang, Yueyang, Changde, Yongzhou, Huaihua City (8)	Shaoyang, Zhangjiajie, Yiyang, Chenzhou, Loudi City (5)
South China	Guangdong (21)	Guangzhou, Shaoguan, Zhuhai, Shantou, Foshan, Zhanjiang, Maoming, Huizhou, Meizhou, Shanwei, Heyuan, Yangjiang, Qingyuan, Dongguan, Chaozhou, Jieyang City (17)	Shenzhen, Zhaoqing, Zhongshan, Yunfu City (4)
	Guangxi (14)	Nanning, Liuzhou, Wuzhou, Beihai, Chongzuo City (5)	Guilin, Fangchenggang, Qinzhou, Guigang, Yulin, Baise, Hezhou, Hechi, Laibin City (9)

	Hainan (4)	Haikou (1)	Sanya (1)
Southwest China	Sichuan (18)	Zigong, Panzhihua, Luzhou, Yibin, Dazhou, Bazhong City (6)	Chengdu, Deyang, Mianyang, Guangyuan, Suining, Neijiang, Leshan, Nanchong, Meishan, Guang'an, Ya'an, Ziyang City (12)
	Guizhou (6)	Guiyang, Zunyi City (2)	Liupanshui, Anshun, Bijie, Tongren City (4)
	Yunnan (8)	Kunming, Yuxi, Lijiang, Pu'er City (4)	Qujing, Baoshan, Zhaotong, Lincang City (4)
Northwest China	Shanxi (10)	Xi'an, Tongchuan, Baoji, Weinan, Yan'an City (5)	Xianyang, Hanzhong, Yulin, Ankang, Shangluo City (5)
	Gansu (12)	Jinchang, Baiyin, Tianshui, Wuwei, Zhangye, Pingliang, Longnan City (7)	Lanzhou, Jiayuguan, Jiuquan, Qingyang, Dingxi City (5)
	Qinghai (2)	Xining (1)	
	Ningxia (5)	Shizuishan, Guyuan, Zhongwei City (3)	Yinchuan, Wuzhong City (2)
	Xinjiang (4)	Urumqi (1)	Karamay City (1)

