The Urban Book Series

Ying Long
Shuqi Gao *Editors*

Shrinking Cities in China

The Other Facet of Urbanization

Springer

The Urban Book Series

Editorial Board Members

Fatemeh Farnaz Arefian, Bartlett Development Planning Unit, University College London, London, UK
Michael Batty, Centre for Advanced Spatial Analysis, University College London, London, UK
Simin Davoudi, Planning & Landscape Department GURU, Newcastle University, Newcastle, UK
Geoffrey DeVerteuil, School of Planning and Geography, Cardiff University, Cardiff, UK
Andrew Kirby, New College, Arizona State University, Phoenix, AZ, USA
Karl Kropf, Department of Planning, Headington Campus, Oxford Brookes University, Oxford, UK
Karen Lucas, Institute for Transport Studies, University of Leeds, Leeds, UK
Marco Maretto, DICATeA, Department of Civil and Environmental Engineering, University of Parma, Parma, Parma, Italy
Fabian Neuhaus, Faculty of Environmental Design, University of Calgary, Calgary, AB, Canada
Vitor Manuel Aráujo de Oliveira, Porto University, Porto, Portugal
Christopher Silver, College of Design, University of Florida, Gainesville, FL, USA
Giuseppe Strappa, Facoltà di Architettura, Sapienza University of Rome, Rome, Roma, Italy
Igor Vojnovic, Dept of Geography, Michigan State University, East Lansing, MI, USA
Jeremy W. R. Whitehand, Earth & Environmental Sciences, University of Birmingham, Birmingham, UK

The Urban Book Series is a resource for urban studies and geography research worldwide. It provides a unique and innovative resource for the latest developments in the field, nurturing a comprehensive and encompassing publication venue for urban studies, urban geography, planning and regional development.

The series publishes peer-reviewed volumes related to urbanization, sustainability, urban environments, sustainable urbanism, governance, globalization, urban and sustainable development, spatial and area studies, urban management, transport systems, urban infrastructure, urban dynamics, green cities and urban landscapes. It also invites research which documents urbanization processes and urban dynamics on a national, regional and local level, welcoming case studies, as well as comparative and applied research.

The series will appeal to urbanists, geographers, planners, engineers, architects, policy makers, and to all of those interested in a wide-ranging overview of contemporary urban studies and innovations in the field. It accepts monographs, edited volumes and textbooks.

Now Indexed by Scopus!

More information about this series at http://www.springer.com/series/14773

Ying Long · Shuqi Gao
Editors

Shrinking Cities in China

The Other Facet of Urbanization

Springer

Editors
Ying Long
School of Architecture and Hang Lung Center for Real Estate
Tsinghua University
Beijing, China

Shuqi Gao
School of Architecture
Southeast University
Nanjing, Jiangsu, China

ISSN 2365-757X ISSN 2365-7588 (electronic)
The Urban Book Series
ISBN 978-981-13-2645-5 ISBN 978-981-13-2646-2 (eBook)
https://doi.org/10.1007/978-981-13-2646-2

Library of Congress Control Number: 2018967423

© Springer Nature Singapore Pte Ltd. 2019
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Preface

Urbanizing China has been longtime associated with expanding cities and booming economy by various of parties. As an emerging topic of urbanizing China, shrinking cities featuring population loss have started to attract increasing attention from academic and practice fields. In recent years, more and more Chinese scholars have been conducting research toward Chinese shrinking cities. Up to date, there are three edited special issues in Chinese urban planning journals and three initiated conferences/symposium as the output. We also established the Shrinking City Research Network of China (SCRNC), through which more extensive studies have been developed by the network members. The website of SCRNC is https://www.beijingcitylab.com/projects-1/15-shrinking-cities for readers' information.

According to our existing academic studies and past experience, shrinking cities in China are exhibiting different patterns in contrast to their counterparts in Western literature in terms of (but not limited to) shrinkage degree, physical performance, causality, and planning reaction. They would be good examples to contribute to the development of the shrinking city theory in the world. In such a background, we edit this book to introduce shrinking cities in China, the other facet of urbanization and a novel way to look at urbanizing China.

This book is versed in urban planning, urban studies, and geography domains. It starts with an introduction of the overall profile of shrinking cities in China, and follows with regional perspective of shrinking cities as well as case studies, ends with multiple highly related media reports. All chapters are contributed by leading urban researchers with specific expertise on shrinking cities in China. We also include some photographs from a well-reputed photographer in the book for readers' better understanding on shrinking cities in China.

In detail, the edited book is consisted of four parts, the overall pictures, regional analysis, case cities, and media reports. Part I is for introducing overall picture of shrinking cities in China, with Chap. 1 focusing on introducing the overall profile of shrinking cities in China and discussing the planning paradox in the filed in China. Part II is for analyzing shrinking cities from regional perspective, with Chap. 2 for Hunan Province, Chap. 3 for Beijing–Tianjin–Hebei Region and Yangtze River Delta, Chap. 4 for Jilin Province, and Chaps. 5 and 6 for Northeast China. Part III is

for the case studies in shrinking cities in China, with Chap. 7 for Yichun, Chap. 8 for Qiqihar, Chap. 9 for Dongguan. In Part IV, we include photograph from the photographer for a more visual show for shrinking cities in China as Chap. 10. We also introduce three media reports related to shrinking cities in China in Chaps. 11–13.

Potential readers may range from researchers and students with a background of urban planning, urban geography, urban economics, urban sociology or urban design, practitioners in urban planning and design, to those who are interested with the other facets of urbanizing China.

Beijing, China — Ying Long
Nanjing, China — Shuqi Gao
November 2018

Acknowledgements

This book is based on collective wisdom of multiple authors, who enthusiastically contributed their insights and time to help more people to understand shrinking cities in China. We applaud these authors' alert and braveness on paying close attention to the issue of shrinking cities, which is so-far politically unacceptable and academically undervalued in China. We also appreciate their collaborative attitude toward the editing process that requires them to provide personal information, publishing agreement, and multiple revisions of former drafts.

We would like to thank the publishers that permit the authors and us to translate and modify some of this book's chapters that have been published in Chinese. The publishers include the Modern Urban Research (Chap. 3), Human Settlements in West China (Chap. 4), Planners (Chap. 6), Urbanism and Architecture (Chap. 8), YIXI (Chap. 12), and The Paper (Chap. 13).

In addition, we are grateful to the National Natural Science Foundation of China that grant us a funding for researching Chinese shrinking cities and publishing related literatures including this book.

Finally, we are in great debt to Springer editors, Lisa Fan, Morgan Ma, and their colleagues who guide us the way to publish this book.

We are also grateful for the financial support of the National Natural Science Foundation of China (No. 51778319) and the MIT MISTI funding (Shrinking Cities in the US and China: A Transnational Comparison).

Contents

Editors and Contributors

About the Editors

Ying Long is an Associate Professor in the Department of Urban Planning at Tsinghua University in Beijing, China. His research focuses on urban planning, quantitative urban studies, and applied urban modeling. He has an education background in both environmental engineering and city planning. Before joining Tsinghua University, he has worked for Beijing Institute of City Planning as a senior planner for 11 years. Familiar with planning practices in China and versed in international literature, Dr. Long's academic studies creatively integrate international methods and experiences with local planning practices. He has published over 100 journal papers and led over 20 research/planning projects. Dr. Long is also the founder of Beijing City Lab, an open research network for quantitative urban studies.

Shuqi Gao is a Lecturer in the Department of Urban Planning at Southeast University's School of Architecture in Nanjing, China, specializing in the fields of planning for shrinking cities, fixing physical disorder, and urban redevelopment. He graduated from Tsinghua University with doctoral degree in urban planning on 2018. From 2016 to 2017, he was a visiting doctoral student at Massachusetts Institute of Technology's Department of Urban Studies and Planning, where he delved into the research of corresponding strategies for shrinking cities in the US. He has published several papers that related to the topic of shrinking cities on top planning journals in China. He has several working papers also on the field of shrinking cities and are supposed to be published on English planning journals.

Contributors

Ronghui Chen is a Chinese photographer and storyteller based in Shanghai, whose work focus on China's urbanization in long-term projects. He has devoted himself to the study the relationship between China's urbanization and individual's experiences. Known for his specific interest in these social issues, he had published his first collection of photographs named Chen Ronghui, which is one of the books among China's Contemporary Photography Catalog. His projects have brought him many awards, including World Press Photo prize, Three Shadows Photography Award & ALPA special prize, and Hou Dengke Documentary Photography Award. Outside of his own professional practice, Chen also acts as the head of the visual department in Sixth Tone, which is a Shanghai local English-language digital publication.

Zhiwei Du received his Ph.D. degree in Human Geography from the Sun Yat-sen University, Guangzhou, China. He is an Assistant Professor in the Guangzhou Institute of Geography, specializing in the fields of regional development and city planning, urban growth and shrinkage. He is managing two selected research projects from the National Natural Science Foundation of China and the GDAS' Special Project of Science and Technology Development.

Jiahui Fan is a postgraduate student majoring in urban and rural planning in College of Architecture and Urban Planning of Tongji University. She specializes in the fields of regional and urban space development. Particularly, she studies on issues about the urban spatial structure performance, regional and urban networks, and peri-urbanization. Besides, the interest in urban shrinkage motivates her continuously to remain focused and actively to conduct relevant research. She finished the bachelor degree of urban planning in Harbin Institute of Technology (2011–2016).

Yongjian He is an Associate Professor in the Department of Urban and Rural Planning in School of Architecture, Tianjin University in Tianjin, China, specializing in the fields of regional and overall urban planning. He was bachelor in the Department of Economic Geography and Regional Planning in Nanjing University and Ph.D. in Urban Planning of Tianjin University. He has been engaging in teaching and research on regional and overall urban planning, also hosting and participating in a number of pratice projects. In recent years, he began to pay close attention to research on shrinking cities, including their development characteristics, mechanism and planning strategies. His study's objects mainly concentrated in the northeast of China, Tianjin, Gansu, and other regions. Besides, preliminary research results have been published in succession.

Xun Li is the director of urbanization institute and a Professor of School of Geography and Planning, at Sun yat-sen university, Guangzhou, china. his research interests include urban and rural planning, urban growth and shrinkage, regional integration, urban renewal, etc., he conducts several-related researches funded by the national natural science foundation of china, entitled "urban growth and

shrinkage in the pearl river delta region under the new normal circumstances" and "city integration and rescaling: comparative research of guangzhou-foshan, shenyang-fushun, and chang-zhu-tan", and so on.

Zhi Li is a Graduate Student of School of Information at University of California, Berkeley, focusing on data science. He got his master's and bachelor's degrees in Architecture at Tsinghua University, where he did researches about the application of data science in city and regional planning, which is also his main academic interest. Now, he is continuing his studies and researches in this interdisciplinary field at UC Berkeley, aiming to acquire a better understanding of cities using state-of-the-art techniques like big data, deep learning, etc.

Fangfang Qian is a Postgraduate Student from School of Architecture, Hunan University, specializing in the field of urban and regional planning. She is also a volunteer of Shrinking City Research Network of China (SCRNC) and participant of the first seminar in Guangzhou. She worked on researches of China's shrinking cities, investigating the Leng Shuijiang City as an example. She conducted quantitative analyses regarding the shrinking population phenomenon at multiple geographical scales, from provincial to township, in Hunan Province in central China.

Yun Wang is a journalist at The Paper. She graduated from Fudan University and worked in Dongfang Morning Post for quite a few years before joining The Paper. She has covered various issues and started her interest in covering shrinking cities since the late 2016.

Kang Wu is an Associate Professor in the Department of Urban Economics and Public Affairs at Capital University of Economics and Business in Beijing. Dr. Wu's research interests include urban economic geography and planning. His most recent research focus on polycentric city regions and urban networks, urban big data analysis, and shrinking cities in China. Dr. Wu has published more than 40 peer-reviewed papers in geography and planning journals, he is the Executive Director of Beijing Key Laboratory of Megaregions Sustainable Development Modelling and also as an associate director of Beijing City Lab.

Yan Yan is a Master's Student in the School of Architecture of Hunan University, studying urban and rural planning. During the postgraduate study, she set about the research on the localization of international "Shrinking City" theory. Her study selected Hunan Province, which is a province with a large population output, as a regional research object. Through quantitative analysis and qualitative induction, its shrinking cities were discovered while the contraction mechanism was explained. Finally, Under the framework of this subject, she took the new requirements of the age of population contraction as the origin to ponder the key issues of urban planning with systematic and strategic thinking.

Lin Yang is an urban planner from company of Arcplus East China Architectural Design & Research Institute, Shanghai, China, who is engaging in urban design and micro-community regeneration. She graduated from School of Architecture, Tianjin University, working on issues related on shrinking cities and urban renovation. Her hometown is also a shrinking one which used to be one of the ten major coal-mining cities in China. She expected to call for more scholars and experts from different fields to form a cluster strength to realize the revival of her hometown.

Kai Zhou is an associate professor in urban planning, Head of Urban Planning Department of Architecture School in Hunan University, China, specializing in the field of regional and urban planning. He works on understanding shrinking cities in China's rapid urbanization, analyzing social justice issues in planning decision-making, and developing effective ICT tools for public participation. He holds degrees from Nanjing University and the University of Manchester.

Part I
The Overall Picture of Shrinking Cities in China

Chapter 1
Shrinking Cities in China: The Overall Profile and Paradox in Planning

Ying Long and Shuqi Gao

Abstract Manifested by population loss, shrinking cities are currently under heated discussion in the developed countries. The emerging shrinking cities in developing world, however, have not attracted enough attention. This paper focuses on the shrinking cities in China, where has been witnessed fast economic growth, rapid urban expansion, and massive urbanization in the last decades. By collecting and analyzing township-level demographic data of the Census in 2000 and 2010, we identified 180 shrinking cities. We then classified them into two sets of categories based on their causalities and spatial patterns of depopulation, respectively. Despite their great quantity, shrinking cities are largely disregarded by China's planners and local authorities during the plan-making process. We conceptualized the causalities of the disregard into the systematic paradox and technological paradox, both of which are the effects of a combination of China's specific planning system, land marketization, cadre promotion system, and the national urbanization policy. We then further conceptualize the overwhelming growth-oriented paradigm into a vicious cycle that continuously exacerbates oversupply of the built environment in shrinking cities. This paper ends with a discussion of appealing for more attention on shrinking cities in China and a paradigm shift from the growth-oriented planning, as well as the future research agenda for shrinking cities' research in China.

Keywords Shrinking cities · Depopulation · Chinese cities · Growth-oriented paradigm

Ying Long and Shuqi Gao contributed equally to this chapter.

Y. Long
School of Architecture and Hang Lung Center for Real Estate, Tsinghua University, Haidian District, Beijing, China

S. Gao (✉)
School of Architecture, Southeast University, Xuanwu District, Nanjing, Jiangsu, China
e-mail: shuqigao@seu.edu.cn

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_1

1.1 Introduction

After the 1980s, scholars always associated Chinese cities with growth, including fast urban expansion, roaring housing price, and increasing urban population (Wu 2015). To most outsiders, it seems that most Chinese cities' growth is too fast to be an undesirable burden, and local governments have to establish various ways to curb the unexpected growth (Zhao 2011). However, such impression is based on the disproportionate academic coverage that most literature focus on China's large cities by leaving most medium and small cities underrepresented. Overshadowed by the large cities' fast growth, medium, and small cities are understudied though the fact that many of them have been identified as shrinking cities (Long and Wu 2016).

We assume that the problem of shrinking cities ought to appeal for more attention. First, the stringent one-child policy has triggered severe aging problem that China's population growth is going to a stagnation (UN DESA 2015). Second, China's urbanization progress is also going to a stagnation after last decades' fast growth (UN DESA 2014). Third, the enhancing regional disparity further exacerbates the unequal spatial distribution of population. In contrast to megacities' overwhelming in-migration, many medium and small cities are suffering from drastic out-migration. These facts justify our research motivations. Although some studies (Wu et al. 2014; Long and Wu 2015; He et al. 2017) have addressed certain aspects of this issue, the overall knowledge is still too limited.

This paper aims to offer two new perspectives to the current knowledge of Chinese shrinking cities: what is the overall profile of shrinking cities in China, and why is planning for shrinking cities so difficult in China? This paper is organized as follows. Followed by a literature review of shrinking cities and their planning problems in Sect. 1.2, data and research methodology are discussed in Sect. 1.3. In the next section, we analyze the demographic data to identify shrinking cities. We then classify them into two sets of categories based on their causalities and depopulation's spatial pattern. In Sect. 1.5, we analyze the causalities of the Chinese planning' growth-oriented paradigm through conceptualizing it into the systematic paradox and the technological paradox, as well as a vicious cycle. In the next section, we appeal for more attention to shrinking cities and an alternative paradigm from the growth-oriented one. The last section presents our concise concluding remark.

1.2 Literature Review

1.2.1 Concept

Although shrinking cities date back to the very beginning age of urban history, the concept of "Shrinking Cities" literally did not gain international notoriety until the mid-2000s, when scholars from Germany, France, Australia, and other countries established the Shrinking Cities International Research Network (SCiRN) in

Berkeley, California, USA. Meanwhile, through the organization of German and Swiss architects Philipp Oswalt and Tim Rieniets, a series of the shrinking cities' exhibitions toured around the world's famous shrinking cities after its initial success in Germany. These exhibitions have greatly inspired more scholars' interest on shrinking cities and thus related publications burst forth. However, shrinking cities have varied context and background that their causalities and manifestations may largely differ with each other. Shrinking cities' major causalities include globalization, deindustrialization, suburbanization, and demographic transition, while their manifestations include depopulation, vacant and abandoned properties, urban decay, etc. (Schilling and Logan 2008; Hollander et al. 2009). The essence of shrinking cities' concept is like the stuffing of a sandwich with two breads, the causalities, and manifestations on its upside and downside (Bernt 2016), while Mallach (2011) points out that shrinkage as a symptom, not a disease. Therefore, except the depopulation, which is the mostly mentioned feature by different definitions, the other features are like the two breads of a sandwich that may differ in everywhere.

1.2.2 Typologies of Shrinking Cities

Given varied causalities and manifestations, there are various types of shrinking cities around the world. From the perspective of geographical location and literatures, we find great difference between shrinking cities in the US and East Europe.

Deindustrialization in tandem with suburbanization is deemed as the main cause of most shrinking cities in the US Rust Belt (Pallagst 2010). Since the post-war age, the rise of the Sun Belt attracted a great amount of population from the Rust Belt. Meanwhile, the rise of newly industrialized countries like Japan and South Korea has continuously squeezed the market of the Rust Belt, while several energy crises further deteriorated the situation. These endogenous and exogenous factors came together and initiated tides of plant closure, economic decline, and population loss in most Rust Belt cities (Bluestone and Harrison 1982). Moreover, the massive suburbanization further hemorrhaged the inner city, which was the former place for most industrial plants. Therefore, the US shrinking cities' spatial pattern is conceptualized as the "doughnut", which means a combination of a hollowing-out inner city and a ring of booming suburb (Hollander et al. 2009).

In the east European countries, many shrinking cities have emerged during the drastic social and economic transition since the post-socialist era (Turok and Mykhnenko 2007). In the post-socialist countries, the fast privatization and marketization triggered the structural crisis that further led to a massive closure of formerly state-owned plants and subsequently, a considerable out-migration (Bontje 2005). Because of their homogeneous spatial structure, the depopulation areas in most east European shrinking cities are not polarized but evenly distributed in the urbanized regions, which are conceptualized as "perforated shrinkage" (Schetke and Haase 2008).

Regarding China, some recent studies have revealed some emerging shrinking cities, some of which are even located in its booming regions. For example, Yixing, a county-level city located in a prosperous province named Jiangsu, has endured population loss due to jurisdictional boundary change (Wu et al. 2014). Furthermore, according to the latest study by He et al. (2017), resource-based cities, especially resource-depleted cities, have high vulnerability of population loss. However, due to some specific features of Chinese cities, it is very easy for the outsiders to mistake some cities as shrinking cities. Since most Chinese cities are still under urbanization and have a large amount of rural population, some of them may have population loss in the rural area that surpasses the population gain in the urban (Wu et al. 2014). These cities do lose population in their jurisdictional areas but have increased urbanized population. Therefore, it is necessary to define and identify Chinese shrinking cities before furthering the study.

1.2.3 Planning for Shrinking Cities

In the US, a coalition of local political-and-social elites formed the "urban growth machine" and thus the growth-oriented paradigm is the mainstream of urban governance (Logan and Molotch 1987). This growth-oriented paradigm is not only popular in the US but also well accepted in other countries like the UK (Rydin 2013), Germany (Wiechmann and Pallagst 2012), and China (Wu 2015). From the perspective of growth-oriented paradigm, urban shrinkage is a counter-vision reality and a stigma to the "urban growth machine." Therefore, it is common that no shrinking cities' government will accept the reality of population loss, needless to say, taking any corresponding strategies (Bernt 2009). It thus justifies the contradict and ridiculous coexistence of population loss and growth-oriented planning in many shrinking cities.

This mismatch has caused various problems. In shrinking cities, growth-oriented planning is in favor of creating excessive properties instead of dismantling redundant properties, which further strikes the dilapidated real estate market. Growing urban built-up area yields a higher maintaining cost while declining population exacerbates local fiscal revenue, both of which further impair shrinking cities' fiscal healthiness. Growth-oriented planning also expands urban infrastructure and amenities that further decreases the efficiency of public goods and increases municipal expenditure, which finally increases the burden of remnant taxpayers. In order to make both ends meet, most shrinking cities' government has to keep raising various taxes' rate (Rybczynski and Linneman 1999). However, any marginal increase of living cost can be the last nail in the coffin that pushes people to leave shrinking cities. Moreover, the mismatch between growth-oriented planning and decreasing population has caused more problems on public security, sanitation, environment, and so forth (Bernt 2009; Hollander et al. 2009).

Recently, some scholars have appealed for a paradigm shift from growth-oriented planning to rightsizing for shrinking cities (Schilling and Logan 2008; Hollander et al. 2009). However, rightsizing is still more about conceptual discussion, and

although some cities have released self-claimed rightsizing plans, their implementation remains to be questionable. Rhodes and Russo (2013) revealed that Youngstown had failed to reach most of the goals in Youngstown 2010 Plan, which was the first rightsizing plan in the US. Regarding China, and planning for shrinking cities is an unprecedented topic for urban scholars in a context that growth has been overwhelmingly underscored, whereas shrinking cities have existed and their amount is quite large according to a UN-HABITAT (2008) report.

1.3 Research Materials

1.3.1 Research Targets

The Chinese city system has long been defined through the administrative dimension, and each city is represented by its administrative boundary.[1] There were 653 Chinese cities in 2014, which can be categorized into five administrative levels: municipalities (MD, *zhi xia shi*) being directly under charge of the central government (4 cities, tier 1), sub-provincial cities (SPC, *fu sheng ji cheng shi*) (15 cities, tier 2), other provincial cities (OP, *sheng hui*) (17 cities, tier 3), prefectural-level cities (PLC, *di ji shi*) (250 cities, tier 4), and county-level cities (CLC, *xian ji shi*) (367 cities, tier 5). We focused on all of these administrative cities in this paper, aiming to identify shrinking cities nationally. The jurisdictional boundaries of these cities (see Fig. 1.1 in Jin et al. (2017)) were used for extracting demographic and spatial information for each city.

1.3.2 Population Census in 2000 and 2010

We reconstructed the township-level population data for identifying shrinking cities in China. The fifth and sixth Population Census of Mainland China, conducted by the National Bureau of Statistics (NBS) of China, were used to retrieve the tabulation of township-level population ("de facto" population not "hu kou" population) information (NBS 2000; Population Census Office under the State Council & Department of Population and Employment Statistics under the National Bureau of Statistics 2012). There were 43,536 and 50,518 township-level census units in 2010 and 2000, respectively. We geocoded the tabular records which generated the point feature class in GIS using Google Map API. Considering China's township-level administrative boundaries kept changing during 2000–2010 due to jurisdictional adjustment, we

[1]The information of Chinese cities from spatial entity dimension (urbanized areas) and functional dimension (e.g., functional urban areas) is not open in China officially, and we use the administrative cities as the study area and object of this paper. We admit that identifying shrinking cities using the cities defined from spatial entity or functional dimension is more feasible.

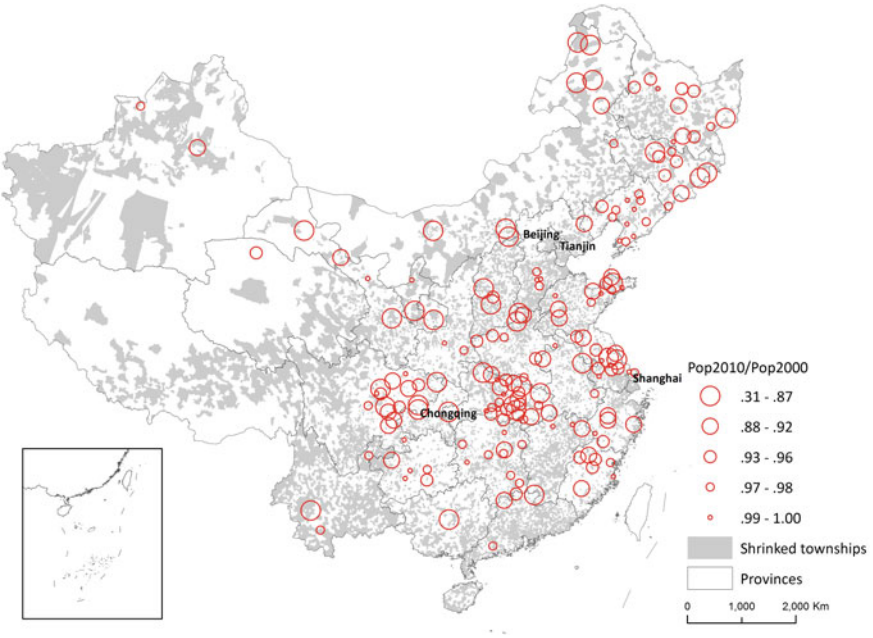

Fig. 1.1 Shrinking cities in China (2000–2010). Note: It should also be mentioned that the territorial population shrinkage is not only limited to the city proper scale, we identified that 4 provinces, 105 prefectures, 897 counties, and 19,822 townships are experiencing population shrinkage in China. In addition, 3,364 subdistricts (one type of townships) with a total area of 442,000 km^2 lost their population during 2000–2010. *Source* Long and Wu (2016)

adopted the township boundaries in 2014 (39,007 townships in total) for calculating population density in 2000 and 2010. This guaranteed the further comparison of population density between 2000 and 2010 (see Mao et al. 2016 for more details). We overlaid the township points with the township boundaries in GIS. Each township boundary was associated with at least one census unit in 2000 and 2010. Then the demographic data of 2000 and 2010 for each township were retrieved in order to calculate population density. The data of township-level population was then synthesized for 2000 and 2010. We found 19,882 among total 39,007 townships have population loss during 2000–2010. The total area of these townships was 3.24 million km^2, which is almost one-third of the total territory of China (see shrinking townships in Fig. 1.1). These shrinking townships are located in both rural and urban areas.

1.3.3 Master Plan Texts and Online Survey

We also gathered additional information for an in-depth understanding of Chinese shrinking cities. Via web crawling for official websites, we collected master plans of 64 cities, which accounted for a large portion of total shrinking cities identified by us. To have a deep understanding of present research conditions of shrinking cities in Chinese planning academia and practice, we conducted an online survey. Most interviewees of our survey were scholars, planners, and planning school students.

1.4 Identification and Classification of Shrinking Cities in China

1.4.1 Identifying Shrinking Cities

At the first step of this study, we identified shrinking cities during 2000–2010 in China. We referred to SCIRN's definition of shrinking cities for identification. According to the definition, a shrinking city is a city meeting the following criteria: (1) with having a total population of 10 thousand or more, (2) witnessing the population loss for more than 2 years, and (3) experiencing structural economic crisis (Wiechmann 2007). Considering the fact that we do not have access to the data for describing economic crisis, which is uncommon and even secret in China, we took the former two criteria to identify shrinking cities in China.[2] Using population census at the township level in 2000 and 2010, the population variation between 2000 and 2010 of each city's proper area (*shi xia qu*) was calculated.[3] Note that we are using the boundaries of city proper, rather than the metropolitan areas (*shi yu*), which include both city proper and counties (if any), of all Chinese cities in 2014 for calculating the population variation within each city proper to avoid the issue of spatial adjustment of city proper in China. The spatial adjustment of city proper makes it not easy to compare the population of a city from the same boundary. Employing fine-scale (e.g., the township level rather county or district level) population data for calculating the population totals within an adjusted city proper boundary during a historical period is a better solution for identifying shrinking cities in China. In addition, since we are using "de facto" population, rather than hukou population, floating population are also accounted in our analysis. Totally, 180 shrinking cities out of all 653 cities were identified, including one provincial capital city, 39 prefectural-level cities, and

[2] As what we have mentioned in Sect. 1.4.3, almost all identified shrinking cities in China have experienced increased economy during 2000–2010. Therefore, it is not feasible to incorporate economy factors into the identification of shrinking cities in China at the current stage.

[3] We admit that the inconsistent between spatial entity of a city and the administrative area of a city (city proper). Generally, a city proper contains several natural cities if we refer to the USA or EU definition on a city. In this paper, we do not challenge the definition of a city in China and still use the administrative-oriented city proper.

140 county-level cities (Fig. 1.1). The whole list of these shrinking cities is available at the website of Beijing City Lab.[4] The identified shrinking cities distribute widely across China and are not limited to a specific region like northeastern China or central China. We find that most shrinking cities are small- to medium-sized cities. The potential causalities of shrinking cities will be discussed in Sect. 1.4.2.

1.4.2 Classifying Shrinking Cities

For better understanding of the 180 shrinking cities in China, we classified them mainly by two dimensions, cause and spatial patterns. Four types of shrinking cities were identified regarding causes. (1) Resource-based cities that were facing resource depletion or severe devaluation of their main product. For example, Yumen in Gansu Province and many others in Northeast China fell into this pool. These cities generally experienced more drastic shrinkage than others during 2000–2010 and have received extensive attention from the central and local governments. (2) Cities in less-developed areas, which took a large share of shrinking cities in China. Most of these cities are located in mountainous western China where mass population migrated to the eastern coastal China since 1980s, e.g., Sichuan, Guizhou, and Fujian. In the recent years, there are also extensive media reports and journal papers (mainly in Chinese and therefore not cited here) in the recent several years revealing that these migrants are floating back to these cities, which are to be carefully examined by the 2020 population census. (3) Industrial cities which experienced painful economic transition, manifested by high unemployment and social unrest. Leshan in Sichuan Province and Loudi in Guizhou Province are examples. Some cities in southeastern coastal provinces also fall into this category. (4) Shrinking cities due to spatial administrative adjustments like Wuzhong and Guyuan in Ningxia. These cities have annexed more rural areas in the spatial adjustments, and these new areas have experienced population shrinkage during 2000–2010. This thus makes the newly formed cities to fall into shrinking cities. This type of shrinking cities may be termed as "man-made shrinking cities in China."

Given the spatial pattern, two types of shrinking cities were identified. (1) Reversed doughnut shrinking cities (Fig. 1.2a), which is in contrast to the doughnut shrinking cities in the USA. These cities had experienced population loss in their outskirt areas and population densification in their core areas. Some typical examples were Zhangye, Wuwei, Huai'an, Guang'an, and Suining. (2) The second type is the cities with a homogeneous spatial population shrinkage like Guyuan, Dingxi, and Qingyang (Fig. 1.2b). Perforated shrinking cities, which are common in Europe, did not manifested in China.

Considering that almost all cities in China were not associated with declining economy during 2000–2010, we did not take the economic factors into our consideration of classification.

[4]For more information, please visit https://www.beijingcitylab.com/ranking/.

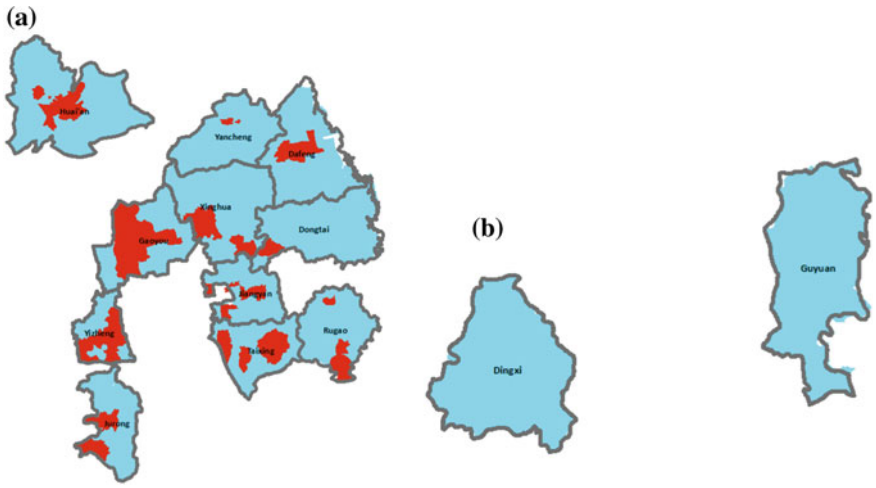

Fig. 1.2 Two types of shrinking cities in terms of morphology. *Note* Red denotes population increasing and blue for population decreasing. The grey boundaries are for the city proper

1.4.3 The Unique Characteristics of Shrinking Cities in China

Chinese shrinking cities have some unique characteristics that are not similar to their counterparts in developed countries. First, China has a large number of shrinking cities, 27.5% of all cities in China. These shrinking cities are located across the whole country. Second, almost all shrinking cities have experienced rapid urban expansion during 2000–2010, which contrast with the depopulation experience and their counterparts in developed counties. Third, the proportion of depopulation of Chinese shrinking cities is much lower than their counterparts in developed counties. A total of 134 shrinking cities in China are associated with less than 10% depopulation loss during 2000–2010. Fourth, most shrinking cities have experienced economic growth during their depopulation process. These cities may fall into the transition areas classified by Wiechmann and Pallagst (2012). Therefore, the four unique characteristics suggest that it is necessary to study shrinking cities in China add to global literature for enriching the related urban theories.

1.5 The Paradox of Planning for Shrinking Cities in China

Predominated by the growth-oriented paradigm, pursuing urban expansion and fiscal revenue, as well as economic growth has become the exclusive value of China's local authorities. Thus, regardless of population loss, Chinese shrinking cities also adopt the growth-oriented paradigm and therefore yield two paradoxes. First, although

keeping losing population, their built-up areas continue expanding. Second, in contrast to the population loss, most shrinking cities' master plans project population growth in the future.

1.5.1 The Institutional Paradox

After the "reform and opening-up," China's grand marketization transition has triggered a series of subordinate reforms, in which the 1994 tax reform and land marketization have largely contributed to the growth-oriented paradigm. The 1994 tax reform created a large gap between local governments' revenue and expenditure, which subsequently galvanized local authorities' incentives to lease out the urban land. Lin and Yi (2011) have presented the sophisticated context and background of the 1994 tax reform. Before the reform, the central government had to negotiate a "lump-sum" remittance with the local governments annually as "fiscal contract." Before the tax reform, the fast-growing economy was accompanied with a drastic inflation, both of which forced the central government to request more remittance from local governments to fulfill the former's escalating expenditure. However, many local governments resisted such request, and therefore the central government had to compromise with the amount of remittance. Insufficient revenue led to central government's fiscal hardship between the late 1980s and the early 1990s. Aiming to solve this problem, the central government inducted a new tax system named "tax sharing," which separated all Chinese taxes into three categories: central government's tax, local governments' tax, and shared tax. The tax reform eliminated the negotiation process and drastically increased the central government's share in total governmental revenue. According to a World Bank Study (2002, p. 16), the central government's share in total governmental revenue has increased from 22.0% in 1993 to 55.7% in 1994. Nonetheless, the governmental expenditure structure has not been changed. Thus, the new tax system transferred the financial hardship from the central government to local governments. In order to deal with the hardship, local governments have to expand the extra-budgetary funds, including the state-owned land leasing fee, which takes the largest share of its kind (Holzer and Zhang 2004).

On the other hand, during the economic transition, urban land has been gradually commercialized. Although the land marketization process does not change the urban land's state-owned tenure status, it has commercialized its use right by creating "state-owned land leasing system," which subsequently generated a large amount of leasing fee and boosted local economy through emerging developers. Before 1998, local governments transferred most of the state-owned land's use rights to state-owned enterprises through negotiation or administrative allocation, and state-owned enterprises utilized most of the land to provide their employees with welfare housing (Wu 2001). It was not until 1998 when the central government canceled governmental and state-owned enterprises' welfare-housing programs that the urban land leasing market was finally established, and soon the real estate market started booming. The cancelation of welfare housing coincided with China's rapid urbanization growth that

millions of new urbanized residents have switched to the real estate market to seek residence. Booming real estate market successfully attracted large sums of developers to engage in urban land leasing auctions, which have generated massive revenue for local governments and have largely covered the aforementioned gap between local governments' revenue and expenditure. This process has been interpreted as the "second capital circulation" from the Neo-Marxism perspective (Harvey 1978) that the growing fixed asset investment has become the major momentum of local economy.

Moreover, new cadre promotion system becomes another major incentive for China's urban expansion. The grand economic reform has changed the Chinese governmental officials' evaluation criteria from political conformity to a package of new features including good education, good local economic performance, and expertize in the specific sector. Li and Zhou (2005) have demonstrated that local economic performance is the most influential factor for governmental officials' political prospect. Under the fierce competition, municipalities have tried various ways to maximize the local economic growth, among which urban land expansion and its related industries have played an important role. Therefore, a great amount of fiscal revenue, a substantial GDP growth rate, and the bright political prospect come together to induce local governmental officials' obsession on urban land expansion, and to push themselves to engage in the land development process (Lichtenberg and Ding 2009).

However, the government officials' frantic desire for urban land development has to be authorized through the legitimate urban plans. This gives rise to the booming industry of urban planning in China. In contrast to the role of curbing irrational urban development in the Western world, Chinese urban planning has served as the facilitator of urban expansion (Wu 2015). Additionally, threatened by unemployment and salary cut, China's urban planners voluntarily evade from the plan-making process and became the pure executors of governmental officials' decision (Zhang 2002). However, China's legislations confined planners' discretion by requiring a higher level government to approve some important urban plans from a lower level government. Thus, many Chinese urban planners have defined themselves as "technicians", whose job is to specify governmental officials' vision through a series of ostensibly "reasonable" blueprints.

Among multiple urban plans in China, the urban master plan has the largest influence on shaping a city's future urban landscape. It designates a city's future pattern of land use, as well as a city's major economic and political function in the region and the large urban agglomeration. Besides, a city's urban master plan also guides many related plans. For example, according to the Land Use Administration Law, a city's urban master plan guides its overall land use plan, which authorizes the maximum amount of land that a city can develop in the near future (National People's Congress 2004). This also means a city's urban master plan can indirectly determine the annual amount of land that can be converted from agricultural to urban, namely, "land quota," which closely related to the amount of land fiscal and fixed asset investment (Ding 2003). In this respect, China's urban master plan and many other related plans have become the most important media for local authorities to

pursue fiscal revenue, economic growth, and personal gain. Therefore, under local authorities' pressure, even shrinking cities have planned for urban space expansion.

1.5.2 The Technological Paradox

Although some legislations and regulations have confined planners' discretion, their effectiveness is still at stake under the growth-oriented paradigm. The "Urban Land Use Classification and Planned Built-up Land Standard" normalizes the urban master plan process via mandating that a city's planned built-up area should be closely related to the projected future urban population, which is hovering around 10,000 residents per square kilometer. Under the growth-oriented paradigm, urban planners are in favor of a large number of projected population to justify the exaggerated planned built-up area. However, restrained by the regulation, Chinese planners are facing with a problem about projecting future population in shrinking cities. Fortunately, some Chinese planners have found certain loopholes in the population projection process, which can be utilized to meet both the regulations' standard and local authorities' expectation.

The first loophole is the data problem of population projection. In China, various governmental entities keep releasing differentiated demographic data, in which the "de facto" population and the hukou population are the most common demographic data for planners (Chan 2007). The National Population Census, starting from 1953, is the largest socioeconomic census in China. The Census publicizes data that includes the "de facto" population with the definition that the residents who have lived in an area for more than a half year. The data of "de facto" population has been praised for its accuracy and reliability, whereas many planners criticized that the interval between two censuses (10 years) is too long. In many cases, the census data is out of date when planners are projecting the city's future population. On the other hand, the hukou population means the number of residents who have registered in a specific, exclusive municipality's Public Security Bureau. Therefore, local municipalities can acquire the information of hukou population from the Public Security Bureau at any time. In most cases, a jurisdiction's hukou population is published annually in the jurisdiction's yearbook. In contrast to the long interval of "de facto" population survey, the data of hukou population can be more up-to-date on planners' request. However, a large amount of "floating population" impairs the hukou population data's accuracy. In China, large and megacities establish a very high threshold for newcomers to migrate their hukou from former residence to current residence (Chan and Zhang 1999). Those newcomers who cannot reach the threshold thus become the "floating population," since their hukous are not in the same place as themselves. China's grand urbanization process has created a binary opposition that prosperous cities and shrinking cities have differentiated discrepancies between hukou population and "de facto" population, respectively. Most prosperous cities have a great amount of "floating population" that their "de facto" population exceeds the hukou population a lot. In contrast, many shrinking cities' former residents have

migrated to elsewhere while their hukous remain there, thus these cities' hukou population exceeds their "de facto" population a lot. Although the "Urban Land Use Classification and Planned Built-up Land Standard" has stipulated that the projected population should be "de facto" population, it does not stipulate the base population for projection. Therefore, some shrinking cities' planners adopted the hukou population as base population for projection, since it is more up-to-date, and more importantly, it is larger than the "de facto" population.

The second and more problematic loophole lays in the mismatch between the demographic data boundary and the planned built-up area boundary within a city's urban master plan. The demographic data boundary is consistent with the jurisdictional boundary, while the built-up area boundary usually differs a lot with any jurisdictional boundaries. According to the Urban and Rural Planning Law (2007) and Measures for Formulating City Planning (2005), all urban and rural plans are only eligible within the "planned area," which is a combination of the planned built-up area and some other crucial areas that require planning control. Regarding urban master plan, its major "planned area" is the future "central urban area," which is usually consisted of the current "central urban area" and a buffer zone that is designated as the urban expansion area. However, in most cases, neither the current "central urban area" nor the future "central urban area" matches with any jurisdictional boundaries, and thus planners have to estimate the number of residents that live within the two boundaries.

Because of these loopholes, it is very difficult for the higher level government authorities to check the correctness of population projection within the lower level government's urban master plan. In addition, the population projection is problematic not only with the base population data but also with the projection method. In the urban master plan, the land use layout is the most pivotal part that presents the planned built-up area and relates to the aforementioned local fiscal revenue and economic growth. Therefore, the growth-oriented paradigm generates another paradigm, effectively the blueprint-oriented paradigm, in which local authorities and planners prioritize the land use layout as the foremost section within in an urban master plan. Thus, although the "Urban Land Use Classification and Planned Built-up Land Standard" commands planners to project the future population before to calculate the area of future "central urban area" according to the number of projected future population, the actual process is usually the opposite that planners use the planned built-up area to back calculate the future population. Afterward, in order to justify the back-calculated population data, planners use a variety of population projection methods that offer a broad range of interval to include the back-calculated population data. In some cases, in order to enlarge the base population for projection and to make the future of over-exaggerated population more justifiable, local governments would submit applications to upper level governments for annexing their contiguous districts and towns.

Moreover, the growth-oriented paradigm has incurred another two problems in shrinking cities' population projection process. First, how to deal with the exaggerated population projection in a shrinking city's former urban master plan. According to the Measures for Formulating City Planning (2005), planners should evaluate

the former urban master plan before making a new one. In most cases, because of the growth-oriented paradigm, planners will find out that a shrinking city's current population is less than the over-exaggerated population projection in the shrinking city's former urban master plan. Meanwhile, they will also find out that a shrinking city's current built-up area has reached or even surpassed the planned built-up area in the shrinking city's former urban master plan. Similar to their precedents, planners have to make a more exaggerated population projection to justify a larger planned built-up area in the new urban master plan for a shrinking city. Therefore, the growth-oriented paradigm has created an incremental fallacy in projecting shrinking cities' population that the discrepancy between real population and projected population is keeping enlarging. Second, how to deal with the exaggerated population projection in the upper level plans. According to the Measures for Formulating City Planning (2005), a city's urban master plan should rely on the upper level plans, including the national urban system plan and corresponding provincial urban system plan. However, under the growth-oriented paradigm, many provincial urban system plans have also projected over-exaggerated population for their subordinate cities. Therefore, under China's top-down governance regime and planning system, the over-exaggerated projected population has trickled down from provincial-level jurisdictions, to prefectural-level jurisdictions, to county-level jurisdictions, and even further to townships.

1.5.3 The Vicus Circle

In conclusion, China's growth-oriented paradigm has created a vicious cycle (Fig. 1.3) that enlarges the mismatches of the two interrelated paradoxes: shrinking population and growing urban built-up areas; and shrinking population and increasing population in the projection. The huge amounts of fiscal revenue from urban land leasing, as well as subsequent large amounts of fixed asset investment and GDP growth, have induced local authorities to maximize a city's future urban built-up area to pursue their own gain, e.g., a larger possibility of promotion. However, restrained by legislations and regulations, local authorities' pursuit of urban growth has to be released by urban plans and planners. Therefore, in contrast to the self-proclaimed market economy status, planning in China is still largely led by administrative mandate. Local authorities not only initiate the planning process but also supervise the process. Although urban planners are supposed to be the chief creators of urban plans, their actual roles are downgraded to the local authorities' command executors. Though it has been restrained by several regulations and legislations, because of its close relationship with the planned built-up area, the population projection process within a city's urban master plan has been deteriorated and becomes a pathetic media for urban planners to achieve local authorities' over-exaggerated urban visions. Using multiple problematic and vague methods, urban planners enlarge the result of population projection to justify the over-exaggerated

Fig. 1.3 The vicious cycle of urban planning in China

future urban built-up area, which has been designated by planners and local authorities in advance. Finally, triggered by local authorities' magnificent urban vision, the vicious cycle keeps pushing shrinking cities into the downward spiral and enlarging the aforementioned mismatches.

1.6 Discussion

1.6.1 Shrinking Cities in China's Growing Context

Overshadowed by the high-speed growth rate, Chinese shrinking cities are underrepresented, understudied, and underreported in the academia. This study has offered the academia with a new perspective into an unexplored territory of shrinking cities. Echoing Hollander (2011)'s study on shrinking cities in the US Sunbelt, this study has also revealed the unexpected phenomenon of shrinking cities in the similar fast-growing China and most of its urban agglomerations. At the national scale, both fast-growing urban agglomerations and shrinking urban agglomerations can be observed, while at the regional scale, shrinking cities and growing cities are coexisting in most of the China's urban agglomerations. Moreover, similar to the diverged population development scenarios of Chinese cities, heterogeneity also exists within Chinese shrinking cities. Resource-depleted cities, underdeveloped cities, deindustrialized cities, and administrative division adjusted cities are all subjected to urban shrinkage. The diversified causalities of Chinese shrinking cities offer the academia more abundant research objects to explore and to compare with their counterparts in and beyond the Western world.

1.6.2 China's Growth-Oriented Paradigm

The growth-oriented paradigm is an important platform to bridge the different contexts between Chinese shrinking cities and their Western world's counterparts. Triggered by the cadre promotion system, Chinese local authorities utilize the urban land leasing and development process to maximize their personal gains, which also pushes forward the "urban growth machine." Similar to Western world's urban regime that population growth is a critical benchmark for measuring the success of local authorities (Wiechmann and Pallagst 2012), urban shrinkage and economic decline are the two worst realities for Chinese local authorities and thus become stigmatized political taboos. The growth-oriented paradigm brings forward some specific problems in China's shrinking cities. One of the biggest differences in land development between China and most western countries lays in the land tenure system. China's state ownership of urban land excludes the property tax, which constitutes a major section of municipal revenue in the US and some other western nations. In contrast to the fact that American shrinking cities can accrue property tax as a major local fiscal revenue, China's shrinking cities stop spatial expansion, they will lose urban land leasing fee and related fixed investment, while no substitutions have been invented to compensate for that loss. Therefore, shrinking cities' mismatch between spatial growth and demographical shrinkage is keeping enlarging in China. On the other hand, Chinese planning and land development system remain a highly top-down paradigm that administrative orders overwhelm property market's role in restraining irrational momentum of urban expansion in dilapidated property market areas. Therefore, some shrinking cities' spatial manifestations, like urban vacancy and decreasing urban infrastructure efficiency, are emerging and becoming more conspicuous in Chinese shrinking cities than their counterparts who have same depopulation ratio in the Western world.

Appealing for a paradigm shift is a common pursuit of international shrinking cities scholars. For Chinese shrinking cities, the paradigm shift cannot be achieved without a top-down institutional reform. Tax reform, land leasing reform, property tax reform, and many other reforms that have relationship with the land development and planning system are still underway of China's grand socioeconomic transition. However, because of Chinese immature regime system, many remaining problems, including property rights, land tenure system, central–local relations, and potential stakeholders' conflicts, have impeded the further reforms and are worth of furthering studies.

1.7 Conclusion

In this paper, we have illustrated the overall picture of shrinking cities in China by identifying 180 shrinking cities among all 653 Chinese cities. These shrinking cities are further categorized into two sets of categories from different perspectives.

China's shrinking cities exhibited specific characteristics like large quantity, rapid urban expansion, inconspicuous depopulation level, and growing economic indicators. Compared with their counterparts in the developed countries, these unique characteristics of Chinese shrinking cities suggest the deficiency of corresponding studies. China's growth-oriented paradigm and related regime have created the aforementioned institutional paradox and technological paradox, which are very challenging to be reformed. Regarding Chinese shrinking cities' complicated situations and understudied status, we expect future research should reveal the specificities of different causalities and manifestations of China's shrinking cities from a finer spatial scale. Transnational comparisons between Chinese shrinking cities and foreign shrinking cities are also needed to help scholars to better understand the unique situation of Chinese shrinking cities and provide worthwhile strategies to reform Chinese planning and land development system. We also suggest experimental planning strategies to be applied to Chinese shrinking cities and subsequent evaluation of these strategies. In sum, China's shrinking cities are far from enough studies and corresponding strategies, and more efforts are needed to be done.

References

Bernt M (2009) Partnerships for demolition: the governance of urban renewal in East Germany's shrinking cities. Int J Urban Reg Res 33(3):754–769

Bernt M (2016) The limits of shrinkage: conceptual pitfalls and alternatives in the discussion of urban population loss. Int J Urban Reg Res 40(2):441–450

Bluestone B, Harrison B (1982) The deindustrialization of America. Basic Books, New York

Bontje M (2005) Facing the challenge of shrinking cities in East Germany: the case of Leipzig. GeoJournal 61(1):13–21

Chan KW, Zhang L (1999) The hukou system and rural-urban migration in China: processes and changes. China Quarter 160:818–855

Chan KW (2007) Misconceptions and complexities in the study of China's cities: definitions, statistics, and implications. Eurasian Geogr Econ 48(4):383–412

Ding C (2003) Land policy reform in China: assessment and prospects. Land Use Policy 20(2):109–120

Harvey D (1978) The urban process under capitalism: a framework for analysis. Int J Urban Reg Res 2:101–131

He SY, Lee J, Zhou T, Wu D (2017) Shrinking cities and resource-based economy: the economic restructuring in China's mining cities. Cities 60:75–83

Hollander JB, Pallagst K, Schwarz T, Popper FJ (2009) Planning shrinking cities. Prog Plann 72(4):223–232

Hollander JB (2011) Sunburnt cities: the great recession, depopulation and urban planning in the American sunbelt. Routledge

Holzer M, Zhang M (2004) China's fiscal reform: The issue of extra budgeting. J Public Budget Account Financial Manag 16(1):19

Jin X, Long Y, Sun W, Lu Y, Yang X, Tang J (2017) Evaluating cities' vitality and identifying ghost cities in China with emerging geographical data. Cities 63:98–109

Li H, Zhou LA (2005) Political turnover and economic performance: the incentive role of personnel control in China. J Public Econom 89(9):1743–1762

Lichtenberg E, Ding C (2009) Local officials as land developers: Urban spatial expansion in China. J Urban Econom 66(1):57–64
Lin GC, Yi F (2011) Urbanization of capital or capitalization on urban land? Land development and local public finance in urbanizing China. Urban Geograp 32(1):50–79
Logan JR, Molotch H (1987) Urban fortunes: the political economy of place. University of California Press, Berkeley, CA, USA
Long Y, Wu K (2016) Shrinking cities in a rapidly urbanizing China. Environ Plann A 48(2):220–222
Mallach A (2011) Comment on Hollander's "The bounds of smart decline: a foundational theory for planning shrinking cities". Housing Policy Debate 21(3):369–375
Mao Q, Long Y, Wu K (2016) Spatio-temporal changes of population density and urbanization pattern in China (2000–2010). China City Plann Rev 25(4):8–14
National People's Congress (2004) Land Administration Law of the People's Republic of China. http://www.npc.gov.cn/englishnpc/Law/2007–12/12/content_1383939.htm. Last accessed June 7, 2017
NBS (2000) The population census data for townships, towns and sub-districts of 2000. http://www.stats.gov.cn/tjsj/ndsj/renkoupucha/2000jiedao/jiedao.htm (in Chinese, last visited, February 7, 2017)
Pallagst K (2010) Viewpoint: the planning research agenda: shrinking cities–a challenge for planning cultures. Town Plann Rev 81(5):i–vi
Population Census Office under the State Council & Department of Population and Employment Statistics under the National Bureau of Statistics (2012) Tabulation on the 2010 Population Census of the People's Republic of China by Township. China Statistics Press, Beijing, China (in Chinese)
Rhodes J, Russo J (2013) Shrinking 'Smart'?: Urban redevelopment and shrinkage in youngstown. Ohio Urban Geogr 34(3):305–326
Rybczynski W, Linneman P (1999) How to save our shrinking cities. Public Interest 135:30–44
Rydin Y (2013) The future of planning: beyond growth dependence. Policy Press, Bristol, UK
Schetke S, Haase D (2008) Multi-criteria assessment of socio-environmental aspects in shrinking cities. Experiences from Eastern Germany. Environ Impact Assess Rev 28(7):483–503
Schilling J, Logan J (2008) Greening the rust belt: a green infrastructure model for right sizing America's shrinking cities. J Am Plann Assoc 74(4):451–466
Turok I, Mykhnenko V (2007) The trajectories of European cities, 1960–2005. Cities 24(3):165–182
UN DESA (2014) World urbanization prospects: the 2014 revision. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, New York. https://esa.un.org/unpd/wup/publications/files/wup2014-highlights.Pdf (last visited, February 7, 2017)
UN DESA (2015) World population prospects: the 2015 revision. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, New York. https://esa.un.org/unpd/wpp/publications/files/key_findings_wpp_2015.pdf (last visited, February 7, 2017)
UN-HABITAT (2008) State of the world's cities 2008–2009: Harmonious Cities. UN-Habitat
Wiechmann T (2007) Between spectacular projects and pragmatic deconstruction. The future of shrinking cities: Problems, patterns, & strategies of urban transformation in a global context. In: Conference on the Future of Shrinking Cities. Berkeley, CA, USA
Wiechmann T, Pallagst KM (2012) Urban shrinkage in Germany and the USA: a comparison of transformation patterns and local strategies. Int J Urban Reg Res 36(2):261–280
World Bank (2002) China: national development and sub-national finance: a review of provincial expenditures vol 3. World Bank, Washington DC, pp 106–107
Wu C, Zhang X, Cui G, Cui S (2014) Shrinkage and expansion in peri-urban China. In: Pallagst K, Wiechmann, Martinez-Fernandez C Shrinking Cities: International Perspectives and Policy Implications. New York, NY: Routledge
Wu F (2001) China's recent urban development in the process of land and housing marketisation and economic globalisation. Habitat Int 25(3):273–289
Wu F (2015) Planning for growth: Urban and regional planning in China. Routledge, New York, NY

Wu C, Zhang X, Cui G, Cui S (2014b) Shrinkage and Expansion in Peri-Urban China. In: Pallagst K, Wiechmann T, Martinez-Fernandez C (eds) Shrinking Cities: international perspectives and policy implications. Routledge, New York, NY

Zhang T (2002) Challenges facing Chinese planners in transitional China. J Plann Educat Res 22(1):64–76

Zhao P (2011) Managing urban growth in a transforming China: evidence from Beijing. Land Use Policy 28(1):96–109

Part II
Looking into Shrinking Cities from Regional Perspective

Chapter 2
A Multi-scaled Analysis of the Shrinking Population in a Region with Out-Migration: A Case Study of Hunan Province

Kai Zhou, Yan Yan and Fangfang Qian

Abstract Using the international "shrinking city" theoretical framework and China's Fifth and Sixth National Census data, this study conducted quantitative analyses regarding the shrinking population phenomenon at multiple geographical scales, from provincial to township, in Hunan Province in central China. From the statistically based analysis, three main types of shrinkage were identified at the county scale: "A hollowed-out labor force," wherein the population shrinks and the economy develops slowly in low-level urbanizing areas because of labor output;" Population take-over," wherein population outflow and the economy develop slowly in urbanizing areas affected by central cities nearby that develop rapidly; and " Resource degradation," wherein the economy declines in highly urbanized areas with a shrinking population. Furthermore, one case study was conducted to further reveal the details of the shrinking mechanism as well as the relevant policy responses.

Keywords Shrinking cities · Out-migration · Multi-scaled analysis · Hunan Province · Central China

2.1 Introduction

With the slowing down of the global economy, studies investigating the concept of the "shrinking city" (SC) have raised concerns regarding the view that growth is the only path to development (Rieniets 2009). Those cities and regions that have suffered population and economic decline in the last century have become examples with which to explore alternative methods for sustainable urban development in no-growth environs (Leo and Brown 2000; Savitch and Kantor 2003; Camarda et al. 2015; Wiechmann and Bontje 2015). Literature on SCs and their urban policies in the last decade started by defining the concept of the SC to create a common ground for discussion (see Fig. 2.1) (Häußermann and Siebel 1988; Haase et al. 2014; Großmann et al. 2013; Beauregard 2007, 2009; Freixas and Fernandez 2014;

K. Zhou (✉) · Y. Yan · F. Qian
School of Architecture, Hunan University, Changsha, China
e-mail: zhoukai_nju@hotmail.com

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_2

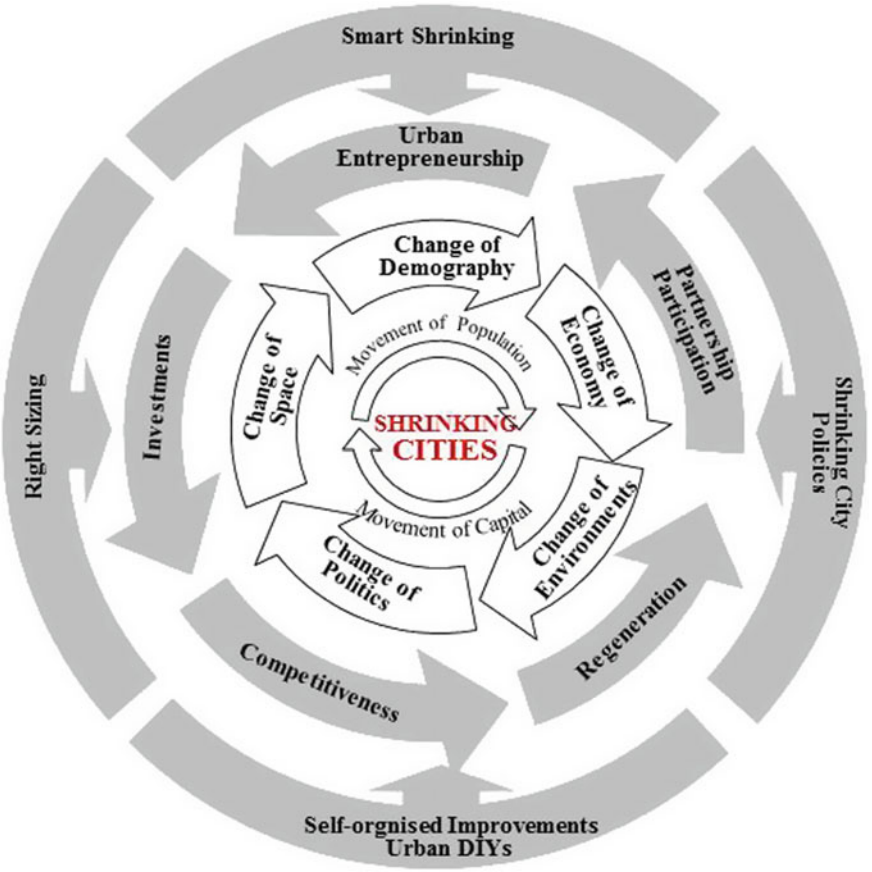

Fig. 2.1 The shrinking city research framework

Hollander and Németh 2011; Bernt et al. 2014; Audirac et al. 2010). Then, following the natural logic of shrinkage, researchers have contributed valuable findings about the "phenomenon," "causality," "mechanism," "typology," and "consequences" of urban shrinkage. Recently, a number of papers have examined policy strategies and planning responses as operational methods to react or adapt to shrinkage (Häußermann and Siebel 1988; Haase et al. 2014; Großmann et al. 2013; Beauregard 2007, 2009; Freixas and Fernandez 2014; Hollander and Németh 2011; Bernt et al. 2014; Audirac et al. 2010; Martinez-Fernandez et al. 2012a; Bontje 2001; Pallagst 2005; Turok and Mykhnenko 2007; Wiechmann 2008; Hollander et al. 2009; Schilling and Logan 2008).

Ever since the SC concept was first introduced to the academic community, researchers around the world have contributed case studies to reveal context-based (but similar) examples of population decline in city development. They started with old industrial cities like Manchester and Birmingham in the United Kingdom, and then moved toward much larger scaled deindustrialization cases in the northeast United States. While German and East European SCs resulted from political change, isolated cases in Japan and West European countries occurred because of a very complex situation involving globalization, aging populations, resource degradation, deindustrialization, and technological innovations. More recently, studies of SCs in Russia and Northeast Asia have shown a belt of abandoned urban habitats along the old Silk Road. Despite the prevalence of SCs, few studies have investigated the SCs of inland China, although this area has been clearly marked as an area of population decline in the world map of shrinking cities (2005–2015) produced by Oswalt (2005) in the book "Shrinking City."

Despite radical growth in China's coastal metropolises, many cities and inland regions have endured continuous population loss in recent decades (Wu et al. 2015). With reference to international SC theory, which developed from cases in North America (Freixas and Fernandez 2014; Hollander and Németh 2011), Eastern Europe (Häußermann and Siebel 1988; Haase et al. 2014; Großmann et al. 2013; Beauregard 2007, 2009; Freixas and Fernandez 2014; Hollander and Németh 2011; Bernt et al. 2014; Audirac et al. 2010; Martinez-Fernandez et al. 2012a; Bontje 2001; Pallagst 2005; Turok and Mykhnenko 2007; Wiechmann 2008; Hollander et al. 2009; Schilling and Logan 2008), Japan (Martinez-Fernandez et al. 2012b), and the United Kingdom (Bernt et al. 2014), Chinese researchers now focus on revealing the situation, process, and mechanism of population shrinkage in Chinese cities. Their studies have claimed that uneven investment, out-flowing migration, changes to the global market, and resources depletion may be the reasons behind urban decline, even in China's period of rapid urbanization (Yang et al. 2013; Wang et al. 2014; Mao et al. 2015).

This chapter seeks to include a case study of Hunan in the international comparative study of SCs around the world. This province is a typical example of a central Chinese region, whereby population shrinkage is occurring within a process of rapid urbanizing. In recent decades, ambitious local governments (which have been very proactive in their attempts to reboot the economy despite issues surrounding environmental costs and sustainability) have worked hard to redevelop the "ghost towns" and "empty districts" in SCs in Hunan. To disentangle the problem of population decline in an era of rapid urbanization, this chapter first starts with a quantitative description of Hunan's demographic change and its spatial pattern at province, prefecture, and county levels. To follow, three counties were selected for an in-depth examination to reveal stories of decline as well as various policy responses at the local level.

2.2 Population Shrinkage in Hunan

Hunan Province is located in central China. In comparison to the economy of China's southeast coastal regions, it is a relatively underdeveloped region. In terms of GDP, it ranked 10th of 31 provincial administrations in 2010. Furthermore, since the start of China's boom period in 1979, Hunan Province has been considered a major supplier of labor. More than 6.5 million workers from the region traveled to coastal provinces like Guangzhou for work during 2000–2010. At the same time, the province has enjoyed significant urbanization, with its urbanized population growing from 29.8 to 49.4% between 2000 and 2010. However, that period also marked the start of the trend of population decline and this has become a main issue for local authorities in Hunan.

Using data from 2000 and 2010 national censuses, a map of demographic change in Hunan at a district/country level (on average, 20,000 population per unit) was produced (see Fig. 2.2). This map shows 1,727 districts/countries, and approximately 61% of these experienced a decline in population during the 10-year period. The map shows that the population surrounding the cities is also shrinking. Population shrinkage is obvious in this rapidly urbanizing province, as are the growth of some cities and the decline of others, and both are occurring at the same pace. To fully understand Hunan's shrinking population map, a multi-scaled analysis was conducted in which demographic change was further explained with other social and economic data using various geographical scales and administrative divisions.

2.3 History of Demographic Change and Trends

At the province level, the history and projection of demographic change provide necessary background information (see Fig. 2.3). Between 2000 and 2010, Hunan benefited from its "demographic dividend," with an abundant labor force and high labor allocation efficiency. Even after more than 6.5 million workers left the region for work (the dark gray area in Fig. 2.3), Hunan's total population still increased by 3.8%, and the working-age population (aged 15–64) increased by 3.15 million (the light gray area). Thus, despite the large out-migration, Hunan's urban population (the slash area) grew from 29.8 to 43.3% in this period. This develops trend continued in 2010–2015. However, as a consequence of the enforcement of China's one-child policy in the 1980s, Hunan's total population growth began to slow (see Fig. 2.4), foreshadowing a shrinking of the labor pool, which is already occurring according to recent statistics.

At the same time, the provincial government expects that the total population will reach about 78 million by 2020 (the upper dash-dot line in Fig. 2.3), while a mathematical model projects a smaller increase (68 million) (the upper dash-dot line). Therefore, Hunan's urbanization process in the next decade (targeting 58%, see Fig. 2.3) is expected to be driven by either further in-situ urbanization or the

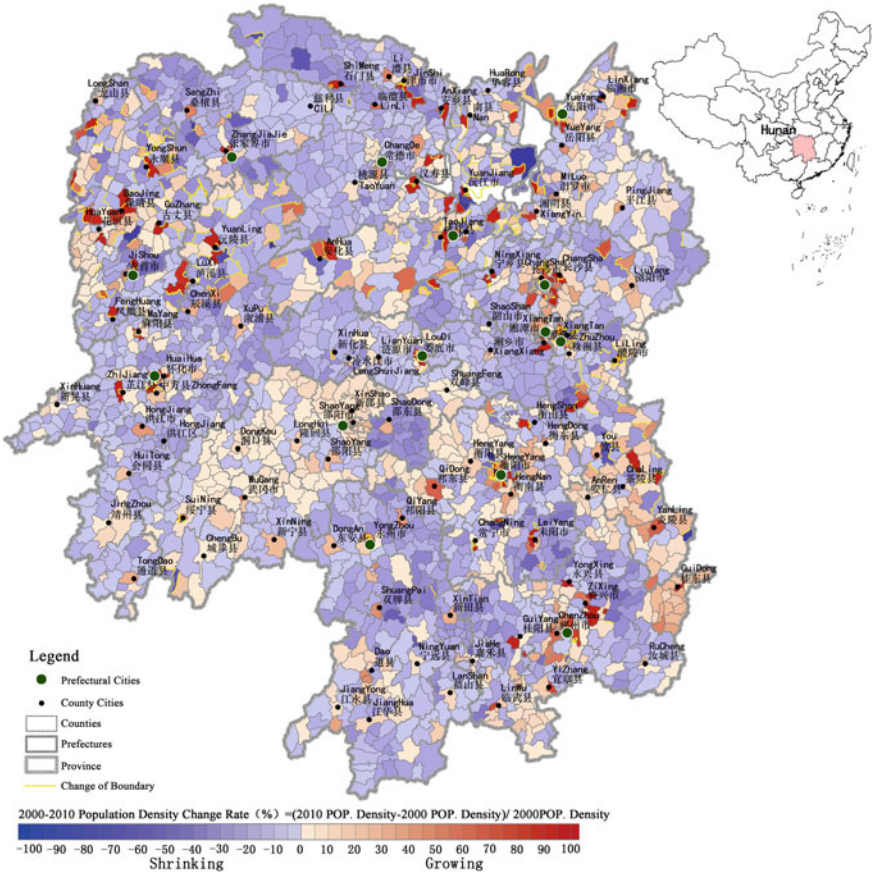

Fig. 2.2 Map of Hunan's shrinking population at the township level, 2000–2010

possible return of workers, which could exacerbate population shrinkage in some bordering areas.

This expectation of growth is better explained in a prefecture-level analysis.[1] According to census data, only the provincial capital city (Changsha) enjoyed double-digit population growth between 2000 and 2010. The total population of all 14 prefectures grew by 3.8%. However, this figure is expected to reach 19.84% between 2010 and 2020 by adding together the population projections included in the local government's urban master plan (see Table 2.1). Despite the growth rate being generally low (even negative) in the last decade, many prefectures are planning for growth to meet the so-called land finance requirements, in which local governments have placed a heavy reliance on land-leasing revenues in recent decades. This practice has

[1] Prefecture-level cities in the context of China refer to administrations under provincial government that govern not only urban areas and surrounding counties but also rural areas within their boundary.

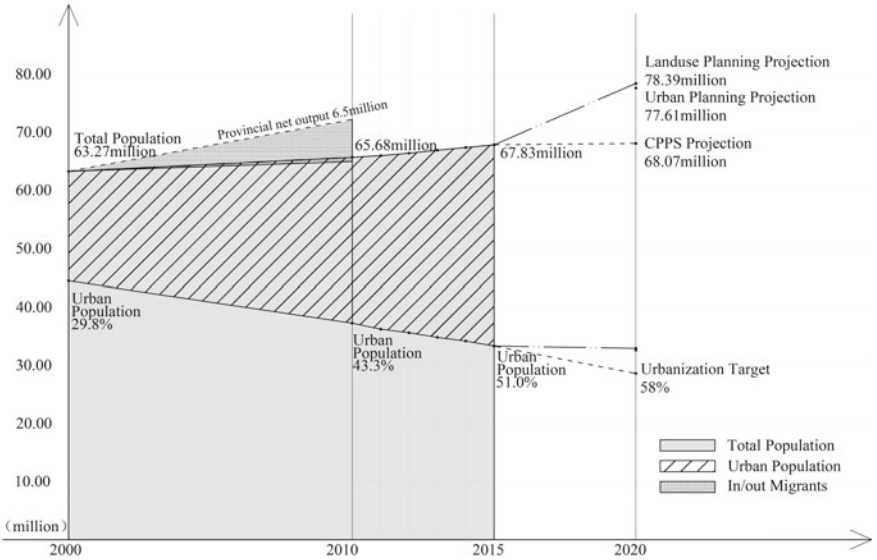

Fig. 2.3 Hunan's urbanization pathway and projection

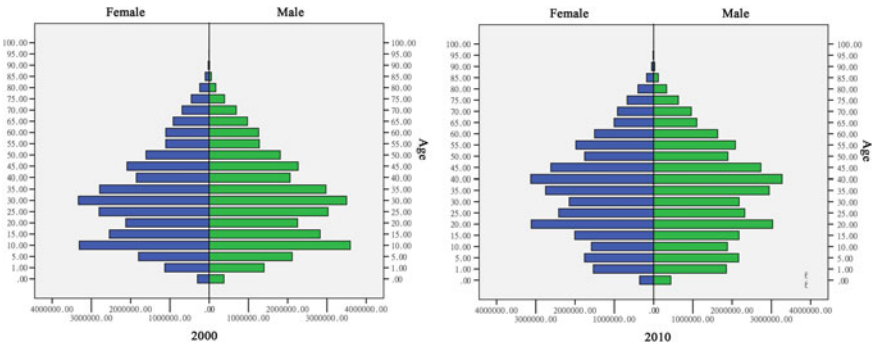

Fig. 2.4 Age structure change in Hunan (2000–2010)

attracted widespread criticism because of the various potential risks and problems. Such a mismatch between a high growth expectation and shrinking population has led local governments to overinvest in urban infrastructures, creating a number of ghost towns, empty industrial parks, and "depressed shopping streets," as well as large local government debts.

Table 2.1 Population change and projections for prefectures in Hunan (million)

Prefectures	2000	2010		2020 urban master plans	
	Population	Population	Growth from 2000 (%)	Projection	Growth from 2010 (%)
Changsha	6.14	7.04	14.7	10.00	42.0
Zhuzhou	3.58	3.86	7.8	4.25	10.1
Xiangtan	2.67	2.75	3.0	3.40	23.6
Hengyang	6.78	7.15	5.5	7.60	6.3
Shaoyang	6.96	7.07	1.6	8.20	16.0
Yueyang	5.01	5.48	9.4	5.90	7.7
Changde	5.74	5.71	−0.5	6.70	17.3
Zhangjiajie	1.49	1.48	−0.7	1.72	16.2
Yiyang	4.31	4.31	0.0	5.00	16.0
Chenzhou	4.32	4.58	6.0	5.05	10.3
Yongzhou	5.37	5.19	−3.4	6.36	22.5
Huaihua	4.64	4.74	2.2	5.75	21.3
Loudi	3.78	3.78	0.0	4.55	20.4
Xiangxi	2.46	2.55	3.7	3.13	22.7
Total	6.33	6.57	3.8	7.76	18.2

2.4 Identification and Classification

At the county level,[2] an analysis that combines demographic census data with socioeconomic data could help to further identify shrinking administrations and reveal a possibly exhaustive set of shrinkage categories.

To identify shrinking administrations, counties with shrinking population and working-age population have been mapped (see Fig. 2.5), and density data were also included to eliminate the possible influence of changing boundaries. Of the 101 county-level administrations, 44 have experienced population shrinkage, 33 a decline in their working-age populations, and 45 have faced a decline in population density. Similarly, 36 counties experienced a decrease in working-age population density. For 31 counties, the synchronized shrinking of all four categories of census data are a result of the migration of labor force, which means the aging issue has not been a major cause of population decline, to date. Therefore, the working-age population was chosen as the index for demographic change at the county level.

In Hunan between 2000 and 2010, a three-dimensional index was used to classify the shrinking counties: (1) population change (i.e., working-age population), (2)

[2]County-level cities refer to administrations under the prefectural government that governs surrounding towns and rural areas within the boundary.

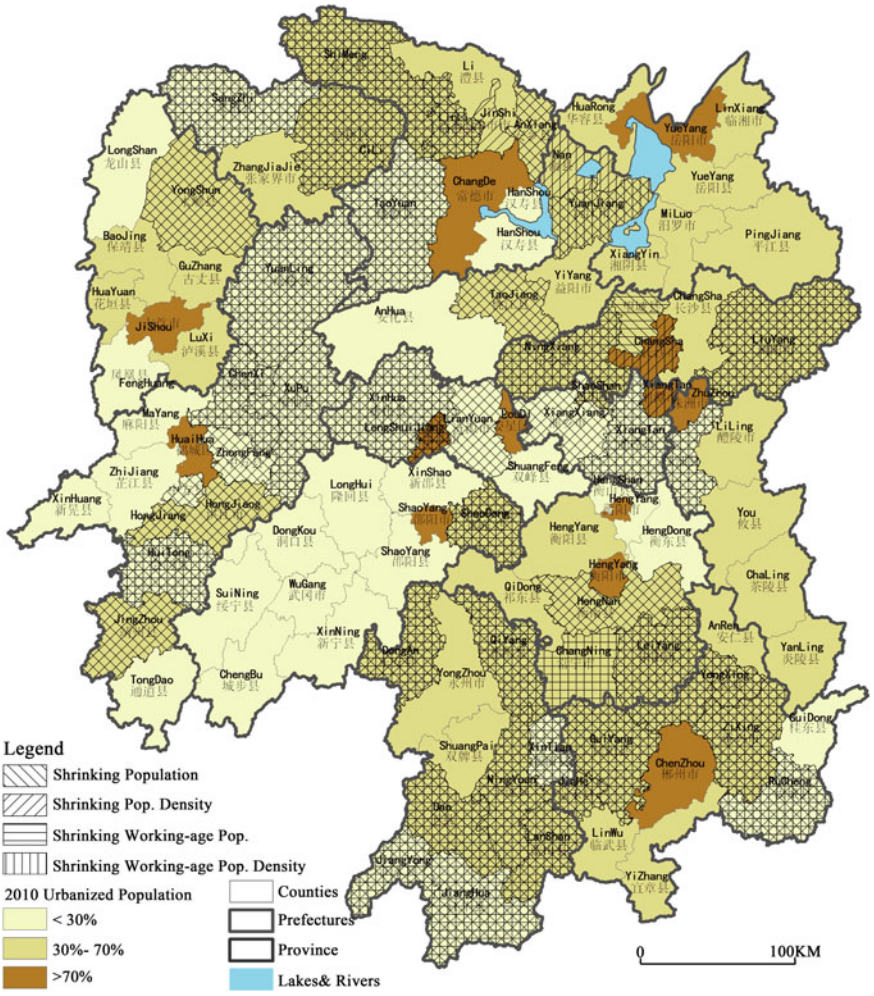

Fig. 2.5 Population shrinkage and urbanization rates of counties in Hunan

economic status (i.e., GDP growth rate compared with the provincial average), and (3) urbanization phrase (i.e., achieving urbanization rates of 30 and 70%) (see Table 2.2).

Looking at all 101 counties (see Fig. 2.6), three types of shrinking administrations were identified: (1) "A hollowed-out labor force," wherein the population shrinks and the economy develops slowly in low-level urbanizing areas because of the loss of the labor force to other areas, for example, Taoyuan (桃源县), Rucheng (汝城县), Xupu (溆浦县), Dongkou (洞口县), Wugang (武冈县), and Huitong (会同县); (2) "Population take-over," whereby in an area that previously enjoyed strong urbanization, a proportion of the population migrates to other areas and the economy slows down because of competition from nearby cities, for example, Shaodong (邵东县),

Table 2.2 Cross-tables of population shrinkage and urbanization, and GDP growth in counties in Hunan, 2000–2010

Working-age population change	Pre-urbanization <30%	Urbanizing 30–70%	Urbanized >70%	Economy growth high	Economy growth average	Economy growth low
Severe shrinking <−10%	–	Shaodong, Wangcheng, Qiyang, Shimeng	–	Shaodong	Wangcheng, Shimeng, Qiyang	–
Minor shrinking −10 to −5%	Taoyuan, Rucheng, Xupu, Xiangtan, Zhuzhou, Shangzhi, Xintian, Jianghua, Xinhua	Shaoshan, Guiyang, Jiahe, Dao, Ningyuan, Ningxiang	–	Taoyuan, Rucheng, Xupu	Xiangtan, Zhuzhou, Shaoshan, Shangzhi, Guiyang, Jiahe, Dao, Ningyuan, Xintian, Jianghua, Xinhua	Ningxiang
Stagnation −5 to 5%	Dongkou, Wugang, Huitong, Xiangxiang, Hengyang, Hengshan, Longhui, Xingning, Anhua, Jiangyong, Yuanling, Chenxi, Xinghuang, Tongdao	Hengnan, Leiyang, Changning, Pingjiang, Anxiang, Li, Liling, Cili,Taojiang, Yuanjiang, Yongxing, Linwu, Zixing, Dongan, Shuangpai, Lanshan, Hongjiang, Yongshun, Liuyang	Lengshuijiang	Dongkou, Wugang, Huitong	Xiangxiang, Hengyang, Hengnan, Hengshan, Leiyang, Changning, Longhui, Xinning, Pingjiang, Anxiang, Li, Liling, Cili, Taojiang, Anhua, Yuanjiang, Yongxing, Linwu, Zixing, Dongan, Shuangpai, Jiangyong, Lanshan, Yuanling, Chenxi, Xinghuang, Tongdao, Hongjiang, Lengshuijiang, Yongshun	Liuyang

Note (1) Working-age population data are from the 5th and 6th national censuses; (2) Urban population data are from the "Hunan Statistical Yearbook 2011". (3) "Economic growth low" means that the GDP growth rate is more than 1 std. below the provincial average (13.9%), i.e., <10.3%; "Economic growth average" means that the GDP growth rate is between 1 std. above and below the provincial average (13.9%), i.e., 10.3–18.4%; and "Economic growth high" means that the GDP growth rate is more than 1 std. above the provincial average (13.9%), i.e., >18.4%

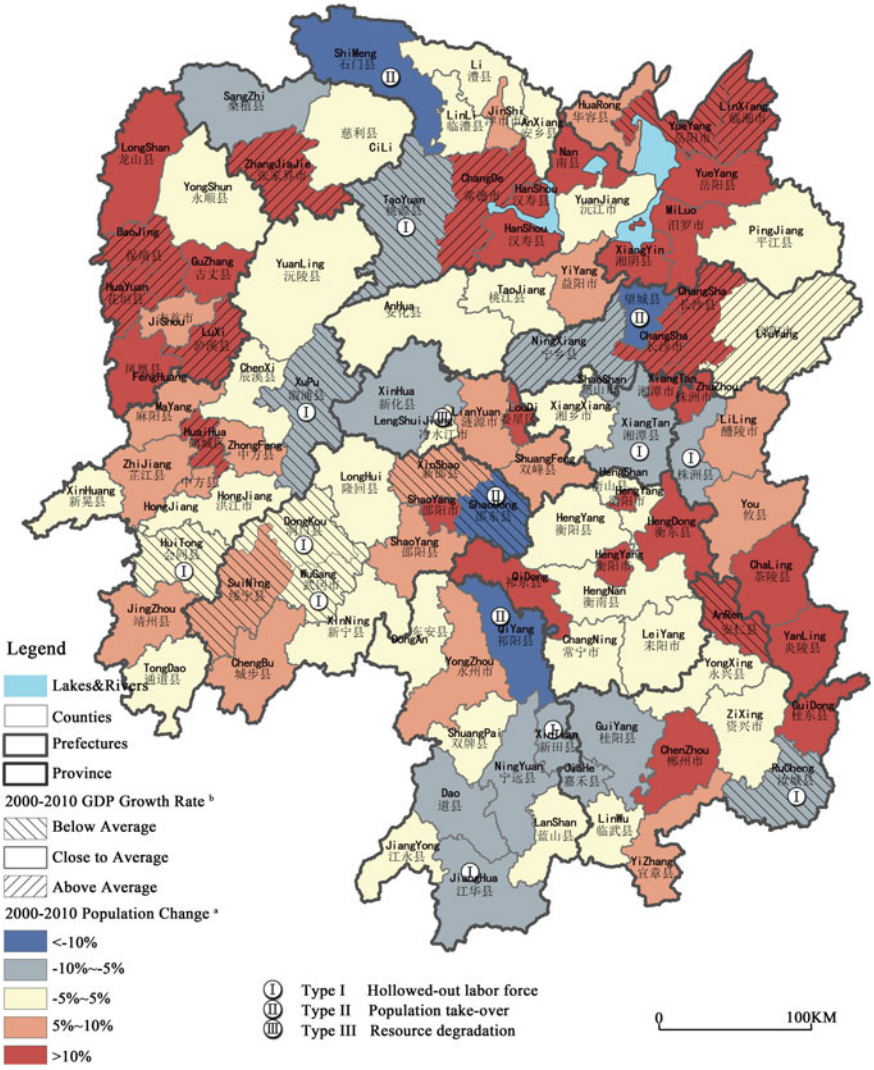

Fig. 2.6 Population shrinkage and GDP growth rates of counties in Hunan

Wangcheng (望城县), Qiyang (祁阳县), and Shimeng (石门县); and (3) "Resource degradation," wherein the economy declines in highly urbanized areas with a shrinking population, for example, Lengshuijiang (冷水江市).

Regarding the three types of shrinking administrations, one case study was conducted to further reveal the details of the shrinking mechanism as well as the relevant policy responses.

2.5 Case Studies

2.5.1 Taoyuan

Located in western Hunan, Taoyuan County is a typical agricultural-based inland administration with poor road access and weak economic conditions. With limited natural resources to exploit and a lack of investments from the outside, Taoyuan's economic development and its urban infrastructures sit far behind that of other counties in Hunan. Because of these backward conditions, the only solution to the poverty issue was to encourage people to find work outside the county. As a result, 18.94% of the registered population in Taoyuan was working outside the county as of 2010, which created a depopulated region with many shrinking towns and villages.

Local government's responses to the out-migration of the labor force have dramatically changed in recent decades. Between 2000 and 2010, workers were advised to seek employment outside the county, and this policy was considered an effective measure to fight poverty. The county government actually encouraged young people to move out of the area, even provided necessary job training for them, with the hope that their wages would increase the average household income. The government also hoped to develop a nationwide reputation for producing a high-quality workforce, with the expectation that the workers would return with their savings and technical expertise to develop their hometown. It was not until 2011 that the local government realized that out-migration would not necessarily boost local development. Despite best intentions, Taoyuan's "hollowed-out labor force" is now a major concern of policymakers, as the strategy has also resulted in numerous abandoned farmlands and broken social ties. Therefore, the development strategy has been reframed to include an awareness of population shrinkage to strengthen Taoyuan's own autonomy in economic and urban development.

Taoyuan's strategy is to target both the depopulation problem and its economic problem (see Fig. 2.7). On the one hand, to set local urbanization on track, the strategy aims to attract both urban inhabitants and tourists. The former relies on urbanizing the rural population and the return of migrant workers, for whom there are new housing developments in place. The latter is to promote tourism by marketing the natural environment using the region's name—Taoyuan (which is a well-known cultural metaphor for escapism and utopia in Chinese literature). However, the local economy is expected to be further driven by establishing labor-intensive factories or hi-tech businesses in an enterprise zone, as well as a new service sector with connections to eco-agriculture and tourism.

2.5.2 Shaodong

The inland county of Shaodong has also struggled in the past to address poverty in the region; however, when the concept of the market economy was first introduced, some

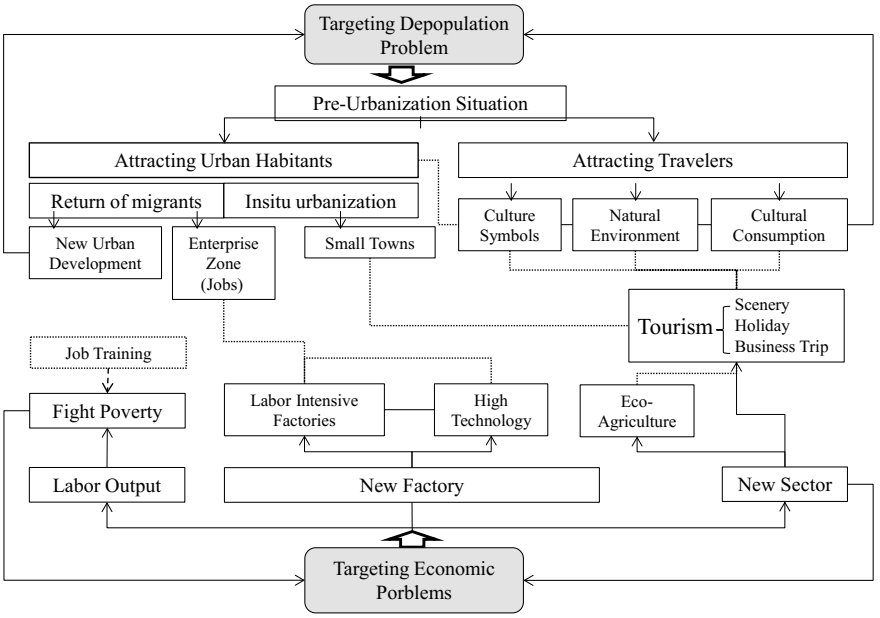

Fig. 2.7 Taoyuan's policy responses to a shrinking population

locals recognized the opportunities presented by China's reform and opening-up in the early 1980s. Local merchants starting purchasing and selling goods nationwide, and they were then able to create successful retail and wholesale businesses. At its peak in the 1990s, there were over 80 specialized trading centers in Shaodong, which were all built and managed by private investors. This resulted in high GDP and local government revenue in the 1980s and 1990s. At one stage, Shaodong ranked 5th in the province in terms of economic strength. With such remarkable economic achievements, this inland county was named the first "Experimental Zone for Development of Private Economy" (民营经济改革与发展试验区) in Hunan.

However, the market changed with the coming of the new millennium. First, an increase of politically powerful competitors with better road access, such as Changsha and Shaoyang (a prefectural city), soon took over Shaodong's business as well as its population. Second, the introduction of online shopping in China further accelerated the devastation of Shaodong's small commodity businesses. The number of registered vendors dropped from 6,800 in 1998 to 5,800 in 2002, and then to 150 in 2010. Shops were closed and the owners left the area with their employees, looking for business opportunities elsewhere. As a result, Shaodong's registered population living outside the county increased from 7.5% in 2000 to 34.7% in 2010, while the loss of the itinerant market workers has also exacerbated the situation.

Local government's responses to the change in the market can be categorized into three phases. First, between 2000 and 2005, efforts were made by local government to reclaim the region's business success by refurbishing, rebuilding, and reorganizing

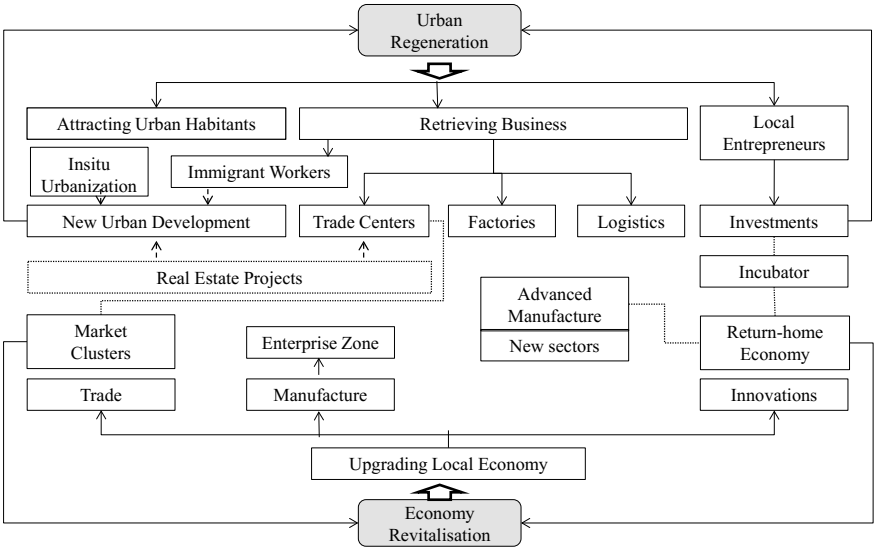

Fig. 2.8 Shaodong's policy responses to its shrinking population

existing trading venues with the hope that improvements to the physical environment (as well as the management standard) of the markets could once again attract business. Obviously, this attempt failed. Second, the local government's vision for urban regeneration was extended to include other aspects of the city between 2006 and 2015. Thus, Shaodong aimed to strengthen its manufacturing sector by welcoming investments in enterprise zones, and to create a better living environment for residents and businesses. Third, recognizing the value of a social network for those successful entrepreneurs who earned their first profit in Shaodong many years ago, the local government introduced a policy initiative in 2016 called the "return-home economy" (返乡经济). The aim was to use investments from local entrepreneurs to set up new factories that would become business incubators for small enterprises and technological innovation. Thus, Shaodong's strategy is to transform the former merchant city into a fully functional modern city through urban regeneration and economy revitalization practices, while also recognizing the importance of human resources in the process (see Fig. 2.8).

2.5.3 Lengshuijiang

Lengshuijiang, a SC in Hunan categorized as suffering "resource degradation," follows the same trajectory as similar areas elsewhere in the world. The key contributing elements toward Lengshuijiang's resource degradation, the so-called "resource curse," are antimony, iron, and coal mining. The depletion of natural resources

together with ever-tightening regulations enforced by national government (which has committed to move toward a green economy) has put an end to the area's centuries-old reliance on mining and metallurgy. Mining operations began to close down, following other small firms sitting at the end of the industrial chain. More than 30% of the population left Lengshuijiang's mining cities between 2000 and 2010, leaving behind a heavily polluted environment and damaged ecology. The mining town Xikuangshan (the mining town) and Lengshuijiang (the main city), were then trapped in a typical and vicious circle of urban shrinkage.

Seeking to revitalize both the economy and the city, the local government reached out to the national government for funds and aid, aligning local actions with the central government's desire to move toward sustainable economic development. Lengshuijiang was included in a list of 44 resource-exhausted cities published by the state council in 2009, and 1.3 billion RMB was channeled into the area via various resources. Some of the funds were designated to remedy the polluted land/water and the ecological degradation, and another portion was earmarked to improve urban living by supporting necessary public services such as education and medical care. National government also supported Lengshuijiang to restructure its economy by providing subsidies for technological upgrades and compensation for the closing mining/metallurgy factories.

A further strategy was to find possible triggers for new urban developments. For example, Lengshuijiang's master plan aims to attract middle-class populations to settle in the city by creating a new urban expansion with quality spaces for modern urban living. With the hope of attracting tourists, attempts have also been made to rebrand the city from a place of "resource degradation" to a landscape with rich cultural memories and industrial heritage (see Fig. 2.9).

2.6 Conclusion

Statistically based forecasts at the province level predict an imminent slowing down of total population growth and an ongoing decline of the working-age population in Hunan Province. Based on such predictions, Hunan's urbanization process in the next 10 years will be driven mainly by either the "possible return of migrants" or "further in-situ urbanization," which could exacerbate population shrinkage in some bordering areas. A comparison of historical demographic data with the prefecture planning proposals reveals that government's expectations for further population growth are too high (Zhou et al. 2017a).

Furthermore, an evaluation of population changes data and urbanization and GDP growth rates between 2000 and 2010 at the county level show three main reasons for decline: a hollowed-out labor force, population takeover, and resource degradation. Counties like Taoyuan once encouraged their workers to move to other regions as a means to reduce poverty. However, that county now needs to identify the necessary endogenous drivers for sustainable economic development, without losing a significant proportion of its population. Counties like Shaodong, who enjoyed a glory

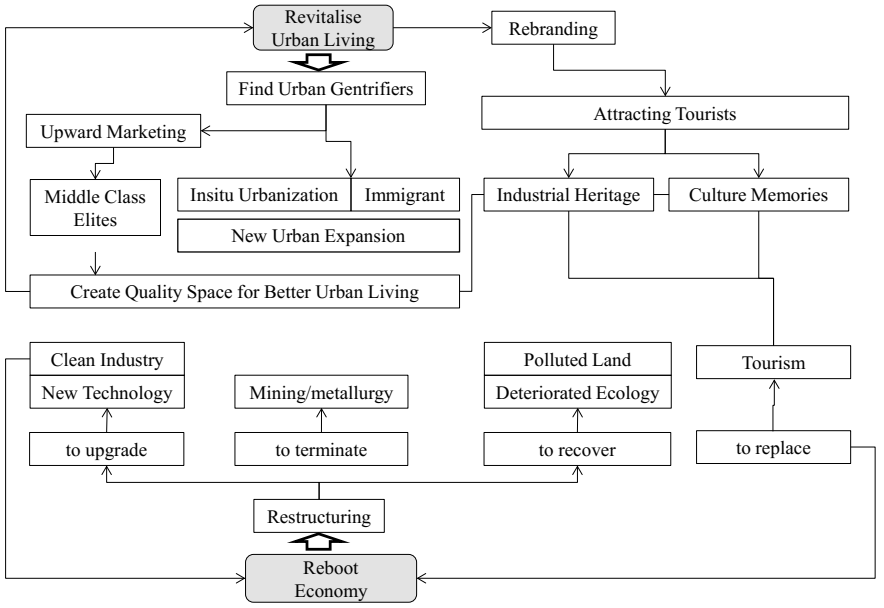

Fig. 2.9 Lengshuijiang's policy responses to its shrinking population

time in China's period of economic reform, face the challenge of a rapidly changing market. If local government is not able to properly react, Shaodong could easily become an SC. Counties like Lengshuijiang have received a large amount of funding from the national government. However, if the local population cannot be retained, the aggressive urban development of the local government will only further hinder attempts to revitalize the region.

Population shrinkages in regions with out-migration, such as many provinces in central or western China, are closely linked to the rapid urbanization of megacities in coastal regions, mostly led by migration flows and then by the return of workers. By studying Hunan's shrinking administrations, it is clear to see that population growth and decline in a rapidly urbanizing China are two sides of the same coin (Zhou et al. 2017b). Taking a broader view, the same can be said for economic and demographic growth and decline within the urbanization process on a global scale. To fully understand growth, insights into cases of decline must be investigated, and vice versa. Thus, China's contribution to international comparative research is its exploration into SCs, investigating both decline and growth within the same story (Zhou and Qian 2015).

References

Audirac I, Fol S, Martinez-Fernandez C (2010) Shrinking cities in a time of crisis. Berkeley Plan J 23(1):51–57. http://escholarship.org/uc/item/8956c002

Beauregard R (2007) Shrinking cities in the United States in historical perspective: a research note. The future of shrinking cities—problems, patterns and strategies of urban transformation in a global context

Beauregard RA (2009) Urban population loss in historical perspective: United States, 1820–2000. Environ Plan 41(3):514–528. https://doi.org/10.1068/a40139a

Bernt M, Haase A, Großmann K et al (2014) How does(n't) urban shrinkage get onto the agenda? Experiences from Leipzig, Liverpool, Genoa and Bytom. Int J Urban Reg Res 38(5):1749–1766. https://doi.org/10.1111/1468-2427.12101

Bontje M (2001) Dealing with deconcentration: population deconcentration and planning response in polynucleated urban regions in north-west Europe. Urban Stud 38(4):769–785. https://doi.org/10.1080/00420980120035330

Camarda D, Rotondo F, Selicato F (2015) Strategies for dealing with urban shrinkage: issues and scenarios in Taranto. Eur Plan Stud 23(1):126–146. https://doi.org/10.1080/09654313.2013.820099

Freixas C, Fernandez PIM (2014) shrinking cities: a sustainability assessment of eco-urbanism strategies. In: The mediated city conference

Großmann K, Bontje M, Haase A et al (2013) Shrinking cities: notes for the further research agenda. Cities 35(4):221–225. https://doi.org/10.1016/j.cities.2013.07.007

Haase A, Rink D, Grossmann K et al (2014) Conceptualizing urban shrinkage. Environ Plan A 46(7):1519–1534. https://doi.org/10.1068/a46269

Häußermann H, Siebel W (1988) Die Schrumpfende Stadt und die Stadtsoziologie. In: Friedrichs J (ed) Soziologische Stadtforschung. Westdeutscher Verlag, Opladen, pp 78–94

Hollander JB, Németh J (2011) The bounds of smart decline: a foundational theory for planning shrinking cities. Hous Policy Debate 21(3):349–367. https://doi.org/10.1080/10511482.2011.585164

Hollander JB, Pallagst K, Schwarz T et al (2009) Planning shrinking cities. Woking Paper, pp 1–37

Leo C, Brown W (2000) Slow growth and urban development policy. J Urban Affairs 22(2):193–213. https://doi.org/10.1111/0735-2166.00050

Mao Q, Long Y, Wu K (2015) Spatio-temporal changes of population density and exploration on urbanization pattern in China: 2000–2010. City Plan Rev 39(2):38–43. https://doi.org/10.11819/cpr20150207a

Martinez-Fernandez C, Audirac I, Fol S et al (2012a) Shrinking cities: urban challenges of globalization. Int J Urban Reg Res 36(2):213–225. https://doi.org/10.1111/j.1468-2427.2011.01092.x

Martinez-Fernandez C, Wu C-T, Laura K, Schatz NT et al (2012b) The shrinking mining city: urban dynamics and contested territory. Int J Urban Reg Res 36(2):245–260. https://doi.org/10.1111/j.1468-2427.2011.01094.x

Oswalt P (eds) (2005) Shrinking cities volume 1: international research. Hatje Cantz Press, Germany

Pallagst K (2005) The end of the growth machine—new requirements for regional governance in an era of shrinking cities. In: Association of Collegiate Schools of Planning's 46th annual conference

Rieniets T (2009) Shrinking cities: causes and effects of urban population losses in the twentieth century. Nat Cult 4(3):231–254. https://doi.org/10.3167/nc.2009.040302

Savitch HV, Kantor P (2003) Urban strategies for a global era, a cross national comparison. Am Behav Sci 46(8):1002–1033. https://doi.org/10.1177/0002764202250492

Schilling J, Logan J (2008) Greening the Rust Belt: a green infrastructure model for right sizing America's shrinking cities. J Am Plan Assoc 74(4):451–466. https://doi.org/10.1080/01944360802354956

Turok I, Mykhnenko V (2007) The trajectories of European cities 1960–2005. Cities 24(3):165–182. https://doi.org/10.1016/j.cities.2007.01.007

Wang L, Feng Z, Yang Y et al (2014) The change of population density and its influencing factors from 2000 to 2010 in China on county scale. Acta Geogr Sin 69(12):1790–1798. https://doi.org/10.11821/dlxb201412005

Wiechmann T (2008) Errors expected—aligning urban strategy with demographic uncertainty in shrinking cities. Int Plan Stud 13(4):431–446. https://doi.org/10.1080/13563470802519097

Wiechmann T, Bontje M (2015) Responding to tough times: policy and planning strategies in shrinking cities. Eur Plan Stud 23(1):1–11. https://doi.org/10.1080/09654313.2013.820077

Wu K, Long Y, Mao Q (2015) Featured graphic. Mushrooming Jiedaos, growing cities: an alternative perspective on urbanizing China. Environ Plan A 47(1):1–2. https://doi.org/10.1068/a140066g

Yang Y, Feng Z, Zhao Y et al (2013) Coordination between urban land expansion and population growth in China. Geogr Res 32(9):1668–1678. https://doi.org/10.11821/dlyj201309009

Zhou K, Qian F (2015) Shrinking city: on searching for urban development in non-growing scenarios. Mod Urban Res 2015(9):2–13. https://doi.org/10.3969/j.issn.1009-6000.2015.09.001

Zhou K, Qian F, Yan Y (2017a) A multi-scaled analysis of the "shrinking map" of the population in Hunan province. Geogr Res 36(2):267–280. https://doi.org/10.11821/dlyj201702006

Zhou K, Gu C, Qian F (2017b) Compact urban development in the new normal. Planners 33(1):12–17. https://doi.org/10.3969/j.issn.1006-0022.2017.01.002

Chapter 3
Urban Shrinkage in the Beijing-Tianjin-Hebei Region and Yangtze River Delta: Pattern, Trajectory and Factors

Kang Wu

Abstract This paper investigates the shrinkage patterns and related influencing factors in the Beijing-Tianjin-Hebei Region (BTH) and the Yangtze River Delta (YRD) using data from the 5th and 6th national censuses. The permanent resident population, registered population and working population are used to measure the urban shrinkage. The results show the following: (1) nearly twenty percent of cities/countries/districts of BTH and half of YRD present a local shrinkage phenomenon, which is still growing. (2) The shrinkage areas in BTH are primarily mainly located north of Hebei in Zhangjiakou and Chengde, and it has spread to the south central plain of Hebei, while the shrinkage in the YRD presents a spatial agglomeration pattern distributed in Northern Jiangsu, southwestern Zhejiang and most of Anhui province, except Hefei and Wuhu. (3) The shrinkage trajectories in the megacity regions can be classified into five forms: less-developed peripheral shrinking, large city downtown shrinking, industrial and mineral city shrinking, adjustment of administrative division and county/rural/town shrinking. (4) Outflow of population caused by unequal development of the regional economy, urbanization level and urban administrative system contributed to the shrinkage; some western shrinkage included suburbanization, deindustrialization or industrial transformation, whereas demographic shifts only emerged in a small number of large cities' downtowns and some old industrial and mining cities (towns). (5) Urban shrinkage in China is more complex and should be considered a cumulative and self-reinforcing process, which warrants further investigation.

Keywords Shrinking cities · City-regional differences · Beijing-Tianjin-Hebei · Yangtze River Delta

K. Wu (✉)
Capital University of Economics Business, 121 Zhangjialukou, Fengtai District, 100070 Beijing, China
e-mail: wukang@cueb.edu.cn

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_3

3.1 Introduction

Urban development is often fluctuating in regional, national and global urban systems. Such fluctuations can be observed through many aspects such as population size, employment scale, transportation networks and enterprise organization (Hall and Hay 1980; Cheshire et al. 1986; Liu et al. 2014; Wang et al. 2014). It is difficult for individual cities to maintain long-term prosperity and economic growth during their long-term evolution. Although the traditional urban and regional development theory recognizes the (transient) decline of cities, it is generally regarded as a stage of development in the urban life cycle and the preparation for the next growth cycle (Leo and Brown 2000; Savitch and Kantor 2003; Wu and Wang 2003). Especially in the past 200 years, human civilization has ushered in the industrial revolution and the wave of urbanization. The rapid growth of the urban population and steady prosperity of the economy in the industrialized countries have prompted theoretical models and practical policies in urban research to be based on broad and even permanent growth. Growth has become the premise of nearly all urban and regional economic development research (Xu and Pang 2014). At the end of the twentieth century, however, under the influence of globalization, suburbanization, deindustrialization, local financial crises and social transformation, 'shrinkage' is becoming an increasingly common phenomenon worldwide. Many people move to cities every year, as urbanization is still increasing (especially in developing countries). Urban shrinkage is becoming the 'new normal' and expansion and growth are no longer a city's only standard succession path (Turok and Mykhnenko 2007; Kabisch et al. 2010). Related research shows that, between 1990 and 2000, more than a quarter of the world's urban population was shrinking, and approximately 40% of Europe's urban population was declining (Turo and Mykhnenko 2007), especially in the post-Socialist countries of eastern Europe (Großmann et al. 2008; Kabisch 2007). Approximately a tenth of the American cities in the rust belt and surrounding areas are experiencing 'shrinkage' (Beauregard 2009, 2013; Blanco et al. 2009). Although the megacities of Japan are prosperous, population loss in small- and medium-sized cities is also very common, and similar situations occurred in South Africa and South Korea (Oswalt and Rieniets 2006).

In urban studies and planning, urban shrinkage refers to the process of population reduction or loss experienced by a densely populated urban area with a minimum population of 10,000 residents that has faced population losses in large parts for more than 2 years and is undergoing economic transformations with some symptoms of a structural crisis (Wiechmann 2008; Pallagst 2008; Hollander and Németh 2011). Urban shrinkage is often accompanied by a series of negative effects such as an ageing population, rising unemployment, vacancy, and public facility idle space, and may trigger further social and economic problems such as investment, finance and land use issues. Urban decline is not a recent phenomenon. As early as the 1950s, urban and regional studies began to focus on the population loss, but wording of decline/decay, demographic depression and disurbanization was used. As a result of the rooted classical urban development model and urban growth theory, although

many cities have encountered similar problems of decline and shrinkage, they have not attracted the attention of urban policy researchers. Because of the rapid urbanization in the world, the small number of cities that have lost their population are considered to be deviating from the conventional 'non-mainstream'. Although urban shrinkage attracted the attention of urban study scholars and policy makers in the United States and Europe after 2000, most focused on how to achieve growth and future prosperity (Haase et al. 2014). Recently, they began to realize that, in the context of the transformation of the world economy and society, the traditional planning concept and management policy focused on 'urban growth' must be transformed into a focus on improving the quality of urban space and the paradigm of smart growth (Martines-Fernandez et al. 2012). This has led some scholars to study the advantages of 'smaller' cities and explore how to achieve sustainable urban development in the context of slow growth or adverse growth (shrinkage) (Schilling and Logan 2008; Haase et al. 2014).

Over the past 40 years of reform and opening up, China's economic development has made a remarkable achievements. Especially in the past 20 years, urbanization is in full swing. Similar to the early urban development of European and American countries, China's urbanization is also based on the top-level design of the growth model (Xu and Pang 2014). Academia and policy circles mainly focus on the growth and expansion of urbanization (Zhao and Zhou 2002; Research Group on China's Economic Growth et al. 2011; Wu and Fang 2009; Gao et al. 2013). Some scholars believe that the excessively high rate of urbanization and widespread spatial expansion make the urbanization in China appear to be in a state of rash advance (Lu 2007, 2010). The pressure on resources and the environment in high-density urbanization areas is prominent (Chen et al. 2010; Wang et al. 2015). Until recently, many cities appeared to be an 'empty city' (Nie and Liu 2013) or 'ghost city' and rural areas appeared to be 'hollowing out' (Xue 2001; Liu and Liu 2010). These 'shrinkage' issues, contrary to the growth and prosperity of traditional urbanization, have attracted further attention. There is no consensus on whether there are shrinking cities in China, although the United Nations Human Settlements Programme identified approximately 50 shrinking cities in its world city report (UN-Habitat 2012). Unlike the west, China's urban economy is still expanding, with no significant population loss, economic decline or high unemployment. However, in a recent report, the Economist noted that China's old industrial cities have begun to decline and, after the level of urbanization stabilizes in the middle of this century, China's cities will experience a period of shrinkage.[②] Domestic scholars believe that China does not have an urban shrinkage problem, but it shows typical shrinkage phenomena in different urban areas. With potential factors such as an ageing population, oversupply and speculation on real estate, the problem of urban shrinkage will inevitably arise (Xu and Pang 2014). In addition to the globalization and informatization, China's urban development has entered an era of 'space of flows' and 'network systems' (Wu et al. 2013, 2015). With the introduction of the national new urbanization plan (2014–2020) and acceleration of the reform of China's household registration system, China's population structure and population movement rebound will undergo major and profound historic changes in the future. Currently, the study of shrinking

cities mainly focuses on Europe and America. Research shows that urban shrinkage has significant global, local, multidimensional and complex characteristics. There is no uniform analytical model for urban shrinkage, and western contexts and structures cannot be applied to eastern Europe or other countries. Comparative analysis, spatio-temporal analysis, regional analysis and prediction simulation analysis are needed (Haase et al. 2012, 2014, 2016; Martines-Fernandez et al. 2012; Wiechmann and Pallagst 2012; Hoekveld 2012). In contrast, shrinkage city research in China is just beginning and is in an introductory stage (Wu et al. 2008; Huang 2011; Yang and Yin 2013; Gao 2015). Last year, the authors conducted an empirical study of shrinking cities based on national population data and found cities and towns with different scales have experienced obvious population loss (Mao et al. 2015; Long and Wu 2016). This study further explores the regional shrinkage of urban agglomeration based on the fifth and sixth nationwide population censuses.

3.2 Research and Data

The largest and only two inter-provincial administrative units of urban agglomeration in eastern China: the Beijing-Tianjin-Hebei Region (BTH) and the Yangtze River Delta (YRD) were selected as the research area. The BTH Region is the largest and the most developed urban agglomeration area in northern China. This region is also the only 'dual-core' mega-region in China that involve two municipalities. For BTH, thirteen prefecture-level cities and 181 prefecture-level administrative units were included in the research. As China's largest and strongest urban agglomeration, the YRD has both broad and narrow scopes. The broad scope covers 25 cities at the prefecture-level and above in Jiangsu, Zhejiang and Shanghai; the narrow scope refers to the 15 cities in the inner circle. Considering the close economic connections[③] between Anhui and the YRD over time, the YRD scale extends to Jiangsu, Zhejiang, Shanghai and Anhui, and 41 prefecture-level cities and 282 prefecture-level administrative units were included in this research.

The main data are the short and long table data from the fifth and sixth nationwide population censuses in 2000 and 2010 and socio-economic indicators in the corresponding years. To facilitate the study, the county administrative units were divided into four attribute types: (1) urban areas; (2) suburban areas; (3) county-level cities; (4) counties. Urban area refers to a city proper established when the city was designated before 2000[④] and suburban area refers to a 'county changed into city proper after 2000. Because such suburban areas were originally located in counties or county-level cities outside the central city and the economic and social development level is relatively lower than urban areas, most of the suburbs remain relatively independent in the fields of administration, finance and taxation.

The proportion of permanent residents in the BTH Region and the YRD increased from 7.1% and 15.4% in 2000, respectively, to 7.8% and 24.4% in 2010, respectively. The GDP of the two regions accounted for 9.2% and 22.4% of the country's GDP in 2000 and for 10.7% and 24.4% in 2010, respectively. The population carrying

Table 3.1 Comparison of basic social and economic indicators between the two urban agglomeration areas

	Beijing-Tianjin-Hebei region			Yangtze River Delta		
	2000	2010	Proportion (%)	2000	2010	Proportion (%)
Permanent resident population/10,000 people	9010	10,441	15.9	19,438	21,561	10.9
Urban population/10,000 people	3517	5871	66.9	8348	12,705	52.2
Urbanization rate (%)	39	56.2	17.2	42.9	58.9	16
GDP/100,000,000 yuan	9144	43,084	371.2	22,190	97,968	341.5

capacity and economic agglomeration of the two mega-regions are increasing (Table 3.1). In the two mega-regions, there is an imbalance development (Fig. 3.1). The imbalance of the BTH is mainly reflected in Beijing, Tianjin and other urban areas. The imbalance of the YRD is mainly existed in the core area (Shanghai, southern Jiangsu and northeast Zhejiang), the peripheral zone (northern Jiangsu, southwest Zhejiang) and the marginal zone (Anhui).

3.3 Measurement and Analysis of Shrinkage Patterns

3.3.1 Indicators

To measure and recognize shrinking, the most common indicators are population indicators. It can also be reflected by employment indicators. In China, population indicators are divided into permanent residents and registered residents. The permanent resident population refers to the population that is living in a place for a certain period of time (more than 6 months). It is a more realistic representation of the actual number of people living and moving in a given area (often called 'the real population'), including both the population with household registrations and actual residents (the 'household resident population') and those without registration but also practically living there (also known as the 'floating population' and 'other administrative region into the local population'). The registered population, also termed *hukou* population refers to the population with a registered permanent residence in the district (including actual residents and the outflow population). Therefore, the 'registered resident population' is a part of the 'permanent resident population' whereas

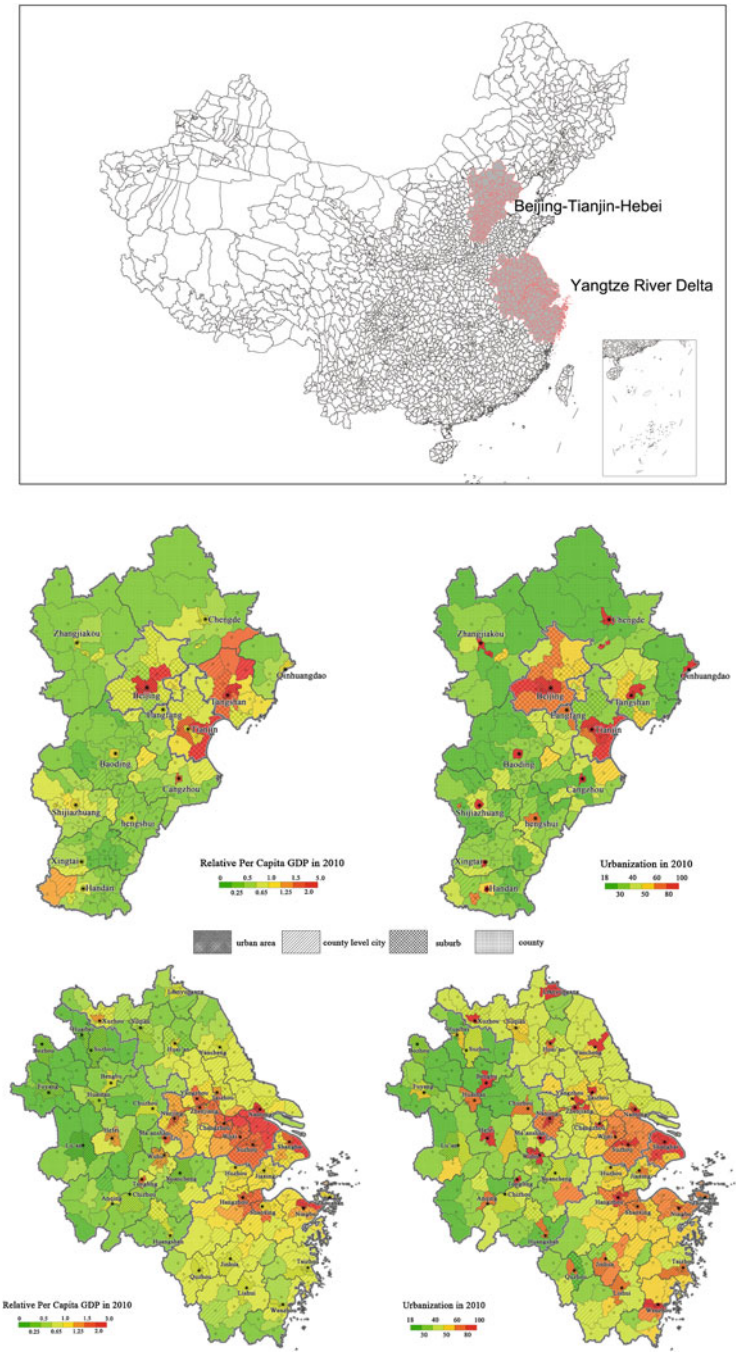

Fig. 3.1 Per capita GDP and urbanization rates in the Beijing-Tianjin-Hebei region and Yangtze River Delta

'resident population' and '*hukou* population' intersect (with each other, each with another part).

Along with the development of China's economy and urbanization, the east coast and several node cities on the frontier of reform and opening up are at the forefront of development. Urban agglomerations represented by the Pearl River Delta, YRD and BTH and several large- and medium-sized cities have become agglomeration areas of various social and economic activities. Due to the relatively developed economy in coastal areas and large and medium-sized cities, more work opportunities and higher incomes caused a large rural surplus population to flow to cities and eastern regions (Du et al. 2005). The trend has been further promoted by the steady progress of household registration reform. Due to the regional development gap (Heilig 2006), first-tier cities such as Beijing, Shanghai and Guangzhou have been preferred development areas for newly employed college students and young people. While many studies focused on population mobilities, they have rarely been associated with urban shrinkage. Many people are streaming into the east coast and some hot cities, creating an 'expansion' effect. For cities and regions where the population is outflowing, shrinking has occurred, especially at a time when the birth rate has decreased.

Therefore, the following indexes are constructed using the three indexes of resident population, *hukou* population and total working population[5], respectively, to comprehensively measure the shrinking pattern of urban agglomeration:

$$C_r = \frac{P_{r2010}}{P_{r2000}} \tag{1}$$

$$C_h = \frac{P_{h2010}}{P_{h2000}} \tag{2}$$

$$C_e = \frac{P_{e2010}}{P_{e2000}} \tag{3}$$

$$C_{rh} = \frac{P_r}{P_h} \tag{4}$$

$$C_{eh} = C_e / C_h = (P_e 2010 / P_e 2000) / (P_h 2010 / P_h 2000) \tag{5}$$

In the formulas, the C_r, C_h and C_e indexes assess the shrinkage by comparing the changes in the three indicators of the permanent resident population, registered population and employed population, respectively, in the study area from 2000 to 2010. The C_{rh} index assesses the shrinkage of the study area by comparing the changes in the permanent resident population and the registered population in 2 years. The C_{rh} index assesses the shrinkage of the study area by comparing the changes in the permanent resident population and the employed population. When the above index value is less than 1, it is assessed as shrinkage; when it is greater than 1, it indicates expansion. For a more intuitive comparison of this shrinkage and expansion, a cartogram transform map is used for visualization (Figs. 3.2 and 3.3).

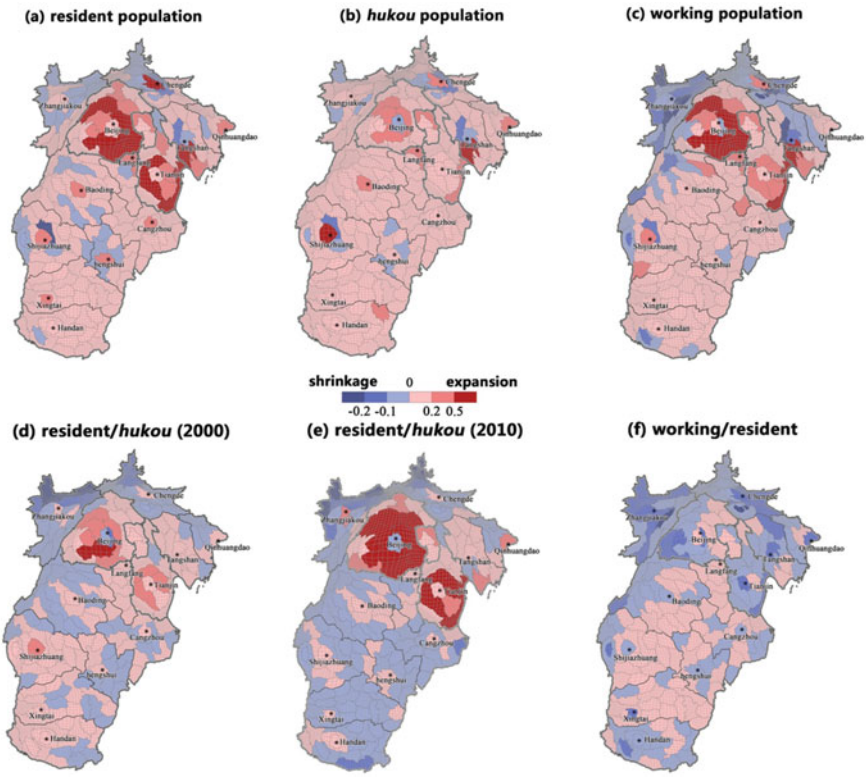

Fig. 3.2 The shrinkage and expansion of the Beijing-Tianjin-Hebei region

3.3.2 The Shrinkage Pattern of BTH

From 2000 to 2010, among 181 research units in the BTH, there were 34 counties and cities with a shrinking permanent population, accounting for 18.8%. They were mainly concentrated in the northern Hebei plateau and central and southern Hebei plain, among which the shrinking degree of the Zhengding and Fengrun districts and Chengde county was more than 10%. In addition, there was a shrinakge in downtown Tangshan and most mining areas such as the Jingxing diggings in Shijiazhuang and the Fengfeng diggings in Handan. If the household registration population index is applied, the number of shrinking counties and cities in the BTH decreases to 17. Notably, in addition to the typical diggings and mining cities, the registered population of Beijing also shrank in the central downtowns of Dongcheng and Xicheng. Further comparing the two years of permanent resident population and household registration population, the number of shrinking counties and cities in the BTH increased from 73 in 2000 to 107 in 2010. Apart from Zhangjiakou and Chengde Bashang plateau counties, the shrinking counties in 2000 are mainly distributed in the

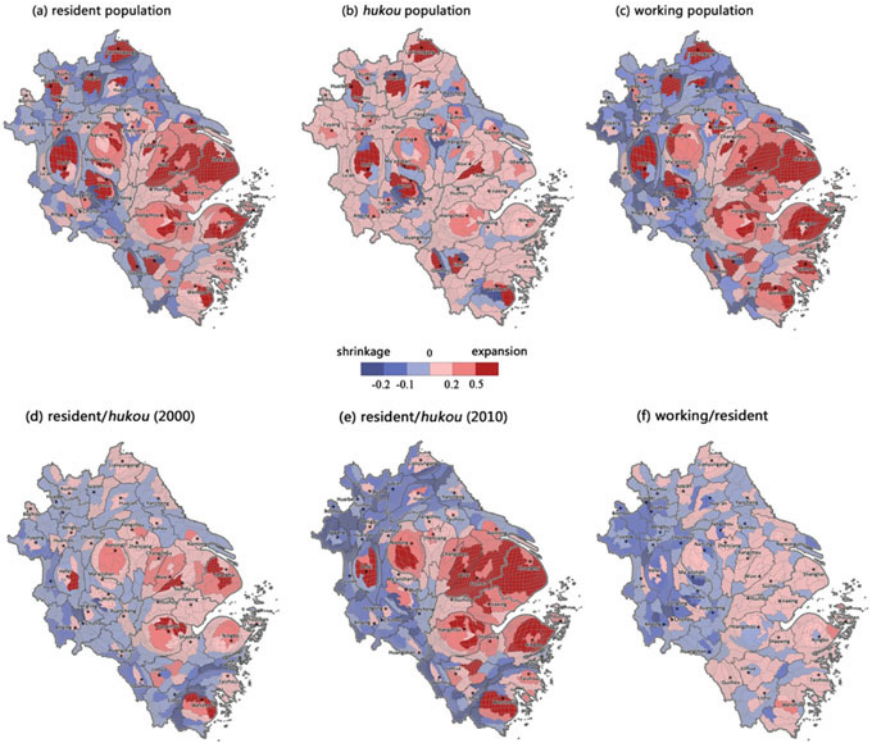

Fig. 3.3 The shrinkage and expansion of the Yangtze River Delta

Taihang mountainous area in the west, Cangzhou, Hengshui, Xingtai in the southeast and central urban areas of Beijing. By 2010, more districts and counties were shrinking than expanding, covering most districts and counties outside the main urban areas of Beijing and Tianjin where an expansion ring had formed around the outskirts of the Beijing and Tianjin megacities.

The shrinking patterns measured by the employment-population are similar to those measured by the permanent resident population, but the degree of the shrinking is strengthened. Especially in the Taihang mountainous area of northern and western Hebei, the employment shrinking in most districts and counties was 5 to 10% higher than that of the permanent residents. Figure 3.2f reflects the shrinkage pattern by comparing the changes in employment in the BTH with the changes in the permanent resident population. According to the calculation results, from 2000 to 2010, in 101 counties in the BTH, the number of employed people increased more than the number of permanent residents decreased. These 'shrinking' units are mainly located in the northern BTH, including some central and suburban areas of Beijing and Tianjin. As the core circle of the BTH urban agglomeration area, the population in the areas around Beijing, Tianjin and Tangshan increased significantly in the past 10 years but

the increase in employment did not match the increase in population, resulting in a 'relative shrinking'.

3.3.3 The Shrinkage Pattern of the YRD

Of the 282 study areas in the YRD, nearly half of the units show a permanent residents shrank, with 11 districts and counties shrinking more than 20%. Due to the adjustment of the administrative division, the population of Wuhu county, Fanchang county, Jindong district and Suyu district shrank by more than 30%. In addition, the regular shrinking areas of the permanent population were mainly located in the north of Jiangsu province (except the urban areas), southwest of Zhejiang and in most of Anhui's cities (except Hefei, Wuhu, Ma'anshan, Tongling and a few other major cities). Under the household registration population scale, the shrinking areas of the YRD decreased to 59, accounting for 21% of the total number of areas. In addition to a number of administrative division adjustments of counties and cities, the shrinkage occurred mainly in the central downtown of Shanghai, Nantong and Yancheng in the northern Yangtze River in Jiangsu province, Zhenjiang and Changzhou in the southern Yangtze River, and Wenzhou in the southern Zhejiang province. Comparison of the permanent resident population and registered population in the 2 years shows the shrinking pattern of the YRD has obvious spatial agglomeration and continuity. In addition to southern Jiangsu and northeast Zhejiang in the core areas of the YRD, Wenzhou in southern Zhejiang and Hefei, the capital of Anhui province, most other counties and cities shrank, and this pattern was further strengthened after 2000. In 2000, more than half of the 150 counties and cities had fewer registered residents than permanent residents. By 2010, although the number of shrinking areas with fewer registered residents than permanent residents had increased to 153, most of the shrinkage had increased (Fig. 3.3e). Among them, the number of districts and counties with a shrinking rate of more than 20% increased from 8 to 42, mainly distributed in western and northern parts of Anhui and southwest Zhejiang. In sharp contrast, the YRD formed seven 'expanding cities' circles in Shanghai, Suzhou, Nanjing, Hangzhou, Ningbo, Wenzhou and Hefei.

Between 2000 and 2010, 140 units in the Yangtze River Delta experienced a shrinkage in employment. Between 2000 and 2010, 140 counties and cities in the Yangtze River Delta experienced a shrinkage in employment. Its shrinkage pattern was basically consistent with that of the permanent resident population, mainly occurring in the cities of northern Jiangsu, the suburbs, county-level cities and counties of southwest of Zhejiang faubourgs and most of Anhui (except Hefei) and the municipal district of Wuhu. Among them, the employed population of Anhui shrank relatively more than its resident population did, which is verified by Fig. 3.2f. Comparison of the changes in the employed population and the permanent resident population shows that the shrinkage pattern of the YRD has been significantly alleviated. In the YRD from 2000 to 2010, nearly half of the regions experienced a less employment increases rate than the increase in permanent residents. However, it was mainly

located in Anhui and covered the central urban areas of many cities including Huaibei, Tongling, Anqing, Chuzhou and Huangshan. In contrast, the shrinkage in northern Jiangsu and southwest Zhejiang provinces decreased and even turned into relative expansion.

3.3.4 Shrinkage Types

Through the above preliminary analysis of the shrinkage pattern of the BTH and YRD, the shrinkages of the two mega-regions can be roughly divided into the following five types:

(1) Shrinking in underdeveloped areas. Underdeveloped areas were often located on the periphery of mega-regions, which was the main area of population outflow and most typical shrinking pattern in China. Shrinking in the northern BTH, central and southern Hebei plain, northern Jiangsu, southwest Zhejiang and much of Anhui fell into this category.
(2) Local shrinking in megacities. With the industrial restructuring of megacities, deindustrialization of the central city and suburbanization driven by the development of rail transit and public transportation, the central cities of Beijing, Shanghai and other megacities were not hot spots for population and employment expansion. In terms of the permanent resident population, household registration population, employment and other indicators, it began to grow slowly and gradually declined.
(3) The decline and shrinkage of industrial and mining cities. This is another important type of shrinking city in China, especially in the BTH. For example, the permanent and employed population of Tangshan, Shijiazhuang, Handan, Zhangjiakou, Chengde and some urban areas and mining areas all declined. The Yangtze River Delta, an old coal mining area in Xuzhou, Jiawang district also experienced a decline in some population indicators.
(4) Statistical shrinkage caused by administrative division adjustment. Such shrinkage occurred mainly in the suburban or suburban areas of central cities. As a result of the expansion of the central city, some towns originally belonging to the suburbs and suburban counties were subdivided into the central city area or municipal district, resulting in the shrinkage of these suburbs and suburban counties statistically, such as in Wuhu county in Anhui and Suyu in Jiangsu.
(5) Shrinkage of counties, villages and small towns. This shrinkage is common and intersects with the above types. Even in regions such as the YRD where the township economy was developed, in addition to the core areas of southern Jiangsu and northeast Zhejiang, most relatively underdeveloped counties, small towns and rural areas were shrinking. Administrative division adjustment could also aggravate this kind of shrinkage. Many rural counties and towns that were assigned to municipal districts had relatively good economic foundations. Most are the key growth towns of the original county and city, and their

delineation negatively impacted the economies of their respective suburbs or suburban counties and caused shrinkage. For example, Yanghe town in northern Jiangsu originally belonged to Siyang. In 2004, it was divided into Suqian city. The shrinkage of Siyang was prominent in northern Jiangsu.

3.4 Identification of Factors Influencing Regional Shrinkage and Expansion

Many factors contribute to urban and regional shrinkage. According to relevant scholars, these factors mainly include five categories, namely, 'demographic changes', 'climate change', 'economic change', 'political change' and 'space variation', and include a number of drivers and functions (Zhou and Qian 2015). The mechanisms are complex; some are linear and more are nonlinear and accumulative (Hoekveld 2012). At present, most cities in China are in the middle and late stages of industrialization, and some developed areas are entering the transition period of a 'new normal' of industrial structure adjustment. Do these factors affect the shrinkage and expansion of urban areas? Combined with relevant research experience in China and abroad as well as the shrinkage patterns and types of the BTH and Yangtze River Delta, this paper identifies and summarizes the influencing factors from five aspects: regional economic difference, urbanization process, industrial structure change, population structure change and administrative level (Table 3.2).

3.4.1 Regional Economic Imbalance

The imbalance of regional economic development is the main cause of the regional and internal population flow in China, which leads to local shrinkage (Wu et al. 2008). The BTH and YRD are no exception. The per capita GDP (yuan) in 2000, which reflects the initial level of economic development, and the GDP growth range in 2000–2010, which reflects the speed of economic development, were selected to analyze the correlation with the Cr index of the permanent resident population.

In general, the initial per capita GDP level has a high correlation with the Cr index. The shrinking areas were distinguished from the expanding areas and correlation tests were conducted. for regions with a Cr index greater than 1, the index and per capita GDP are positively correlated. A shrinking area with a Cr index less than 1 has little correlation with the GDP per capita, that is, the worse the economic foundation, the more significant the shrinkage.

Table 3.2 Pearson coefficient of C_r index and related factors

	C_r		$C_r > 1$		$0 < C_r < 1$	
	Beijing-Tianjin-Hebei region	Yangtze River Delta	Beijing-Tianjin-Hebei region	Yangtze River Delta	Beijing-Tianjin-Hebei region	Yangtze River Delta
Initial per capita GDP	0.541**	0.501**	0.578**	0.216**	−0.096	0.103
Rate of economic growth	0.157*	0.256	0.237**	0.295**	−0.123	−0.174
Initial urbanization level	0.452**	0.672**	0.489**	0.504**	0.009	0.105
Urbanization growth	−0.084	0.345**	−0.077	0.464**	0.001	0.130
Manufacturing employment change	0.009	0.145*	−0.065	0.430**	0.083	0.089
Tertiary sector employment change	0.426**	0.633**	0.164*	0.725**	0.368*	0.117
Ageing change	−0.441**	−0.58**	−0.408**	−0.385**	0.027	−0.159
Birth rate change	−0.197**	−0.098	−0.346**	0.257**	0.097	−0.018
Administrative level	−0.447**	−0.65**	−0.481*	−0.661**	−0.303**	−0.237*

Note **Indicates a significant correlation at the level of 0.01 (bilateral); *Indicates a significant correlation at the 0.05 level (bilateral)

3.4.2 Urbanization Level

Urbanization is also closely related to the shrinkage and expansion of cities. As a complex social and economic process, urbanization has a significant population agglomeration effect that promotes the expansion and development of urban and regional economies. When the agglomeration effect reaches full load, especially with the emergence of adverse phenomena such as urban crowding, environmental degradation and reduced quality of life, enterprises must spontaneously move to the edges of cities, and urban centres face an inevitable loss of population.

A correlation analysis was conducted with the urbanization rate in 2000, which reflects the initial urbanization level, the urbanization rate in 2000–2010, which reflects the urbanization process speed, and the Cr index of the permanent resident population. The results show that the initial urbanization level is significantly correlated with subsequent shrinkage and expansion. The shrinking area was distinguished from the expanding areas and correlation tests were conducted. For expansion areas with a Cr index greater than 1, the index value is positively correlated with the initial urbanization level. However, shrinking areas with a Cr index less than 1 have no

significant relationship between the subsequent shrinkage degree and early urbanization level. Thus, a lower initial urbanization level does not lead to a more obvious subsequent shrinking.

The correlation between the urbanization speed and Cr index value differs in the BTH and YRD. During 2000–2010, the rate of increase of urbanization level of districts, counties and cities in the BTH had no correlation with its shrinkage or expansion. That is, the urbanization speed did not significantly affect whether districts, counties and cities in the BTH shrank or expanded whereas the overall performance of the YRD was positively correlated. For the shrinking areas with a Cr index less than 1, the urbanization speed also influenced the remission of shrinkage but it was not significant.

3.4.3 The Change in Industrial Structure

Relevant studies abroad have confirmed that the shrinkage of many cities is related to deindustrialization, post-Fordism and structural adjustment of the global economy. China is still in the process of mid-industrialization. Evolution of the industrial structure in most areas is still in the decline of primary industry and the rise of manufacturing-based secondary and tertiary industry. Changes in the number of people employed in manufacturing and tertiary industries were selected to reflect the relationship between the change in industrial structure and the shrinkage and expansion of the two urban agglomerations in the past decade.

The linkage between manufacturing and urban shrinkage differs in the BTH and YRD. For the BTH, although the decline in the proportion of manufacturing in a small number of industrial and mining cities coincides with population shrinkage, for more cities, there is no significant correlation between shrinkage and structural changes in manufacturing. The YRD, where manufacturing has boomed over the past decade, showed a weak correlation, especially in the expanding cities ($Cr > 1$), and the manufacturing industry has obvious synchronous change trend. This shows that China's urban and regional shrinkage has not been significantly affected by the worldwide deindustrialization and economic restructuring.

The changes of the tertiary industry structure in the BTH and YRD are significantly correlated with the Cr index of the permanent resident population, that is, the more obvious the improvement of the tertiary industry in the industrial structure, the more cities tended to expand rather than shrink. For the BTH, the rapid development of the tertiary industry more positively impacted the shrinking area of cities with a Cr index less than 1. In contrast, in the Yangtze River Delta, the expansion areas with a Cr index greater than 1 showed a correlation with the growth contribution of tertiary industry as high as 0.725 whereas the shrinking area is not obvious.

3.4.4 The Change in Population Structure

A correlation analysis was conducted with the change in the proportion of the elderly population, the change in the birth rate and the Cr index of the permanent resident population. The results show that for, the two urban agglomeration areas, the ageing increase or decrease has a significant correlation with the expansion or shrinkage of the permanent population. Especially for regions with a Cr index greater than 1, ageing inhibited the expansion to some extent. However, for the shrinking regions, the increase in ageing did not significantly impact the degree of shrinkage.

The correlation between the change in the birth rate and the Cr index of the permanent population is not obvious. There is a certain negative correlation in the BTH, especially for the low birth rate in expansion areas with a Cr index greater than 1 but there is no such correlation in the shrinking regions. The YRD is not related as a whole, but its expansion area is positively correlated.

The above shows that the problem of urban shrinkage in western countries due to ageing and low birth rate is not typical in China's urban agglomeration areas. Although the correlation statistic shows that an increase in ageing inhibits the expansion and growth of cities, most of the shrinking areas are relatively old and have relatively high birth rates. This also shows that most of the shrinking urban areas in China are caused by population outflow due to relatively backward economic and social development, particularly in the young and middle-aged, rather than ageing demographics.

3.4.5 Administrative Hierarchy

The top-down administrative system in China determines the different levels of towns that use the resources in its development and provide public services, and development opportunities are very different. Cities with high levels often have absolute advantages in transportation infrastructure, public service facilities, investment attraction and financial support, continuously attracting people in the regional logistics information flow capital flow to its agglomeration. Over time, a virtuous circle of development has formed. Small- and medium-sized cities, small towns and villages are facing capital and human resource outflows. Cities that rely on a single industrial sector are more vulnerable to recession (Wu et al. 2008; Marines-Fenandez et al. 2012). Therefore, the correlation between the administrative units and the shrinkage was tested according to the classification of the administrative units (urban, suburban, county-level city, county region) in the two urban agglomerations.

The results show that different types of regions (administrative levels) are negatively correlated with urban shrinkage and expansion. The correlation coefficients between urban type and the Cr index of the permanent population in BTH and YRD are -0.0447 and -0.65, respectively. Thus, the shrinking trend of urban areas and

some suburban areas was significantly smaller than that of more marginalized and lower level county-level cities and counties.

3.5 Conclusions

As two large mega-regions along the east coast of China, the BTH and the YRD have attracted a large number of people, logistics and information flows that have been developing and expanding continuously for more than 10 years. There is also significant local shrinkage within these areas. The shrinking patterns of the BTH and the YRD were measured using household registration, permanent residence and employment data from two censuses. The results show the following:

(1) In approximately one-fifth of cities, counties and districts in the BTH, the permanent resident population has suffered local shrinkage and the shrinkage unit in the YRD is nearly half, slightly less than the shrinkage of the employed population. Although the shrinkage of the household registration population is not obvious, the shrinking of the household registration-permanent residence ratio is the most prominent, and the shrinkage in 2010 was still increasing compared with that in 2000.
(2) Although the degree of shrinkage measured by different data is not completely consistent, the shrinking spatial pattern reflected is generally the same. The main shrinking areas of the BTH are concentrated in Chengde and Zhangjiakou and scattered across the central and southern Hebei plain. The shrinking areas of the YRD are spatially concentrated and continuous, concentrated in northern Jiangsu, southwest Zhejiang and most areas of Anhui except Hefei and Wuhu.
(3) The shrinkage types of the two mega-regions can be roughly divided into six types: shrinking in the less-developed periphery, shrinking of the central urban areas of megacities, represented by Beijing and Shanghai, decline and shrinkage of industrial and mining cities and mining areas, statistical shrinkage caused by administrative division adjustment, and widespread shrinkage of counties, villages and small towns.
(4) The shrinkage in China was mainly caused by the imbalance of regional economic development, differences in the urbanization level and the population outflow caused by differences in urban administrative registration. The typical shrinkage of western cities such as suburbanization, deindustrialization or industrial transformation and demographic changes are only seen in the central urban areas of a few large cities or some old industrial and mining towns in China and are not representative and universal.
(5) The factors and action mechanisms that influence the shrinking pattern in China are very complex. Moreover, it has prominent regional consistency (for example, the correlation between industrial structure and population structure and shrinkage is not consistent in the BTH and the YRD). Although the level and speed of economic development, the level and process of urbanization and the

level of urban administration have some explanatory power, the correlation is clearer in expanding cities and regions, more precisely affecting expansion or shrinking. For shrinking regions, these factors are less illuminating.

Limited by the data and the length of the article, this research did not analyze other important factors such as investment, finance and transportation infrastructure. The influencing factors and path of shrinkage are a nonlinear and complex cyclic accumulation process. The correlation analysis in this paper is not sufficient and should be explored further.

Annotation:

① Shrink city international research network (SCIRN) define shrinking cities as densely populated urban areas with at least 10,000 people with most areas experiencing population loss over a period of more than two years and undergoing an economic transformation characterized by some sort of structural crisis.
② How to shrink a city. https://www.economist.com/leaders/2015/05/30/how-to-shrink-a-city, 2015-05-30.
③ According to the sixth national population census, Anhui nationality ranks first in the non-resident population of Shanghai with a registered residence of 2.6 million, accounting for 30% of Shanghai's migrant population, far more than other provinces.
④ Generally, this kind of municipal district is the centre of the 'purity' high urbanization area, especially in 1995 before the ground level above the city divided into districts, but part of the municipal districts also contains the proportion of rural population.
⑤ The total employed population index is derived from the national population censuses based on the employment length table data of 10% sample.

References

Beauregard RA (2009) Urban population loss in historical perspective: united states, 1820–2000. Environ Plann A 41(3):514–528

Beauregard RA (2013) Voices of decline—the postwar fate of US cities. Blackwell, Malden, MA

Blanco H, Alberti M, Forsyth A, Krizek KJ, Rodríguez DA, Talen E et al (2009) Hot, congested, crowded and diverse: emerging research agendas in planning. Prog Plann 71(4):153–205

Chen MX, Lu D, Zha L (2010) The comprehensive evaluation of china's urbanization and effects on resources and environment. J Geog Sci 20(1):17–30

Cheshire P, Carbonaro G, Hay D (1986) Problems of urban decline and growth in eec countries: or measuring degrees of elephantness. Urban Stud 23(2):131–149

Du Y, Park A, Wang S (2005) Migration and rural poverty in china. J Comparat Econom 33(4):688–709

Gao JL, Chen JL, Su X (2013) Urban expansion and its driving mechanism in China: from three main shools' perspectives. Prog. Geogr 32(5):743–754

Gao SQ (2015) A review of researches on shrinking cities. Urban Plann Forum 3:44–49

Großmann K, Haase A, Rink D, Steinführer A (2008) Urban shrinkage in East Central Europe? Benefits and limits of a cross-national transfer of research approaches. Polish and German Perspectives, Declining cities/Developing cities, pp 77–99
Haase A, Rink D, Grossmann K (2016) Shrinking cities in post-socialist europe: what can we learn from their analysis for theory building today? Geogr Ann 98(4):305–319
Haase A, Rink D, Grossmann K, Bernt M, Mykhnenko V (2014) Conceptualizing urban shrinkage. Environ Plann A 46(7):1519–1534
Haase D, Haase A, Kabisch N, Kabisch S, Rink D (2012) Actors and factors in land-use simulation: The challenge of urban shrinkage. Environ Model Softw 35:92–103
Hall P, Hay D (1980) Growth centres in the european urban system. Heinemann Education Books London England 72(3):360
Heilig GK (2006) Many Chinas? The economic diversity of China's provinces. Populat Developmen Rev 32(1):147–161
Hoekveld JJ (2012) Time-space relations and the differences between shrinking regions. Built Environ 38(2):179–195
Hollander JB, Németh J (2011) The bounds of smart decline: a foundational theory for planning shrinking cities. Housing Policy Debate 21(3):349–367
Huang H (2011) Smart decline: planning measures for urban decay and its practice in US. J Urban Region Plann 4(3):157–168
Kabisch N, Haase D, Haase A (2010) Evolving reurbanisation? Spatio-temporal dynamics as exemplified by the East German city of Leipzig. Urban Stud 47(5):967–990
Kabisch S (2007) Shrinking cities in Europe–reshaping living conditions in post communist cities—experiences from Eastern Germany. Housing and Environmental Conditions in Post-Communist Countries, Gliwice, pp 175–192
Leo C, Brown W (2000) Slow growth and urban development policy. J Urban Affair 22(2):193–213
Liu X, Derudder B, Taylor P (2014) Mapping the evolution of hierarchical and regional tendencies in the world city network, 2000–2010. Comput Environ Urban Syst 43:51–66
Liu YS, Liu Y (2010) Progress and prospect on the study of rural hollowing in China. Geograph Res 29(1):35–42
Long Y, Wu K (2016) Shrinking cities in a rapidly urbanizing China. Environ Plann A 48(2):220–222
Lu DD (2007) Urbanization process and spatial sprawl in China. Urban Plann Forum 4:47–52
Lu DD (2010) We haven't got rid of the rash advance of urbanization. People's Tribune 13:26–26
Mao QZ, Long Y, Wu K (2015) Spatio-temporal changes of population density and exploration on urbanization pattern in China: 2000–2010. City Plann Rev 2:38–43
Martinez-Fernandez C, Audirac I, Fol S, Cunningham-Sabot E (2012) Shrinking cities: urban challenges of globalization. Int J Urban Reg Res 36(2):213–225
Nie XY, Liu XJ (2013) Types of "Ghost Towns" in the process of urbanization and countermeasures. J Nantong Univ (Soc Sci Edition) 29(4):111–117
Oswalt P, Rieniets T (2006) Atlas of shrinking cities. Hatje Cantz
Pallagst KM (2008) Shrinking cities: planning challenges from an international perspective. Cities Growing Smaller
Research Group on China's Economic Growth (CASS) Zhang P, Liu XH (2011) Urbanization, Fiscal Expansion and Economic Growth. Economic Research Journal, 11(1):95–96
Savitch HV, Kantor P (2003) Urban strategies for a global era: a cross-national comparison. Am Behav Sci 46(8):1002–1033
Schilling J, Logan J (2008) Greening the rust belt: A green infrastructure model for right sizing America's shrinking cities. J Am Plann Assoc 74(4):451–466
Turok I, Mykhnenko V (2007) The trajectories of European cities, 1960–2005. Cities 24(3):165–182
Un-Habitat (2012) State of the World's Cities 2008/9: Harmonious Cities. Routledge
Wang CJ, Wang W, Zhang MT, Cheng JJ (2014) Evolution, accessibility of road networks in China and dynamics: from a long perspective. Acta Geogr Sin 69(10):1496–1509
Wang SJ, Fang CL, Wang Y (2015) Quantitative investigation of the interactive coupling relationship between urbanization and eco-environment. Acta Ecol Sin 35(7):2244–2254

Wiechmann T (2008) Errors expected—aligning urban strategy with demographic uncertainty in shrinking cities. Int Plann Stud 13(4):431–446
Wiechmann T, Pallagst KM (2012) Urban shrinkage in Germany and the USA: a comparison of transformation patterns and local strategies. Int J Urban Reg Res 36(2):261–280
Wu B, Wang Z (2003) The life cycle of cities and its theoretic model. Geograph Geo-Informat Sci 19(1):55–58
Wu CT, Zhang XL, Cui GH, Cui SP (2008). Shrinkage and expansion in peri-urban China. Exploratory case study from Jiangsu Province. In: ACSP-AESOP 4th Joint Congress, University of Illinois at Chicago, pp 6–11
Wu K, Fang CL (2009) The development process and basic pattern of china's small towns since 1949 and its recent new situation. Econom Geogr 29(10):1605–1611
Wu K, Fang CL, Zhao MX (2015) The spatial organization and structure complexity of Chinese intercity networks. Geogr Res 34(4):711–728
Wu K, Fang CL, Zhao MX, Chen C (2013) The intercity space of flow influenced by high-speed rail: a case study for the rail transit passenger behavior between Beijing and Tianjin. Acta Geogr Sin 68(2):159–174
Xu B, Pang DL (2014) Growth and recession: the research of international urban shrinkage and its implications for China. Economist 4(4):5–13
Xue L (2001) Study on the inner-decaying village and the countermeasures with jiangsu province as the case. City Plann Rev 6:8–13
Yang DF, Yin CZ (2013) How to save the shrinking cities: old industrial cities' transition in the UK. Urban Plann Int 6:50–56
Zhao XP, Zhou YX (2002) Research on urbanization and urbanization in China since the reform. Soc Sci China 2:132–138
Zhou K, Qian FF (2015) Shrinking city: on searching for urban development in non-growing scenarios. Modern Urban Research 9:002

Chapter 4
Research on the Spatial Distribution and Influencing Factors of Shrinking Cities in Jilin Province

Yongjian He and Lin Yang

Abstract Based on a brief comment on the status quo of domestic and foreign shrinking cities research, this paper highlights the significance of analyzing urban shrinkage in Jilin Province. By collecting and analyzing county-level demographic data from the 2000 and 2010 censuses, we identified 26 shrinking cities in a total of 48 administrative units in Jilin and summarized the development process and spatial distribution characteristics of depopulation. Then, we classified the factors influencing urban shrinkage from both external and internal perspectives and analyzed the comprehensive mechanism in depth. This paper expects to provide a reference for future planning of shrinking cities in Jilin Province.

Keywords Spatial distribution · Influencing factors · Shrinking cities · Jilin province

4.1 Introduction

China's economic development has achieved remarkable results since the 1978 reform, and regional imbalance has become more pronounced recently. On the one hand, core cities, especially Eastern coastal ones, have developed rapidly. On the other hand, population loss has brought great challenges to peripheral shrinking cities in Western and Northeastern regions. Foreign research on shrinking cities has developed from a focus on external perspectives, such as quantitative changes and performance characteristics, to a focus on motivational mechanisms and planning strategies (Rieniets 2005; Martinez et al. 2012a, b; Reckien and Martinez 2011; Wiechmann and Pallagst 2012; Karina et al. 2016; Zhou and Qian 2015). However, due to the large differences in the spatial definition of cities and urban population

Y. He (✉)
School of Architecture, Tianjin University, Nankai District, Tianjin, China
e-mail: horace1976@126.com

L. Yang
Arcplus East China Architectural Design & Research Institute Co., Ltd.,
Urban Planning & Architectural Design Institute, Shanghai, China

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_4

size in China and abroad, there is no clear, uniform Chinese standard for the definition of shrinking cities in the Chinese academic community. Second, most Chinese shrinking cities are still in the initial stages of shrinkage; they are not shrinking as aggressively as their counterparts in Western countries and have not shown any related characteristics of a structural economic crisis. The specific characteristics of these cities and the influencing factors also vary from region to region (Gao 2015; Wu et al. 2015; Gao 2017; Liu and Yang 2017). Third, domestic studies pay the most attention to the impacts and consequences of urban shrinkage, such as population decline and spatial expansion. However, there is a serious lack of concrete and in-depth empirical research on the economic, social, and cultural factors affecting shrinking cities. Overall, shrinking cities in China are faced with a combination of spatial expansion, economic growth, and population loss, a more complex situation than in the West. Thus, it is urgent to construct a framework for shrinking cities that conforms to China's locality (Long et al. 2015).

The situation of shrinking cities in Northeast China is similar to that of Rust Belt cities in the USA. Most of these resource-based cities have experienced population loss since the end of the prosperity of traditional heavy industries in the 1980s. Therefore, urban shrinkage research has been a heated topic of discussion in Chinese academic circles. Existing studies on Northeastern shrinking cities have achieved preliminary results, and the research framework for urban shrinkage has been initially established. However, few studies have analyzed the influencing factors from a more refined spatial perspective. Therefore, this paper takes the county and county-level cities as basic research units to deeply analyze the status quo and formation mechanisms of urban shrinkage in Jilin Province. Not only can this study enrich research on shrinking cities in China, but it can also provide a reference for future planning of shrinking cities in Jilin Province.

4.2 Spatial Distribution of Shrinking Cities in Jilin Province

4.2.1 Basic Situation of the Study Region

The study region, Jilin Province, is located in the northeastern part of China and covers an area of approximately 187,400 km^2. It is bordered by Heilongjiang Province to the north, Liaoning Province to the south, the Mongolia Autonomous Region to the west and Russia and North Korea to the east. Jilin Province has jurisdiction over Changchun (which is also the provincial capital), 7 prefecture-level cities, and Yanbian Korean Autonomous Prefecture (this administrative division is subject to 2010s situation). Overall, in terms of resident population, the population growth in Jilin Province has slowed significantly since 2010, growing by approximately 10,000 people per year. Additionally, the population growth rate has dropped steeply and remains at approximately 0.04%, which is far below the national average value. In

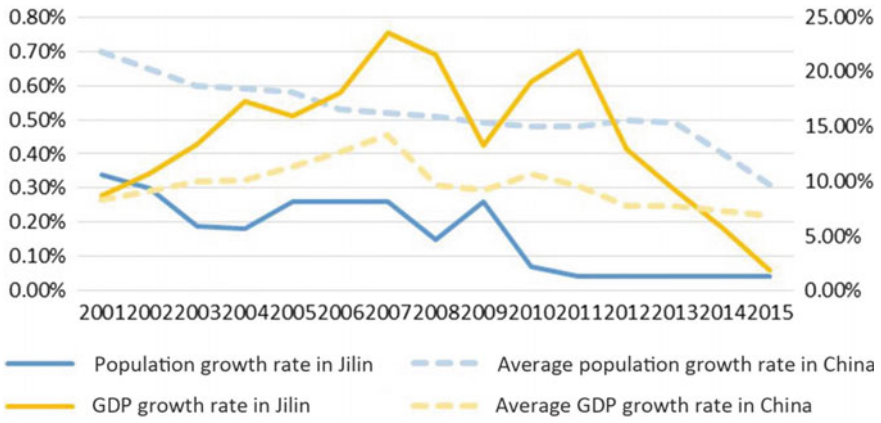

Fig. 4.1 Comparison of the population and economic growth rates between Jilin Province and China (2001–2015)

terms of the economy, the GDP growth rate of Jilin Province peaked at 23.62% in 2007. It was subsequently significantly reduced by the global financial crisis in 2008–2009. After 2009, the economic growth rate started to rebound but fell sharply after reaching 21.94% in 2011. The growth rate of the GDP in 2015 was only 1.88%, which was also lower than the national average value. Although the economic growth of Jilin Province has been the fastest among the Northeastern provinces (the other two being Liaoning Province and Heilongjiang Province) in recent years, it is still at the lowest level in all of China (Fig. 4.1).

4.2.2 Identification of Shrinking Cities in Jilin Province

Currently, the identification of shrinking cities in China mainly focuses on two issues. On the one hand, a "city" in the geographical space is not equal to a "city" in administrative divisions (Gao and Long 2017). This is mainly due to the adjustment of administrative divisions, such as the withdrawal of counties, cities, etc. On the other hand, the increasing frequency of population movement makes the separation of households more obvious. It is necessary to find the real demographic indicators reflecting urban population changes by obtaining data on the 'hu ji' population, 'de facto' population, urban population and employed population.[1] Based on comprehensive research on the definition of shrinking cities in domestic and foreign research,

[1]The 'hu ji' population refers to the population with administrative residence registration. The 'de facto' population means the actual population living in an administrative area. The urban population refers to the population living in cities and towns and that is mainly engaged in non-agricultural industries. The employed population refers to the population aged 16 or above that is engaged in certain social work or business activities and obtains remuneration or business income.

this paper defines the population and spatial extent of shrinking cities at both generalized and narrowly defined levels. In the broad sense, taking the city or county de facto population as the research scope can reveal population distribution change in general. In the narrow sense, taking the de facto population of central urban areas (urbanization level > 80%) as the research scope reflects population concentration more specifically.

(1) Research scope and definition of a spatial unit

As this paper takes Jilin Province as a research subject, the research object is defined as a shrinking city on a general level. Considering administrative division changes in Jilin Province, administrative units at the county level in 2010 were used as the basic research units. Demographic data from administrative units in other years were adjusted corresponding to the borders in 2010. Ultimately, all county-level administrative units (the Shixia district[2] of a prefecture-level city was considered a basic research unit) were taken as the research object. Thus, a total of 48 research units were included.

(2) Population data

Data from the fifth census (2000) and the sixth census (2010) were used. The specific algorithm is shown in Formula 1. 'Cr' indicates urban shrinkage calibrated to the de facto population. The calculation result is shown in Tab 1. In addition, the hu ji population data from Jilin's 1984 to 2016 Statistical Yearbooks are considered to be long-term and diachronic demographic data that roughly reflect the duration of urban shrinkage in Jilin Province (Table 4.1).

$$Cr = \left(\frac{\text{Pr}\,2010}{\text{Pr}\,2000} - 1\right) * 100\% \tag{4.1}$$

Thus, 26 shrinking units were selected from the 48 administrative units in Jilin Province, including 11 county-level cities and 15 counties. Comprehensively considering both the division standard for urban shrinkage at home and abroad (Liu 2016; Yang et al. 2015; Li et al. 2015) and the population change in Jilin Province, this study classifies shrinkage degrees into four categories: mild shrinkage (0–2.9%), moderate shrinkage (3.0–9.9%), severe shrinkage (10.0–29.9%) and critically severe shrinkage (30.0% or more) (see Table 4.2). From the perspective of administrative divisions, the population of all Shixia districts grew, while approximately 70% of county-level cities and counties have contracted; moreover, from the perspective of shrinkage degree, 65% of shrinking cities have a shrinkage degree of less than 10%. Although Longjing City exhibited the most severe shrinkage (up to 32.2%), this shrinkage still does not exceed that of foreign cities such as Yubari in Japan (89.6%) and Detroit in the United States (61.3%) (Oswalt 2005).

[2]The Shixia district is the core component of urban districts and the center of regional development, where urbanization and population density are generally high.

Table 4.1 Shrinking cities in Jilin Province based on the de facto population

County and city names	Cr (%)
Nong'an County	−10.7
Jiutai City	−23.5
Dehui City	−14.8
Yongji County	−6.8
Jiaohe City	− 5.7
Shulan City	−2.2
Panshi City	−4.7
Lishu County	−10.2
Yitong Manchu Autonomous County	−1.4
Dongfeng County	−13.1
Dongliao County	−11.9
Tonghua County	−3.1
Huinan County	−0.2
Liuhe County	−3.0
Meihekou City	−0.4
Ji'an City	−3.2
Fusong County	−2.9
Jingyu County	−6.7
Changbai Korean Autonomous County	−14.3
Linjiang City	−5.4
Fuyu County	−2.0
Zhenlai County	−7.1
Taonan City	−2.0
Longjing City	−32.2
Helong City	−12.0
Wangqing County	−0.2

4.2.3 Development of Shrinking Cities in Jilin Province

Although the unique Chinese phenomenon of 'Renhufenli'[3] makes it impossible for hu ji population data to reflect actual population changes, these data can still be used to analyze the duration of population changes owing to their continuity. The study divided the 26 shrinking administrative units into two categories, initial population > 400,000 and initial population < 400,000 (the initial year was 1983)[①], to further analyze the shrinkage development process. Figures 4.2 and 4.3 show that most shrinkage units occurred in a period of population growth from 1983 to 2000,

[3] 'Renhufenli' means that a person's administrative residence registration is different from where he/she lives.

Table 4.2 List of shrinking cities in Jilin Province classified by shrinkage degree

	Mild shrinkage (0–2.9%)	Moderate shrinkage (3.0–9.9%)	Severe shrinkage (10.0–29.9%)	Critically severe shrinkage (≥30.0%)	Total
County-level city	3 (Shulan City, Meihekou City, Taonan City)	4 (Jiaohe City, Panshi City, Ji'an City, Linjiang City)	3 (Jiutai City, Dehui City, Helong City)	1 (Longjing City)	11
County	5 (Huinan County, Yitong Manchu Autonomous County, Fusong County, Wangqing County, Fuyu County)	5 (Yongji County, Tonghua County, Liuhe County, Jingyu County, Zhenlai County)	5 (Nong'an County, Lishu County, Dongliao County, Dongfeng County, Changbai Korean Autonomous County)	–	15
Total	8	9	8	1	26

which was the result of the third childbirth peak in China from 1981 to 1990 (Li 2012). In contrast to shrinking cities in Western countries that have experienced shrinkage over a long period of time, the contracting units in Jilin did not occur until approximately the last 15 years. After a stable population period from 2000 to 2004, most of the shrinkage units peaked between 2004 and 2006. Then, the population began to decline slowly (Fuyu City has abnormal data due to the adjustment of administrative divisions). Studies have shown that shrinking cities in Jilin Province are either those that have had a dwindling population during the past five years or those whose hu ji population in 2015 was more than 2% lower than the peak rate. Therefore, it can be concluded that there is indeed city shrinkage in Jilin Province; however, the process is relatively new.

4.2.4 Spatial Distribution of Shrinking Cities in Jilin Province

According to Fig. 4.4, the population change in Jilin Province showed polarized shrinkage and growth, along with a certain degree of agglomeration and continuity in spatial distribution. On the one hand, the growth area shows characteristics of agglomeration in Shixia districts, most of which have a population growth rate of

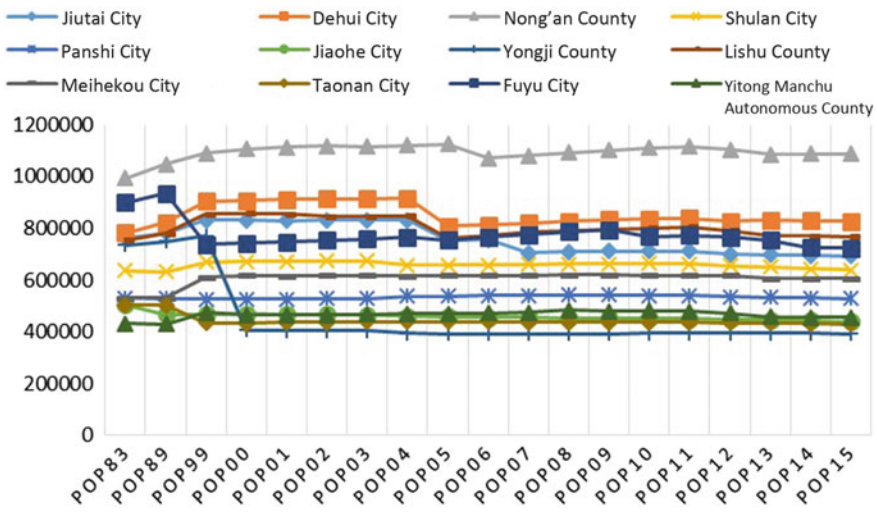

Fig. 4.2 Hu ji population change in 12 of Jilin's shrinking cities from 1983 to 2015

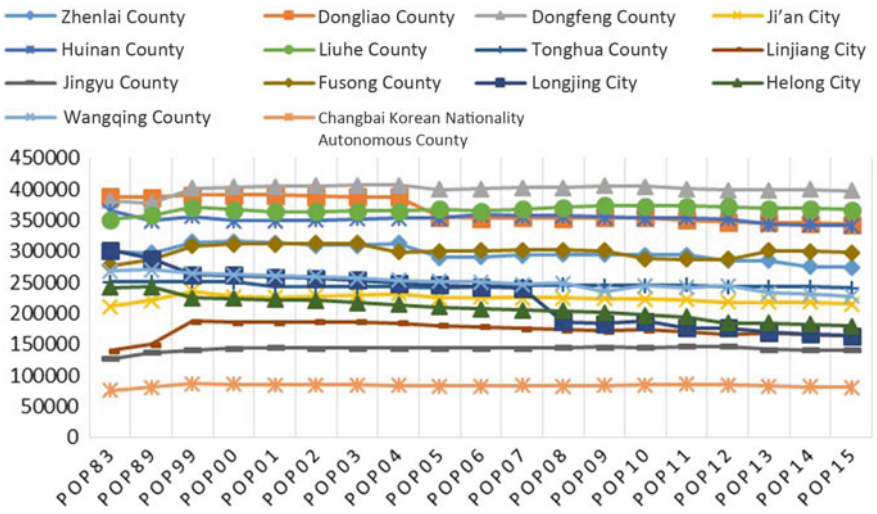

Fig. 4.3 Hu ji population change in 14 of Jilin's shrinking cities from 1983 to 2015

more than 10%. The county's population growth slows as the distance to Shixia districts (that is, core urbanized districts) increases. An exception is Hunchun City, which, though it is located in a border area, still shows strong population growth of 14.5% because of favorable policies, such as the Changjitu Development and Opening District Strategy. In summary, the 26 shrinking units can be divided into four categories of spatial distribution as follows:

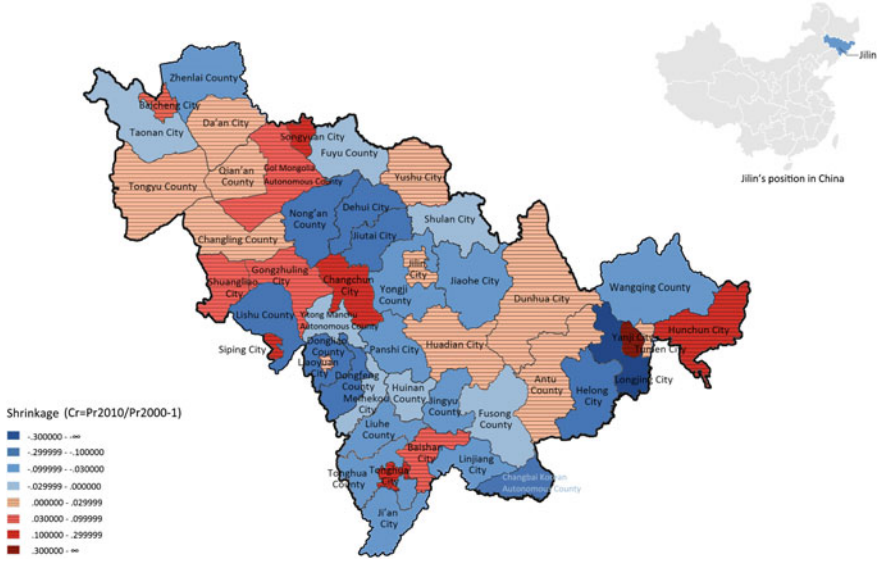

Fig. 4.4 Spatial distribution of population change in Jilin Province from 2000 to 2010

(1) Shrinking ring around core cities

County-level cities and counties around Shixia districts have a large area of shrinkage. This pattern can be seen in Nong'an, Dehui, and Jiutai around the core district of Changchun City; Yongji, Shulan, and Luohe around the core district of Jilin City; Lishu County around the core district of Siping City; and Dongliao and Dongfeng County around the core district of Liaoyuan City. Furthermore, the closer the regional core city is, the greater the population contractions of shrinking cities. Moreover, city shrinkage abates the distance increases.

(2) Shrinking urban belt at the interprovincial border of Jilin and Neimenggu Province

Both Taonan City and Zhenlai County are located at interprovincial borders. Such shrinking cities are located in the hinterland and are far from regional core cities. As a result, they have fewer opportunities to share transportation dividends and undertake industrial transfer, resulting in continuous population loss.

(3) Shrinking urban belt along the state border

Yanbian Korean Autonomous Prefecture, Yitong Manchu Autonomous County, and Changbai Korean Autonomous County have their own characteristics of population outflow. The Korean population in these areas is relatively large, which means that residents can communicate easily with people in the neighboring countries of North Korea and South Korea. This ability has motivated them to go abroad to find advantageous economic opportunities. Interestingly, Yanbian Korean Autonomous

Prefecture exhibits both foreigner input and outflow of the local population. However, shrinking cities along the state border show a strong tendency for population movement exiting Jilin Province or even going abroad in general, thus showing more severe shrinkage.

(4) Central-South shrinking agglomeration

Meihekou City, Huinan County, and surrounding shrinking cities make up the central-southern shrinking agglomeration area of Jilin Province. These shrinking cities are neither along the 'China-Mongolia Economic Corridor' nor within the 'Hachang Development Axes,' leading to continued economic downturn and population loss.

4.3 Factors Influencing Shrinking Cities in Jilin Province

4.3.1 External Influencing Factors

4.3.1.1 External Economic Environment Factors

First, the reconstruction of global production systems has shaped new regional and urban orders (Martinez et al. 2012a, b). Since China joined the globalization wave of the WTO in 2001, developed cities, such as Beijing and Shanghai, have continuously attracted talent and social capital, built key infrastructure, and cultivated high technology, which helped them become leaders in China's economic development. Coastal cities continued to implement economic transformation and structural upgrades, and thus, a relatively diversified industrial structure was formed. Inland cities such as Chengdu, Chongqing and Wuhan have also seized opportunities for industrial penetration from coastal districts to inland regions in recent years and have adjusted their industrial structure and function models efficiently to meet industrial needs in a new era. However, Jilin and most cities in Northeast China still maintain a conventional resource-based industry model and static structure. Thus, it is difficult for Jilin to position itself in a global economic environment dominated by information and service industries, resulting in economic malaise and population shrinkage.

Second, the crisis of overproduction triggered by economic cycle decline is another exogenous factor that causes urban shrinkage (Li et al. 2016). The global economic downturn that occurred after the 2008 financial crisis brought economic decline to most of China's export-oriented cities. The import and export value changes in Jilin Province show that due to the impact of the global financial crisis, export value fell sharply in 2009. Although there was a slight recovery in 2011, it again declined after 2012. Overproduction, coupled with low demand in international and domestic markets, has impacted the city's foreign trade. Moreover, the single industrial structure led to greater economic vulnerability and lower risk-resistance. As

a result, the economic growth rate of shrinking cities has fallen severely, causing population loss and city shrinkage.

Furthermore, the Chinese economy recently entered a 'new normal period' of changing direction, and demand for destocking reformation has made the outlook for resource-based industries even more bleak. Cities in Northeast China lack innovation ability and have problems with transformation. The ever-declining economy has caused a continuous loss of population, which has intensified city shrinkage.

4.3.1.2 Location Factors

Jilin Province is located in the inland area of Northeast China and has no sea ports. Although it borders Russia and faces North Korea across the river, this inland location is not conducive to the proliferation and absorption of resources and elements. In addition, the unstable geopolitical pattern is also worsening the economic development of Jilin Province (Zhang 2011). For example, shrinking cities, such as Taonan City, Longjing City and Helong City, are located in the marginal area of Jilin Province. They are geographically difficult to reach, and their infrastructure and public service facilities are relatively underdeveloped. The population in Jilin Province continues to aggregate in regional core cities with higher service levels, thus leading to shrinkage of these marginal cities.

4.3.1.3 Climate Factors

Historically, the cold climate of the Northeast region has not been suitable for productivity and habitation. Thus, climate is another exogenous factor influencing urban shrinkage in Jilin Province. Historically, because of cold weather, the Northeast cities have been sparsely inhabited. From the late Qing Dynasty to the founding of the People's Republic of China, when the country vigorously developed heavy industry in the Northeast region, the 'Guan Nei' population constantly immigrated to 'Guan Wai' districts (that is, the Northeast region).[4] Most people living in Jilin now are descendants of these immigrants. In addition, the latitude of Jilin Province is high, and the cold in winter reduces the time available for production and daily life activities and causes people to stay indoors. Night consumption and winter consumption are greatly reduced. However, in the hot and humid environment of South China, people are more willing to go out, and consumption is higher. It is also found that the main destination for relocation from the Northeast is either core cities such as Beijing, which are closer to home in the North, or coastal cities with a pleasant climate and suitable temperature. The more developed economy and pleasant living environment of these destinations have led to a continuous decrease in Jilin's population and that of the entire Northeast.

[4] 'Guan Nei' districts refer to the area south of Shanhaiguan. 'Guan Wai' districts refer to the area north of Shanhaiguan, essentially equivalent to the Northeast region.

4.3.2 Internal Influencing Factors

4.3.2.1 Economic Factors

(1) Convergence of industrial structures and weak cooperation within the region

In terms of industry functions, there are many similarities among most cities in Jilin Province. Petrochemical engineering, agricultural product processing and medicine are seen as leading industries, and comparative advantage industries have not been formed. This fact has led to vicious competition among cities.

In terms of the spatial distribution of industry, a large number of dominant resources and leading industries are concentrated in the Shixia districts of Changchun, Jilin, Siping, Tonghua, Songyuan and other cities. Thus, no cooperative relationships with surrounding cities or counties exist. Fewer available resources and a lack of radiating effects from core cities limit the economic growth of shrinking units.

In terms of industrial structures, Jilin still dominates agriculture and heavy industries with low economic efficiency, ignoring light industry and the tertiary sector. The input-output ratio of the first industry is low (60% of the population of shrinking cities contributed to 10% of the GDP), and the promotion of new technology has decreased the demand for labor. For example, Liaoyuan City, Tonghua City and Baishan City are the main bases for agricultural product processing (Zhou and Yuan 2015). With information platform construction, demand for labor has steadily decreased, and agricultural populations have been induced to emigrate to find new opportunities. Tertiary sector development is slow. Low-value production services, such as transportation, storage, postal and water conservancy, are still the main services in shrinking cities, and public service and new service industries are still emerging.

(2) Large proportion of traditional and resource-based industries

Although traditional industry has a development foundation and resource advantage, this dominance has led to a huge amount of investment in technology, capital and talent for transformation and upgrading. However, high consumption, high pollution and low added value have greatly hindered the sustainable development of industry. Furthermore, the low overall technical level results in low input and output efficiencies for products. Most enterprises can only produce primary products at the front of the industrial chain and lack the talent, technology and capital needed to penetrate further, which leads to low efficiency in economic growth, population outflow and city shrinkage.

(3) The rigid state-owned system and its low efficiency

The Northeast area has always had the highest proportion of state-owned enterprises. These enterprises have adapted to the long-standing planned economic production mode, that is, the state guarantees the sales and price of products and eliminates direct competition between factories with different production efficiencies (Chen 2014). In the transition from the planned economy to the market economy system,

enterprises and the government still tread familiar ground and cannot adapt to a post-Forster production model that is targeted and customized. Thus, they are gradually eliminated by the market. Cui Wan Tian of Liaoning University noted that 2/3 of the GDP in Northeast China was derived from state-owned enterprises, most of which have been unable to make ends meet since the 2000s (Cui 2004).

4.3.2.2 Population Factors

(1) Extremely low birth rates affect labor supply

Strict implementation of the 'one child' policy in the Northeast region resulted in a relatively low overall fertility level. In 2010, the average birth rate in the 26 shrinkage units in Jilin was only 0.69%, even less than in Shanghai, which has the highest urbanization level in China. Moreover, the average natural growth rate of shrinkage units in 2010 was only 0.13%, far behind the national average level of 0.48%. Additionally, China is transitioning from having a high marriage rate, low divorce rate and high fertility rate to having a low marriage rate, high divorce rate and low fertility rate, which leads to a long-term low fertility rate in many cities. The large reduction in newborns directly leads to a shortage in the labor supply, thus impeding urban economic development. The labor shortage has also led to a labor price increase, thus pushing up product prices, restraining consumption demand and further reducing the total output of society, which inevitably makes a labor-intensive economy unsustainable and leads to city shrinkage.

(2) Aging aggravates the government's financial burden

Shrinking cities have entered the full aging stage. The aging of the population also implies the gradual disappearance of demographic dividends and a decrease in the working-age labor supply. These factors restrict a city's economic growth and urban vitality. Additionally, the increasing elderly population has overstretched already strained finances, and the pension system is clearly in crisis. For example, the per capita GDP in Jilin was 51,086 yuan in 2015, which was less than half that in Shanghai. Poor economic capacity and the aging population put greater pressure on a government's fiscal revenue and expenditure. To reduce expenditure, the government has reduced the input to and service level of public facilities, which exacerbates population loss.

(3) The aggravation of population outflow, especially of high-quality talent

With a rigid enterprise system and conservative ideology, it is difficult for economies in the Northeast to provide an excellent platform and sufficient income for the overall development of young people, which leads to population outflow. In particular, high-quality talent seeks work in more developed areas, such as eastern coastal areas. This process has caused less-developed economies to lose talent and the technological elements needed for innovation and drives them into an industrial transformation predicament. Therefore, how to keep the economy running normally in the context of the stress produced by population outflow is a very challenging problem.

4.3.2.3 Infrastructure Factors

(1) High-speed railways and expressways cause space deprivation in shrinking cities

While traffic corridors, such as high-speed railways and highways, bring population and capital benefits for cities along the line, they also create a spatial deprivation situation in the surrounding cities without high-speed transportation (Liu and Zhang 2017). In Northeast provinces, not only did high-speed rail and highway construction strengthen the structure of "One Corridor, Three Districts and Four Hearts" ②, it also consolidated the leading role of central cities, such as Harbin, Changchun, and Shenyang (Yi 2013). This infrastructure development actually aggravated the imbalance of spatial and regional development.

Further comparing shrinkage maps of Jilin (Fig. 4.5) and traffic advantage assessment maps (Fig. 4.6) reveals that there is a certain correlation between traffic advantage and urban shrinkage, that is, the greater the traffic advantage of a core city is, the more surrounding cities shrink and the greater the shrinkage is. Take Changchun (the provincial capital city of Jilin Province) as an example: the construction of the Beijing-Shenyang high-speed rail, Hunchun high-speed rail and a highway considerably shortened travel time from Changchun to surrounding rural counties from 3 h to half an hour. This greater accessibility also provides greater convenience for the outflow of population and capital. Although transport corridor construction has promoted the development of the local economy, it has also accelerated the loss of local resources.

(2) Imperfect traffic facilities system

Jilin Province does not have a comprehensive, integrated traffic network. At present, only two high-speed railways—the 'Hada axis' and 'Changhun axis'[5]—have been built, and high-speed railway construction is slow. At present, most railways still provide traditional rail service. Therefore, there is no perfect highway network system connecting cities in Jilin Province. As the isolation of urban and rural districts is more serious, accessibility between cities is strong and that between towns and villages is poor. For example, shrinking cities such as Taonan City, Longjing City and Helong City are located at the edge of Jilin Province. The inaccessible geographical conditions and underdeveloped transportation infrastructure of marginal cities make populations aggregate in the core cities of the region, which leads to the shrinkage of the marginal cities.

[5]The 'Hada axis' refers to the urban development zone along traffic corridor from Harbin to Dalia. The 'Changhun axis' is the urban development zone along the traffic corridor from Changchun to Hunchun.

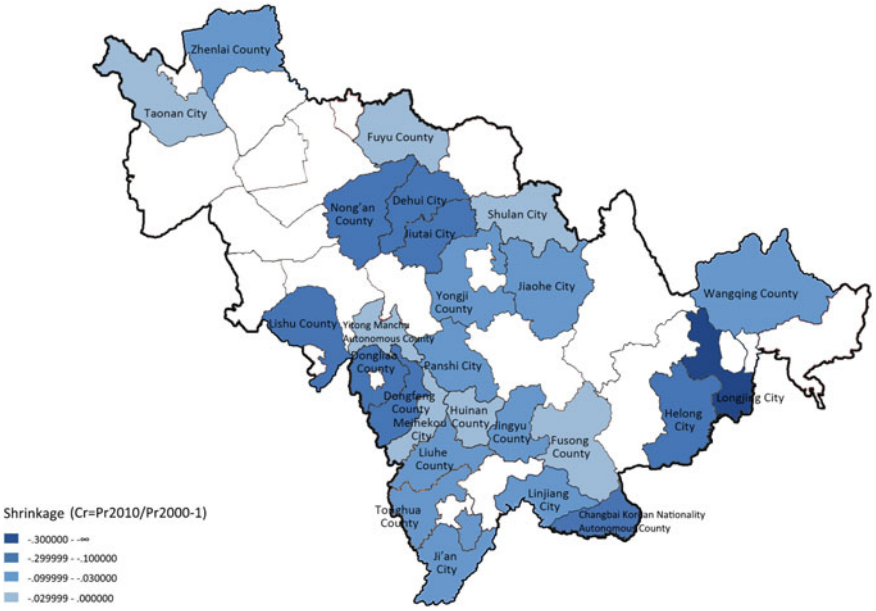

Fig. 4.5 (Left) Spatial map of shrinking cities in Jilin Province

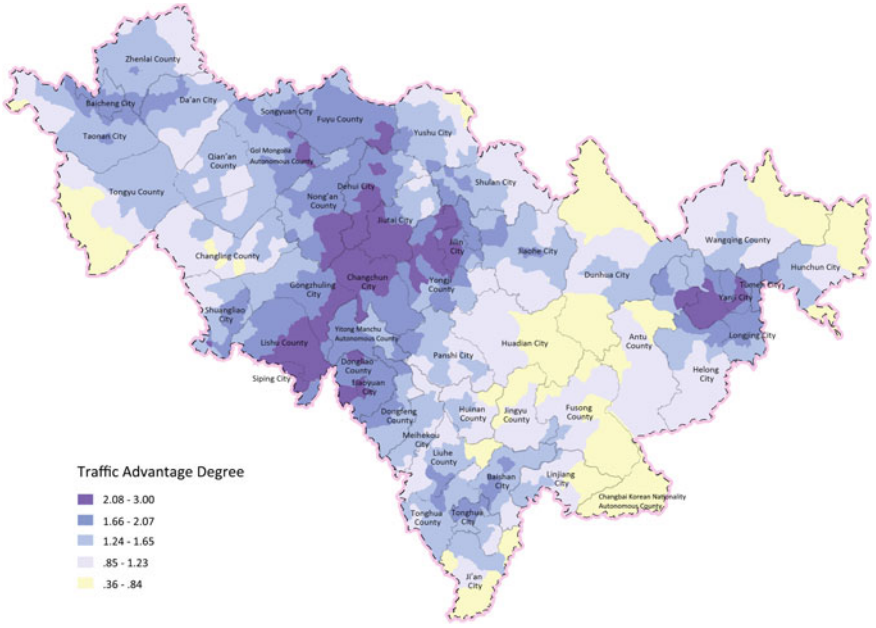

Fig. 4.6 Evaluation chart of traffic advantages in Jilin Province (by township unit)

4.3.2.4 Cultural Factors

(1) Immigrant culture

The Northeast region experienced two periods of large population influx. One was at the end of the Qing Dynasty, and the other was in the early period of the founding of the People's Republic of China when the Northeast region was the most developed area in the whole country. During these two periods, as a key construction area, the Northeast region attracted inhabitants from all over the country seeking a bright future. However, since the reform and opening up policy, the focus of economic development has gradually shifted to coastal areas in East China, and the immigrant spirit of the inhabitants of the Northeast gives them a stronger sense of striving and thus leads them to settle in cities with more opportunity. In addition, residents who migrated to the Northeast still maintain consanguineous ties with their relatives, so their sense of belonging and "hometown" identity are weaker than those of residents in Fujian Province and Guangdong Province. It can be concluded that immigrant culture has indirectly led to urban shrinkage in the Northeast region.

(2) Old ideologies of state-owned systems

The institutional mechanism and the "nationalization" ideology also seriously affect the development process of urban shrinkage, and these are actually deep-rooted problems in the Northeast region. The planned economic system has instilled the "big pot"[6] philosophy deep in the minds of Northeasterners, which makes them proud of finding a stable and systematic job. Lack of autonomy and of innovation make the social, economic and cultural environment relatively conservative and inflexible. Therefore, it is difficult to attract innovative and entrepreneurial talent, leading to the vicious cycle of "innovation loss—economic recession - population outflow" in the Northeast region.

4.3.3 Analysis of the Comprehensive Effect of the Influencing Factors

External factors, such as globalization, the new normal period of China's economy, the relative disadvantage of location and the unsuitable climatic conditions for living, inevitably led to an employment demand decline in Jilin Province. The urban population will continue to emigrate and settle in more developed areas. However, internal factors play a more important and profound role in urban shrinkage. First, reduced birth rates and the strict 'one child' policy brought about a long-term lower birth rate than the national average in Jilin Province, which led to a labor supply crisis. Second, an increasingly aging population has aggravated labor shortages. Thus, the structural change, density decline and uneven distribution of the population have had many

[6] 'Big pot' is a metaphor for the egalitarian phenomenon.

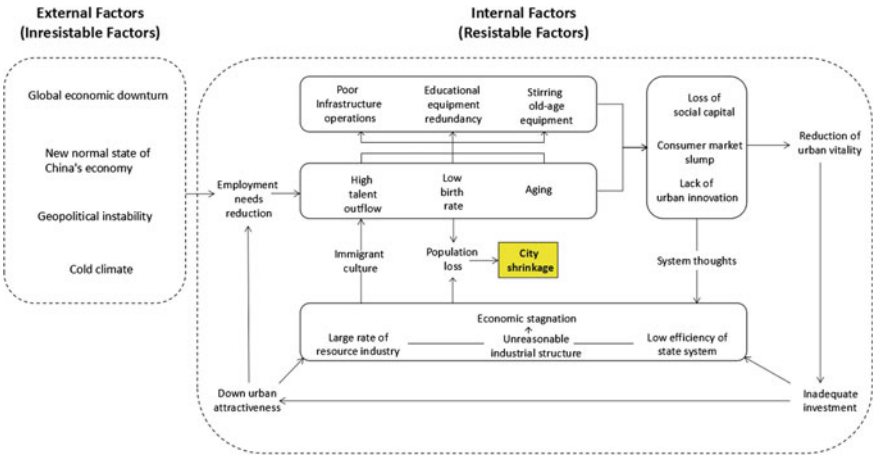

Fig. 4.7 Mechanism map of the influencing factors in Jilin Province

effects on shrinking cities, such as redundant educational facilities, crowded pension facilities and poor infrastructure operation. Third, service backwardness affects entry into enterprises and projects, resulting in social capital loss. Moreover, the weakness of the consumer market and the lack of innovative vitality further impede industrial structure transformation and sustainable economic growth. In addition, economic problems such as irrational industrial structures, the large percentage of resource industries and the low efficiency of state-owned systems have led the endogenous capacity for urban economic growth to stagnate. Gradually, regional development has become increasingly unbalanced. Declining urban attractiveness promotes population outflow, especially of high-tech talent. As a result, these negative economic factors also affect the low population growth rate. Ultimately, a city is likely to fall into a downward spiral of "economic recession—population shrinkage—urban vitality decline" (see Fig. 4.7).

4.4 Conclusion

By using population data from the fifth (2000) and sixth census (2010) and economic statistics for corresponding years, this paper identifies 26 shrinkage units from the 46 research units in Jilin Province and then summarizes the characteristics of the development process and the spatial distribution of urban shrinkage. Then, it analyzes the factors affecting urban shrinkage in Jilin Province from external and internal perspectives. Finally, the comprehensive mechanism of the influencing factors is presented. The main results are as follows:

(1) Population characteristics and spatial distribution of the urban shrinkage process in Jilin Province

Of all 48 research units in Jilin Province, 26 units are experiencing shrinkage. According to the difference in shrinkage degree, the shrinking cities are divided into four categories: mild shrinkage (0–2.9%), moderate shrinkage (3.0–9.9%), severe shrinkage (10.0–29.9%) and critically severe shrinkage (30.0% and more). However, the cities did not begin to shrink until the past 15 years, which is much more recent than the shrinkage initiation of foreign shrinking cities. In terms of spatial distribution, Jilin Province shows polarizing characteristics of growth and shrinkage, along with a certain degree of agglomeration. According to spatial distribution differences, shrinking cities can be classified into four types: shrinking ring around core cities, shrinking urban belt at the interprovincial border of Jilin Province and Neimenggu Province, shrinking urban belt along the state border and Central-South shrinking agglomeration.

(2) Factors influencing urban shrinkage in Jilin Province

Population loss is the external manifestation of urban shrinkage, and economic development and uneven allocation of resources are the underlying causes. First, factors such as globalization, the new normal period of China's economy, the relative disadvantage of the location and the unsuitable climate for living are the external factors affecting urban shrinkage in Jilin Province. However, internal factors are actually the main and specific factors affecting Jilin's urban shrinkage. The main endogenous factors causing urban shrinkage in Jilin Province are the irrational industrial structure, the high proportion of resource-based industries, the rigidity of state-owned systems, the very low birth rate, the increasingly aging population, the loss of high-quality talent, the spatial deprivation effect created by high-speed rail services and the inefficient infrastructure system. In addition, immigrant culture and old ideologies of state-owned systems in the Northeast region are endogenous causes of shrinkage.

External factors are the irresistible factors that constrict urban development. When formulating planning and coping strategies, we should fully respect and adapt to this basic environment. However, internal factors can be adjusted and reconstructed through planning and policy measures.

Planners should take a dialectical view of the impact of shrinkage. On the one hand, planning guidance and policy implementation should be carried out to guide capital flow reasonably and increase city competitiveness, thus attracting population return; on the other hand, the government can leverage the turning point of smaller cities to realize intrinsic growth. Only in this way can public service quality be enhanced and the living environment be improved to avoid continuous urban shrinkage.

Notes

① The paper conducted cluster analysis on the county scale for Jilin Province in 1983 using SPSS software. As the cutoff point is 400,000, shrinking cities are divided into two categories: those with an initial population of more than 400,000

and those with an initial population of less than 400,000. This classification helps us accurately summarize the development process and duration of urban shrinkage.

② "One Corridor, Three Districts" refers to the Hadaqi Industrial Corridor, Liaoning Coastal Economic Zone, Shenyang Economic Zone, and Changji Economic Zone. "Four Hearts" means four core cities, that is, Harbin, Changchun, Shenyang and Dalian.

Acknowledgements This research was funded by the National Natural Science Foundation Project (NO: 51678393).

References

Chen W (2014) Research on the status industrial structure in Jilin Province from perspective of Changjitu Development. Yanbian University of Basic Principles of Marxism, Yanji, Yanbian Korean Autonomous Prefecture, China

Cui WT (2004) Research on regional revitalization in Northeast China and prospect of regional cooperation in Northeast Asia. Econom Developmen 03:26–28

Gao SQ (2015) Research overview on shrinking cities. Urban Plann J 03:44–49

Gao SQ (2017) Phenomenon, concept and research traceability of Shrinking Cities. Int Urban Plann 03:50–58

Gao SQ, Long Y (2017) Identification analysis and planning of Northeast shrinking cities of China. Planner 01:26–32

Karina P, Rene F, Siba S (2016) The proper city shrinkage: two cases of German cities. South Build China 2:54–60

Li H (2012) Research on provincial migration and population migration from other provinces in Jilin Province. Jilin University of Demography, Changchun, Jilin, China

Li X, Du ZW, Li XF (2015) The spatial distribution and mechanism of shrinking cities in the pearl river delta region. Modern City Res 09:36–43

Li X, Xu XX, Du ZW (2016) The concept, influencing factors and policy implications of urban shrinkage based on the economic cycle hypothesis. First Academic Seminar of Chinese Shrinking City, 12

Liu CY, Yang PF (2017) Comparative research on mechanism and characteristic features of Chinese and foreign shrinking cities. Modern City Res 03:64–71

Liu HL (2016) Research on quantitative calculation method of Shrinking Cities. Modern City Research 02:17–22

Liu LW, Zhang M (2017) Research on impact of high speed railway on urban accessibility and regional economy in China. Int Urban Plann 32(04):76–81

Long Y, Wu K, Wang HJ (2015) Research progress and framework of Chinese shrinking cities. Modern City Res 09:14–19

Martinez FC, Audirac I, Fol S et al (2012a) Shrinking cities: Urban challenges of globalization. Int J Urban Reg Res 36(02):213–225

Martinez FC, Wu CT, Laura K et al (2012b) The Shrinking mining city: Urban dynamics and contested territory. Int J Urban Reg Res 36(02):245–260

Oswalt, P. (Ed.) (2005) Shrinking Cities Volume 1: International Research (Ostfildern-Ruit: Hatje Cantz)

Reckien D, Martinez FC (2011) Why do cities shrink? Eur Plan Stud 19(8):1375–1397

Rieniets T (2005) Global shrinkage. In: Oswalt P (Ed.) Shrinking cities Volume 1: International research, 20–34 (Ostfildern-Ruit: Hatje Cantz)

Wiechmann T, Pallagst KM (2012) Urban shrinkage in Germany and the USA: a comparison of transformation patterns and local strategies. Int J Urban Reg Res 36(02):261–280
Wu K, Long Y, Yang Y (2015) The partial shrinkage of Yangtze river delta and Beijing-Tianjin-Hebei region: pattern, types and influencing factors recognition. Modern City Res 09:26–35
Yang DF, Long Y, Yang WS et al (2015) Population loss and space expansion: the paradox of urban shrinkage in Chinese rapid urbanization progress. Modern City Res 09:20–25
Yi HF (2013) Research on economic integration of Northeast China in High speed rail age. Region Econom 05:143–146
Zhang BH (2011) Research on industrial development in Jilin Province based on Changjitu Development and Opening District Strategy. Northeast Normal University of Regional economics, Harbin, Heilongjiang, China
Zhou K, Qian FF (2015) Shrinking Cities: Research progress on urban development pathways based on inverse growth background. Modern City Res 9:2–13
Zhou Y, Yuan JD (2015) Research on sectoral structure and spatial organization characteristics of industrial clusters in Jilin Province during 1990 and 2008. Geograph Sci 35(05):575–582

Chapter 5
Space-Time Analysis and Factors Attribution of Urban Shrinkage in Northeast China

Jiahui Fan

Abstract Northeast China has been involved in urban shrinkage, or a decline in the economy and the population in recent years. This paper used population data to identify shrinking cities, analyzed the space-time distribution of urban shrinkage in Northeast China, and then attempted to identify influencing factors. The space-time distribution of the urban shrinkage was measured at the prefecture and district–county levels using data from 2000, 2008, 2010, and 2016. During 2000–2010, nearly 1/3 of prefecture-level units and 1/2 of district–county units experienced urban shrinkage. Moreover, during 2008–2016, the data increased to nearly 8/9 and 3/4. The phenomenon of urban shrinkage is becoming increasingly common in Northeast China. Several significant agglomeration areas have been formed in Daxinganling, Yichun-Heihe, Jiamusi, and Jixi-Qitaihe-Mudanjiang-Yanbian. On the whole, the shrinking areas are expanding. The phenomenon is obvious, particularly in Heilongjiang Province. This paper uses quantitative and qualitative methods to identify influencing factors from regional economic disparities, urbanization processes, industrial structure changes, population structure changes, and administrative division adjustments. The results showed that the secondary and tertiary industrial structure changes and administrative division adjustments had the strongest relevance to urban shrinkage in Northeast China and that this urban shrinkage was mainly influenced by the second industry atrophy caused by the "deindustrialization" of this time. At the same time, the adjustment of regional divisions in Northeast China objectively led to substantial changes in population statistics, which caused population shrinkage in some areas. Urban shrinkage is a process of objective development and an unavoidable and diachronic issue in many cities. The process is complex, and the population changes and economic vitality, in particular, represent a mutual cause-and-effect phenomenon that requires more in-depth research.

Keywords Northeast China · Urban shrinkage · Space-time analysis · Factors

J. Fan (✉)
College of Architecture and Urban Planning, Tongji University, Yangpu District, Shanghai, China
e-mail: fanjiahui043@163.com

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_5

5.1 Introduction

Since the middle of the twentieth century, some western cities have gradually experienced urban shrinkage, or a decline in the economy and the population. Between 1990 and 2010, more than one quarter of the urban population throughout the world was in decline, approximately 40% of the European urban population also declined, 10% of American cities were shrinking, and population losses in small- and medium-sized cities in Japan, South Korea, and South Africa were common (Wu et al. 2015). In addition to western developed countries, some scholars found that 26.71% of prefecture-level units and 37.16% of district–county units in China were shrinking, and the phenomenon in Northeast China and the Yangtze River Economic Belt were most evident (Zhang et al. 2016).

The concept of a "shrinking city" was first proposed in 1977 by the German scholar Göb, who discovered a trend in large cities in West Germany of the population constantly relocating to small and medium-sized cities (Göb 1977). Subsequently, in 1988, German scholars Häußermann and Siebel began to study shrinking cities from a sociological view, increasing the attention paid to the topic (Häußermann and Siebel 1988). Until 1998, shrinking cities were used to describe hollowed-out inner cities that lost a significant part of their population from suburbanization (Howe et al. 1998). Then, urban scholars began to frequently use the term (Gao 2017). Urban shrinkage usually refers to a densely populated area facing serious population loss and a structural economic crisis (Pallagst 2008). However, urban shrinkage is usually accompanied by a multidimensional decline in geography, society, and space (Martinez-Fernandez et al. 2012). Some scholars concluded that narrow urban shrinkage referred to the continuous loss of population in a region and, in a broad sense, referred to a decline in population, economy, society, environment, culture, and space (Xu and Pang 2014). Shrinking City International Research Network defined urban shrinkage as "a densely populated urban area with more than 10,000 population, facing population loss for more than 2 years and experiencing structural economic crisis" (Yang and Yin 2013).

In recent years, domestic scholars began to pay attention to the phenomenon of urban shrinkage. Wu kang and others used two sets of census data, from 2000 and 2010, to investigate the urban shrinkage in the Beijing–Tianjin–Hebei area and the Yangtze River Delta, and identify some influencing factors (Wu et al. 2015). Li Wei and others examined the spatial distribution of urban shrinkage and analyzed the urban shrinkage characteristics and mechanism in the Pearl River Delta (Li et al. 2015). Zhao Dan and others took Sheyang County in Jiangsu Province as an example of an analysis of the common characteristics and development difficulties of urban shrinkage in competitive regions (Zhao and Zhang 2018). Liu Jin and others analyzed the external features and internal mechanisms of population shrinkage in Maoming City in Guangdong Province—an area in the process of rapid urbanization—and proposed the concept of "hard shrinkage," which is the outflow of the agricultural population (Jin and Chunfeng 2018). In addition to the research on developed regions, the study on urban shrinkage in Northeast China has gradually increased in recent

years. Gao Shuqi and others identified and analyzed shrinking cities in Northeast China from 2000 to 2010 and selected Yichun City in Heilongjiang Province—with noticeable shrinkage—as a case study (Gao and Long 2017). Ma Jian conducted a study on the characteristics, trends, and influencing factors of urban shrinkage in Liaoning Province from 2010 to 2014 (Ma 2016). Li Yuanwei studied the status and formation mechanism of urban shrinkage in Jilin Province from 2000 to 2010 (Li 2016). It is worth noting that urban shrinkage is a population change phenomenon in a city over a certain period. Therefore, choosing the period to study is questionable. Current research on Northeast China mainly focuses on the 2000–2010 period—long in the past—making it necessary to study urban shrinkage in Northeast China in recent years.

Northeast China, which contains Heilongjiang Province, Jilin Province, and Liaoning Province, is a geographical and economic region of China and was once "the oldest son of the Republic." Today, under the background of capacity reduction and economic restructuring, urban shrinkage in Northeast China, which is characterized by economic and population decline, attracts significant attention. According to preliminary calculations by the National Development and Reform Commission, excluding the influences of natural growth, the migration out of Northeast China from 2010 to 2015 was approximately 240,000. As shown in Fig. 5.1, during 1990–2000, the population in Northeast China had relatively high growth. However, since 2000, the population growth has fluctuated and the growth rate has declined. Since 2010, the population growth rate has continuously declined, and even dropped to 0.00% in 2014. The changes in GDP in Northeast China from 1990 to 2015 (Fig. 5.2) indicate that, since 2008, economic growth has slowed and decreased sharply since 2011, at only 1.1% in 2015. Taking into account the population and economic changes in Northeast China in recent years, this paper mainly analyzed the spatial distribution characteristics of urban shrinkage during 2000–2010 and 2008–2016, to recognize the space-time evolution of urban shrinkage in Northeast China, further identify the influencing factors, and to attempt to analyze the mechanism.

5.2 Research Data and Indicators

5.2.1 Research Data

The research objects of urban shrinkage in Northeast China are at two levels. The research object at the prefecture level contains 36 prefecture-level units, and the research object at the district–county-level contains 295 district–county units. This paper used data on permanent residence and household registrations from the fifth and sixth national population census for 2000–2010 and data on the household registration population from statistical yearbooks for 2008–2016.

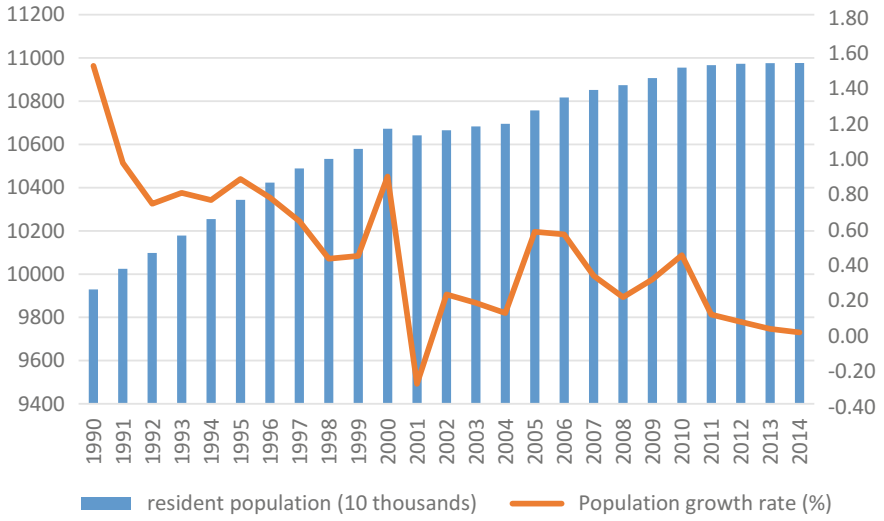

Fig. 5.1 Total population change in Northeast China from 1990 to 2014. *Sources* China Statistical Yearbook 2001–2015, China Population and Employment Statistics Yearbook 1990–2000

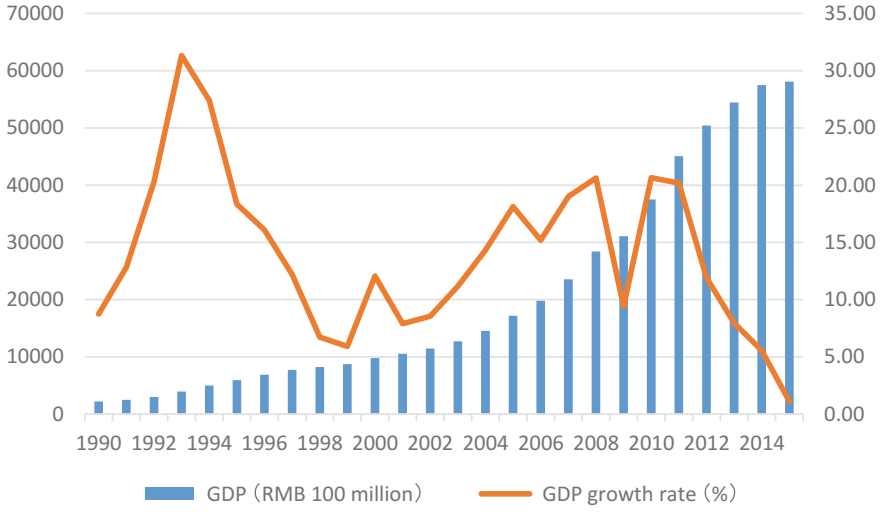

Fig. 5.2 Total GDP change in Northeast China from 1990 to 2015. *Sources* China Statistical Yearbook 1990–2015, Fifty-year Statistical Data Collection of China, Progress Database of the National Bureau of Statistics

5.2.2 Indicators

At present, the definition of shrinking cities is inconclusive. Most scholars use population reduction as a criterion for judging shrinking cities, but the specific criteria for defining the time span of continuous population reduction and total population reduction are also inconclusive (Gao 2017). Through a comprehensive consideration of domestic and foreign urban shrinkage discriminant indicators and combining the actual situation of population change in Northeast China, this study defines the shrinking cities in Northeast China as follows: during a certain period longer than 5 years, the annual population growth rate R is negative. Population data are selected at two time points to calculate the average annual population growth rate R. The formula is

$$R = \left[\left(\frac{p_2}{p_1} \right)^{\left(\frac{1}{n}\right)} - 1 \right] \times 100\%$$

The formula for calculating R is transformed from the formula, $p_2 = p_1 \times (1+R)^n$, where R is the average annual population growth rate; P_2 and P_1 are population data for 2 years, with P_2 being the prior year and P_1 being the following year, and n is the period of 2 years.

The discrimination of the annual population growth rate R is divided into six categories: obvious growth ($R > 1\%$), general growth ($0.5\% < R < 1\%$), weak growth ($0 < R < 0.5\%$), weak shrinkage ($-0.5\% < R < 0$), general shrinkage ($-1\% < R < -0.5\%$), and noticeable shrinkage ($R < -1\%$).

5.3 Space-Time Analysis of Urban Shrinkage in Northeast China

5.3.1 Space Distribution of Urban Shrinkage in Northeast China During 2000–2010

Census data from 2000 and 2010 were used to examine the urban shrinkage of prefecture-level and district–county units in Northeast China. Due to the adjustment of administrative divisions in some cities, this study matched and amended the population data on the 295 district–county units in 2000 based on the administrative boundary boundaries in 2010.

As shown in Fig. 5.3, from the perspective of permanent residents, 11 out of the 36 prefecture-level units in Northeast China were experiencing shrinkage. Among them, only Liaoyuan City, Fushun City, and Yichun City were in general shrinkage. Hegang City, Qiqihar City, Jixi City, Jilin City, Baishan City, Tieling City, Fuxin City, and Chaoyang City were in weak shrinkage and mainly distributed in the adjacent edges

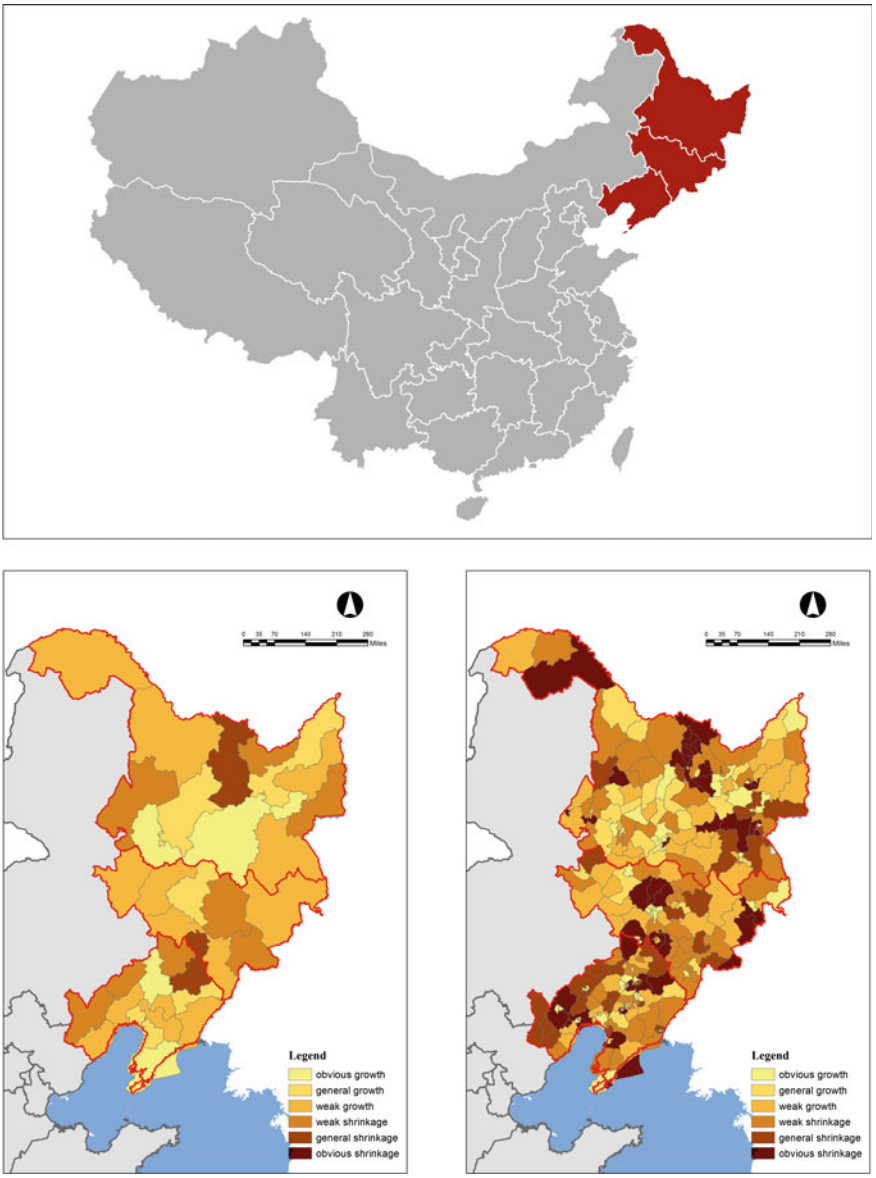

Fig. 5.3 Average annual growth rate of permanent residents in prefecture-level units (down left) and district–county units (down right) in Northeast China during 2000–2010

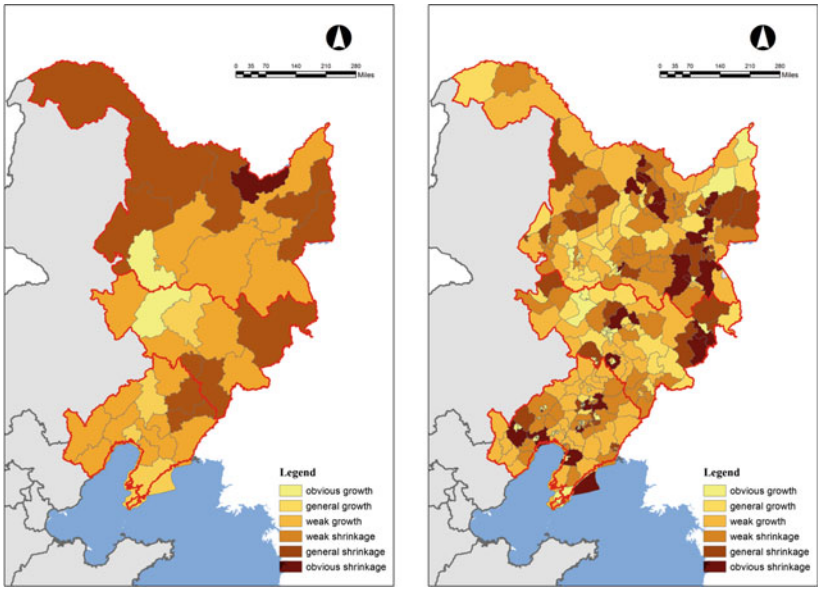

Fig. 5.4 Average annual growth rate of the household registration population in prefecture-level units (left) and district–county units (right) in Northeast China during 2000–2010. *Source* Drawn by the author

of and outside Northeast China. In the 295 district–county units in Northeast China, 146 units were in shrinkage, accounting for 49.5% of the total. In other words, nearly half of the cities experienced different levels of negative population growth. Among them, 55 district–county units were in noticeable shrinkage, accounting for 37.7% of the total shrinking cities. Shrinking cities in Northeast China appear to be common, and there were some characteristics in spatial distribution. Most of the shrinking areas focused on the border to the outside, and several agglomeration areas formed in the space, such as Yichun, Mudanjiang, Liaoyuan-Fushun, and Fuxin-Chaoyang. Other areas were mainly in local shrinkage and distributed discretely in space.

According to the household registration population, as shown in Fig. 5.4, there were 12 prefecture-level units experiencing shrinkage, and most of them were distributed in northern Heilongjiang Province. These areas are mostly restricted areas of development, such as mountainous areas and virgin forests. The climate is cold, which may be the reason for the negative growth in the household registration population. Compared with permanent residents, there were fewer shrinking cities in district–county level, with 132 units experiencing shrinkage and only 34 district—county units experiencing noticeable shrinkage. The spatial distribution was more dispersed. Except for the Mudanjiang area, the phenomenon of urban shrinkage in other areas was weaker relative to permanent residents. This finding indicates that the decrease in the household registration population in the Mudanjiang area was very evident.

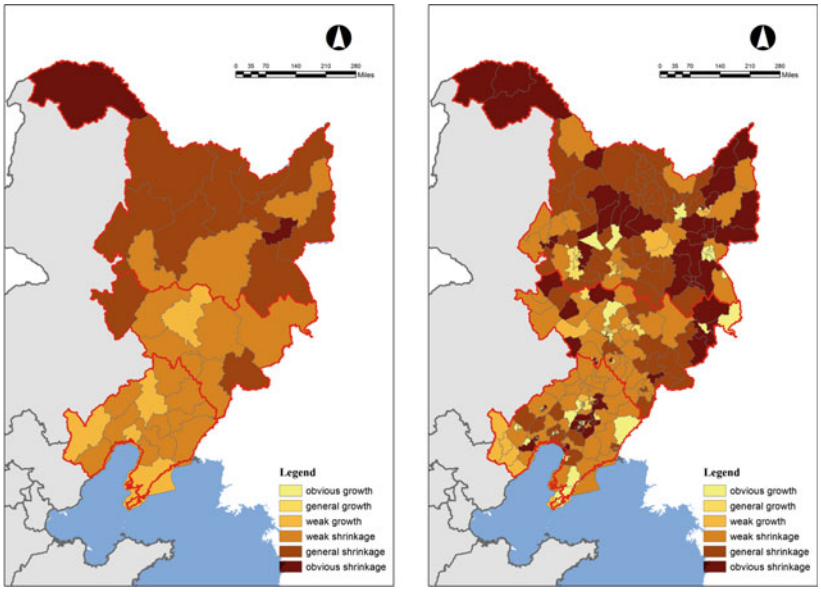

Fig. 5.5 Average annual growth rate of the household registration population in prefecture-level units (left) and district–county units (right) in Northeast China during 2008–2016. *Source* Drawn by the author

5.3.2 Space Distribution of Urban Shrinkage in Northeast China During 2008–2016

According to the statistical data from the 2008 and 2016 yearbooks, this paper analyzed the change in the household registration population in Northeast China from 2008 to 2016. The analysis made it evident that the number and scope of shrinking cities in Northeast China increased and expanded during this period, and the urban shrinkage phenomenon became more pronounced. Among the 36 prefecture-level units, 31 units experienced shrinkage at different levels, and only the population of Changchun City, Shenyang City, Chaoyang City, Panjin City, and Dalian City increased slightly. Of the 295 district–county units, 211 experienced urban shrinkage, accounting for 71.5% of the total. In terms of the spatial distribution, all cities in Heilongjiang Province experienced population shrinkage, and most of them experienced general shrinkage. Moreover, the prefecture-level units that experienced noticeable shrinkage were all located in Heilongjiang Province. Regarding the distribution of district–county units, the shrinkage phenomenon was more noticeable. Daxinganling, Yichun-Heihe, Jiamusi, and Jixi-Qitaihe-Mudanjiang-Yanbian were major gathering areas. As a whole, the shrinkage areas were continuous in space, and the shrinkage phenomenon in Heilongjiang Province was the most obvious (Fig. 5.5).

In summary, from 2008 to 2016, the urban shrinkage phenomenon was more serious than during 2000–2010, covering almost all regions in Northeast China. Therefore, the phenomenon of urban shrinkage in Northeast China tends to be more noticeable, making it necessary to explore the influencing factors and mechanisms of urban shrinkage in Northeast China.

5.4 Factors Attribution of Urban Shrinkage in Northeast China

5.4.1 Factors Identifying Urban Shrinkage in Northeast China

There are many influencing factors related to urban shrinkage. According to the summation of relevant scholars, the influencing factors of urban shrinkage may be placed into five categories, such as population changes, environmental changes, economic changes, political changes, and spatial changes, and there were several motivations and action modes in each category (Zhou and Qian 2015). The specific mechanisms were more complex, some were linear, and others were nonlinear and cyclical (Hoekveld 2012). However, an in-depth analysis showed that some factors are indeed the cause of urban shrinkage, but others are derived or strengthened from urban shrinkage and cannot be generalized. Combining related research and the actual situation in Northeast China, this paper identified the influencing factors of urban shrinkage in Northeast China from five aspects, including regional economic differences, urbanization processes, industrial structure changes, population structure changes, and adjustments in administrative divisions. This paper also conducted a Pearson correlation analysis between the socioeconomic data of the 295 district–county units and the average annual change rate of the permanent residents in Northeast China during 2000–2010. In addition, this paper took the average annual change rate of the permanent residents as the dependent variable and the socioeconomic data as the independent variable in this regression analysis. The result is as follows.

According to the Pearson correlation analysis (Table 5.1), changes in urbanization rate, changes in the proportion of secondary and tertiary industries, and changes in the proportion of over 60 are significantly correlated with the average annual change rate of permanent residents R, and the changes in the proportion of secondary and tertiary industries has the strongest correlation with R. From the results of the regression analysis (Table 5.2), only changes in the proportion of secondary and tertiary industries and changes in the proportion of over 60 are significantly related to R. Among them, the changes in the proportion of secondary industry are extremely significant with R.

Table 5.1 Pearson coefficient between average annual change rate of permanent residents R and related factors

		R	R > 0 (growth)	R < 0 (shrinkage)
Regional economic differences	Initial GDP per capita	0.087	0.188*	−0.195*
	Economic development speed	0.270**	0.304**	0.052
Urbanization process	Initial urbanization level	0.194**	0.318**	−0.255**
	Changes in urbanization rate	0.076	−0.094	0.332**
Industrial structure changes	Changes in proportion of mining industry	0.164**	0.093	0.112
	Changes in proportion of secondary industry	0.486**	0.486**	0.486**
	Changes in proportion of tertiary industry	0.605**	0.531**	0.504**
Population structure changes	Changes in birth rate	−0.045	−0.081	−0.093
	Changes in natural growth rate	0.001	−0.099	−0.032
	Changes in the proportion of 0–19	0.104	0.255**	−0.089
	Changes in the proportion of 20–34	0.276**	0.269**	−0.147
	Changes in the proportion of 35–60	−0.297**	−0.310**	0.093
	Change in the proportion of over 60	−0.253**	−0.344**	0.309**

Note ** indicates a significant correlation at the 0.01 level (bilateral); * indicates a significant correlation at the 0.05 level (bilateral)

Table 5.2 Regression analysis between average annual change rate of permanent residents R and related factors

		R			R > 0 (growth)			R < 0 (shrinkage)		
		Beta	T	Sig	Beta	T	Sig	Beta	T	Sig
Regional economic differences	Initial GDP per capita	0.081	1.465	0.144	0.177	2.004	0.048	−0.125	−1.352	0.179
	Economic development speed	−0.235	−3.437	0.001	−0.244	−2.245	0.027	0.071	0.680	0.498
Urbanization process	Initial urbanization level	0.332	4.760	0.000	0.339	2.946	0.004	0.088	0.711	0.478
	Changes in urbanization rate	0.025	0.460	0.646	−0.012	−0.143	0.887	−0.064	−0.677	0.500
Industrial structure changes	Changes in proportion of mining industry	−0.019	−0.362	0.718	−0.045	−0.581	0.563	−0.057	−0.595	0.553
	Changes in proportion of secondary industry	0.358	5.470	0.000	0.314	3.218	0.002	0.415	3.302	0.001
	Changes in proportion of tertiary industry	0.344	4.619	0.000	0.284	2.535	0.013	0.239	2.415	0.018
Population structure changes	Changes in birth rate	−0.061	−0.809	0.419	0.154	1.246	0.215	−0.231	−1.884	0.062
	Changes in natural growth rate	−0.039	−0.477	0.634	−0.276	−2.144	0.034	0.181	1.357	0.178
	Changes in proportion of 0-19	−0.027	−0.349	0.728	0.061	0.687	0.493	−0.005	−0.044	0.965
	Changes in proportion of 20–34	−0.122	−0.918	0.360	Exclude			−0.231	−1.620	0.108
	Changes in proportion of 35–60	−0.075	−0.614	0.540	0.059	0.559	0.577	0.095	0.654	0.515
	Change in proportion of over 60	−0.362	−4.682	0.000	−0.363	−3.742	0.000	−0.256	−2.304	0.023

Note Regarding the Sig value, $P > 0.05$ indicates that the difference is not significant; $0.01 < P < 0.05$ indicates that the difference is significant; $P < 0.01$ indicates that the difference is very significant

5.4.2 Regional Economic Differences and Urban Shrinkage

Regional economic differences are one of the main causes of local shrinkage by triggering China's interregional and intraregional population movements (Gao and Long 2017). How does it affect the shrinking cities in Northeast China? This paper used initial GDP per capita in 2000 and GDP growth in 2000–2010 to conduct the correlation analysis using the average annual change rate of permanent residents R during 2000–2010.

Overall, both the correlation analysis and the regression analysis showed a significant correlation between GDP growth rate and R. Further differentiating the growing and the shrinking areas, the growing areas with $R > 0$ showed a more significant positive correlation between the GDP growth rate and R. However, for shrinking areas with $R < 0$, the correlation was not significant, indicating that the relationship between urban shrinkage and the economic growth rate was not obvious during a certain period.

There was a significant correlation between the initial GDP per capita and R in both the growing and shrinking areas. For the growing areas, the initial GDP per capita showed a significant positive correlation with R, indicating that a higher initial GDP per capita resulted in an increasing average annual change rate R. However, for the shrinking areas, there was a negative correlation between the two factors, indicating that a higher initial GDP per capita resulted in a decreasing average annual change rate R.

5.4.3 Urbanization Process and Urban Shrinkage

Urbanization has a close relationship with the growth and shrinkage of cities. The population agglomeration of urbanization promotes urban growth. When urbanization reaches a certain high level, problems such as traffic congestion and environmental deterioration in the urban center prompt the development of the urban edge and shrinkage of the center. Therefore, this paper selected the urbanization rate in 2000 that reflected the initial urbanization level and the urbanization rate changes in 2000–2010 as the identification factors.

There was a clear correlation between the initial urbanization level and R in both growing and shrinking areas. For the growing areas with $R > 0$, there was a significant positive correlation between the initial urbanization level and R. However, for the shrinking areas with $R < 0$, the correlation was negative. The situation differed from the perspective of changes in the urbanization rate. On the whole, the average annual population change rate R had no obvious correlation with changes in the urbanization rate, and the same was true for growing areas with $R > 0$. However, for shrinking areas with $R < 0$, there was a significant positive correlation between changes in the urbanization rate and R. By focusing on the results of the regression analysis, it could be concluded that either the initial urbanization level or the changes in the

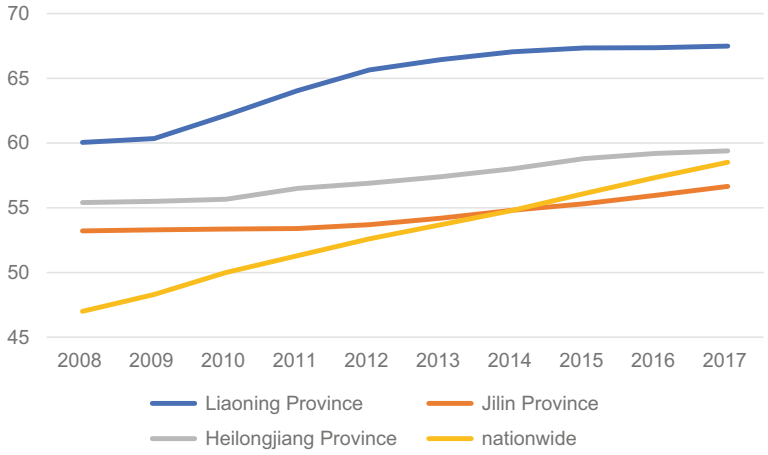

Fig. 5.6 Urbanization rate of three provinces in Northeast China from 2008 to 2017. *Sources* Statistical bulletin of three provinces during 2008–2017

urbanization rate had no significant correlation with the average annual change rate of permanent residents R.

Northeast China has always had a relatively high rate of urbanization. Throughout history, the abundant population resources brought by "braving the journey to the Northeast," which was a significant migration of the population in Chinese history, held the region as the most developed in China at that time. In 1942, the urbanization level of Northeast China reached 23.8%, whereas the nation's urbanization level reached 23.7% in 1986. Before 2015, the urbanization rate of Northeast China was far higher than the nationwide rate, but the growth rate of urbanization has slowed in recent years. In 2015, the urbanization rate in Jilin Province was lower than the nationwide rate, and the urbanization rate in Heilongjiang Province was very close to the nationwide rate. Northeast China had a high urbanization rate base, making it inevitable that the population would decrease after peaking. The results of the regression analysis prove that, although the initial urbanization rate and changes in the urbanization rate were relatively highly correlated with population changes, both were reinforced by urban shrinkage and were not the factors that affected urban shrinkage (Fig. 5.6).

5.4.4 Industrial Structure Changes and Urban Shrinkage

Related studies abroad showed that the shrinkage of many cities was related to deindustrialization and adjustments in the global economic structure (Wu et al. 2015). Northeast China has significant resource advantages, and many resource-based cities face the challenge of resource depletion and transition. At the same time, Northeast

China is in an important period for the rejuvenation of old industrial bases, and the industrial structure is being adjusted. Therefore, this paper selected changes in the number of employees in the secondary industry, the tertiary industry, and the mining industry to analyze the relationship between industrial structure changes and urban shrinkage.

There was no obvious correlation between changes in the mining industry and R for both growing and shrinking cities. It could be inferred that the transformation of resource-based cities in Northeast China was not the main factor that caused urban shrinkage. Moreover, both the correlation analysis and the regression analysis showed that there was a significant positive correlation between the structural changes in the secondary and tertiary industries and R. That is, the higher the proportion of secondary and tertiary industries, the more the city tended to grow rather than shrink. Additionally, the regression analysis showed that the Sig value of the changes in the proportion of the secondary industry in the shrinking areas was less than 0.01, indicating that the changes in the proportion of the secondary industry had an extremely significant correlation with R.

Judging from the changes in the proportion of the secondary industry during 2000–2010 (Fig. 5.7), only 9 of 34 prefecture-level units experienced a decline in the proportion of the secondary industry, and the proportions of the secondary industry in other cities were still increasing, some substantially. This finding also reflected the fact that the deindustrialization in Northeast China was still not obvious during 2000–2010, the old industrial base was solid, and the increase in the proportion of the secondary industry was still an important factor in promoting urban growth. However, the proportion of the tertiary industry in the units of Northeast China varied significantly. There were 14 units in which the proportions of the tertiary industry increased and the proportions in other units declined. Also found was that, in addition to Fushun and Yichun, the proportion of the tertiary industry in other units decreased or remained basically unchanged. Combined with the increase in the proportion of the secondary industry in most units, it could be judged that the main factor affecting urban shrinkage in the change in the industrial structure in Northeast China was not the decline in the proportion of the secondary industry caused by deindustrialization, but the shrinkage of the tertiary industry. However, given the industrial transformation of old industrial bases, the structure of the secondary and tertiary industries would inevitably be gradually adjusted, and the phenomenon of urban shrinkage would change.

Then, the paper analyzed changes in the proportion of secondary and tertiary industries during 2008–2016 and found that the situation was different. The proportions of the secondary industry in most prefecture-level units were declining, and the proportions of the tertiary industry were increasing, indicating that “deindustrialization” was obvious. The changes in the secondary and tertiary industries had a very significant positive correlation with R; that is, when the proportions of the secondary and tertiary industries increased, the city tended to grow. When the proportions of the secondary and tertiary industries declined, the city tended to shrink. Judging comprehensively, during 2008–2016, the impact of the changes in the industrial structure of Northeast China on urban shrinkage was mainly due to the decline in the proportion

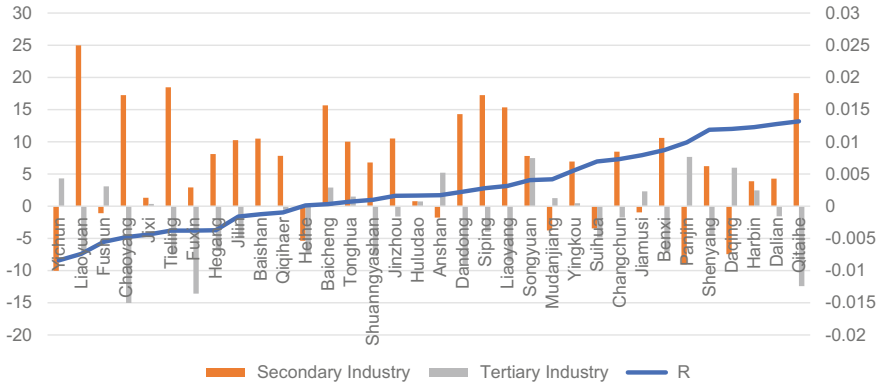

Fig. 5.7 Changes in the proportion of the secondary and tertiary industries in 34 prefecture-level units (excluding Yanbian Korean Autonomous Prefecture and Daxinganling Region) from 2000 to 2010. *Source* China Urban Statistical Yearbook 2001, 2011

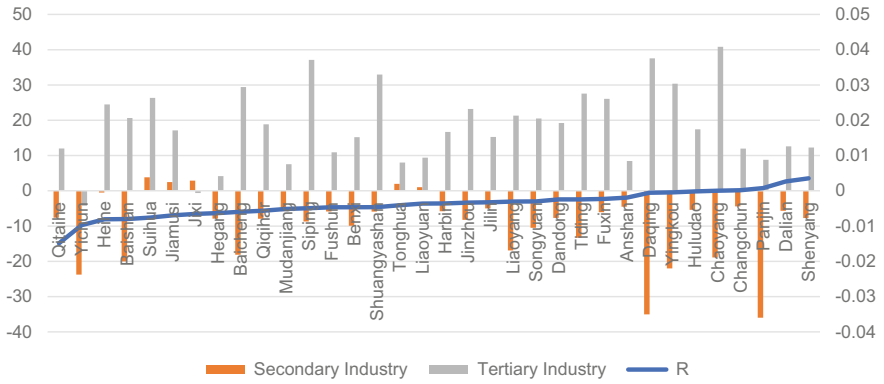

Fig. 5.8 Changes in the proportion of the secondary and tertiary industries in 34 prefecture-level units (excluding Yanbian Korean Autonomous Prefecture and Daxinganling Region) from 2008 to 2016. *Source* China Urban Statistical Yearbook 2009, 2017

of the secondary industry brought by "deindustrialization." Because of the high educational costs and barriers to entry into the high-end service industry, employment for the population that was displaced from the industry is limited and is mainly concentrated in the relatively low-end service industry. Moreover, unemployment occurs frequently, which is also an important cause of the population outflow (Fig. 5.8).

Table 5.3 Change in population in different age groups in Northeast China

	Heilongjiang Province		Jilin Province		Liaoning Province	
Year	2008	2017	2011	2017	2012	2017
0–14 (%)	12.60	10.70	12.95	12.31	10.80	10.35
15–64 (%)	78.20	77.20	78.32	75.31	78.90	75.30
Over 65 (%)	9.20	12.00	8.73	12.38	10.30	14.35

Source Statistical Yearbook of the three provinces

5.4.5 Population Structure Changes and Urban Shrinkage

In terms of population structure, Northeast China has always had a low fertility rate and the population outflow—particularly the outflow of the young and middle-aged population—is currently serious. Therefore, this paper selected factors such as changes in the birth rate, changes in the natural growth rate, and changes in the proportion of the various age groups when considering the impact of the changes in the population structure on urban shrinkage. The results indicated that there was no significant correlation between changes in the birth rate and changes in the natural growth rate and R.

The changes in the proportions in the 20–34, 35–59, and over 60 groups had significant correlations with R. The change in the proportion of 20–34 was positively correlated with R, and for growing areas with $R > 0$, but there was no significant relationship with shrinking areas. The changes in the proportion in the 35–60 and over 60 groups were negatively correlated with R; that is, the larger the proportion of the population aged 35–60 and over 60, the more the city shrank. There was also a negative correlation with growing areas. However, for shrinking areas, only the change in the proportion over 60 had a strong correlation with R, and the result was the same using the regression analysis. The higher the proportion of people over 60, the more the city tended to shrink.

It should be noted that, although the change in the structure of the population was significantly correlated with the average annual rate of change in permanent residents, it was not the factor that affected urban shrinkage but, rather, was a consequence and a characteristic of urban shrinkage. From the perspective of changes in the population structure of the three provinces in recent years (Table 5.3), the proportion of the population in the 0–14 and 15–64 groups apparently declined, and the proportion of the population over 65 increased substantially. It can be judged that the basic characteristic of urban shrinkage in Northeast China was the outflow of the young and middle-aged population. Moreover, the proportion of the elderly population has rapidly increased, resulting in a significant aging trend.

5.4.6 *Adjustment in Administrative Divisions and Urban Shrinkage*

The adjustment in administrative divisions affected a portion of the urban population because it changed the scope of the administrative units. Since 2000, zoning adjustments have been carried out in many prefecture-level and district–county units in Northeast China (as shown in Table 5.4), which led to a significant increase or decrease in the urban population. For example, in 2006, Harbin City canceled the Power District in Xiangfang District and set up a new Xiangfang District. After adjusting the administrative divisions in 2000 according to the administrative divisions in 2010, the population of Xiangfang District increased substantially, from 367,382 to 778,224, causing population shrinkage in the statistical data for Xiangfang District.

5.5 Conclusion

This paper conducted an exploratory study of urban shrinkage at the prefecture and district–county levels in Northeast China during 2000–2010 and 2008–2016, defined the spatial and temporal distribution of urban shrinkage, identified the influencing factors of urban shrinkage in Northeast China, and briefly analyzed the mechanism. The results were as follows.

From time to time, urban shrinkage during 2008–2016 in Northeast China was more significant than that during 2000–2010. During 2000–2010, nearly 1/3 of the prefecture-level units and 1/2 of the district–county level units experienced urban shrinkage. During 2008–2016, the data increased to nearly 8/9 and 3/4. Several significant agglomeration areas formed in Daxinganling, Yichun-Heihe, Jiamusi, and Jixi-Qitaihe-Mudanjiang-Yanbian. Overall, the shrinking areas were expanding. In Heilongjiang Province, in particular, the situation was serious.

The changes in the secondary and tertiary industrial structures and the adjustments in the administrative division had the strongest relevance to urban shrinkage in Northeast China, and the urban shrinkage was mainly influenced by the second industry atrophy caused by the "deindustrialization" during this time. At the same time, the adjustment in the regional division in Northeast China objectively led to a significant change in the population statistics, which caused shrinkage in some areas. Factors such as regional economic differences and declines in resource-based cities affected population changes but were not the main reasons for the urban shrinkage in Northeast China. The urbanization rate of the region had a relatively high mathematical correlation with population changes but was not an influencing factor of urban shrinkage. Northeast China had a high urbanization rate base. Additionally, it was inevitable that the population declined after reaching a peak. Changes in the population structure were a consequence and characteristic of urban shrinkage. The basic characteristic of urban shrinkage in Northeast China was a significant outflow of young people, and the proportion of the elderly population has risen rapidly.

Table 5.4 Adjustment of administrative divisions in Northeast China from 2000

Before	After	Time	Contents
Taiping District	Daowai District	2004	Taiping District of Harbin was revoked and its administrative area was placed into the jurisdiction of Daowai District
	Songbei District	2004	Songbei District was established in 2004. It administers Songbei town, Songpu town, Wanbao town, Sun Island street, and Sandian street, which previously belonged to Daowai District, as well as Leye town and Duiqingshan town, which previously belonged to Hulan County
Hulan County	Hulan District	2004	Hulan County was abolished and Hulan District was established. The administrative region of the former Hulan County (excluding Leye town and Duiqingshan town) was the administrative region of Hulan District
Power District	Xiangfang District	2006	The old Power District and Xiangfang District were canceled and a new Xiangfang District was formed
Acheng City	Acheng District	2006	Acheng City was canceled and Acheng District was established. Yongyuan Town and Juyuan Town of Acheng City were placed under the jurisdiction of Daowai District
Wensheng District	Wensheng District	2011	Wusheng, Wensheng, Fuping, Nanmen, Dongxing (excluding Hedong Entrepreneurship) were placed in Baita District; Luodatai Town of Dengta City, Dongjinglin Town of Taizihe District, and Xiaotun Town of Liaoyang County (excluding 6 administrative villages such as Yanjiatun) were placed in Wensheng District

Objectively, urban shrinkage is an urban development process and an unavoidable and diachronic issue in many cities. Therefore, it is of great significance to study the characteristics and mechanisms of these cities. However, the mechanism of urban shrinkage in Northeast China is very complicated, such as population changes and economic vitality being mutual causes and effects in particular. Therefore, the topic requires more in-depth research.

References

Gao S (2017) Tracing the phenomenon, concept and research of shrinking cities. Urban Plan Int 3:50–58 (in Chinese)

Gao S, Long Y (2017) Distinguishing and planning shrinking cities in Northeast China. Planners 33(01):26–32 (in Chinese)

Göb R (1977) Die Schrumpfende Stadt. Archiv für Kommunalwissenschaften 16(2):149–177

Häußermann H, Siebel W (1988) Die Schrumpfende Stadt und die Stadtsoziologie. In: Friedrichs J (ed) Soziologische Stadtforschung. Springer, pp 78–94

Hoekveld J (2012) Time-space relations and the differences between shrinking regions. Built Environ 38(2):179–195

Howe SR, Bier T, Allor D (1998) The shrinking central city amidst growing suburb; case studies of Ohio's inelastic cities. Urban Geogr 19(8):714–734

Jin L, Chunfeng D (2018) Feature and mechanism of the "hiding shrinkage" for urban population under the background of fast urbanization: a case study of Maoming of Guangdong Province. Dev Small Cities Towns 03:43–48

Li Y (2016) The research of the phenomenon and formation mechanism of city shrinking in Jilin Province. Northeast Normal University (in Chinese)

Li X, Du Z, Li X (2015) The spatial distribution and mechanism of city shrinkage in the Pearl River Delta. Mod Urban Res 09:36–43 (in Chinese)

Ma J (2016) Characteristics, trends and factors identification of urban shrinkage in Liaoning Province. In: Annual national planning conference 2016. China Urban Planning Society, Shenyang Municipal Government (in Chinese)

Martinez-Fernandez C, Audiraci, Fol S (2012) Shrinking cities: urban challenges of globalization. Int J Urban Regional Res 36(2):213–225

Pallagst K (2008) Shrinking cities: planning challenges from an international perspective. In: Cities growing smaller, vol 10

Wu K, Long Y, Yang Y (2015) Urban shrinkage in the Beijing-Tianjin-Hebei Region and Yangtze River Delta: pattern, trajectory and factors. Mod Urban Res 9:26–35 (in Chinese)

Xu B, Pang D (2014) Growth and shrinkage: research on international urban shrinkage and its enlightenment to China. Economist 4:5–13 (in Chinese)

Yang D, Yin C (2013) How to save the shrinking cities: old industrial cities' transition in the UK. Urban Plan Int 6:50–56 (in Chinese)

Zhang X, Liu Y, Lv C (2016) Background, identification and characteristics of urban shrinkage in China. J Southeast Univ 18(4):132–136 (in Chinese)

Zhao D, Zhang J (2018) Shrinking city characterized by competitiveness: phenomenon, mechanism and countermeasures: taking Sheyang City for example. Urban Probl 03:12–18 (in Chinese)

Zhou K, Qian F (2015) Shrinking city: on searching for urban development in non-growing scenarios. Mod Urban Res 9:2–13 (in Chinese)

Chapter 6
Recognition, Analysis, and Corresponding Strategies for Shrinking Cities in Northeast China

Shuqi Gao and Ying Long

Abstract Although most up-to-date studies of shrinking cities are mainly done in western countries, some reports have pointed out that there is quite a number of shrinking cities in developing countries. This paper reviews the relevant research, distinguishes, and analyzes shrinking cities in northeast China, and chooses the City of Yichun as a case study. The paper finds that regional decay, marginality, and institutional change all affect city shrinking, and some more specific factors also contribute to the population shrinking in the City of Yichun. In contrast with shrinking resource-based cities in northwest China, Yichun's shrinkage has more complex causes, including some unique phenomena such as "suppress the second industry and develop the first industry" and "counter urbanization." Relevant planning measures are proposed.

Keywords Shrinking cities · Resource-based city · Population shrinking · Counter-urbanization

6.1 Research Background and Significance

Historically, the issue of shrinking cities has mostly been treated as a concern in developed countries. However, recent studies indicate that the phenomenon of shrinking cities cannot be ignored in developing countries, either. The data reveal that, during the period from 1990 to 2000, depopulation took place in 143 cities with a population over 100,000 in developing countries, 50 of which are in China (UN-Habitat 2009). From 2000 to 2014, significant population loss has taken place in a number of cities in developing countries, such as Khulna in Bangladesh, Yichun in China, Hamhung in North Korea, and Yerevan in Armenia (UN-Habitat 2015). After comparing the

S. Gao (✉)
School of Architecture, Southeast University, Xuanwu District, Nanjing, Jiangsu, China
e-mail: shuqigao@seu.edu.cn

Y. Long
School of Architecture and Hang Lung Center for Real Estate, Tsinghua University, Haidian District, Beijing, China

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_6

population data at the street (town) level of the Fifth Population Census with that of the Sixth Population Census, this study finds that population contraction has taken place in 180 cities in China in total (Long and Wu 2016).

This Shrinking Cities phenomenon has been the subject of growing interest from urban researchers in China. The contents of current studies mainly focus on the following categories: ① An introduction to the topic, an analysis and comparison of well-known foreign shrinking cites in terms of distribution, causes, typology, and potential countermeasures. Literature in this category, which introduces and analyzes cities like Liverpool and Sheffield in the United Kingdom (Huang 2014), Youngstown in the United States (Huang 2011) and Leipzig in Germany (Zhang and Guo 2016), accounts for the vast majority of research. Many of the studies utilize transnational comparisons to explore the differences between shrinking cities with different geographical backgrounds, for example, a comparison between Magdeburg in Germany and Cleveland in the USA (Li et al. 2015) and those among shrinking cities in Germany, France, Japan, and Canada (Xu and Pang 2014). ② An overview of concepts, causes, research theories and research methods used to study shrinking cities (Gao 2015, Zhou and Qian 2015). ③ An exploration of prospects for future Chinese studies on shrinking cities (Long et al. 2015, Liu 2016).

This paper focuses on shrinking cities in China. First, it summarizes research theories on shrinking cities and determines the object and the issue of the research through an investigation of research on shrinking cities among our domestic urban planning colleagues. Second, it identifies and analyzes shrinking cities in Northeast China. Finally, it takes Yichun in Heilongjiang Province as an example to specifically analyze the background and causes of its population decline and to propose corresponding countermeasures with regard to urban planning.

6.2 Research Theory, Target, and Issue

Academics have long argued about two major issues regarding shrinking cities: the precise definition of shrinking cities and the common features shared by shrinking cities in addition to population decline.

According to the latest research conclusions, though we still have not attained a unified answer to the above issues, the trend is gradually becoming clear. First, shrinking cities should experience massive and prolonged population contraction, which primarily signifies population decline in the urbanized area. Second, the population contraction in shrinking cities should be dominated primarily by a net outflow of the population rather than by net mortality. There are two major factors leading to net outflow of the population: first, a global or local economic crisis, such as the global financial crisis and overcapacity, or local exhaustion of resources and reduction of comparative advantages; and second, the change in social systems such as politics and the economy, such as the rise of post-socialism, post-Fordism, and counter-urbanization. Finally, shrinking cities are always a concentrated representation of regional crisis, and the majority of shrinking cities are located in shrinking areas.

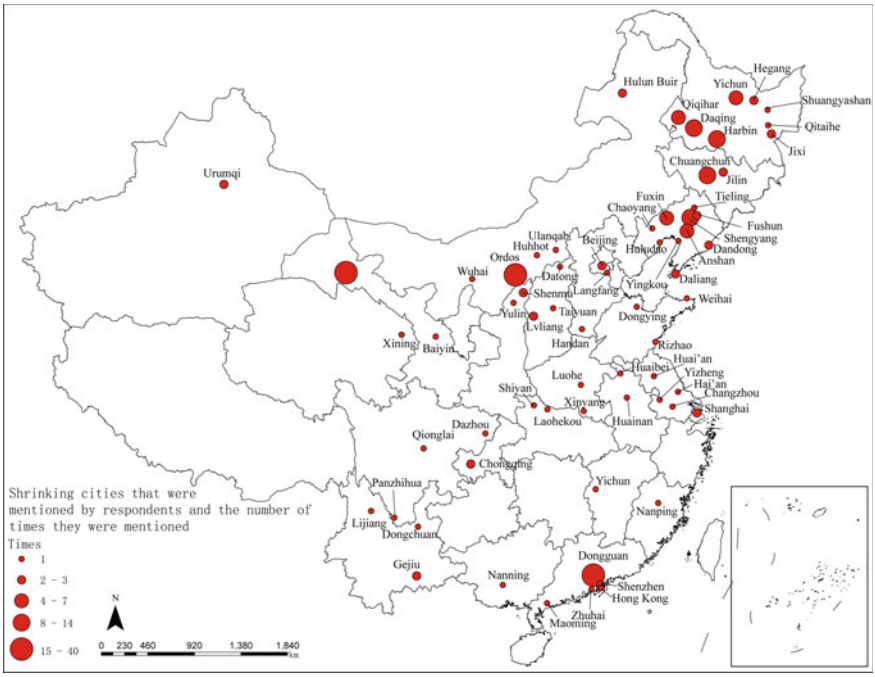

Fig. 6.1 Cognitive map of shrinking cities in China

In order to grasp the current domestic researchers' understanding of Shrinking Cities, the authors undertook an investigation of the fundamental approach of Chinese studies on shrinking cities through the Internet platform "Questionnaire." As of this writing, a total of 522 valid responses have been obtained. In terms of the professional background of the respondents, urban and rural planning (206 persons), geography (101 persons) and architecture (48 persons) account for the vast majority. In terms of occupation, college students (191 persons), designers (101 persons), and university teachers account for the largest proportion. A total of 71 cities are mentioned in feedback on typical shrinking cities in China. Accordingly, this paper drew a cognitive map of Chinese shrinking cities (Fig. 6.1) and thus discovered that by this measure, the agglomeration of shrinking cities is in the northeast of China rather than in the central and western regions identified in existing studies.

In recent years, Northeast China has become a focus of attention due to its economic recession and population loss. Some scholars even call it a Chinese "rust belt area" as an analogy to America (Lee 2007). Currently, problems such as resource atrophy, environmental pollution, and social instability have become the "northeastern phenomenon," which is now stymying the development of the region (Chen et al. 2004). Though a number of preferential policies have been provided for Northeast China since the CPC Central Committee and the State Council proposed a plan for the revitalization of the Northeast, the motivation for reform is still severely restricted

by inveterate conservatism and critical corruption (Chung et al. 2009). In addition, in terms of transnational cooperation and this policy of regional development, the complicated and unstable geopolitical structure in Northeast Asia restricts the development of Northeast China.

Currently, China is still in a rapid growth period of urbanization. Therefore, shrinking cities are still a relatively rare phenomenon in China. Some scholars speculate that, regarding the common characteristics of Shrinking Cities in China, most of them may be resource-based cities (Zhao et al. 2015). In accordance with the National Sustainable Development Plan for Resource-based Cities (2013–2020), there are in aggregate 37 resource-based cities with different administrative levels in Northeast China, 19 of which are in recession, accounting for the highest proportion across all of China. Based on international experience, the following factors may contribute to the shrinking of resource-based cities: first, as a result of the improvement of production techniques, resource-based enterprises slash the staff of the production department through the utilization of more highly mechanized production equipment (Kotilainen et al. 2015); second, resource depletion leads to mass layoffs in resource-based enterprises (Martinez Fernandez et al. 2012); third, under the influence of globalization, problems such as the long-term weakness of the global commodity market result in an economic crisis in resource-based cities. As emerging resource-based cities with higher quality commodities, lower labor costs and better locations continually take part in the global production network, the comparative advantage of the original resource-based cities has been reduced.

6.3 The Identification and Analysis of Shrinking Cities in Northeast China

6.3.1 Identification of Shrinking Cities in Northeast China

For a long time, the inconsistency between the definition of "city" as geographical space and "city" as an administrative division has plagued urban studies in China, which also makes it difficult to define shrinking cities. In general, current domestic studies only use the change in the resident population in the administrative divisions to measure whether a city is shrinking. However, when applied to studies on areas with low urbanization rates, this method may identify those cities as shrinking cities that have suffered a decline in total population due to off-site urbanization of the rural population. This article incorporates changes in both the resident population and the urban population into the consideration of Shrinking Cites in Northeast China (Table 6.1). The results show that, compared with the survey, the difference is significant. Cites that have been mentioned frequently, such as Daqing and Shenyang, have not yet suffered population shrinkage under any standard. However, cities such as Yichun, Jixi, and Fuxin have seen population shrinkage under one or more standards.

Table 6.1 Prefecture-level cities with population shrinkage in 2000–2010

City	Natural population growth rate in 2010/‰	Population shrinkage rate during 2000–2010				Typology	Industry
		Total population		Urban population			
		Administrative region	Urbanized region	Administrative region	Urbanized region		
Jixi	−0.15	−4.3	−5.3	−1.2	−10.0	Mature mode	Mining
Yichun	−2.47	−8.1	−10.3	−14.4	−14.7	Recession mode	Forestry
Hegang	1.70	−3.7	−4.3	−4.0	−4.3	Recession mode	Mining
Liaoyuan	0.64	−7.2	–	−6.4	–	Recession mode	Mining
Fushun	−1.17	−5.4	–	−5.2	−3.0	Recession mode	Mining
Baishan	0.98	−1.2	–	−1.0	–	Recession mode	Forestry
Qiqihaer	2.28	−1.0	−0.2	–	–	–	–
Anshan	−0.74	–	−0.8	–	–	Regenerative mode	Iron
Chaoyang	2.07	−4.7	–	–	–	–	–
Tieling	−0.12	−3.7	–	–	–	–	–
Fuxin	−0.87	−3.7	–	–	–	Recession mode	Mining
Jilin	1.57	−1.7	–	–	–	Mature mode	Mining

This article puts forward four major criteria for identifying shrinking cities: the total population of the city, the urban population of the city, the total population of the urbanized area in the city and the urban population of the urbanized area in the city. If we take Hollander et al. (2009)'s "population shrinkage in the urbanized area" as the criterion for judging urban shrinkage or take the fact that urban administrative boundaries are basically urban areas into consideration, the contraction of the urban population in an urbanized area is the most compatible with international shrinking urban characteristics. In view of this, among the prefecture-level cities in the Northeast, only Jixi, Yichun, Hegang, and Fushun can be defined as shrinking cities. Therefore, compared with the "rust belt" area in America, Shrinking Cities are not yet widespread phenomena in Northeast China. In addition, as mentioned above, resource-based cities, especially resource-exhausted cities, are the most common type of shrinking cities.

6.3.2 Analysis of the Causes of Shrinking Cities in Northeast China

6.3.2.1 Common Causes of Shrinking Cities in Northeast China

(1) Reduced birth rate. In the initial stages of reform and opening up, the Northeast is the region with the highest level of urbanization except the Municipality because of its leading level of industrialization. However, a high level of urbanization leads to the high implementation of China's one-child policy and correspondingly a relatively low fertility level. In addition, after the reform and opening up, economic development in Northeast China has lagged behind the eastern coastal areas, which results in low immigration and high emigration. Under the combined effects of a reduced birthrate and an aging population, the natural growth rate of Northeast China is already near the bottom among the various regions of the country. In shrinking cities such as Jixi and Yichun, the natural growth rate has generally approached or reached a negative value.
(2) Marginality. The Northeast is located outside the Shanhaiguan Pass and was historically inaccessible. In the beginning of the twentieth century, large-scale investment by Japan and Tsarist Russia rapidly made the Northeast region, which was originally located at the edge of the country, the core area of a global vision. After the establishment of new China, Northeast China maintained its core position due to the good relations between China and the Soviet Union. Among the 156 key projects supported by the Soviet Union, 56 were located in the northeast, which established the foundation of industrialization and urbanization in Northeast China. However, since the Sino–Soviet political split, geopolitics in Northeast Asia has been unstable, making the Northeast a marginal area again.
(3) Institutional Changes. The proportion of employment by state-owned enterprises in Northeast China has always ranked the highest in the country (Xiao

and Weiss 2007). Over a long period of time, state-owned enterprises in Northeast China have adapted to the production mode of a planned economy, which is based on demand. After reform and opening up, China has transformed from a planned economy to a market economy. However, many state-owned enterprises with rigid systems failed to transform themselves from Ford Production, with standardization, large volume output, and a single variety of product, to a refined, diversified and personalized Post-Ford Production Model, which has led to the crisis and even collapse. The welfare system, which was originally established on the basis of an enterprise-run society, also collapsed accordingly.

6.3.2.2 The Common Causes of the Resource-Based Shrinking Cities in Northeast China

(1) Simplicity of industry structure. The most significant feature of resource-based cities is that the industries of the whole city are closely related to product exploitation. In addition, long-term path dependence makes this industry chain continue to strengthen itself, leading to the continuous increase in the level of specialization. However, the life cycle of a resource-based city is firmly tied to the life cycle of the product. Once the resources are exhausted or the products encounter a global market crisis, it will be difficult for such cities to build new industries in the short term to achieve economic and population recovery.
(2) Production and Urban contradictions. Unlike most of the cities in China with a long civilizational history of farming, the developing history of resource-based cities in the northeast is relatively short, and the purpose of urban construction is to facilitate resource mining. Therefore, most resource-based cities are located in the vicinity of resource discovery sites, and some are even located in inconvenient places such as mountainous areas. On the other hand, because of the irregular distribution of resources, the layout of the agglomeration is dispersed. The size of a single city group is relatively small, and public service facilities are concentrated in the larger core concentration. The lack of public service facilities in other areas makes them extremely unattractive to practitioners outside the resource extraction industry and makes it difficult to cultivate other industries.

6.4 Yichun: A Case Analysis of Shrinking Cities in Northeast China

On the basis of the case study method (Yin 2013), this article selects Yichun to conduct a single case study for the following reasons: ① Currently, cities with severe shrinkage are relatively rare in China, resulting in the lack of a mature research model. Therefore, it is appropriate to conduct research on the most severely shrinking cities first. ② Studies on shrinking cities in China are still in an exploratory stage, lacking

in prior knowledge. It is appropriate to explore the local characteristics of shrinking cities in the form of a single case study and then conduct multiple case comparisons to summarize general laws.

6.4.1 Background

Yichun, located in the hinterland of the Xiao Hinggan Mountains, is called "the Capital of Forest" because of its abundant forestry resources. The north of Yichun borders on Russia across Heilongjiang. The history of development in Yichun is relatively short. It was not until the government of Hejiang Province (located in the northeast of Heilongjiang province, which existed from 1945 to 1949 and is now incorporated into Heilongjiang Province) organized the surrounding masses to develop a forestry industry that the city was able to be built. Early in its development, the rapid agglomeration of production factors accelerated the economic and social development of Yichun. However, excessive exploitation has led to a decline in forest resources over time. Meanwhile, the development of additional industry is weak. As a result, Yichun has plunged into a situation of forestry depletion and city decline since the 1980s.

6.4.2 The Specific Causes of Urban Shrinkage in Yichun

6.4.2.1 Policy Intervention

In addition to the exhaustion of forestry resources, population contraction in Yichun is also affected by policy intervention. Yichun has long implemented planned management of timber production. The harvesting method that geared production to demand led to forest harvesting exceeding forest growth for a long time (Yu et al. 2008). However, after the implementation of the Forestry Law in 1985, the amendment to the Forest Act in 1998, and the Natural Forest Resources Protection Project launch in 2000, the scale of forest exploitation has been increasingly restricted. Furthermore, in 2011 and 2013, the city stopped main cutting and commercial cutting successively and officially bid farewell to its history of forest cutting. Over the process of wood production reduction, the dependence of the local economy on wood and its surrounding industries gradually decreased. However, the sudden stop of forest cutting in recent years has seriously impacted local industries that had previously taken advantage of abundant raw materials, such as wood processing and furniture manufacturing. Related enterprises have had to purchase timber from other places, leading to a substantial increase in their production costs and far worse operating conditions. Taking the original timber processing industry, which had the second largest industrial scale in Yichun, as an example, its output value in 2014 was less

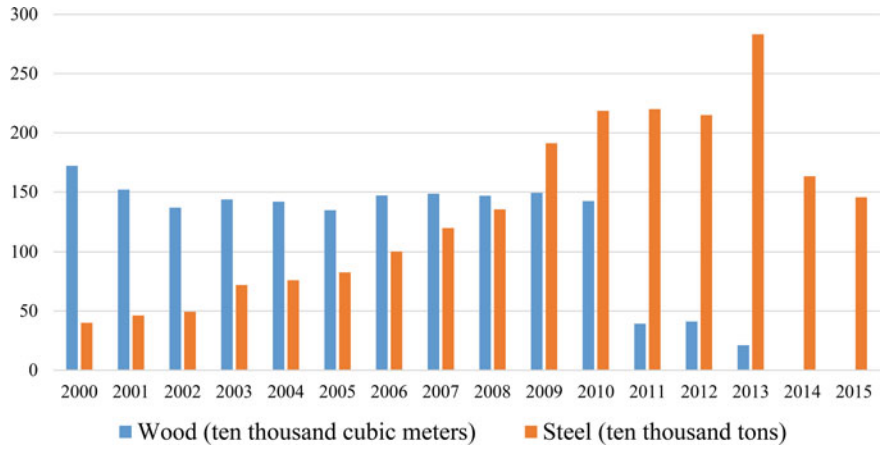

Fig. 6.2 Production changes in timber and steel production in Yichun in recent years

than 25% of that in 2010, and there are only 20 companies left among the original 69 enterprises above designated size.

6.4.2.2 The Decline of Substitutive Industry

For most shrinking cities, the response to population shrinkage usually follows the decline of the cities (Martinez Fernandez et al. 2012). After the decline of the original industry, resource-based cities with a single economic structure often rely on a new industry again (Reckien and Martinez-Fernandez 2011). Supported by abundant iron ore resources, Yichun has established many iron and steel enterprises during the exhaustion of its forestry resources. In the context of the overall prosperity of the national steel industry in 2000, its steel manufacturing industry grew rapidly and exceeded the position of the timber mining and processing industry in the local economy. In recent years, however, the steel industry in Yichun has been compelled to reduce production on a large scale due to the decline in market demand and the blind expansion of enterprises. The Xilin Steel Group, which used to be the largest in Heilongjiang Province, is already on the verge of bankruptcy (Fig. 6.2). Yichun's economy entered a negative growth channel following its population in the double blow of the cessation of wood cutting and the reduction of steel production (Fig. 6.3). Currently, Yichun has the characteristics of both population shrinkage and economic recession, moving from the former "transition area" to the more problematic "downgraded area" (Wiechmann and Pallagst 2012).

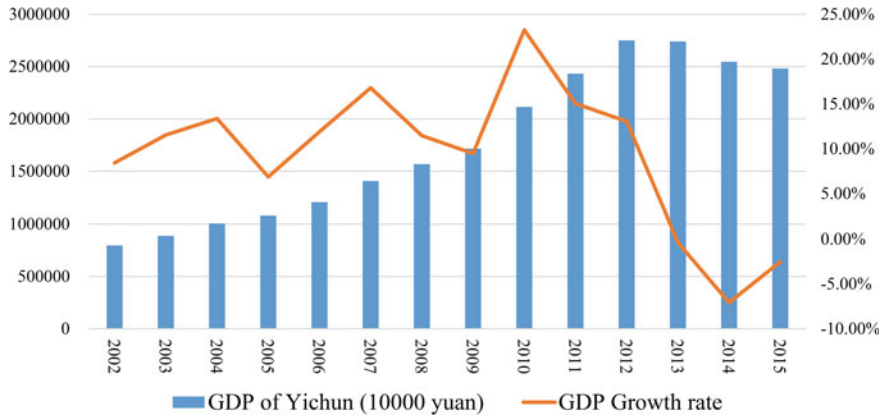

Fig. 6.3 Yichun's GDP and its growth rate in recent years

6.4.2.3 Unity Between Enterprise and Government

During the period of the planned economy, a production-oriented mode of unity of government and enterprise was established that is not fit for a market economy. However in Yichun, this mode is still retained due to the heavy resistance to reform. Apart from Yichun district, where the prefecture-level city government is located, Xilin district, which is based on iron and steel smelting, and Jiayin County, which is mainly based on agricultural production, in the 17 districts (counties and cities) under the jurisdiction of Yichun, there are 14 districts that have continued to follow the mode of unity of government and enterprise. Although it receives a subsidy from the government at higher levels, which is intended for a "natural forest protection project," and although resource-based cities account for over 80% of the local fiscal revenue in Yichun, Yichun's local finances are still in straitened circumstances, as both the operation of local governments and forestry workers rely on higher levels of appropriation due to the unity between enterprise and government. On the one hand, the funds applied to improve the life of workers in the forestry farms have been greatly reduced, making them unwilling to cultivate the forest. On the other hand, the income of local government workers in Yichun is much lower than that of ordinary public servants, which makes it difficult for the local government to recruit suitable personnel. In addition, under the unity of government and enterprise, funds for local social undertakings are not listed in national financial budgets. Therefore, the supply level of urban infrastructure and public service facilities is relatively low (Zhang et al. 2008).

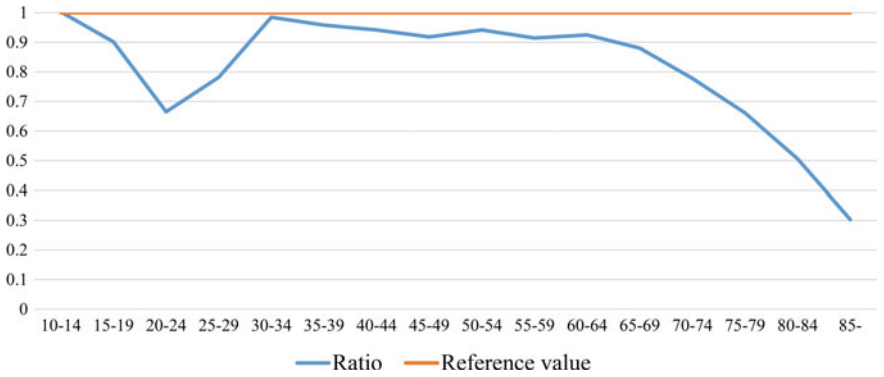

Fig. 6.4 Cohort analysis between 2000 (increased by 10 years on the basis of 2010) and 2010

6.4.3 Analysis of the Appearance of Urban Shrinkage in Yichun

6.4.3.1 Mass Outflow of the Youth and Population Aging

In shrinking western cities, the outflow of young people is a common phenomenon: on the one hand, they have relatively higher mobility, for their employability is the strongest of all age groups. On the other hand, studying outside their hometowns provides more young people with more opportunities for migration. In order to explore the difference in the performance of population shrinkage in different age groups in Yichun, this article conducted cohort analysis in which the author compared the population in each age group in 2010 to the population of each age group that is increased by 10 years on the basis of that recorded in 2000. The results showed that the ratio of the age groups 15–29 and 65 plus had significantly decreased. Unlike the elder age group, whose rapid reduction in ratio was caused by natural death, the decrease in the population of those aged 15–29 is mainly affected by migration (see Fig. 6.4). With the outflow of young people, the aging of Yichun is intensifying and the trend of an inverted triangle of the Population Pyramid becomes more significant (see Fig. 6.5). The proportion of the population aged over 65 rose from 6.8% in 2000 to 11.6% in 2010. What is even more significant is that the population of those aged 40–49, which comprised the highest proportion in the 2010 census, is about to enter the aging stage. In the future, the pace of population aging and shrinkage in Yichun will undoubtedly continue to accelerate.

6.4.3.2 Spatial Characteristics of Population Shrinkage

Currently, all the districts (counties, cities) in Yichun have suffered population shrinkage, except for Yichun district, which is mainly based on the service industry, and

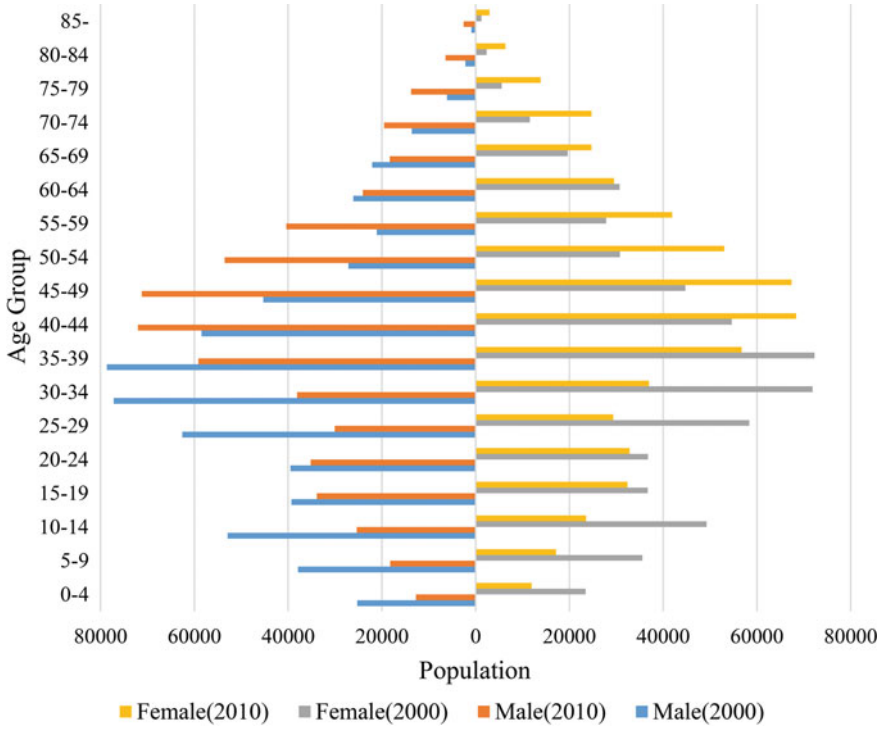

Fig. 6.5 Population pyramid of Yichun in 2000 and 2010

Jiayin, an agricultural county that is still in the early stages of urbanization (see Fig. 6.6).

The administrative divisions of Yichun mainly refer to the scope of the forest area. Since the area of the forest farm area determines the quantity of the employed population to a large extent, the area under the jurisdiction of each county in Yichun is similar to that of the population. In addition, urban settlements are set in flat terrain in the forest area. Except for Yichun District, Wumahe District, and Cuiluan District, which are all under the jurisdiction of the Center of Yichun City and are bordered by the built-up area, the rest of the urban built-up areas in Yichun are often separated by dozens of kilometers. Yichun is therefore actually a "shrinking city" composed of a small shrinking urban area and dozens of small shrinking towns.

6.4.3.3 "Retreat from the Secondary Industry to the First Industry" and "Counter-Urbanization"

In the period of the planned economy, the state provided forestry workers with urban residence registration and high welfare, attracting a large number of foreign

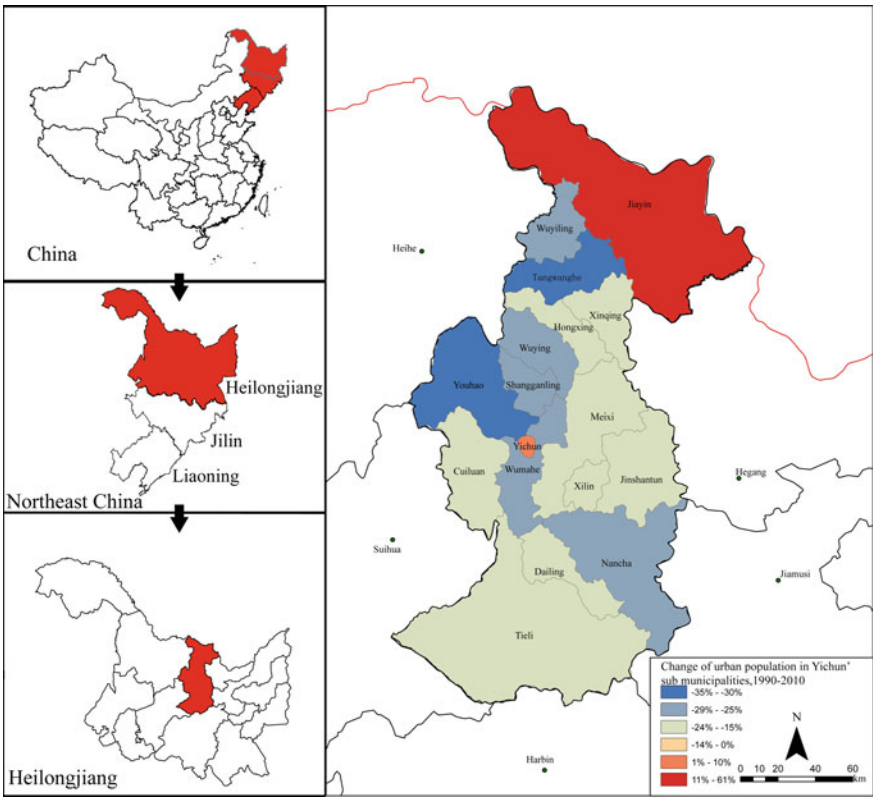

Fig. 6.6 Changes in the urban population in districts (counties and towns) in Yichun from 1990 to 2010

workers to Yichun and resulting in a high level of urbanization. However, with the relatively low level of economic development of Yichun in recent years, this path of urbanization has been difficult to sustain. In the meantime, the extremely high level of urbanization also makes it difficult for Yichun to increase its population by attracting the surplus labor force in the nearby countryside through the development of its central city, like those central and western cities with similar levels of economic development.

At present, the level of economic development in Yichun is far from being matched by that of urbanization. Therefore, there has been a unique phenomenon of "retreat from the secondary industry to the first industry" and "counter-urbanization." In recent years, after the rapid decline of the forest industry and iron industry led to deindustrialization, under the support of local government for the development of the "forest economy," this primary industry shows a rapidly developing trend and has become the leading industry in Yichun (Fig. 6.7). In addition, a large number of

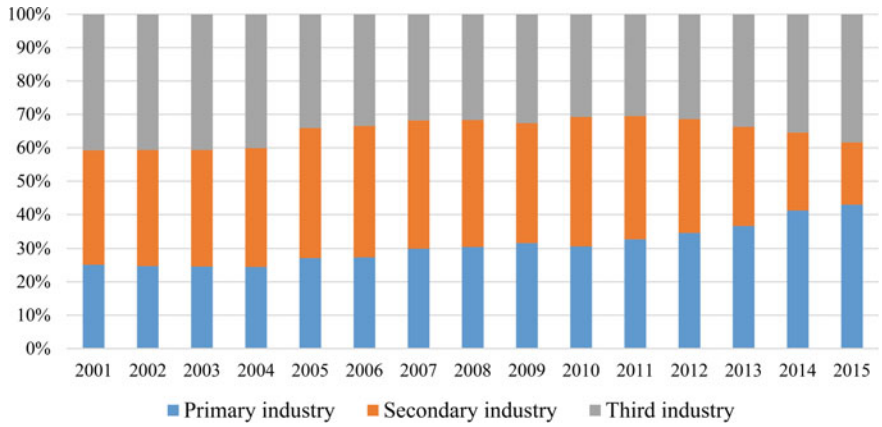

Fig. 6.7 Dynamic changes in the three industrial structures in Yichun from 2001 to 2015

working urban residents have been transferred to agriculture-related industries such as fungi and poultry farming.

6.5 Summary and Suggestions

6.5.1 Summary

Based on the analysis above, this paper constructs an analytical framework (Fig. 6.8) for urban shrinkage in Yichun and draws the following conclusions:

(1) This research differentiates and analyzes the effectiveness of diverse criteria in identifying shrinking cities in China and finally concludes that the change in the urban population in the urbanized area in the census is one of the proper bases to judge shrinking cities in China.
(2) Although the investigation shows that practitioners of urban planning generally believe that northeast China is the most concentrated area of shrinking cities in China, there are actually not so many shrinking cities in the Northeast according to the actual analysis, which means that this region cannot be appropriately compared to the "rust belt" in the United States. At the same time, the perceptions of practitioners in urban planning regarding shrinking cities are quite different from the actual situation, which reflects significant deviations in the definition and understanding of shrinking cities and the lack of knowledge of the medium and small cities in China.
(3) Currently, shrinking cities in Northeast China are mainly resource-based. In the future, changes in the global energy consumption structure and in the demand for resources caused by the transformation of the economic structure in China

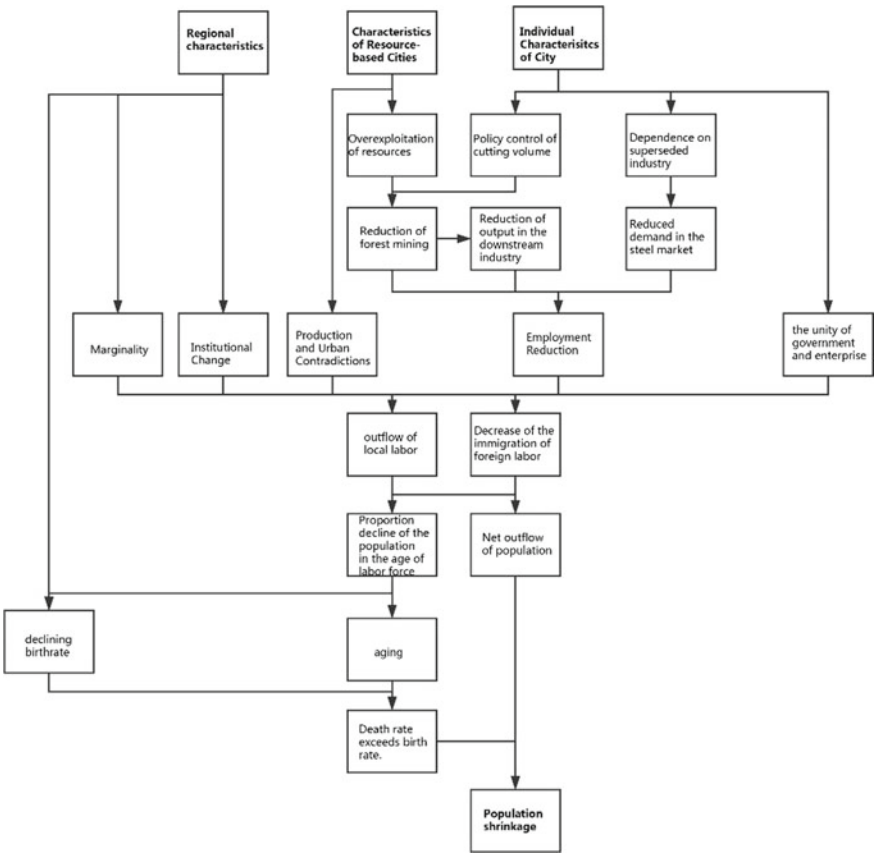

Fig. 6.8 Analytical framework for urban shrinkage in Yichun

will undoubtedly lead a large number of resource-based cities to the latter half of their lifecycles. A great many resource-based cities are very likely to become new shrinking cities.

(4) The characteristics of the region, the resource-based cities, and their own characteristics jointly contribute to population shrinkage in resource-based cities in Northeast China.

(5) In addition to the outflow of the young population and population aging, which are relatively common in international shrinking cities, there are also some unique economic and social phenomena taking place in Yichun, such as "Retreat from the secondary industry to the first industry" and "counter-urbanization." In terms of the spatial characteristics of population shrinkage, Yichun is represented by population centralization in its central area and population shrinkage in the surrounding area. This "Anti Doughnut-like urban shrinkage" is significantly different from the "Doughnut-like Urban Shrinkage" in Britain and the

United States and "Perforated Urban Shrinkage" in Europe. Since the spatial patterns of most resource-based cities are similar to those of Yichun, where urban concentration intended for production is scattered around the central city, the population shrinkage of this type of city is likely to have a pattern of "Anti Doughnut-like urban shrinkage" similar to Yichun.

6.5.2 Suggestion on Urban Planning

Based on the research conclusions above, the following suggestions for urban planning are proposed:

(1) Advocacy of a pluralistic value orientation. Abandoning single, growth-oriented values is the most important direction of reform for China's response to shrinking cities. Take Yichun as an example. Its population has been shrinking since the late 1980s onwards. However, the "Urban Master Plan of Yichun City (2001–2020)" proposed that its population in the administrative region be 1.33 million in 2005 and reach 1.4 million in 2020. Actually, the population in the 2010 census only reached 1.15 million. There are many reasons leading to this problem. On the one hand, local government regards population shrinkage as the failure of its governance, and it is thus a closely guarded secret. On the other hand, the planned population directly determines the scale of urban land use, thus determining finance and development for a long time in the future. Hence, the planned population has always been growing. In addition, the casual control of the superior units in the planning review process has also resulted in the distortion of the planned population. Based on this, it is necessary for all sectors of the society to advocate a diverse value orientation. It is not a failure but an initiative to face the reality to plan for urban shrinkage. At present, from the perspective of the age structure of Yichun, the population will continue to shrink if there is no mass immigration in the future, which has been reflected in the 1% population sampling survey in 2015. Therefore, the population problem should be envisaged in the formation of local urban planning in the future and there should be common awareness that the population shrinkage will continue for a long time. Relevant laws and regulations also need to be established and perfected. In the future, during the examination and approval of master planning for the region, the departments at all levels need to strictly check and examine the anticipated population and land use scale. Units that have repeatedly failed the links of examination and approval will have to bear legal liability. In the implementation stage, superior departments should regularly organize evaluations for urban planning. If there is a huge gap between the planned urban population and reality, higher authorities should propose requirements for replanning; if this situation occurs repeatedly, higher authorities may even suspend or revoke the qualifications of the related planning organization.

(2) Advocacy of smart shrinkage. Paying attention to the improvement of the quality rather than the scale of the city is the main countermeasure for China to respond to shrinking cities. The "Urban Master Plan of Yichun City (2001–2020)" delimited Yichun District, Wumahe District and Cuiluan District, which originally did not border on the built-up space in the central district, in order to expand the scale of Yichun's downtown area. In this way, the spatial structure of the city is rapidly increasing and huge amounts of money have to be invested into the establishment of the city's infrastructure in order to strengthen the ties between the three districts. At the same time, the city's east-west commuting pressure has also rapidly increased. Actually, Yichun has excellent tourism resources. It will be far more sensible to utilize funds to improve the infrastructure inside the urban area, enhance tourist acceptance of the city, and tap existing tourism resources, rather than sell land to build additional buildings in the traditional way.

(3) Advocacy of planning urban agriculture. Dismantling and greening abandoned buildings in shrinking cities is a good measure to deal with poor prior planning. Judging from the recent phenomenon of "Retreat from the secondary industry to the first industry" and the relatively better development of agriculture in Yichun, the construction of agricultural industry parks should be considered in urban planning. The higher authorities should also solve the problem of the current one-way flow between urban and rural areas. This may require a new method to open the anti-urbanization path from town to township in order to promote regional development and solve the problem of the surplus labor force in cities and towns in Yichun, where the level of urbanization is much higher than that of industrialization. In addition, previous planning often focused only on the growth of the built-up space and neglected the negative growth of the population. As a result, there are many buildings in the city that have been suspended for a long time, vacant and abandoned, which not only damages the natural landscape but also becomes a hidden danger to social security. The ideal approach is to dismantle and ecologically restore these sites. However, it is quite tricky in the practice of planning and management because of complex property rights issues. Relevant legislation should be improved to solve this problem in the future.

(4) Advocacy of division adjustment. With respect to regional planning, the implementation of the withdrawal of the district-based townships and the establishment of a multi-tiered urban system are good ways to change the residual system of the planned economy in many resource-based cities. Yichun should implement reforms as soon as possible to establish a normal government function system and transform the existing "two brands, one team" status of the forestry bureau and the people's government. The urban planning system in Yichun should strengthen the development of downtown areas and individual key urban areas. The original decentralized and homogeneous urban systems for forestry production should also be transformed through centralizing the industry, using public service facilities and other resources to guide the redistribution of the population in the place. With respect to administrative division, more of the

remaining districts (counties and cities) should be reorganized into towns and then merged into—two to three districts. The capital town should be set up in the district that is currently of a relatively large size. In this way, a well-defined town system will be established.

Note

- The so-called corporate-run society is mainly directed at traditional state-owned enterprises. These enterprises have established some institutions and facilities that have no direct connection with the production and operation of enterprises but have assumed social functions such as pre- and post-natal services and employee life, welfare and social security.
- The superseded industry refers specifically to the industry intended for the reconstruction and sustainable development of industrial cities that are built on the basis of the development of mineral resources. Based on existing resource conditions and foundations, the industries use high technology to achieve development through industrial extension and substitution.

References

Chen Q, Song Y, Zhang P et al (2004) Urbanization problems and countermeasures facing the revitalization of northeast old industrial base. Urban Plan Forum 2:47–51 (in Chinese)

Chung JH, Lai H, Joo JH (2009) Assessing the "Revive the Northeast" (Zhenxingdongbei) program: origins, policies and implementation. China Q 197:108–125

Gao S (2015) Review of researches on shrinking cities. Urban Plan Forum 3:44–49 (in Chinese)

Hollander JB, Pallagst K, Schwarz T et al (2009) Planning shrinking cities. Prog Plan 4:223–232

Huang H (2011) Shrewd contraction: planning strategy to cope with urban decline and its practice in the US. Urban and Regional Planning Research (in Chinese)

Huang W (2014) Experience and inspiration of urban shrinkage in Britain. Planner (suppl 5):205–209 (in Chinese)

Kotilainen J, Eisto I, Vatanen E (2015) Uncovering mechanisms for resilience: strategies to counter shrinkage in a peripheral city in Finland. Eur Plan Stud 1:53–68

Lee CK (2007) Against the law: labor protests in China's Rustbelt and Sunbelt. University of California Press, Berkeley, CA

Li X, Chen K, Guo X (2015) A contractile strategy for urban renewal under the background of the transformation of the values of growth doctrine. Int Urban Plan 2:81–86 (in Chinese)

Liu H (2016) Progress of quantitative urban shrinkage calculation method. Mod Urban Stud 2:17–22 (in Chinese)

Long Y, Wu K (2016) Shrinking cities in a rapidly urbanizing China. Environ Plan A 48(2):220–222

Long Y, Wu K, Wang J (2015) Shrinking cities in China and its research framework. Mod Urban Stud 9:14–19 (in Chinese)

Martinez-Fernandez C, Wu CT, Schatz LK et al (2012) The shrinking mining city: urban dynamics and contested territory. Int J Urban Reg Res 2:245–260

Reckien D, Martinez-Fernandez C (2011) Why do cities shrink? Eur Plan Stud (8):1375–1397

The United Nations Human Settlements Programme (UN-Habitat) (2009) State of the world's cities 2008/2009: harmonious cities

The United Nations Human Settlements Programme (UN-Habitat) (2015) The state of Asian and Pacific cities 2015: urban transformations, shifting from quantity to quality. Earthscan, London

Wiechmann T, Pallagst KM (2012) Urban shrinkage in Germany and the USA: a comparison of transformation patterns and local strategies. Int J Urban Reg Res 2:261–280
Xiao G, Weiss J (2007) Development in North East People's Republic of China: an analysis of enterprise performance 1995–2002.China Econ Rev (2):170–189
Xu B, Pang L (2014) Growth and decline: research on the contraction of international cities and its enlightenment to China. Economist 4:5–13 (in Chinese)
Yin RK (2013) Case study research: design and methods. Sage Publications, Los Angeles, CA
Yu L, Hou Q, Li J (2008) The key to the "three forest problem" is the reform of forest rights. Financ Probl 9:37–44 (in Chinese)
Zhang J, Guo C (2016) Germany's research and strategy for shrinking cities: take Leipzig as an example. Mod Urban Stud 2:11–16 (in Chinese)
Zhang Z, Man Y, Liu Y (2008) The reform of government and enterprises in state-owned forest areas and related policy issues—research report on Greater Khingan Range and Yichun. For Economy 1:26–32 (in Chinese)
Zhao M, You L, Chen C (2015) "Smart contraction" guidance and planning strategy for rural human settlements. City Plan Rev 7:9–18 (in Chinese)
Zhou K, Qian F (2015) Shrinking cities: research progress of urban development path under the adverse growth scenario. Mod Urban Stud 9:1–13 (in Chinese)

Part III
Case Study

Chapter 7
Shrinking Cities' Depopulation Process and Spatial Pattern: A Transnational Comparison Between Yichun, Heilongjiang, China, and Youngstown Metropolitan Area, US

Shuqi Gao

Abstract Although many urban scholars have reached a consensus that depopulation is the major benchmark by which to define shrinking cities, some scholars have proposed distinct standards for this benchmark, which has caused confusion for those seeking to conduct comparison studies. On the other hand, because of the differences in administrative division systems, cities in different nations have distinct relationships between geographic boundaries and jurisdictional boundaries, as well as varied relationships with their higher and lower level jurisdictions, which makes transnational comparison an arduous and problematic task in urban studies. This study aims to unveil the differences in depopulation processes and in the spatial patterns of depopulation between shrinking cities in China and those in the US. In contrast to the US, whose shrinking cities are well known to a broader audience due to American scholars' predominance in the academic discussion of shrinking cities, China's shrinking cities are poorly studied. To enrich the current literature on shrinking cities and provide foundations for a better understanding of Chinese shrinking cities, this study analyzes the historical depopulation processes and their manifestations at different spatial scales of two shrinking cities, one in China (the City of Yichun, Heilongjiang) and the other in the US (Youngstown Metropolitan Area, Ohio). The study reveals differences between the two cases in both their general depopulation processes and their municipalities' depopulation patterns. Compared with the Youngstown Metropolitan Area, the City of Yichun exhibits a much shorter boom and bust cycle. On the municipality level, the City of Yichun's high population density municipalities still maintain population stability, while most low-density municipalities have endured drastic population loss in the meantime. In contrast, after the whole region entered its depopulation era, most of Youngstown Metropolitan Area's high population density municipalities lost population, while most of those low-density municipalities gained population.

S. Gao (✉)
School of Architecture, Southeast University, Xuanwu District, Nanjing, Jiangsu, China
e-mail: shuqigao@seu.edu.cn

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_7

Keywords Shrinking cities · Depopulation · Transnational comparison · Chinese cities · Rust belt

7.1 Introduction

Up-to-date academic discussions on shrinking cities lack a sufficient variety of transnational comparisons. Shrinking cities have been depicted as heterogeneous manifestations of differentiated localities' backgrounds and contexts instead of being characterized as displaying similar symptoms of different diseases. Thus, scholars have proposed diversified definitions and benchmarks for shrinking cities by overemphasizing local specifications (Bernt 2016). However, some drivers and factors that led to urban shrinkage have been overlooked from the narrow perspective. Therefore, scholars such as Großmann et al. (2013) called for more interurban and transnational comparisons of shrinking cities.

On the other hand, current studies have primarily centered on shrinking cities in developed nations, neglecting to consider shrinking cities in developing nations. In fact, though most developing countries' experiences of depopulation have been less drastic than their counterparts' experiences in developed nations, the prevalence of shrinking cities is beyond the expectations of most scholars, even in the developing nations. According to UN-Habitat (2008), 143 out of 1,408 major cities in the developing world endured population loss between 1990 and 2000, a percentage (10.2%) that is sufficiently large to warrant caution. However, most domestic and international studies on cities in the developing world overwhelmingly focus on urban growth and overlook its counterpart of decline.

This chapter attempts to partially bridge the gap of current knowledge by conducting a transnational comparison between two shrinking cities (Yichun and Youngstown) in China and the US. My motivation for conducting this research is based on my personal observation of the academic discussion in which prominent urban scholars from these nations have been deeply engaged. Most American urban scholars are very familiar with shrinking cities since they have witnessed their emergence and growth in number and extent after the Oil Crisis. However, they may not have a clear perspective of the nature of shrinking cities across the Pacific Ocean. In the US, a variety of perspectives of China include views of the country as a rising superpower, a new leader of the world economy, or a currency manipulator, among other characterizations that are influenced by the political rhetoric (Weidenbaum 1996; Fishman 2005; Mercurio and Leung 2009). Does China have shrinking cities? This is a common question that I have always been asked and was often expected to answer when I was in the US. For most Chinese urban scholars, the phrase "shrinking city" is a brand new foreign buzzword that has little resonance or meaning in China's current phase of development, since its urbanization process is still incomplete, and each year, millions of rural laborers surge into cities. In China, the depopulation of shrinking cities in the US does not draw as much attention as issues such as racial conflict, poor public safety, and other side effects of urban decline and decay. In

conclusion, both nations' urban scholars misunderstand the character of shrinking cities in the other nation, which is the origin of my interest in comparing them.

7.2 Comparative Study and Comparative Method

In this study, I focus on comparing the depopulation processes and spatial patterns of depopulation in two shrinking cities, or more precisely, in two shrinking metropolitan areas. The areas I compare are Yichun, a prefectural city that has 17 sub-jurisdictional districts and cities in the Heilongjiang province, and Youngstown Metropolitan Area, which contains two counties (Mahoning County and Trumbull County) in Ohio and one county (Mercer County) in Pennsylvania, each encompassing dozens of municipalities.

However, the first and foremost problem encountered in this research is the drastic difference between these two cities. Huntington (1993) offered a famous comment on the importance of culture that also applies to transnational comparisons: "The culture of a village in southern Italy may be different from that of a village in northern Italy, but both will share in a common Italian culture than that distinguishes them from German villages". This may be just as true for the difference between Youngstown and New York compared to Youngstown's difference from Yichun.

Lijphart (1971) pointed out a key problem for comparative studies, namely, that these studies consider "many variables, small number of cases". To solve or minimize this problem, four suggestions were proposed: (a) increase the number of cases as much as possible; (b) reduce the "property-space" of the analysis; (c) focus the comparative analysis on "comparable" cases; or (d) focus the comparative analysis on the "key" variables. Regarding the first suggestion, this study does not aim to provide a full picture of Chinese and American shrinking cities since it would be impossible to do so in only one chapter; the aim of this study is instead to provide a pair of more tangible and detailed cases for scholars in and beyond China and the US to consider. In light of this limitation, I did not devote substantial discussion to the question of how representative Yichun and Youngstown are of shrinking cities in China the US in general when I constructed this study. The second suggestion is applied in this study to limit the focus to depopulation processes and their spatial patterns, omitting consideration of many other features, such as the causalities of urban shrinkage or the many social and economic effects of shrinking cities, from the core section of this study. The third suggestion is also applied in this study. Considering that a systematic difference exists in the two nations' territorial administration (see Ma 2005 and Abramson 2006 for more details), this study does not directly compare the City of Yichun with the City of Youngstown since the former is a prefectural-level municipality, which is similar to a county-level municipality in the US from the perspective of geography and administration, while the latter is at the bottom of the American territorial administration system and is similar to a municipal district of the former. Instead, this study compares the Youngstown Metropolitan Area with the City of Yichun. This is justified by the fact that both areas contain a series of

submunicipalities, which have strong social and economic connections with each other and are largely affected by a single core area, Yichun District and the City of Youngstown, respectively. In addition, Mahoning County, the higher level jurisdiction of the City of Youngstown, is not taken as a counterpart of the City of Yichun because a county's influence on its sublevel municipalities in the US is not as strong as the influence a prefectural-level city has on its sublevel municipalities in China and because Youngstown Metropolitan Area's urban area has far surpassed the jurisdictional boundary of the Mahoning County. This is also the reason that the US Census Bureau takes the boundary of Metropolitan Area as the Core-Based Statistical Area for this region. The third suggestion of Lijphart (1971) is my initial motivation for conducting this study. Both the City of Yichun and the Youngstown Metropolitan Area endured deindustrialization and population loss over the last several decades, and each area's economy was monopolized by only one sector: the lumber sector in Yichun and the steel sector in Youngstown. This study focuses on the depopulation process and its spatial pattern in each case, thus meeting the "comparable cases" requirement to a large extent. The final suggestion is the basis of this study's research question that the major "key variable" is depopulation, and minor "key variables" are components of depopulation.

7.3 Context and Background

7.3.1 City of Yichun

The City of Yichun contains 17 municipalities, among which 15 are city-governed districts and the two others, Jiayin (on the far north) and Tieli (on the far south), are relatively independent municipalities. The City of Yichun is located in the north of the Heilongjiang Province, and its northern boundary acts as a partial border between China and Russia (see Fig. 7.1). This region was historically uninhabited until the late 1940s and early 1950s, after the founding of the People's Republic of China, when the new central government discovered its abundant forestry resources, which spurred the exploitation of wood as an important raw material for industrialization. Since then, the city experienced a substantial surge in migrants coming from elsewhere within the nation, either due to involuntarily planned migration or voluntary attraction to the high welfare status of state-owned lumbering enterprises. The unregulated lumbering and neglected cultivation caused severe resource depletion after the 1980s, which coincided with the era of expansion in which marketization and privatization largely substituted and challenged the remaining state- and public-owned enterprises. This period was also followed by the central government's decision to switch the priority of the preferable regional policy from the remote area to the coastal area after the opening-up era. Since then, the City of Yichun has endured economic hardship and population loss. Its depopulation status was further exacerbated by the One-child Policy, which strictly regulated the state-owned enterprises' staff, and the Natural

Fig. 7.1 The location of the City of Yichun (left) and the Youngstown Metropolitan Area (right). *Note* the white lines within the left map indicate all the prefectural-level jurisdictions of China, and the gray areas within the right map represent all core metropolitan areas of the US

Forest Protection Program, which gradually curtailed the lumber industry. Hence, the of Yichun's population status is currently facing two challenges: first, more deaths and fewer births, which have resulted in a fertility gap; second, more out-migration and less in-migration as a result of economic downturn.

7.3.2 Youngstown Metropolitan Area

In this study, the boundary of the Youngstown Metropolitan Area is defined by the US Census Bureau and contains three counties, Mahoning County (Ohio), Trumbull County (Ohio) and Mercer County (Pennsylvania). The Youngstown Metropolitan Area is located in northeastern Ohio and western Pennsylvania (see Fig. 7.1). Since the Mahoning River is the largest river in this region and links the most important municipalities, the Youngstown Metropolitan Area is also known as the Mahoning Valley. Additionally, the Youngstown Metropolitan Area has another moniker: Steel Valley, due to its historically prosperous steel industry. The region started booming after the middle of the 1800s, when large iron mines were established there and regional transportation facilities such as the Erie Canal improved. Two of the region's large neighbors, Cleveland to the northwest and Pittsburgh to the southeast, also underwent fast industrialization in the same era, which further strengthened the region's economic connection with the labor and consumer markets. Though sporadically affected by economic downturns such as the Great Depression in the late 1920s and the beginning of 1930s, for most other years within the first half of the twentieth century, the region witnessed fast growth, and the first and second World Wars largely stimulated the steel industry. However, Steel Valley encountered a different scenario during the latter half of the 20th century. The oversupply of steel products and emerging new industrial competitors such as Japan and the German Federal

Republic consistently aggravated the American steel industry, and it was even worse after the Oil Crisis, which triggered a massive decline in industrialization across the Rust Belt ever since. The Youngstown Metropolitan Area was no exception. The closure of hundreds of factories and subsequent drastic population loss have transformed many of its formerly viable communities into ghettos, especially within its major core area, the City of Youngstown. However, the Youngstown Metropolitan Area's other industries have remained largely unaffected, and thus, they have played an important role in maintaining the whole region's social and economic stability. Today, the administrative, sales, production, management, and culinary industries are the top five industries of this region according to the American Community Survey one-year estimate data from 2013 to 2016. The impact of the steel industry's decline has gradually diminished, but the region is still struggling for a new industry to revitalize.

7.3.3 Basic Comparison

Although this paper does not aim to offer a comprehensive comparison between the City of Yichun and the Youngstown Metropolitan Area, some of their basic features shall be presented as the foundation for further comparison on the depopulation process. First, the two cases differ in their land use patterns, which have created totally different landscapes. Though the City of Yichun's population is twice that of the Youngstown Metropolitan Area, its area is also 10 times larger. Therefore, the City of Yichun's population density is relatively low compared to the Youngstown Metropolitan Area (see Table 7.1). In fact, the City of Yichun consists of 17 spatially independent units, some of which may also contain several subunits (see Fig. 7.2). In contrast, the Youngstown Metropolitan Area has a clear, large and continuous urban area that centers on the City of Youngstown. Though the Youngstown Metropolitan Area also has a few independent spatial units, such as the Borough of Greenville (Pennsylvania), Grove City (Pennsylvania), the Borough of Mercer (Pennsylvania), and Sebring Village (Ohio), most of its urban area is contiguous. Therefore, the City of Yichun is actually a series of small cities and towns that have connections via administrative governance, while the Youngstown Metropolitan Area is mostly a large city, though it has many more municipalities (97) than the former (17). The city of Yichun also exceeds the Youngstown Metropolitan Area in terms of total population, but the latter region actually consists of a much larger core area than the former.

Table 7.1 Basic information on the City of Yichun and Youngstown Metropolitan Area

	City of Yichun	Youngstown Metropolitan Area
	2010 census	2010 census
Location	Heilongjiang Province, China	Ohio and Pennsylvania, US
Population	1,148,126	565,773
Area	15,064 mi^2	1,745 mi^2
Population density	76 per mi^2	324 per mi^2
Submunicipalities	17	3 counties and 97 municipalities
Core area	Yichun district	City of Youngstown

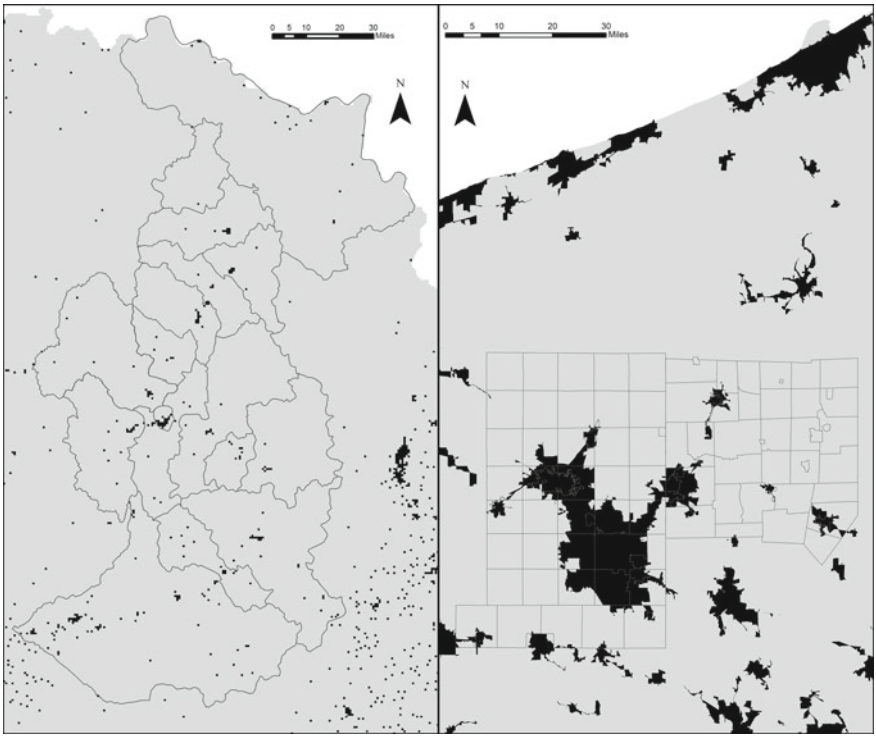

Fig. 7.2 Urban area of the City of Yichun (left) and the Youngstown Metropolitan Area (right). *Note* the black patches within the left map are the built-up area generated from remote sensing images in the year of 2010, and the right map is the urban area that was provided by the American Census Bureau in the year of 2016

7.4 The Population Change Processes and Spatial Patterns of Each Case

7.4.1 Comparison of General Population Change in Each Region

The first conspicuous finding after comparing historical population data from the City of Yichun and the Youngstown Metropolitan Area is that while both regions have experienced depopulation, the former region's tipping-point lags 20 years behind that of the latter. The Youngstown Metropolitan Area's total population switched from growth to shrinkage at the 1970 Census, just a few years before the Oil Crisis that triggered the massive deindustrialization of this region. However, at that time, the City of Yichun was still enjoying the population growth under the planned economy. It was not until the 1990 Census, when China's opening-up policy had been in place for around ten years and the lumber industry was no longer viable, that the City of Yichun's population reached its turning point.

Second, the two cases exhibit a stark difference between their population growth and decline rates. The City of Yichun has a much faster growth rate than the Youngstown Metropolitan Area (see Fig. 7.3). From 1953 to 1990, the City of Yichun had a 4.1% annual population growth rate that quadrupled its population. In contrast, the Youngstown Metropolitan Area's annual growth rate has never matched the growth rate of the city of Yichun in any decade within the twentieth century, before the region reached the turning point. The fastest period of growth occurred between 1910 and 1920, when Youngstown Metropolitan Area's annual population growth rate reached 4.0%. There are also obvious differences between the two regions with regard to the depopulation rate. From 1990 to 2010, the City of Yichun's annual depopulation rate was 0.7%, while Youngstown Metropolitan Area's depopulation rate was much less severe. After 1970, when Youngstown Metropolitan Area's population reached its historical peak, the following 40 years witnessed a 0.3% annual depopulation rate.

Third, the sub-administrative units of both regions have demonstrated heterogeneous population change processes. In the City of Yichun, the city-governed districts are lumber industry oriented, so their population change is highly associated with the industry's boom and bust. Although the City of Tieli, another major administrative unit of the city of Yichun, also has a lumber industry, it is less dominant than the industries in the 15 city-governed districts. Thus, the City of Tieli's population growth and shrinkage rate is relatively tempered when compared with those of the Yichun city-governed districts (see Fig. 7.4). Regarding another component of the City of Yichun, the County of Jiayin is agriculture-oriented and has no lumber industry; therefore, as a relatively independent administrative unit, its population change is inconsistent with that of the others. Regarding the Youngstown Metropolitan Area's three major component counties, the population change in Mahoning County and Trumbull County is largely synchronized since both of them largely depend on the steel

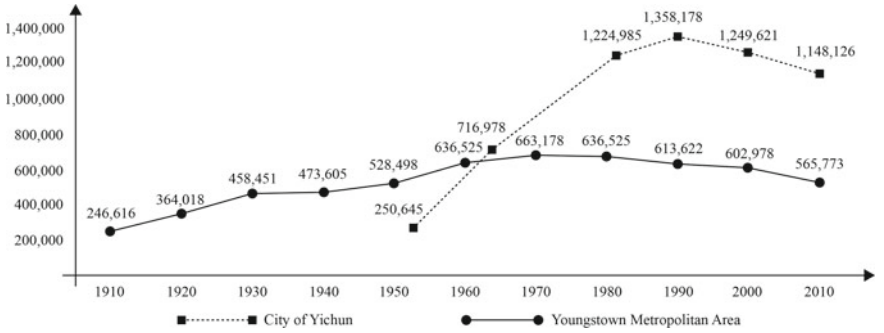

Fig. 7.3 Population change in the City of Yichun and the Youngstown Metropolitan Area. *Note* Both regions' population change data retrieved from census reports of the two countries; the first, second and third years of Census population data on the City of Yichun are 1953, 1964, 1982, respectively

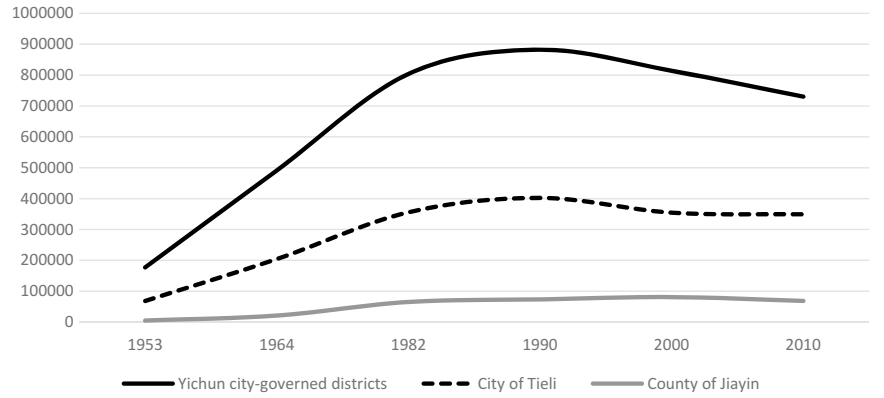

Fig. 7.4 Population change in the City of Yichun's three major components

industry. In contrast, Mercer County only contains a small portion of the Youngstown Metropolitan Area's urban area (see Fig. 7.2) and has relatively little connection with the steel industry, so its population stays relatively stable when compared with the other two counties (see Fig. 7.5).

7.4.2 Comparison of the Population Change Processes in Submunicipalities

Before further delving into the comparison between the two cases' population change processes at the municipality level, the study began with analyzing their heterogeneous population density as one of their specific characteristics. The study adopted

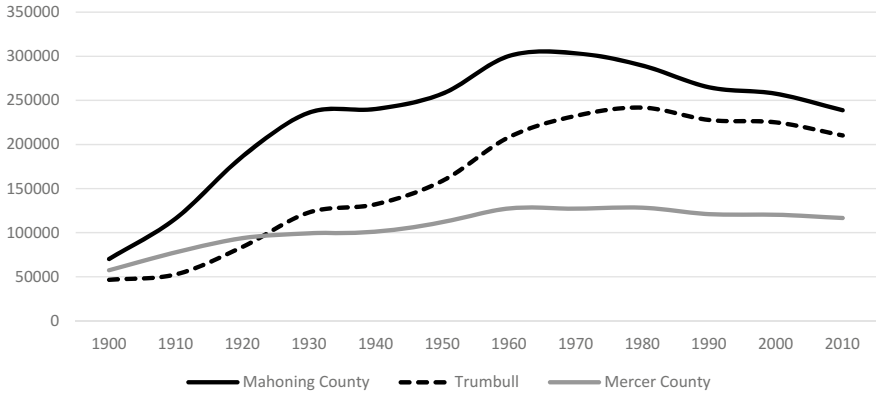

Fig. 7.5 Population change of Youngstown Metropolitan Area's three counties

turning point population data, which refers to the moment when population converted from growth to shrinkage in each case. Thus, the 1990 Census data and 1970 Census data are adopted for analyzing analyze the population densities of the City of Yichun and the Youngstown Metropolitan Area, respectively.

The City of Yichun and the Youngstown Metropolitan Area share some similarities and exhibit some difference when their population density maps are compared (see Fig. 7.6). On the one hand, both cases' core areas have relatively high population density. Under China's highly centralized urban regime system, the Yichun District is the City of Yichun's core area, which contains most governmental agencies and important facilities in the City of Yichun. In contrast to most of the other lumber industry oriented districts in the City of Yichun, the Yichun District does not have any lumber industry, and its major function is as the administrative, cultural and consumption center of the whole city. In the Youngstown Metropolitan Area, the City of Youngstown and the City of Warren, as well as small incorporated municipalities, are located in urban areas, so they have relatively high population densities when compared with the others; the City of Youngstown and its surrounding municipalities in particular make up the region's core high population density area. On the other hand, the rural municipalities of both regions have fairly low population density. The County of Jiayin, the only agriculture-oriented municipal in the City of Yichun, has the lowest population density. Similarly, most unincorporated municipalities in the Youngstown Metropolitan Area, which are also rural and agriculture-oriented, have population density that is as low as it is for the County of Jiayin.

However, the depopulation patterns for the two regions differ to a very large extent on the municipality level. In the City of Yichun, its high population density municipalities are Yichun District and Xilin District, both of which have maintained population stability or even a little population growth amidst the population decline elsewhere throughout the region (see Fig. 7.7). On the other hand, the Youngstown Metropolitan Area's municipalities revealed stark differences in their population change patterns. Most of the high population density municipalities, such as the

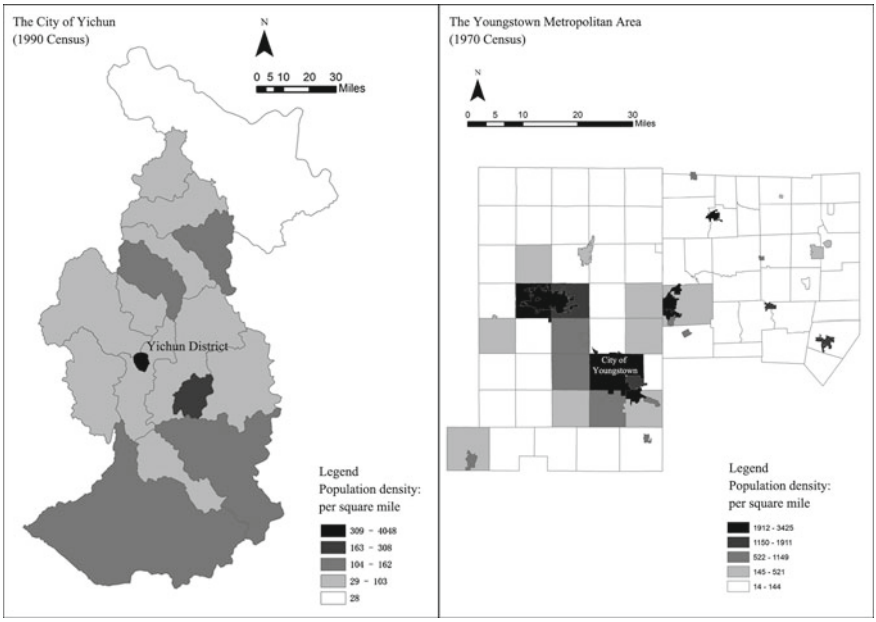

Fig. 7.6 Municipality-level population densities in the City of Yichun (left) and the Youngstown Metropolitan Area (right). *Note* both maps have the same legend

City of Youngstown, the City of Warren and many other small incorporated urban municipalities, endured drastic population loss, while the low population density municipalities, including most unincorporated towns, increased in population during the same era.

The scatter-point diagram (see Fig. 7.8) further clearly reveals that the municipalities of the two cases drastically differed in their population changes after both regions have entered the depopulation era. In the City of Yichun, though its total population has declined more than 15% within 20 years (1990–2010), the only high-density municipality, the Yichun District, still exhibited 6% population growth over the same time period. A large cluster of the City of Yichun's municipalities fall into the "low population density and severe depopulation rate" category. One exception is the County of Jiayin, which has the lowest population density but only has a very trivial depopulation rate. This is justified by its idiosyncrasy as an agriculture-oriented municipal that is still at the beginning of the urbanization process and that was barely affected by the overall regional decline in the lumber industry. In contrast, Youngstown Metropolitan Area's municipalities fall into two different clusters of population density and population change. One is the "high population density, severe depopulation rate" class, which contains the region's core urban areas such as the City of Youngstown, the City of Warren and most of the incorporated municipalities. The other is the "low population density, fast population growth rate" group,

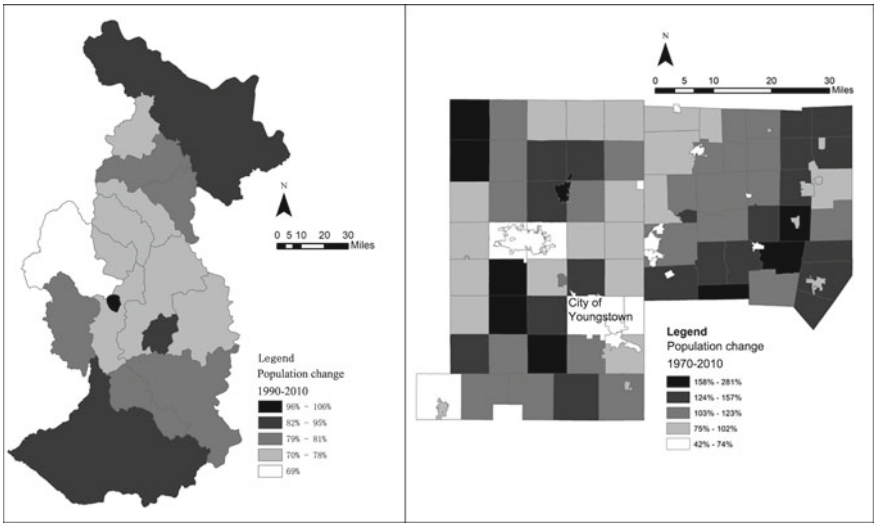

Fig. 7.7 Population change of the City of Yichun's submunicipalities (left) and the Youngstown Metropolitan Area's submunicipalities (right)

which includes most rural and unincorporated municipalities, some of which even doubled their population within 40 years (1970–2010).

7.5 Discussion and Conclusion

7.5.1 Discussion

Just as there are stark differences between American and Chinese culture, politics, and economies, this study reveals that those two nations' shrinking cities can be easily distinguished from each other by looking into their depopulation processes and patterns.

Compared with the US, China has a much more centralized regime that concentrates better amenities and infrastructure facilities, as well as working and living resources, among the core urban areas and leaves out their counterparts (see Fig. 7.9). This allows core areas to drain other municipalities' populations even as the overall region's population is declining. China's centralized regime system also engenders centralized growth poles by leaving the peripheral areas unstable, especially under the population loss scenario. In the City of Yichun, although the Yichun District is on the same level as other severely depopulated municipalities, its city-seat status makes it much more attractive to all the people in that region. Therefore, currently and in the foreseeable future, Chinese shrinking cities will still be dominated by

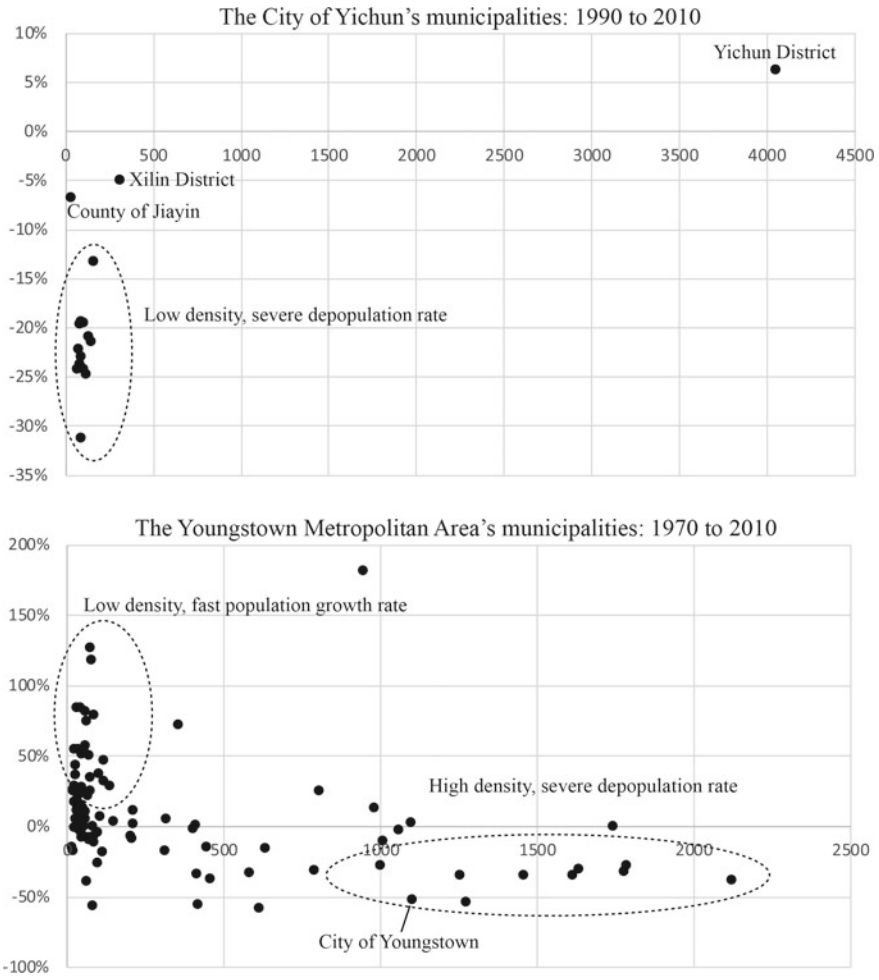

Fig. 7.8 The reverse relationship between municipalities' population density and population change: the City of Yichun (top) and the Youngstown Metropolitan Area (bottom). *Note* both figures' horizontal axes represent population density per square mile (the City of Yichun: 1990s; Youngstown Metropolitan Area: 1970s), and both figures' vertical axes represent population change (the city of Yichun: 1990–2010; Youngstown Metropolitan Area: 1970–2010)

small-sized and inter- or intraregional peripheral areas, and those core urban areas with fairly high population densities and large scales will still be able to maintain population growth or at least keep the population stable.

Compared with China, the US has a much more decentralized regime system in that although it has various types of municipalities, including villages, boroughs, towns, and cities, they do not have substantial differences in attracting or maintaining their populations (see Fig. 7.9). The only exception is when a municipality

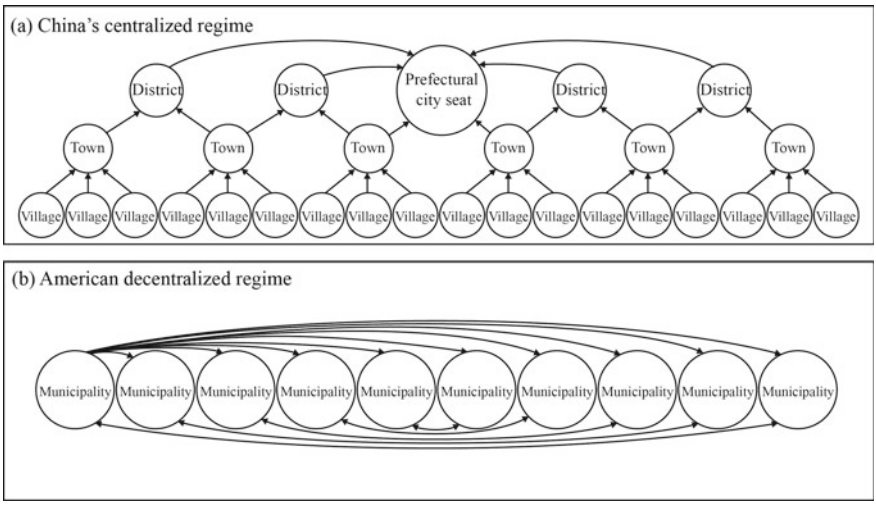

Fig. 7.9 The differentiated regime systems in China and America that lead to their distinguishable population change patterns

has a home rule that distinguishes incorporated municipalities from unincorporated municipalities, which have substantial differences in their political functions. In most cases, Americans are voting with their feet instead of voting by the municipalities' administrative level (Tiebout 1956). Thus, American municipalities are valuing entrepreneurialism to compete with each other for success. Under such a decentralized regime system, whether a municipality is an administrative center is not at the core of people's choices; rather, the standards of living, including low crime rates, good education systems, low-density zoning and other factors, are the most common motivations for those who want to migrate.

In addition to the regime differences, job market accessibility and real estate choices also matter with the differentiated patterns between China and American urban shrinkage. In the Youngstown Metropolitan Area, there are 97 municipalities, most of which can be reached from the city of Youngstown in less than an hour by car. Therefore, anyone who works in the City of Youngstown or nearby can have almost a hundred choices when selecting the best location for a home. In contrast, it takes almost three hours by train to travel from the northernmost city-governed district, Tangwanghe District, to the Yichun District, which is a much less feasible travel time for commuting. That being said, most people who are working in Yichun District have to live in the same district or as far as the Wumahe District, the nearest district with respect to the Yichun District in the City of Yichun; otherwise, they cannot tolerate the commuting time. From this perspective, if a municipality wants to maintain population stability or population growth in America, it has to increase its living standards, while in China, it has to create as many well-paying job opportu-

nities as possible since China does not have similar geographical units to American metropolitan areas and most urban areas are isolated from each other.

7.5.2 Conclusion

This study reveals that the two regions, the City of Yichun and the Youngstown Metropolitan Area have various differences between their population change processes and patterns in general and more specifically at the municipality level. The City of Yichun has a much faster population growth rate and a slightly faster population loss rate than the Youngstown Metropolitan Area, which maintains relative stability in population even though many of its municipalities have endured drastic population loss. Both cases are similar in that a major industry's collapse is the crucial cause of their depopulation and municipalities with strong connections to the major industry of the region have been deeply affected. Population loss is one major manifestation of that. The two cases differ substantially in their municipalities' depopulation patterns. In the City of Yichun, its urban and high-density municipalities can maintain population stability, while the low-density municipalities experienced severe depopulation after the overall region's population growth ended. In the Youngstown Metropolitan Area, its urban and high-density municipalities are severely depopulated, while the low-density municipalities have increased in population in the meantime. These differences can partially be explained by the two cases' distinct regime systems and differences in accessibility within municipalities.

Funding Information This work was partially funded by a MIT MISTI funding: Shrinking Cities in the US and China: A Transnational Comparison.

References

Abramson DB (2006) Urban planning in China: continuity and change: what the future holds may surprise you. J Am Plan Assoc 72(2):197–215

Bernt M (2016) The limits of shrinkage: conceptual pitfalls and alternatives in the discussion of urban population loss. Int J Urban Reg Res 40(2):441–450

Fishman T (2005) China, Inc.: how the rise of the next superpower challenges America and the world. Simon and Schuster

Großmann K, Bontje M, Haase A, Mykhnenko V (2013) Shrinking cities: notes for the further research agenda. Cities 35:221–225

Huntington SP (1993) The clash of civilizations? Foreign Affairs 22–49

Lijphart A (1971) Comparative politics and the comparative method. Am Polit Sci Rev 65(3):682–693

Ma LJ (2005) Urban administrative restructuring, changing scale relations and local economic development in China. Political Geogr 24(4):477–497

Mercurio B, Leung CSN (2009) Is China a currency manipulator: the legitimacy of China's exchange regime under the current international legal framework. Int'l Law 43:1237–1256

Tiebout CM (1956) A pure theory of local expenditures. J Polit Econ 64(5):416–424
UN-Habitat (2008) State of the world's cities 2008/2009: harmonious cities. Earthscan
Weidenbaum M (1996) Greater China: the next economic superpower. In: The dynamic American firm, pp 79–87. Springer, Boston, MA

Chapter 8
Analysis of the Variation in Quality of Street Space in Shrinking Cities Based on Dynamic Street View Picture Recognition: A Case Study of Qiqihar

Zhi Li and Ying Long

Abstract As the focus of urban planning in China changes from incremental planning to stock-based planning, studies of shrinking cities become increasingly important. As the street is one of the basic elements of the study, changes in its spatial quality are essential to evaluating the changes in shrinking cities. This study uses street views from Tencent Maps to evaluate changes in the quality of street space in downtown Qiqihar from 2013 to 2015. The research reveals that the quality of street space in Qiqihar is improving, while the rapid change in first-floor shops suggests a declining economy. Based on this finding, the "Population-economy-space decline lagging phenomenon" is proposed to illustrate the change mode of population, economy, and spatial quality during the shrinking process of the city.

Keywords Shrinking city · Spatial quality · Street view picture · Recognition

8.1 Introduction

It is widely acknowledged among academics that the key feature of a shrinking city is a decrease in population. Additionally, the shrinking of a city is accompanied by a change in economy and space. Economically shrinking cities in Western countries are made up of both growing cities and declining cities (Wiechmann and Pallagst 2012), while the economic indicators of most of China's shrinking cities are still increasing, like Qiqihar (Qiqihar Statistics Bureau 2015). Concerning space, shrinking cities in Western countries generally experience a decline in the city center, such as Detroit in the United States, Leipzig in Germany, etc., while the spatial variation in China's shrinking cities shows different characteristics. Long et al. (2015) characterize shrinking cities in China as experiencing "pie" contraction and "global"

Z. Li
School of Architecture, Tsinghua University, Haidian District, Beijing, China

Y. Long (✉)
School of Architecture and Hang Lung Center for Real Estate, Tsinghua University, Haidian District, Beijing, China
e-mail: ylong@tsinghua.edu.cn

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_8

contraction. Yang et al. (2015) point out the phenomenon of "population loss and space expansion" in China's shrinking cities. At a more microlevel of spatial quality, vacant buildings, unused infrastructure and dilapidated streets sometimes appear in shrinking cities, typical examples of which are Detroit and Pittsburgh in the United States Rust Belt. Shrinking cities in China also have relatively high vacancy rates, and construction quality and environment are deteriorating, as in Longjing County in Yanbian, Jilin Province (Wang 2017). However, there is not a large amount of idle infrastructure (Liu and Yang 2017) or a large-scale decline in streets.

Evaluation of the quality of space is based on different standards with different focuses. Based on the three categories of use, appearance and safety, Zhou and Huang (2003) proposes a series of subdivided measurement elements. Tang et al. (2016) divide the street into elements such as architecture, roads, and first-floor shops and make separate evaluations. There are many evaluation methods, including objective evaluation, subjective evaluation, and two-dimensional data analysis. Some researchers have also identified changes while assessing quality. Naiket al. (2015) use the Streetscore index to evaluate street quality and compare five urban streets from 2007 to 2014. Tang et al. (2016) subdivide street quality into two dimensions—whether the location of the section has changed and whether the quality has been improved—and assess changes in the quality of some of Beijing's streets from 2012 to 2015.

Images are a common tool used to record the characteristics of street space and people's activities. For example, Zhang Tsetung's *Riverside Scene at Qingming Festival* and Van Gogh's *Night Cafe* both show us specific street space. However, due to the technical limitations of their time, these images can only display local streets and cannot summarize the characteristics of the entire city. With the development of the mobile Internet, Google, Baidu, Tencent and other major map software, increasingly comprehensive Street View functions have been launched, enabling studies on large-volume and full coverage of street images. Increasingly, scholars worldwide have begun to use street view pictures to study urban street space, including Rundle et al. (2011), Zamir et al. (2011), Tang et al. (2016) and others.

In recent years, Tencent maps and other service providers have introduced the time machine function in street view pictures, which enables users to see pictures of the same street at different times, making it possible to study changes. This study will use Tencent's street view pictures and time machine function to compare the spatial quality of Qiqihar downtown streets in 2013 and 2015 to evaluate changes in the quality of Qiqihar's streets.

8.2 Method

8.2.1 Area of Research

The scope of this study is the downtown area of Qiqihar in Heilongjiang Province. It is mainly located in Jianhua District, Tiefeng District and Longsha District and covers an area of approximately 88 square kilometers (Fig. 8.1).

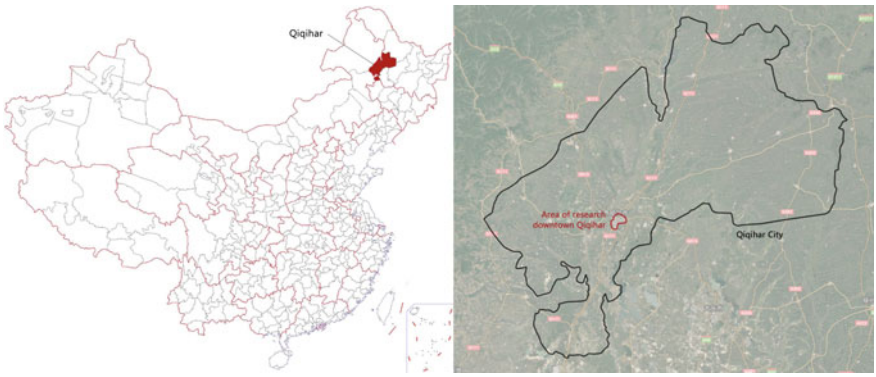

Fig. 8.1 Area of research: downtown Qiqihar

According to the statistics of the National Bureau of Statistics of China, the total population of the districts of Qiqihar (including seven districts) at year's end has continued to decline since 2006, dropping from 1,442,200 in 2006 to 1,365,900 in 2015. "Total population at the end of a year" refers to the total population in the city at midnight on December 31 each year, regardless of whether or not they are permanent residents. As the trend of its changes can largely reflect the overall urban population, this measure demonstrates that the urban population in Qiqihar is shrinking. According to the definition of "population contraction in urban areas" (Hollander et al. 2009), downtown Qiqihar is a shrinking city. In economics, the gross domestic product (GDP) in Qiqihar City has continued to grow in recent years. In 2014, the GDP of Qiqihar was 122.88 billion yuan, an increase of 5.2% over the previous year.

8.2.2 Data Collection

Within the scope of the study, 3267 points on all the city's streets, measured at an interval of 100 meters, and their latitude and longitude coordinates are first obtained and then converted to the Mars coordinate system. Next, 1216 of these points are sorted out according to whether the nearest street view within 50 meters has a time machine function on Tencent Map. The Tencent Street View time machine provides pictures in July 2013 and November 2015, and each point has four directions around, so each point has eight pictures, for a total of 9728 street view photos. (See spatial distribution of the observed points in Fig. 8.2).

Fig. 8.2 Spatial distribution of points with multiyear street views

8.2.3 Evaluation Standards

First, the street space is divided into three large categories based on location and construction: street, building, and open space (Fig. 8.3). Each large category is subdivided into middle categories and small categories to be evaluated. For example, a street can be divided into two middle categories of roadway and sidewalk, and a roadway can be divided into two small categories of pavement and driveway.

There are two types of evaluation used for changes in the quality of space: objective recognition and subjective evaluation. Objective recognition is carried out separately in each small category to determine whether or not it changes. Subjective evaluation is done separately for each middle category. Based on subjective experience and his professional knowledge of architecture, the author excludes the seasonal factors and

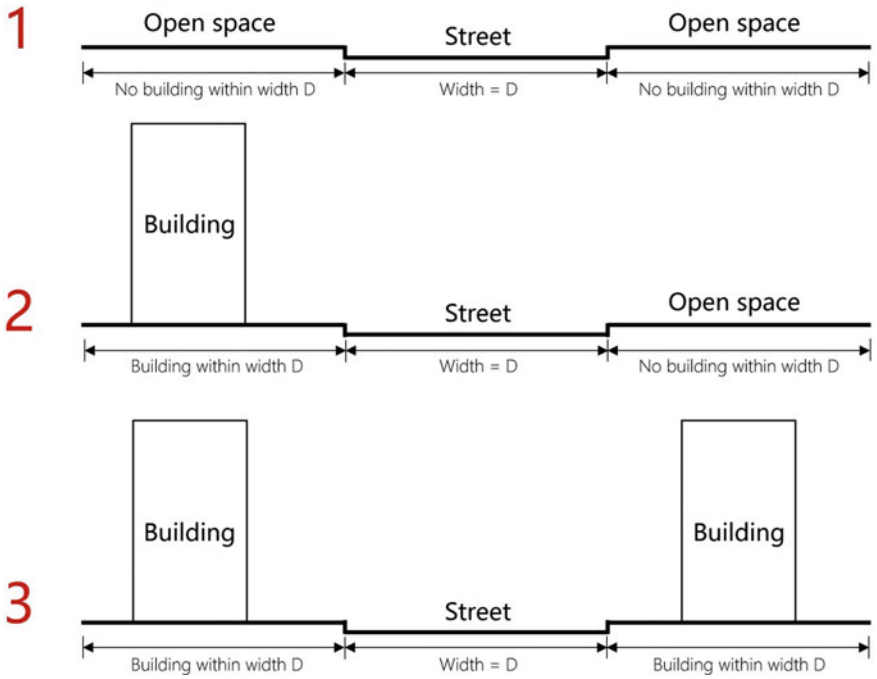

Fig. 8.3 Categories of street space

integrates the changes of each small category to determine whether a middle category is better, worse or neither. (See categories and subjective and objective evaluation criteria in Table 8.1).

The subjective evaluation is used only for the middle category. Small categories are too trivial to obtain clear and meaningful results, while each of the middle categories is much different from and independent of each other. If the quality of two middle categories goes in the opposite direction, it is difficult to comprehensively estimate whether the quality of a scene is becoming better or worse. Thus, there is no subjective evaluation of the quality change of large categories and the entire scene. The entire analysis of the quality changes is divided into middle categories for the purpose of discussion.

Factors in the subjective evaluation include quality, the environment, and so on. More specifically, the main signs of roadway quality change are the quality of pavement, the clarity of boundaries and road signs, while the signs of the sidewalk are mainly the quality of pavement and greening, the number and standardization of parking spaces, and the degree of street furniture improvement. The evaluation of the nature of a building is to measure the environment before and after demolition or new construction, including construction quality, cleanliness, etc., and a change of façade means a change in the quality of a façade rather than the pros and cons of different façade styles. The signs of a change in quality of first-floor shops include the

Table 8.1 Categories and subjective and objective evaluation criteria

Large category	Middle category	Small category	Objective recognition	Subjective evaluation
Street	Roadway	Pavement	Change or no change	Better, no difference or worse
		Driveway	Change or no change	
	Sidewalk	Pavement	Change or no change	Better, no difference or worse
		Greening	Change or no change	
		Parking space	Change or no change	
		Street furniture	Change or no change	
Building	Nature	Torn down	Yes or no	Better, no difference or worse
		New building	Yes or no	
	Façade	Color and material	Change or no change	Better, no difference or worse
		Reformation	Yes or no	
	First-floor shops	Number	Change or no change	Better, no difference or worse
		Signboard	Change or no change	
		Change of façade	Change or no change	
Open space	Nature	New building	Yes or no	Better, no difference or worse
	Quality	Greening	Change or no change	Better, no difference or worse
		Furniture	Change or no change	
		Parking space	Change or no change	

quality of signboards, façade and occupancy rate, the signs of a change in the nature of open space are the quality of new buildings and environmental cleanness, and the signs of a change in the quality of open space include the quantity of greening, the quality of furniture and the quantity and standardization of parking spaces.

Seasonal impact needs to be excluded from the subjective evaluation. More specifically, the evaluation content does not include subjective impressions, willingness to stay, and other factors that are greatly affected by the seasons. Instead, it only

involves judgments of the changes in physical space. As we know, buildings and roads are seldom influenced by the seasons. Only greening may be affected by different seasons (existing in sidewalks and open space). When comparing the greening of two pictures, each of the plants will be carefully compared. The morphological difference between summer and winter is not considered as a change in the greening. Only when the quantity of a plant changes or the branch is apparently trimmed can a change in the greening be recognized. After confirming this change, the changes in the other small categories are combined to evaluate the change in the quality of the middle category. The air quality in the two streetscape pictures is not much different, which has little effect on the subjective evaluation.

Any change in any direction of a point will be recognized as objective change, while subjective evaluation will be made with changes in every direction considered (Examples of subjective evaluation and objective recognition are shown in Fig. 8.4).

8.3 Results

The statistics on subjective and objective changes in the studied categories are shown in Table 8.2 and Fig. 8.5 (subjective evaluation in middle categories only). The noteworthy results are as follows:

(1) Nearly half the points have changed objectively, and the number of changes of building is the greatest, followed by street and open space.
(2) Signboards of first-floor shops, sidewalk pavement, and road pavement are the most varied three small categories.
(3) Overall, the number of points with positive change is far greater than that with negative change, and the rate of negative evaluation is very low.
(4) Street has a higher proportion of positive change than building and open space.

Figure 8.6 reflects the spatial distribution of the subjective evaluation of each middle category, and the notable results are as follows:

(1) In all categories, there are only a few spatial quality deteriorations, there is no contiguous deteriorating area, and there is no certain observation point whose indicators all decrease.
(2) The overlapping rate of points with better roadway and better sidewalk is high, and the layout is characterized by less central distribution and more peripheral distribution.
(3) The nature of the building, the nature of the open space and the quality of the open space have a lower rate of better change, but the better points are also distributed peripherally.
(4) Building façades and first-floor shops have a high rate of change and many of the changed points have no obvious difference, especially in the first-floor shops. Additionally, the better points in the first-floor shops are concentrated in the center.

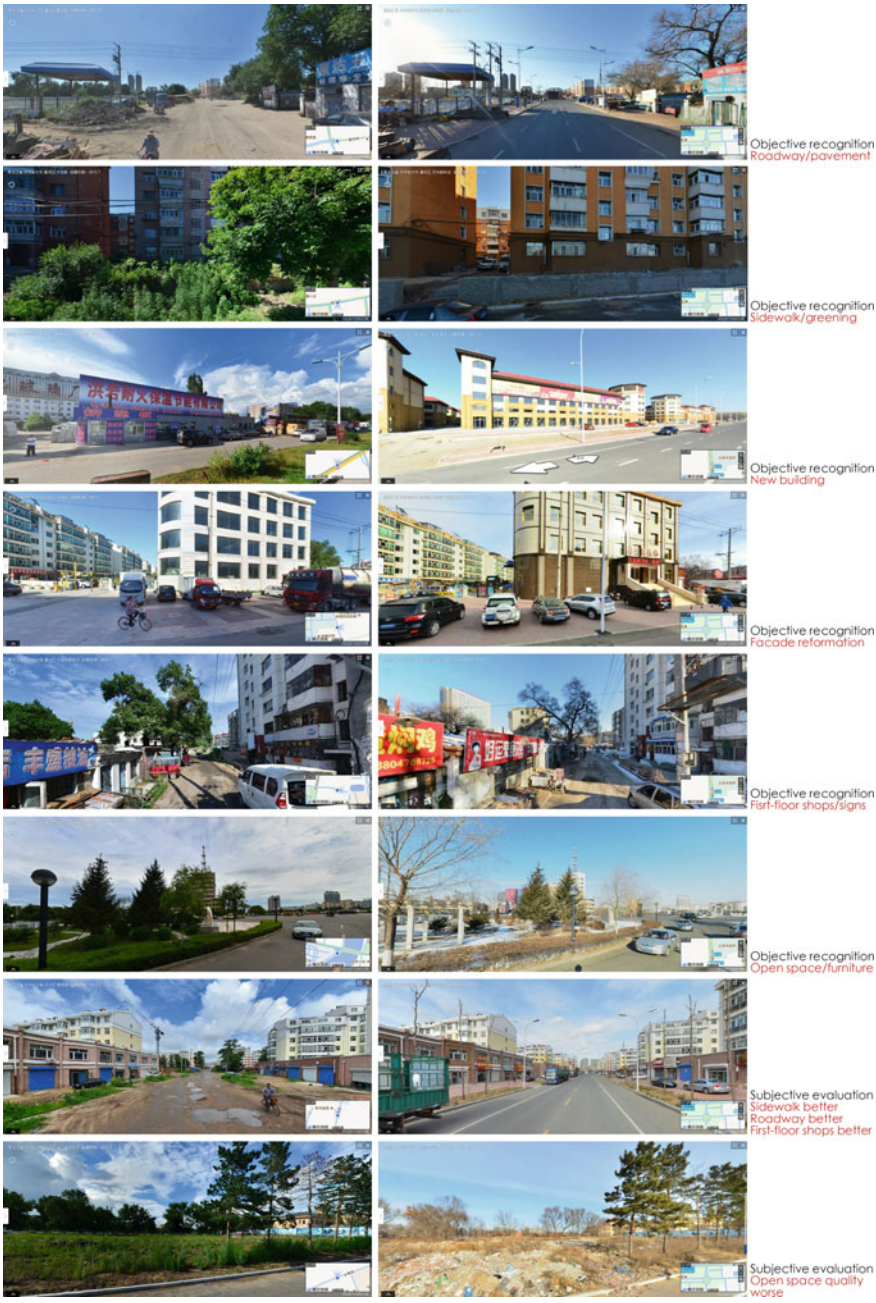

Fig. 8.4 Examples of objective recognition and subjective evaluation

Table 8.2 Statistics of the results of subjective and objective changes

Total	Large category	Middle category		Small category	
590 (48.52%) Note: 1216 points observed	Street 251 (20.64%)	Roadway	154 (12.66%) Better: 138 Worse: 0	Pavement	126 (10.36%)
				Driveway	50 (4.11%)
		Sidewalk	194 (15.95%) Better: 178 Worse: 3	Pavement	170 (13.98%)
				Greening	36 (2.96%)
				Parking space	24 (1.97%)
				Street furniture	94 (7.73%)
	Building 367 (30.18%)	Nature	30 (2.47%) Better: 17 Worse: 1	Torn down	13 (1.07%)
				New building	17 (1.40%)
		Façade	126 (10.36%) Better: 53 Worse: 1	Color and material	92 (7.57%)
				Reformation	68 (5.59%)
		First-floor shops	272 (22.37%) Better: 20 Worse: 1	Number	37 (3.04%)
				Signboard	268 (22.04%)
				Change of facade	17 (1.40%)
	Open space 97 (7.98%)	Nature	83 (6.83%) Better: 44 Worse: 0	New building	83 (6.83%)
		Quality	19 (1.56%) Better: 8 Worse: 2	Greening	9 (0.74%)
				Furniture	10 (0.82%)
				Parking space	5 (0.41%)

8.4 Discussion

8.4.1 Better Space and Weaker Economy

First, there are still signs of space expansion in Qiqihar. During the process of evaluating street view pictures, the author found that the better points of streets that are distributed peripherally are mainly those that were upgraded from an unsurfaced road to a well-paved and well-divided road. The overlap rate is high because the streets are rebuilt as a whole. The streets in the central area are well-paved and without

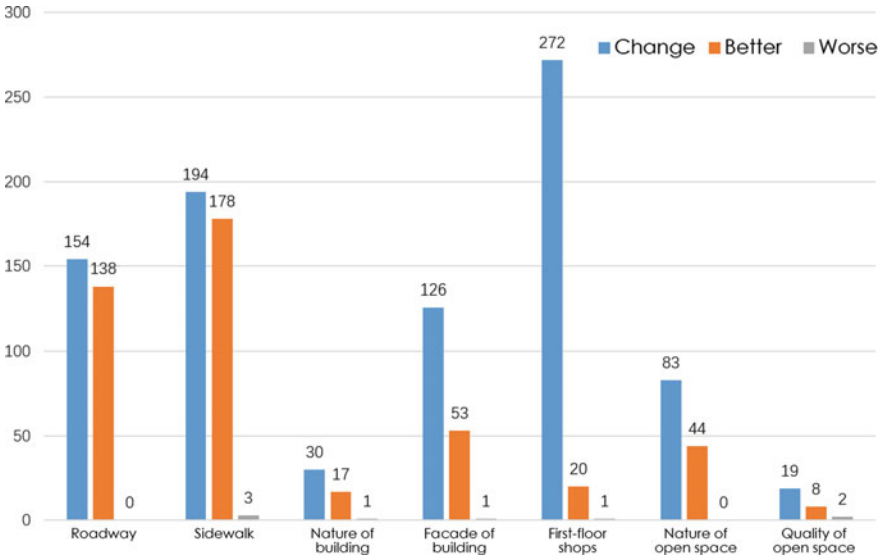

Fig. 8.5 Histogram of the results of the subjective and objective changes of the middle categories

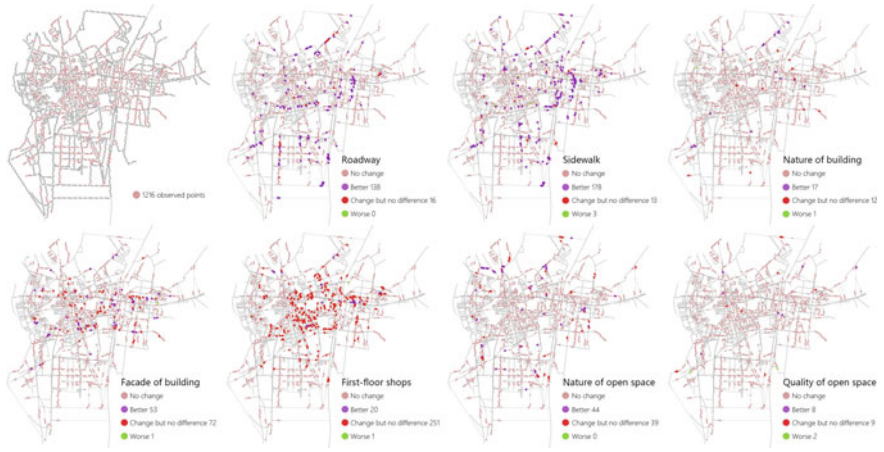

Fig. 8.6 Spatial distribution of the change in the subjective evaluation of the middle categories

major damage, so most of them do not have obvious changes. The points with better changes in building and open space in the periphery are also mainly composed of new buildings and parks that enhance spatial quality. From these findings, we can see that the urban area of Qiqihar is still expanding. This is in line with the paradox of population contraction and spatial expansion in China's shrinking cities proposed by Yang et al. (2015).

Second, the quality of the street space in Qiqihar does not show any signs of decline, but rather a trend toward better quality. On closer examination, most of the contribution to better quality comes from street improvements. These street improvements show that in spite of the decreasing population, municipalities have not stopped investing in improved street quality. Although there have been many changes in buildings, most of them are simple changes in first-floor shops. Several elevation and material changes improve the quality of space, while few points have experienced a natural decline.

In addition, the frequent change of first-floor shops means weaker economic vitality. Statistics show that during the 2 years studied, more than 20% of the city's first-floor shops changed (in light of the fact that there are no first-floor shops in some pictures, this proportion should be even higher). Most of these changes involve only changes of merchants, not improved signboards. These changes are concentrated in the more central areas, which better reflects changes in the urban centers. The number and trend of changes in first-floor shops can reflect a city's economic vitality, but not in a simple linear correlation. An appropriate number of changes represents a certain degree of economic vitality, but too frequent changes indicate a lack of economic vitality. The reason for the rapid changes in the stores in Qiqihar may lie in reduced consumption vitality caused by a shrinking population, which makes it more difficult for businesses to survive for long. However, the lack of such vitality is not very serious. A complete lack of vitality will result in a decrease in the number of shops, which did not occur in Qiqihar. It should be noted that the change in signboards here refers mostly to merchant replacement, not improved signboards for the same merchant. This result is essentially different from that found by Tang et al. (2016) on changes in shop signboards in the outskirts of Beijing's residential area. Although the Beijing study shows a 34% change in signboards for first-floor shops, this does not necessarily mean that the merchants were replaced. Indeed, it can be inferred from the description in the article that the high rate of change is mainly attributed to merchants' improvement of their own signboards. This is different from the characteristics of Qiqihar, and the two results are not contradictory.

In brief, the scale of space in Qiqihar is expanding and the quality of space is gradually improving. However, there are signs that the economic vitality of the city is declining, resulting in the current phenomenon of "Better space and weaker economy" in Qiqihar.

8.4.2 Population-Economy-Space Decline Lagging

Combining the findings of this article and other studies of China's shrinking cities, we should be able to deduce changes in population, economy and space both now and for the foreseeable future in Qiqihar. First, the population of Qiqihar is declining, which is a trend that has already begun and will continue in the years to come. Second, the economy of Qiqihar is still growing. However, both changes in first-floor shops and population decline have revealed a declining trend in economic

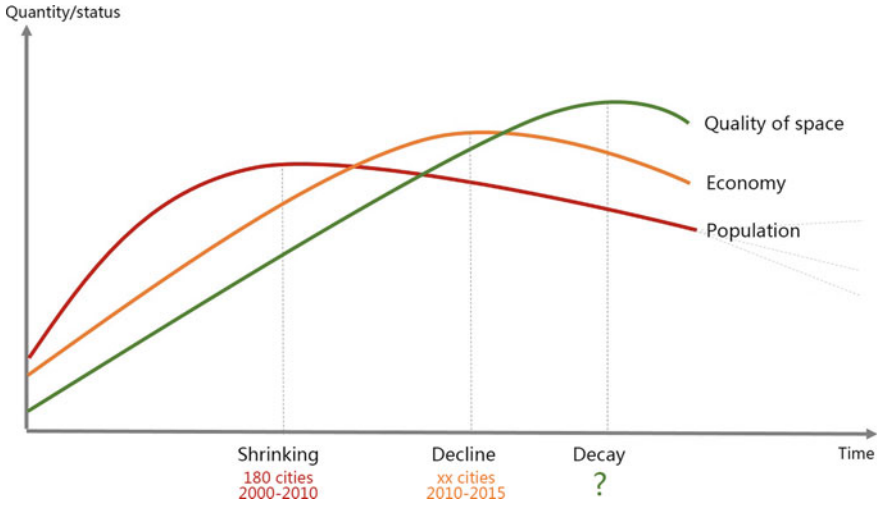

Fig. 8.7 Population-economy-space decline lagging

vitality. Without any intervention, it can be predicted that economic indicators will also decline or stagnate in the near future. Third, there is the issue of space to consider. This study shows that spatial quality continues to improve with nearly no declining areas, but as the population and the economy decline, capital investments in improving and maintaining spatial quality will decrease and without intervention, space will eventually begin to decay.

Putting the trends in these three indicators together, we can see the phenomenon of "Population-economy-space decline lagging" in shrinking cities. Figure 8.7 shows the sequence of the decline of population, economy, and spatial quality.

The reasons for the delay in this downturn are related to the causes of the downturn and the delayed response to same. In general, middle-sized or small cities are less attractive than big cities and their population will start to decrease. When this occurs, the growing economy will not stall immediately but will continue to increase. As the impact of the decrease of population expands, the economy will gradually slow down and then begin to decline. Spatial quality is an embodiment of economic vitality. When the economy grows, spatial quality will maintain an upward trend, and when the economy starts to decline, investment in improving spatial quality will decrease. Space does not decay immediately, but gradually deteriorates over time, and without enough capital to counteract these declining trends, space begins to decay. This is a cycle of positive feedback. The regressive economy and worsening space quality will lead to more loss of population, and the loss of population will accelerate the decline of both the economy and space.

If this theory is enlarged to a nationwide scale, most of China's shrinking cities are currently in the period between population contraction and economic downturn, and some have been in a period of economic downturn, but there is no example of

space decay for now. In contrast to some foreign cities where population, economic and spatial quality have totally collapsed, the shrinking cities in China now have a chance for recovery and will have the opportunity to prevent economic and spatial deterioration through proper planning and intervention.

8.4.3 Advice on Measures

Most of China's shrinking cities, which here are represented by Qiqihar, are at a stage between demographic contraction and economic decline. To prevent a massive decline in economy and spatial quality, certain necessary urban planning measures should be taken. The focus of planning should be transferred from population growth to population shrinkage. "Shrewd shrinking" is a planning strategy for shrinking cities that originated in Eastern Europe and the United States (Huang 2011). Some of these ideas can be used in China's shrinking cities.

First, city managers and citizens need to recognize the shrinking of cities. At present, the mainstream expansion plan does more harm than good for shrinking cities. If limited resources are scattered in a wide range, urban problems are unresolved and the decline of urban areas is accelerated. A change of concept remains the top priority that China needs to resolve in its shrinking cities. Only by confirming the fact that cities shrink will it be possible to make appropriate plans.

Second, cities should emphasize their unique characteristics and find a way to perform economic restructuring. If we do not change the mode of economic development, population reduction will inevitably affect the economy. In this case, it is necessary to make an in-depth assessment of the features of these cities and seek new paths toward economic growth. The aim is to develop the cities deliberately and in an advantageous manner to become small but exquisite cities with distinctive characteristics.

In addition, we should pay more attention to creating urban public space, enhancing street vitality through reasonable design, improving the quality of public space and making the streets more pleasant in scale and details. By doing so, people's willingness to stay will be enhanced, and negative public space that elicits spatial decay will be avoided.

8.5 Summary

Using Tencent street view pictures, this study objectively identifies and subjectively evaluates street quality changes at 1216 observation points in the downtown area of Qiqihar from 2013 to 2015. The evaluation results show that although the population of Qiqihar is decreasing and the economy lacks vitality, the spatial quality of the central city is still slowly improving. This phenomenon of "Better space and weaker economy" prompts the author to deduce the phenomenon of "Population-economy-

space decline lagging" in shrinking cities. A declining population, a declining economy and declining spatial quality do not synchronize during the process of shrinking. Instead, there is a time difference. As most of China's shrinking cities are in the early stages of contraction, accepting this time difference and adopting certain measures can prevent the economy and spatial quality from declining.

This study only considers the downtown area of Qiqihar as an example to discuss the spatial quality change of shrinking cities. The next step is to evaluate the spatial quality changes of other shrinking cities to confirm the scope of application of the "Population-economy-space decline lagging" phenomenon. In addition, an evaluation of the quality of the street space should not be limited to subjectively scoring streetscape pictures. It can also combine the actual feelings of people in the street space with machine-learning methods that can be used to reduce the subjectivity of the evaluation and make the measurement of the quality of the space more comprehensive and scientific.

Acknowledgements The National Natural Science Foundation of China (No. 51778319).

References

Gao S (2015) Summary of studies on shrinking cities. J Urban Plann 3:44–49

Gao S, Long Y (2017) Identification and planning of contracted cities in Northeast China. Planners 33(1):26–32

Hollander JB, Pallagst K, Schwarz T, Popper FJ (2009) Planning shrinking cities. Prog Plann 72(4):223–232

Huang H (2011) Smart shrink: planning strategies for urban recession and its practice in the United States. Urban Region Plann Res 4(3):157–168

Lin X, Yang J, Zhang X, Chao H (2017) Analysis of urban contraction in China and its influencing factors—based on population and economic change perspective. Geograph J Humanit 1:82–89

Liu C, Yang P (2017) Motive mechanism and performance characteristics of contracted cities in China and abroad. Mod Urban Stud 3:64–71

Long Y, Wu K, Wang J (2015) China's contracted cities and their research framework. Mod Urban Stud 9:14–19

Naik N, Kominers SD, Raskar R, Glaeser EL, Hidalgo CA (2015) Do people shape cities, or do cities shape people? The co-evolution of physical, social, and economic change in five major US cities (No. w21620). National Bureau of Economic Research

Qiqihar Statistics Bureau (2015) Qiqihar economic statistical yearbook. China Statistics Press, Beijing

Rundle AG, Bader MD, Richards CA, Neckerman KM, Teitler JO (2011) Using google street view to audit neighborhood environments. Am J Prev Med 40(1):94–100

Tang J, Long Y, Zhai W, Ma Y (2016) Study on the measurement, change evaluation and influential factors of street space quality—Based on the analysis of large-scale multi-temporal street view pictures. New Architect 5:110–115

Wang Y (2017) Longjing County, China-DPRK border: lantern shining empty room. Surg News. Accessed Sept 28, 2017, from http://mp.weixin.qq.com/s/TY5CAzr5gaBjI-bV3Pz_2g

Wiechmann T, Pallagst KM (2012) Urban shrinkage in Germany and the USA: a comparison of transformation patterns and local strategies. Int J Urban Reg Res 36(2):261–280

Yang D, Long Y, Yang W, Sun H (2015) Population loss and spatial expansion: urban contraction paradox in China's rapid urbanization process. Mod Urban Stud 9:20–25

Zamir AR, Darino A, Shah M (2011) Street view challenge: identification of commercial entities in street view imagery. In: 2011 10th international conference on machine learning and applications and workshops (ICMLA), vol 2, pp 380–383. IEEE

Zhou J, Huang J (2003) Discussion on the evaluation index system of urban public space quality. Architect 3:52–56

Chapter 9
Measuring Growth and Shrinkage in a Rapidly Urbanized Area: The Case of Dongguan

Xun Li and Zhiwei Du

Abstract Urban shrinkage is a global phenomenon which has aroused widespread concern about modern urban shrinkage from researchers across the world. Due to China's rapid economic growth since the reform and opening-up, the Pearl River Delta (PRD) is now recognized as a typical area of rapid urbanization, and has continually attracted the attention of economic geographers and urban planners. However, after the 2008 global financial crisis, a new spatial phenomenon has been occurring in the PRD, synchronically involving general growth and partial shrinkage in the same city area. Based on the vacancy caused by the outflow of development factors (i.e., capital and labor), this paper combines the two dimensions of economy and population to develop a judgment matrix to be used in measuring urban growth and shrinkage. Moreover, by identifying four patterns of urban growth and shrinkage (growing cities, transitional cities, population centers, and shrinking cities), we are able to determine the trajectory changes and spatial distribution of growing and shrinking townships in Dongguan City. Conclusions and avenues for future research are also discussed.

Keywords Urbanization · Shrinking city · Spatial pattern · Pearl river delta · Dongguan · China

9.1 Introduction

In an era of economic globalization, the "shrinking city" phenomenon cannot be ignored in the study of urban development worldwide. This phenomenon has caught the attention of academic scholars and even social media (Oswalt 2006; Rieniets 2009; Beauregard 2009; Martinez-Fernandez et al. 2012a, b; Großmann et al. 2013; Martinez-Fernandez et al. 2016; Hartt 2018), especially after the 2008 global financial

X. Li (✉)
School of Geography and Planning, Sun Yat-Sen University, Guangzhou, Guangdong, China
e-mail: lixun23@126.com

Z. Du
Guangzhou Institute of Geography, Guangzhou, Guangdong, China

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_9

crisis—a turning point for shrinking cities as they transformed from a marginal topic to a mainstream concern (Audirac 2017). Globally, over a quarter of large cities with a population of more than 100,000 people are experiencing shrinking (Rieniets 2009). In Europe, nearly 42% of the large cities with a population of over 200,000 are facing the challenge if population loss (Mykhnenko and Turok 2008), whereas 19 of the top 100 U.S. cities became shrinking cities between 1980 and 2010 (Hartt 2018).

After the implementation of the reform and opening up policy in 1979, China has achieved phenomenal economic and urban development (World Bank 2009), making Chinese cities typical representatives of rapid urbanization areas in the world. According to statistics (National Bureau of Statistics of China), the urbanization rate in China has rapidly increased from 19.98% in 1978 to 58.52% in 2016, accompanied by the movement of over 500 million labor migrants from rural to urban sectors in the past 40 years. In particular, the urbanization rate in the Pearl River Delta (PRD) reached as high as 84.84% in 2016. The PRD provides numerous advanced experiences and lessons in rapid urbanization in China, which is more important for the nation than its economic performance (Enright et al. 2005). However, the global financial crisis of 2008 significantly affected the PRDs economy, causing a major downturn in export markets (Federation of Hong Kong Industries 2015). At the same time, bankruptcy closures and unemployment were frequently reported in newspapers and other forms of media, triggering a series of massive population transfers and relocation of enterprises which eventually resulted in vacant dwellings (Li et al. 2015). The "shrinking cities" phenomenon is relatively new in the post-growth era; hence, studies on the relevant research paradigms, definitions, and evaluation indicators of such cities in China remain in the initial stage. Urban shrinkage, accompanied by rapid urbanization, has gradually attracted widespread attention in academic and urban planning fields in China (Wu et al. 2008; Long and Wu 2016).

The current study focuses on the PRD as the study object and presents an in-depth discussion on the identification methods and types of shrinking cities in international literature. Moreover, the study aims to present methods for measuring urban growth and shrinkage in rapid urbanization areas. It also aims to provide information on international shrinking cities in developing countries, in general, and identifying and evaluating Chinese shrinking cities, in particular. The rest of the paper is divided as follows. Chapter 2 provides a systematic review of the main identification and evaluation methods of shrinking cities in recent years. Chapter 3 constructs a comprehensive judgement matrix for measuring shrinking cities in rapid urbanization areas, combining the population and economic dimensions. Within the case study of Dongguan, Chapter 4 analyses the trajectory change in different urban patterns and their characteristics of spatial distribution in two phases, respectively. Chapter 5 presents the conclusion and a discussion of the status of Chinese shrinking cities in the future.

9.2 Measurement and Identification of Shrinking Cities: International Perspectives

In recent times, many studies have proposed different ways of measuring the shrinkage in shrinking cities. Urban population loss is the most common evaluation index for identifying urban shrinkage, along with industrial hollowing, rising housing vacancy rate, and lower birth rate (Häußermann and Siebel 1988; Oswalt 2006; Buhnik 2010; Martinez-Fernandez et al. 2012a, b; Martinez-Fernandez et al. 2012b; Haase et al. 2014; Alves et al. 2016; Mallach et al. 2017). Mainstream definitions of international shrinking cities generally utilize demographic change as the main indicator to measure urban "growth" or "shrinkage" (Wiechmann and Pallagst 2012; Martinez-Fernandez et al. 2012a, b; Bernt 2016). The Shrinking Cities International Research Network (SCIRN) defines shrinking cities as an urban area, which includes a city, a part of a city, an entire metropolitan area, or a town; and has experienced population loss, economic downturn, employment decline, and social problems as symptoms of a structural crisis (Wiechmann and Pallagst 2012; Hollander et al. 2009). The Shrinking City Project (SCP) regards the shrinking threshold as 10% of the total population or more than 1% of the population lost each year (Oswalt 2006). According to Schilling and Logan (2008), shrinking cities make up a special subset of old industrial cities with significant and sustained population loss (25% or greater over the last 40 years) and increasing levels of vacant and abandoned properties, including blighted residential, commercial, and industrial buildings. Considering the above evidence, nearly all definitions focus on population loss as the major determinant of shrinking cities.

Similarly, the types and trajectories of shrinking cities are also mainly based on the degree and duration of the decrease in population. Beauregard (2011) divided American cities into three categories (growing, stable, and shrinking) based on population change. Wiechmann and Wolff (2013) followed SCIRNs definition and classified four dynamic typologies of shrinking cities in Europe, namely continuous, episodic, temporary, and no shrinkage. Moreover, Kabisch et al. (2012) identified five clusters according to demographic changes in European cities during the period 1991–2008: extreme growth, moderate growth, resurgence, moderate decline, and continuous decline. Turok and Mykhnenko (2007) discovered nine trajectories of urban growth and contraction by observing changes in demographic data in European cities during the period 1960–2005. These include persistent decline, long-term decline, midterm recessions, short-term recessions, fluctuating growth, short-term recovery, medium-term growth, long-term growth, and sustained growth. In Australia, Martinez-Fernandez et al. (2016) summarized four types of shrinking cities, where shrinkage represents mid- to long-term continuous negative demographic growth: stabilized shrinkage represents a decline in population followed by growth, but it is negative overall; relapse–remission represents cities that are periodically growing and shrinking for over 50 years; finally, shrinkage and growth, respectively, refer to negative and positive population changes.

However, simply using demographic dimensions to evaluate urban shrinkage has certain limitations (Großmann et al. 2013; Bernt 2016). Several cases have been used to demonstrate the notion that population loss does not represent the phenomenon of urban shrinkage (Rink 2009; Hartt 2018) and that explaining urban growth is also difficult due to the labor-saving technological progress. Bernt et al. (2012) and Wiechmann (2008) pointed out that both demographic and economic changes are crucial drivers of urban shrinkage, prompting other scholars to focus on both demographic and economic dimensions to measure growth and shrinkage (Turok and Mykhnenko 2007; Martinez-Fernandez et al. 2015; Wiechmann and Pallagst 2012; Hartt 2018). Wiechmann and Pallagst (2012) first proposed a population and economic matrix and summarized four types of cities: urban growth poles, urban gravitation centers, transition areas, and downgrading areas. Bartholomae et al. (2017) summed up four categories of urban development (shrinking cities, smartly growing cities, population magnets, and growing cities) via simple comparisons of economy and population indicators of shrinking cities. In addition, Hartt (2018) proposed six different trajectories across 30 years: growth, recovery, cyclic growth, cyclic shrinkage, stabilized shrinkage, and shrinkage. Following the literature and discussions above, both demographic and economic dimensions can be considered in the case of Chinese shrinking cities. First, we need to investigate the change and distribution of urban growth and shrinkage in the context of rapid urbanization areas.

9.3 Measuring Growth and Shrinkage in Rapid Urbanization Areas

Bernt (2016) described a shrinking city as a container being emptied out. In this sense, urban shrinkage can be characterized by the outflow of essential productive factors (e.g., capital and labor), which results in spatial changes like vacant industrial buildings and abandoned infrastructure. Urban economics theory regards urban growth as a process of capital and labor mobility, which is further characterized by the spatial manifestations of city agglomeration and urbanization (Bertinelli and Black 2002; Quigley 2009). Therefore, measuring urban shrinkage can also begin with an examination of the flowing and agglomeration of essential productive factors in an area. When capital and population elements flow out from urban areas, the intensity and density of social and economic activities will inevitably decline. Once the scope of activities and urban built-up areas are mismatched, urban structures in the form of industrial plant buildings, residences, and roads will become vacant due to the declining intensity of use. Harvey (2003, 2006) pointed out that the capital must continually search for a new space to realize the capability for appreciation through a "spatial-temporal fix." The author also mentioned that capital in the materialized territory leaves traces of destruction and depreciation after the spatial shift.

9.3.1 Methodology

The current study adapts the methodology of combining economic and demographic dimensions as proposed by Wiechmann and Pallagst (2012). Economic shrinkage is a particular stage in a long-term economic cycle, and is characterized by economic slowdown or recession. Gross domestic product (GDP) is the most representative economic indicator of urban development as it often mirrors the drastic decline or recession caused by external factors. GDP growth rate was selected in this study to measure economic growth or shrinkage. Through a domain-wide comparison of the average annual GDP growth rate of each town (Rn) and the first quartile of average annual economic growth rate of the whole area (Q1), we establish that, when Rn is higher than Q1, it is regarded as economic growth; and when Rn is lower than Q1, it is regarded as economic shrinkage.

With respect to the demographic dimension, urban population size is the main criterion to measure growth and shrinkage in current literature. On the basis of the definition provided by SCIRN, we compared changes in the population size of each town over the years. Growth or shrinkage in the demographic dimension is determined by the annual permanent population change rate: demographic growth means the annual population change rate is positive (>0), whereas demographic shrinkage means the annual population change rate is negative (<0).

9.3.2 Urban Patterns of Growth and Shrinkage

Based on the above discussion, we developed a comprehensive method to identify urban growth and shrinkage using both economic and demographic dimensions (see Fig. 9.1). Following Wiechmann and Pallagst's (2012) matrix, we constructed a judgement matrix for urban growth and shrinkage considering economics and demography. Referring to the two concurrent causative processes (population and economic changes), four urban patterns were determined: growing cities, transitional cities, population centers, and shrinking cities.

Pattern I: Growing cities. This pattern is represented by the simultaneous growth of economic and demographic dimensions. It is often indicative of an emerging city, whose growth is driven by advanced industries which have brilliant prospects and sufficient economic growth momentum. These industries are also capable of maintaining growth even when confronted with external shocks (e.g., a financial crisis) and continuously attracting the inflow of capital elements and labor while promoting the expansion of urban construction and land use efficiency.

Pattern II: Transitional cities. This pattern represents an area in which the economic dimension is growing, but the population dimension is shrinking. In this pattern, cities generally tend to undergo an economic transformation and upgrading, whereby the industrial structure is transiting from traditional low-end economy (e.g., labor-intensive manufacturing) to automated production or a service economy. Given

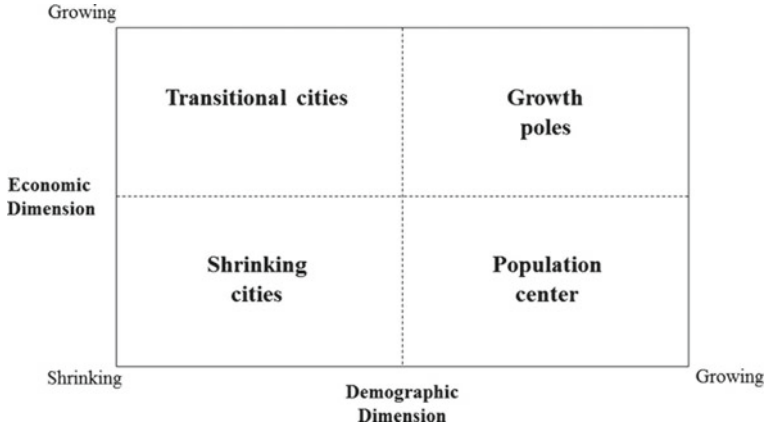

Fig. 9.1 Judgement matrix for urban growth and shrinkage

that their economic structural dependence on labor input has weakened, economic growth in this pattern is mainly driven by labor productivity and increase in economic scale.

Pattern III: Population centers. This pattern represents a situation, in which the population dimension is growing, but the economic dimension is shrinking. This pattern describes cities within a good population base. Although the original impetus for urban economic growth has been weakened, they still maintain their huge attraction for population agglomeration. Notably, however, economic recession often leads to possible population loss, thereby deeming this pattern a precursor to shrinkage.

Pattern IV: Shrinking cities. It represents a situation wherein both economic and demographic dimensions are shrinking. This pattern indicates a typical shrinking city or even a "ghost town." In their areas, urban development faces sluggish economic growth and continuous population loss. Considering that urban construction is still expanding, a wide range of plant and land vacancies are expected in the urban areas, congruent with the characteristics for the spatial phenomenon of shrinking cities.

9.4 Growing and Shrinking in Rapid Urbanization Areas: The Case of Dongguan

9.4.1 Dongguan

Dongguan City is located in the South Central area of Guangdong Province on the east bank of the Pearl River Estuary. Its location falls between the two metropolises of Guangzhou (to the north) and the Shenzhen Economic Zone (to the south). It covers 2,465 km^2. of land area and has a population of 7.33 million (Dongguan Statistical

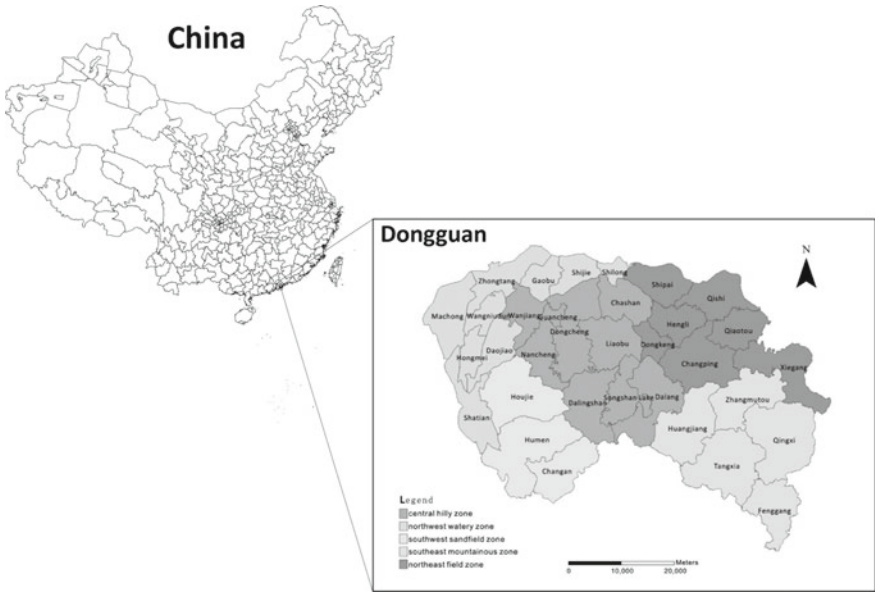

Fig. 9.2 Towns and zones in the Dongguan area

Bureau 2017). Dongguan, known as the "world's factory," is a rapidly urbanizing region that has been influenced by global market forces after the reform and opening up in 1978, thus attracting the attention of geographical researchers (Sit and Yang 1997; Lin 2006; Yang 2006; Airriess 2008; Yang 2017).

Dongguan has a total of 33 administrative units, which consist of 28 town units, 4 street units, and 1 industry park. Based on its natural geographic state, Dongguan can be divided into five main zones (see Fig. 9.2): the central hilly zone (including Guancheng, Wanjiang, Nancheng, Dongcheng, Liaobu, Chashan, Dalingshan, Songshan Lake, and Dalang), the southeast mountainous zone (including Huangjiang, Tangxia, Zhangmutou, Qingxi, and Fenggang), the northeast field zone (including Shipai, Qishi, Hengli, Dongkeng, Changping, Qiaotou, and Xiegang), the northwest watery zone (including Machong, Hongmei, Wangniudun, Zhongtang, Gaobu, Shijie, Shilong, and Shatian), and the southwest sandfield zone (including Houjie, Humen, Changan).

9.4.2 Trajectories of Urban Growth and Shrinkage in Dongguan

Overall growth accompanied by partial shrinking is the general characteristic of urban development in Dongguan's rapid urbanization process. Urban growth remains

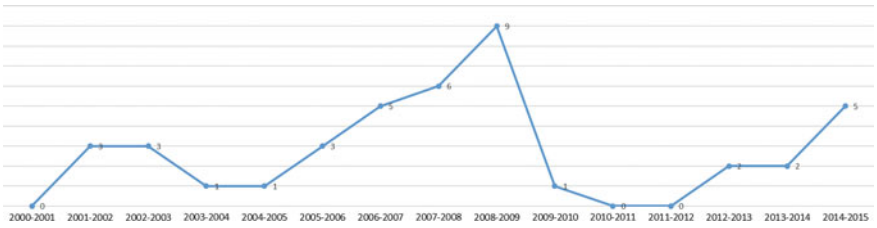

Fig. 9.3 Trajectories of shrinking towns in Dongguan (2000–2015)

the mainstream urban development process of Dongguan. During the period of 2000–2015, nearly all the townships we investigated in Dongguan simultaneously experienced demographic expansion and economic growth, and only a few towns were considered shrinking towns. In Dongguan's 32 townships, the proportion of growing towns is close to 90.91%, but nearly one-tenth (9.09%) of the towns are shrinking (see Fig. 9.3). Among Dongguan's growing cities, Songshan Lake's performance was the most remarkable during the whole period—the town achieved around 22.72% average annual GDP growth and 19.55% population growth. Despite the temporary downturn caused by the financial crisis during 2008–2009, the real GDP growth was most remarkable in Songshan Lake (30.58%), followed by Hongmei (25.45) and Wangniudun (21.68%).

Six analyzed townships (Shilong, Daojiao, Wangniudun, Hongmei, Zhangmutou, and Xiegang) in Dongguan can be defined as shrinking towns based on the time period of 2000–2015, reflecting the fact that urban shrinkage is neither a specific case nor a short-term phenomenon in this rapid urbanization area. Zhongtang and Shijie are the most remarkable of the shrinking towns because they experienced shrinkage four times in 15 years. Moreover, growth and shrinkage occurred simultaneously within the same township scale in Dongguan's rapid urbanization areas. Notably, the phenomenon of shrinking cities previously appeared in Dongguan as early as the beginning of the 21st century, with three shrinking towns (Qishi, Changping, and Zhangmutou) between 2001 and 2003.

Furthermore, urban growth and shrinkage in Dongguan appeared along a fluctuating trajectory from 2000 to 2015. Two significant phases of trajectory happened, divided in 2009 as the turning point. Although the urban development trajectories of the 32 towns were dominated by growth, a slow shrinkage tendency clearly existed as the number of shrinking towns increased drastically from 0 to 9 in the first phase (2000–2009). In the second phase (2010–2015), Dongguan's urban development promptly bounced back to growth after the financial crisis (from 2010 to 2012), but the annual average numbers of urban shrinkage increased again to three shrinking towns in 2015.

9.4.3 Spatial Distribution of Growth and Shrinkage in Dongguan

9.4.3.1 First Phase (2000–2009)

In the first phase of the early 2000s, 32 towns in Dongguan maintained the characteristics of rapid urbanization, with only 2 towns (Guancheng and Changping) suffering from economic and demographic shrinkage (see Fig. 9.4). A total of 21 towns, covering Dongguan's 5 main zones, achieved urban growth during the period 2000–2009. As mentioned above, the 2008 global financial crisis exacerbated the phenomena of shrinking cities: a few townships reflected slight population shrinkage. Among the four patterns of urban growth and shrinkage, no significant spatial characteristic of urban development surfaced during this phase (see Table 9.1).

9.4.3.2 Second Phase (2010–2015)

The distribution of urban growth and shrinking towns in Dongguan has a certain degree of spatial agglomeration. In this phase (see Fig. 9.5), shrinking towns can be more obviously identified than they were during the first phase. Spatial agglomeration

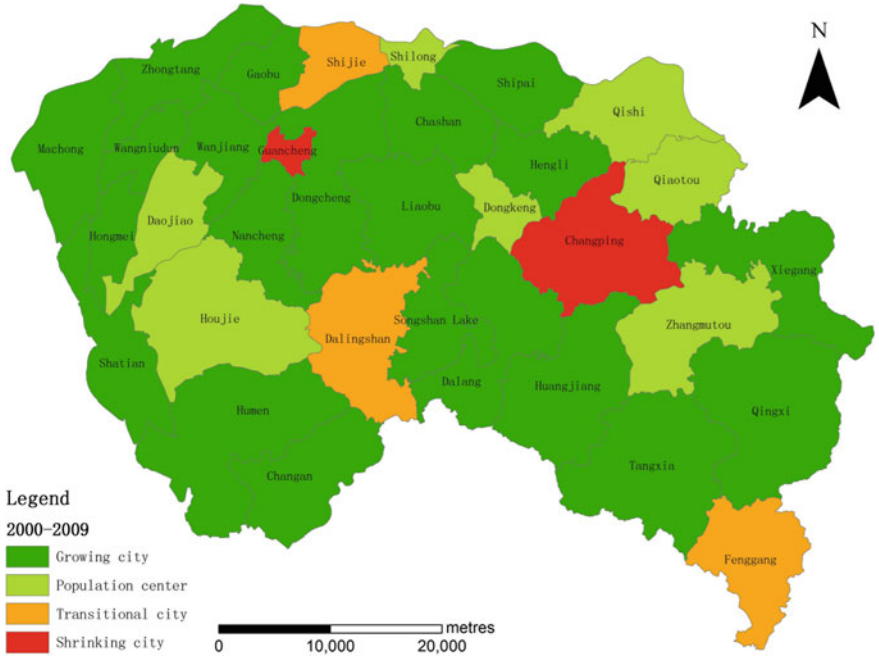

Fig. 9.4 Spatial distribution of growth and shrinkage in Dongguan (2000–2009)

Table 9.1 Growing and shrinking towns in Dongguan during 2000–2009

	Demographic growth	Demographic shrinkage
Economic growth	*Growing towns* Humen, Dongcheng, Wanjiang, Nancheng, Zhongtang, Wangniudun, Machong, Gaobu, Hongmei, Shatian, Changan, Liaobu, Dalang, Huangjiang, Qingxi, Tangxia, Xiegang, Hengli, Shipai, Chashan, Songshanhu	*Transitional towns* Shijie, Dalingshan, Fenggang
Economic shrinkage	*Population centers* Shilong, Daojiao, Houjie, Zhangmutou, Qiaotou, Dongkeng, Qishi	*Shrinking towns* Guancheng, Changping

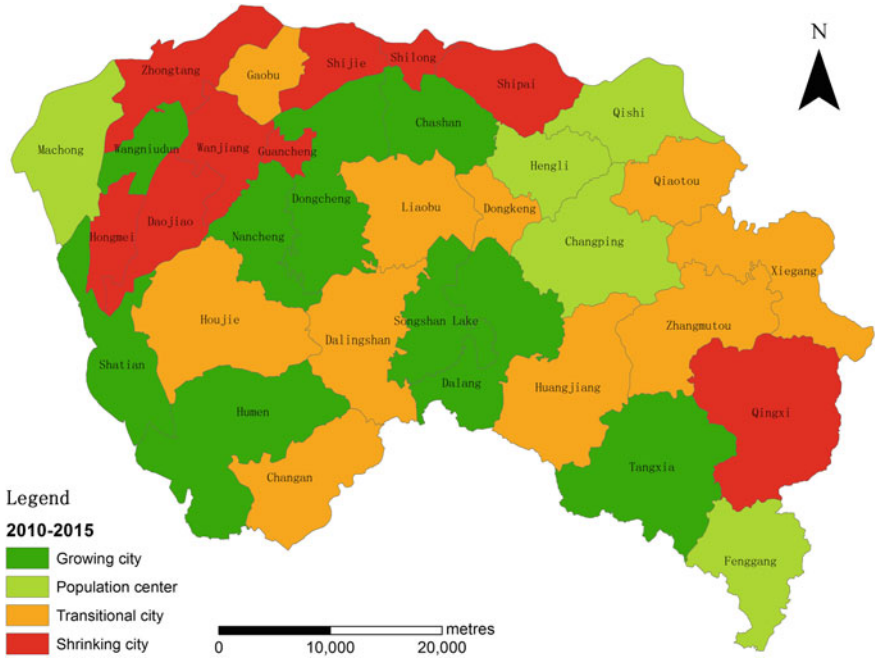

Fig. 9.5 Spatial distribution of growth and shrinkage in Dongguan (2010–2015)

was classified according to four types of urban patterns, and shrinking towns were concentrated in the northwestern water zone, with Zhongtang, Wanjiang, Wangniudun, Daojiao, and Guancheng forming the northwest part of the urban shrinkage agglomeration. Moreover, Nancheng, Dongcheng, Chashan, Songshan Lake, and Dalang were the divisions consistently categorized as growing towns (see Table 9.2).

Table 9.2 Growing and shrinking towns in Dongguan during 2010–2015

	Demographic growth	Demographic shrinkage
Economic growth	*Growing towns* Humen, Dongcheng, Nancheng, Wangniudun, Shatian, Dalang, Tangxia, Chashan, Wangniudun	*Transitional towns* Gaobu, Houjie, Changan, Liaobu, Dalingshan, Huangjiang, Xiegang, Qiaotou, Dongkeng
Economic shrinkage	*Population centers* Machong, Fenggang, Changping, Hengli, Qishi	*Shrinking towns* Guancheng, Shilong, Wanjiang, Zhongtang, Shijie, Daojiao, Hongmei, Qingxi, Shipai

Furthermore, urban growth and shrinkage have some degree of correlation with their economic patterns. Generally, growing towns contain good industrial bases, which are achieved by integrating modern service industry upgrades or developing advanced manufacturing. Transitional towns promote the transformation and upgrade of labor-intensive industries, enhance the agglomeration and scale for their advantageous industries, and successfully rebound in economic growth. Although the population in the population centers remains stable, these towns experience continual decline in economic indicators, and face the risk of economic shrinkage. Additionally, towns characterized by shrinking have weak original economies and population bases, whose economic shrinking became more pronounced subsequent to the financial shocks.

9.5 Conclusion and Discussion

The PRD is a highly representative region of rapid urbanization, in which overall growth and partial shrinkage in urban areas have become a normal spatial phenomenon of urban development since the 2008 financial crisis. Starting with the vacancy caused by the outflow of developmental factors, this paper has integrated two analytical dimensions (the economic and demographic) to propose a judgement matrix by which to measure urban growth and shrinkage.

By distinguishing four urban patterns, the current study discovered that agglomerated areas of growth and shrinkage evidently existed in the PRD. Using the case of Dongguan, the study demonstrated the urban growth and shrinkage within Dongguan City coexisted among the general characteristics of urban development before and after the 2008 financial crisis. In addition, the spatial distribution of urban growth and shrinking towns had a high degree of spatial agglomeration. While shrinking towns (Zhongtang, Wanjiang, Wangniudun, Daojiao, and Guancheng) are concentrated in the northwestern water zone, Nancheng, Dongcheng, Chashan, Songshan Lake, and Dalang are the growing towns distributed among the two divisions.

Unlike the highly urbanized cities of developed countries in Europe and the United States, the process of urbanization in developing countries has only recently entered

a maturity stage. The local shrinkage in the rapidly urbanizing regions of developing countries under the impact of the economic crisis can provide new information about shrinking cities across the world. It is not difficult to reviewing the history of urban development to determine that every city in the world has its decline or shrinking period. Is there any correlation between the growth and shrinkage of cities in developing countries accompanied by the economic development cycle? Is population shrinkage temporary or persistent? What is the difference between the motivations and mechanisms of urban shrinkage in a rapidly urbanizing region? By revealing the existence of shrinking towns in China, we can answer these questions by tracking the development process, gaining insights into their spatial patterns and formation mechanisms, and discovering many important findings for researchers studying shrinking cities worldwide.

References

Airriess C (2008) The geographies of secondary city growth in a globalized China: comparing Dongguan and Suzhou. J Urban Hist 35(1):134–149

Alves D, Barreira AP, Guimarães MH, Panagopoulos T (2016) Historical trajectories of currently shrinking Portuguese cities: a typology of urban shrinkage. Cities 52:20–29

Audirac I (2017) Introduction: shrinking cities from marginal to mainstream: views from North America and Europe. Cities. https://doi.org/10.1016/j.cities.2017.10.012

Bartholomae F, Nam CW, Schoenberg A (2017) Urban shrinkage and resurgence in Germany. Urban Stud 54(12):2701–2718

Buhnik S (2010) From shrinking cities to Toshi no Shukushō: identifying patterns of urban shrinkage in the Osaka metropolitan area. Berkeley Plann J 23(1):132–154

Beauregard RA (2009) Urban population loss in historical perspective: United States, 1820–2000. Environ Plann A 41(3):514–528

Beauregard RA (2011) Spaces of shrinkage: United States 1950–2000. International RC21 Conference 2011

Bertinelli L, Black D (2002) Urbanization and growth (No. UCL-Université Catholique de Louvain). Universite catholique de Louvain

Bernt M (2016) The limits of shrinkage: Conceptual pitfalls and alternatives in the discussion of urban population loss. Int J Urban Reg Res 40(2):441–450

Enright MJ, Scott EE, Chang KM (2005) Regional powerhouse: the greater Pearl River Delta and the rise of China. Wiley, Chichester

Federation of Hong Kong Industries (2015) Hong Kong Industries: the way Forward. Hong Kong: Federation of Hong Kong Industries

Großmann K, Bontje M, Haase A, Mykhnenko V (2013) Shrinking cities: notes for the further research agenda. Cities 35:221–225

Haase A, Rink D, Grossmann K, Bernt M, Mykhnenko V (2014) Conceptualizing urban shrinkage. Environ Plann A 46(7):1519–1534

Hartt M (2018) The diversity of North American shrinking cities. Urban Stud 55(13):2946–2959

Häußermann H, Siebel W (1988) Die schrumpfende Stadt und die Stadtsoziologie. VS Verlag für Sozialwissenschaften, Wiesbaden, In Soziologische Stadtforschung

Harvey D (2003) The new imperialism. Oxford University Press, USA

Harvey D (2006) The limits to capital (new and fully updated edition). London and New York: Verso

Hollander JB, Pallagst K, Schwarz T, Popper FJ (2009) Planning shrinking cities. Progress in planning 72(4):223–232
Kabisch N, Haase D, Haase A (2012) Urban population development in Europe, 1991–2008: The examples of Poland and the UK. Int J Urban Reg Res 36(6):1326–1348
Li X, Du Z, Li X (2015) The spatial distribution and mechanism of city shrinkage in the Pearl River Delta. Modern Urban Res 9:36–43 (in Chinese)
Lin GC (2006) Peri-urbanism in globalizing China: A study of new urbanism in Dongguan. Eurasian Geogr Econ 47(1):28–53
Long Y, Wu K (2016) Shrinking cities in a rapidly urbanizing China. Environ Plann A 48(2):220–222
Mallach A, Haase A, Hattori K (2017) The shrinking city in comparative perspective: Contrasting dynamics and responses to urban shrinkage. Cities 69:102–108
Martinez-Fernandez C, Audirac I, Fol S, Cunningham-Sabot E (2012a) Shrinking cities: urban challenges of globalization. Int J Urban Reg Res 36(2):213–225
Martinez-Fernandez C, Weyman T, Fol S, Audirac I, Cunningham-Sabot E, Wiechmann T, Yahagi H (2016) Shrinking cities in Australia, Japan, Europe and the USA: From a global process to local policy responses. Prog Plann 105:1–48
Martinez-Fernandez C, Wu CT, Schatz LK, Taira N, Vargas-Hernández JG (2012b) The shrinking mining city: urban dynamics and contested territory. Int J Urban Reg Res 36(2):245–260
Mykhnenko V, Turok I (2008) East European cities—patterns of growth and decline, 1960–2005. Int Plann Stud 13(4):311–342
Oswalt P (2006) Shrinking Cities, International Research, vol 1. Hatje Crantz Verlag, Ostfildern
Quigley JM (2009) Urbanization, agglomeration, and economic development. Commission on Growth and Development Working Paper Series 19. World Bank: Washington, DC
Rieniets T (2009) Shrinking cities: causes and effects of urban population losses in the twentieth century. Nat Cult 4(3):231–254
Rink D (2009) Wilderness: the nature of urban shrinkage? The debate on urban restructuring and restoration in Eastern Germany. Nat Cult 4(3):275–292
Schilling J, Logan J (2008) Greening the rust belt: a green infrastructure model for right sizing American's shrinking cities. J Am Plann Assoc 74:451–466
Sit VF, Yang C (1997) Foreign-investment-induced exo-urbanisation in the Pearl River Delta. China Urban Stud 34(4):647–677
Turok I, Mykhnenko V (2007) The trajectories of European cities, 1960–2005. Cities 24:165–182
Wiechmann T, Pallagst KM (2012) Urban shrinkage in Germany and the USA: a comparison of transformation patterns and local strategies. Int J Urban Reg Res 36(2):261–280
Wiechmann T, Wolff M (2013) Urban shrinkage in a spatial perspective: operationalization of shrinking cities in Europe, 1990–2010. In AESOP-ACSP Joint Congress (Vol. 1519)
Wu CT, Zhang XL, Cui GH, Cui SP (2008). Shrinkage and expansion in peri-urban China. Exploratory case study from Jiangsu Province. In: ACSP-AESOP 4th Joint Congress, University of Illinois at Chicago
World Bank (2009) Urbanization and growth: setting the context. The World Bank, Washington
Yang C (2006) Overseas Chinese investments in transition: the case of Dongguan. Eurasian Geogr Econ 47(5):604–621
Yang C (2012) Restructuring the export-oriented industrialization in the Pearl River Delta, China: Institutional evolution and emerging tension. Appl Geogr 32(1):143–157

Part IV
Media Report

Chapter 10
Freezing Land

Ronghui Chen

My project Freezing Land is a series of photos made, on the road, across northeastern China's countryside that mixes landscape photography with environmental portraits. It is a story about the shrinking cities in northeastern China and their lonely young people.

I grew up in southern China with warm weather, and therefore I long for the freezing environment in the north. I'm obsessed with a novel called Tales of Hulan River, which is about the declining northeastern region of China. For years, I couldn't shake the scenes described in the book, a scene of ice and snow intertwining with peculiar characters. Finally, I got the chance to travel to the northeast for a media assignment. I packed my large format camera and flew to the freezing land I've always dreamt of.

The northeast was the wealthiest area in China, bordering Russia and North Korea. With the help of Soviet Union, it developed heavy industries and stayed prosperous for years. This land represented China's communist roots and authoritarianism. But now, it has become the most recessionary land in China, with shrinking cities and declining population.

Meanwhile, Chinese President Xi Jinping started a campaign for the "Chinese Dream." But what does this mean to the young people living in the northeast, the once prosperous land? What's the story of today's northeastern China? I set out to see for myself.

The reason I use an 8×10 larger format camera is mainly for the quality, plasticity, and impression on film, which corresponds to the style of my work. I want to give time to develop both my images and my reflections. Shooting with a large format camera, other than quality, gives me the opportunity to really think about what I'm photographing; what the essence of the story is, and what it means to me.

It is difficult to encounter subjects on the street in an environment of minus 30 degrees centigrade. Therefore, I knocked on doors looking for young people who

R. Chen (✉)
Sixth Tone, Room 1901, No. 839 Middle Yan'an Road, Shanghai, China
e-mail: chenronghui@sixthtone.com

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_10

were willing to share their stories. The young people I chose were experiencing a sense of uncertainty. They were facing a choice to leave for challenges in bigger cities, or stay behind and embrace their fate. Their voices were sparsely documented by Chinese media or through other mediums. Few people knew about their stories.

I photographed environmental portraits for these young people. Their stories are colorful, but also full of loneliness. I photographed the derelict landscape—places that are once lively but now forgotten. During this process, the emotion expressed by these young people—a mixed sense of hesitation, loneliness, and hope—has brought me resonance.

This made me realize that I'm not just photographing the lost "Chinese Dream" on this freezing northeastern land, but also the uncertainty we young people, as individuals, are facing under today's collectivism in China. At this moment, I pressed the shutter.


抚顺

Chapter 11
Urban Shrinkage in China: A Look at Three Northeast China Cities

Yun Wang

11.1 Fulaerji: A Former Industrial Powerhouse Grinds to a Halt

Located in Fularji, a district of Qiqihar in the northeastern Chinese province of Heilongjiang, the headquarters of China First Heavy Industries (CFHI) boasts an interesting nugget of trivia: It is situated farther north than any other state-owned enterprise. The company's origins can be traced back 60 years to the amalgamation of a heavy industry factory, a thermal power station, and a steel mill. On a good day, CFHI churns out high-grade energy and industrial equipment that's sold across the country.

The factory's peak lasted until the late 1990s, when the booming metropolises of China's coastal regions pushed able-bodied workers out of the interior and onto trains heading south. In an attempt to stem the loss of staff, CFHI moved its logistics, technological development, and marketing teams to coastal cities like Shanghai, Dalian, and Tianjin. At roughly the same time, higher education institutions began to leave Fularji, and the city's state-owned chemical, glass, and textile factories either went bankrupt or were restructured by the government. Regional industry shrank and local authorities took over the cradle-to-grave provision of social services once provided by state-owned enterprises. Fularji's development has essentially been on hold for the last 20 years.

"Fularji" is a Chinese translation of the Daur word hulane'rige, meaning "red riverbank." The district's name is derived from its location along the banks of the Nen River, as well as from the area's abundant red agate deposits. In the early twentieth century, bolstered by its position along the Chinese Eastern Railway, Fularji grew into a commercial hub.

Y. Wang (✉)
Yan'an Middle Road 839#, Jing'an District, Shanghai, China
e-mail: wangy@thepaper.cn

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_11

Six decades ago, a wave of engineers, retired soldiers, and their families were sent north to the harsh, cold climate of northeastern China. There, they worked under military-style Soviet leadership to set in motion the gears of a new, industrial China. Suffering and honor often go hand in hand, and the area's proud workers—whose efforts once earned them a stop on top Chinese leaders' inspection tours—aged quickly. "Our parents' generation gave their youth to this place and left us here," said Ying, a 50-year-old second-generation resident.

Those now nearing retirement age still sometimes stroll through the district's Hong'an Park. Located on the west bank of the Nen, the park was inspected by Premier Zhou Enlai himself when it opened in 1956. Walk toward the riverside and you'll find a giant red orb ringed by five stainless steel statues: a worker, a peasant, a businessman, a student, and a soldier. Their shining surfaces are a testament to the region's former industrial might.

Fig. 11.1 Abandoned structures stand amid barren trees and snow in Fularji's parks

When I visited in January, however, a flyer posted beneath the worker's metal feet called for help finding a lost cow. Villagers who reside on the outskirts of the city make a living by grazing cattle in the public park, with few people bothering to

watch over them. Behind the statue, rusted industrial machinery sits quietly amid the snow.

Traces of the 1950s are scattered across Hong'an Park. Walk past the out-of-service amusements and you'll come across a pillbox-style public restroom. Two-thirds of the building is set aside for men, with only the remaining third open to women—a design choice that reflected the mainly male demographic of Fularji's mid-century immigrants. Two years would pass before their wives and families could join them.

Head toward CFHI's main gate and you'll encounter the largest statue of Chairman Mao anywhere in China. Cast completely from stainless steel cut by this very factory, it weighs more than 33 tons and stands over 10 m tall. Visible regardless of which direction visitors are coming from, it is a towering monument to a bygone era, and one of the best-maintained landmarks in Fularji.

Fig. 11.2 A disused Heilongjiang chemical plant has started to become overgrown

CFHI manufactures military and nuclear equipment, steel, automotive parts, and nonferrous metal products. At the start of the year, the factory began a large round of "competitive hiring." Factory heads emphasized the need to increase efficiency and promote talented workers, but the fact remains that after the recruitment drive, total staff numbers had been cut from more than 11,000 to just over 8,500. Since then, employees have walked through the factory gate briskly, not daring to slow their pace. Factory management penalizes those who arrive at their posts late, and employees stand fastened in place like screws.

Most young people prefer to work in the slightly freer atmosphere provided by the service industry. CFHI Technician College, an institution with a rich industrial tradition, has recently begun offering service-oriented majors, including courses in e-commerce and cosmetic science. The school long ago severed its formal ties with CFHI, and while students are still able to intern at the company, only a select few will ever be hired on. As an instructor named Chen Yu put it: "Finding a job isn't a problem, but parents don't want their kids to become factory workers." The smell of coal hangs heavy over Fularji; the air is cold and dusty. Walking from factory to factory through the dense smog feels like passing through a succession of self-contained communities.

Wanping District is a new "village" built to house workers at the Beiman Special Steel plant. Its community message boards are now covered with signs advertising homes for sale. A young girl plays on a swing set that creaks as she rocks back and forth. Nearby homes sit empty and have long since fallen into disrepair. At Beiman's old culture center, Sansan Cultural Palace, the characters for "welcome" have long since faded from the broken windows. On the other side of the center sit villas that formerly housed Soviet industrial experts. Elegant yet decrepit, they are the opulent legacy of yesteryear.

Fig. 11.3 A local man performs a traditional sword dance

Fig. 11.4 A rusted roller coaster rail stands abandoned in Hong'an Park

Every road in the residential district in front of the CFHI factory leads to the factory gate. A retired second-generation factory employee points out the place where the dorms for unmarried employees used to sit: “When my father first came to Fularji, that’s where he lived. It was such a lively place.”

But many residents have already moved away. Behind the darkened hallway windows of the monolithic socialist architecture, private businesses have sprung up: a ramshackle hostel, a convenience store, a restaurant, and a children’s training school. CFHI is a growing company, but it’s not growing in Fularji. All that remains here is a manufacturing base and the company’s nominal headquarters. The homes designated for employees of the company’s design institute sit largely empty and are priced in the low six figures. The older brick buildings are even cheaper and emptier, costing about 80,000–100,000 yuan ($12,000–$15,000) per unit. Even new homes, which only cost about 3,600 to 3,700 yuan/m^2, struggle to find buyers.

The majority of the 240,000 or so people still living in Fularji are middle-aged workers nearing retirement. This so-called rearguard tends to congregate in the event space of Dajiating Mall, where they play cards and ping-pong. Many have only stayed to take care of their aging parents: Now in their 80s and 90s, members of the first generation of workers are unable to return to the hometowns they left all those years ago.

Li Zhi

Fig. 11.5 “I don’t have a house, and I spend most of my time at the internet café. When I’m tired, I go to a cheap hotel to rest”

While the area is still home to some people of working age, anyone who has managed to save money intends to move away in the future. Most say they want to retire to a city with a warmer climate and better air. "A friend of mine moved to Sanya [in southern China's Hainan province], and pretty soon her tracheitis and arthritis began to improve," Chen said eagerly. Most of the rearguards are in their 50s and 60s, and have plenty of siblings. To many of them, this is a boon: As long as someone stays behind to take care of the elders, the others are free to range as far as they like.

Hui Zi

Fig. 11.6 "I work at the bar at night, and I have another job during the day so I can earn a living"

The majority of leavers maintain jobs in heavy industry. "CFHI operated on a large scale, so I've used every kind of machine and can handle them all," boasts Zhang Ying, a retired CFHI worker whose relatives now work in the company's Shanghai branch. "Compared to workers from northeastern China's other cities, technicians from Fularji are capable of thriving anywhere."

The ties binding Fularji's third generation to the area are even more tenuous. While Fularji has no shortage of talented young people willing to become high-level blue-collar workers, the city is considered "too cold"—winter temperatures plunge as low as minus 40 degrees Celsius—and such individuals prefer to look for jobs farther afield. In recent years, the government has tried to recruit local technicians, and as a result of reforms to vocational education, students can now enroll in a program at CFHI Technician College and earn a vocational diploma. Yet, better career prospects

mean more opportunities to leave: "I guess about 80% of the college's graduates now work elsewhere," said Li Yaying, the head of the technical school.

Like other cold and struggling cities in northeastern China, Fularji has a vibrant live streaming culture. Broadcasters usually record themselves at home with their computer cameras. Most of the parents struggle to understand why their youngsters don't try to find positions at CFHI after they graduate from college, but the children see no guarantee that the factory will provide them with a better life.

In an area where a salary between 5,000 and 6,000 yuan a month is considered high, even comparatively well-off young people rely on their parents' savings to find their footing in a major city like Beijing, Shanghai, or Guangzhou, though the vast majority still struggle to buy homes there. Some choose a less risky means of escape, settling in the regional hub of Qiqihar, Heilongjiang's second-largest city, which not only boasts a lower cost of living than first-tier cities but also allows young adults to return home and visit their families from time to time. Once their grandparents have passed away, this generation will bring their parents to the city to live with them, while also setting their own children up with the opportunity to move to even larger cities in the future. By that time, Fularji will perhaps more closely resemble a ghost town.

Some ex-factory workers continue to work in Fularji, opening stalls at Dajiating Mall or starting street-side restaurants. In years past, migrants from Zhejiang province in eastern China often came to Fularji to hawk furniture and leather shoes—back when workers still had money to spend. These days, those same workers find themselves waiting on others.

Fig. 11.7 Flashing neon lights adorn the facades of nightclubs in Fularji

Faced with a declining population and a deteriorating economy, Fularji's leadership has tried to attract new industrial projects. Yet, such ill-timed endeavors have only increased people's desire to leave. In August 2016, Fularji signed a deal with

Zijin Mining for a smelting project that would occupy 500,000 m^2 of land and bring an investment of about 4 billion yuan.

Zijin has been linked to several pollution cases, however, and many residents doubted its ability to keep the problem under control. Worried that the company would secretly dump copper-laced pollutants—a chronic problem in the region and one that led to the closure of a Heilongjiang chemical plant and other industries—many locals turned against the plan. Although their concerns failed to attract the interest of major media outlets, many simply chose to vote with their feet and moved out.

In Fularji, even the local entertainment feels like an elegy for the past. In 2017, as the bells rang in the new year, local retirees took the stage at Dajiating Mall in turns, singing and dancing to the accompaniment of sound effects meant to invoke the factory floor. Wholly uninterested in the crowd's reaction to their performances, they evinced a happiness that was pure and direct in a way so rarely seen these days. Meanwhile, younger residents stayed home, performing skits in front of webcams for China's Internet users.

11.2 Longjing: Exodus from a Chinese Border Town

The Yanbian Korean Autonomous Prefecture is crammed into the gap left by the hulking shapes of its nearest neighbors: Heilongjiang Province to the north, North Korea to the south, and the Russian Province of Primorsky Krai to the east.

Last winter I visited Longjing, one of Yanbian's biggest cities. Sixty percent of Longjing's residents are ethnic Koreans, but many have left town in search of better opportunities elsewhere. The mornings were silent. In a roadside Internet bar, groups of children were playing computer games, the sound of clicking mice cutting through the quiet. Outside, a couple of sanitation workers idly swept the shopping streets.

There is no rush hour in Longjing. During work hours, most of the cars you see are heading toward government buildings.

From 1907 to 1937, the Japanese occupied Longjing and made it the administrative center of the region. Later, the municipal government sat on the site of the former Japanese consulate. The city hall recently moved to a brand-new four-storey building nearby, and the old consulate building was converted into a museum commemorating the Japanese occupation. Occasionally, schools organize field trips to the museum, and the exhibition halls fill with gaggles of chattering children. But usually, it sits empty and untended.

Until the 1990s, Longjing was a thriving base for heavy industry. Lots of mines and factories were located nearby, and more people lived here than in the prefectural seat, Yanbian. "Before, it didn't matter that Longjing wasn't large," said a longtime restaurant owner, explaining why he went into business here. "Longjing was the center of the whole prefecture." But now it is difficult to earn a living in Longjing. At the entrance to each apartment block, posters are hung all over the walls, advertising eggs and milk, cleaning services, and the homes within.

Fig. 11.8 The groundbreaking ceremony for an investment fund's construction project. No buildings can be seen for several kilometers in any direction

Fig. 11.9 The local government is attempting to renovate its shantytowns, with limited success

Fig. 11.10 An abandoned construction site on the outskirts of the city. Many such projects have been halted

In the last two decades, as Longjing's industrial output has slowed, a wave of workers have gone to South Korea seeking employment. At the outset, most of the men worked as laborers, while the women found jobs as waitresses. Though their adopted country was expensive, the money was good: You could earn tens of thousands of yuan per month in South Korea, while Longjing's per capita disposable income at the turn of the century was less than 6,000 yuan (then $700) a year.

China's ethnic Koreans traditionally have large families. Bonds between family members tend to be strong, even where distant relations are concerned. However, as migration to South Korea increased, more and more Chinese Korean women chose to marry men in their adopted country, severing their ties to Longjing's minority communities. China and South Korea normalized diplomatic relations in 1992. After this, marriages between Chinese Korean women and South Korean men increased dramatically. By 2004, the divorce rate in Yanbian hit 68%. According to South Korean government statistics, in 2016 there were 630,000 Chinese Koreans residing in the country. In the last few years, as South Korean economic growth has slowed, fewer construction sites have hired male laborers from China. There is still work for the women, however. As Chinese Korean women have gained spending power, more and more of their male counterparts complain that they can't find women willing to stay in town and run the household.

Fig. 11.11 Wedding decorations still remain in an abandoned hotel

Most Chinese Koreans who leave Longjing now do so for good. Some save up money earned abroad, return to the city, and open their own businesses—usually restaurants or karaoke bars. As one Han Chinese local, an online shop owner surnamed Li, put it "In Longjing, you either work for the government, or you run a business out of your house." Even in a bad month, Li's business still earns him around 8,000 yuan—much higher than Longjing's average wage of about 3,000 yuan a month. But he still worries about the future. "Longjing is as well-connected logistically as Yanbian," he said. "The main problem is that businesses in the northeast aren't open as long as in the south of the country. After 2 p.m., delivery companies stop taking orders," he explained. In the winter months, night falls in Longjing as early as 4 p.m.

Longjing's commercial street is lined with karaoke bars and stores peddling Korean products. It would not be unusual to walk past a small supermarket and see the employees watching South Korean TV shows. Workers just back from South Korea are their best customers, as they tend to hoard money while abroad and splurge on luxuries when they return, especially during annual festivals.

Li Nan

Fig. 11.12 "I'm a high school student who loves playing the guitar. Korean folk songs are my favorite, but the clothes they wear are too tacky"

North Korea lies on the opposite side of the Tumen River. From the Qing Dynasty onward, Koreans migrated across the Tumen River to settle down in the ancestral lands of the Manchu, despite an imperial edict forbidding them from doing so. Yanbian's Korean population was one of the groups hardest hit by the tumultuous history of early twentieth century China. During the Japanese occupation, the imperial army had Koreans help them rule over the Han majority. In the eyes of the Han, Koreans were frequently seen as co-conspirators with the Japanese. After the Communist Party reunified China in 1949, many wealthy Koreans fled to South Korea. During the Korean War, many of those who remained were killed while serving in the Chinese army.

Today, politics on the Korean Peninsula continue to influence the collective mindset of Yanbian's ethnic minority population. Around a decade ago, China and South Korea arranged a work permit policy whereby ethnic Koreans in China were able to get permission to work in South Korea on request.

Fig. 11.13 A hotel on the border with North Korea comes equipped with telescopes that can be used to observe a different way of life to the south

Fig. 11.14 Every winter, local farmers burn straw to replenish their fields with nutrients

Fig. 11.15 Two black bears sit on an elevated platform at a black bear farm

Most Longjing residents have taken advantage of the policy at some point, but when they return to China, they rarely resettle in Longjing. Instead, they head for the eastern Chinese province of Shandong, where many South Korean companies are based. When young people finish high school, they now go to bigger cities as well. Walking through Longjing's streets, you rarely hear the laughter of young children. Before 2000, the city had five primary schools: two for Han Chinese, and three for Koreans. Now there are only three, and they count no more than a few thousand pupils between them.

Residents look back fondly on the 1980s and '90s. During the Cultural Revolution, many university students were sent to farm the countryside around Longjing. Around 18,000 of these young people were from Shanghai and settled in Longjing during the end of the campaign and the first free-wheeling years of China's economic reforms. But many returned to Shanghai in the '90s, when it became apparent that Longjing was slipping inexorably into an economic funk.

The local paper mill, established by the Japanese in 1936, once processed wood pulp into banknotes and high-quality paper products. It even had its own railway tracks and station. After the Second Sino-Japanese War, the mill disposed of its now-invalid banknotes at the behest of the Communist government. The mill went bankrupt in 1998, and its old workshop is now a glass factory. When I arrived to take photos, the workers shied away from my camera, and a manager came hurrying over. "Don't photograph them," he said. "They're from North Korea."

Since 2005, Longjing's industrial zone has tried to encourage new businesses and reinvigorate the flagging local economy. Officials hoped that the zone, located just a few bus stops from the city center, would attract investment, develop foreign trade with Russia and North Korea, and swell Longjing's diminishing population. It didn't.

There is one area that was supposed to support its economy through trade with Yiwu, a city in eastern China's Zhejiang Province well known for its small commodities market. But the initiative has seen limited success. Today, the foundations lie exposed, and weeds have overgrown the few dilapidated structures. "This region is too mountainous for trade," laments Li, the e-commerce merchant. "Logistics costs are too high to get small commodities in and out."

The industrial zone is 18 km^2 in size. Construction has gradually dried up, and no businesses are open. Instead, the vast network of roads is used mainly by locals taking their driving tests.

11.3 Yichun: The Timber Town that Banned Logging

In the south of Yichun, a city in northeastern China's Heilongjiang Province, is a memorial hall named after one of the town's most well-known former residents, Ma Yongshun. Next to the building sits a dark red tractor, made in Harbin, the provincial capital of Heilongjiang, that was once a cog in an army of machines that turned the local boreal forests into the timber that made Yichun a boomtown.

Now, the tractor lies disused on the roadside, a scene repeated in cities and towns dotting this vast, empty landscape. The American-Canadian author Jane Jacobs once wrote that while cities shape the countryside, they eventually exhaust the very resources they were built to exploit. This is the fate that has befallen Yichun: a city now bereft of all that defines a city.

Source: Yichun Bureau of Statistics, Statistical Report on Yichun's Economic and Social Developments (2007-2016); Heilongjiang Bureau of Statistics, "An Analysis on Yichun's Forestry Development."

Yichun is known nationally as China's largest "forest city." In this remote and sparsely populated corner of the country, the municipal government offices in the city center practically look onto the densely wooded mountains that surround it.

Yichun's development into a city began in the 1950s, as a product of the region's booming lumber industry. In the seven decades since, the area has supplied the nation with 240 million cubic meters of high-quality lumber and contributed more than 30 billion yuan ($4.6 billion) in taxes and funds earmarked for forestry projects. Yet even the most abundant resources can dry up. In 2008, Yichun was among the first to be included on a national list of cities that had exhausted their natural resources.

Over the past 3 years, Yichun has gone from reducing the amount of logging in its environs to banning the practice altogether. These decisions, in turn, have led to a dramatic decline in population. Yichun had 1.25 million registered residents in 2012 and 1.1 million in 2016, a population decrease of around 12% in just 4 years. But the impact on the local economy is not accurately reflected in the official statistics: The large numbers of homegrown workers who temporarily migrate to larger cities for work have nearly decimated the city's industry.

Although Yichun is transitioning away from logging and toward ecotourism, it is often paralyzed by the latter industry's growing pains. The uncomfortable transition makes Yichun a classic case of deurbanization in China.

Fig. 11.16 By 3 o'clock, the sun has already begun to set in Yichun

Fig. 11.17 The city of Yichun is surrounded by sparsely wooded hills and mountains

In 2006, Yichun New City, a planned district located across the river from the old city center, was opened for development. On a visit there this fall, I found the roads and skyscrapers even quieter and more lifeless than the nearby pine forests. As is the case with many new urban districts in China, local government departments

were the first to move into the New City, including administrative buildings and the procuratorate, followed closely by the local bank branches. Architecture in the New City leans toward the monumental: There is a vast new sports complex that towers over passersby, complete with a sizeable soccer stadium. But nobody lives here. There is no rush hour or nightlife to speak of. The broad, six-lane roads lie empty, except for the occasional car or tractor. Red decorative Chinese knots hang from the light posts lining the streets. The sidewalks are spotless, and the trash cans largely unused.

My room was in a large, partly refurbished hotel not far from the stadium, with a full view of the soccer field. In 2014, Yichun hosted the Heilongjiang Provincial Games, and many of the event's high-profile guests stayed in this building. Only two attendants were on duty, however, when I checked in.

Since autumn of 2015, the stadium's ground-level shopping center has been home to the Yichun E-Commerce Industry Mall. Almost every storefront is boarded-up, including those belonging to state-owned enterprises like China Post and China Mobile. Just outside the stadium's gate, a father idly kicks a ball around with his young son. An actual soccer match is taking place inside, and the sound of the referee's whistle reverberates through the still air.

Northeastern China has all sorts of natural advantages when it comes to winter events. Not only does the climate provide abundant ice and snow, but the region's expansive area and small population also make it great for ice skating. In winter, perhaps as a result of the return of the city's migrant labor population for the holidays, or perhaps due to the omnipresent sound of people trudging through the snow, you can almost—but not quite—convince yourself that Yichun isn't as desolate as it seems. The river running through the city freezes over to become a place where families can take their kids for light shows and theme park rides.

The older part of town is a little livelier. The commercial district boasts a pedestrian street known, albeit somewhat optimistically these days, as "Prosperity Street." Built in a vaguely Russian style, it looks more like an upscale farmer's market than anything else. Milk tea stands, so ubiquitous along pedestrian streets in other major Chinese cities, are few and far between. There's a Xinhua Bookstore, a clothing store, and a hardware store. The most popular spots on the street are a restaurant specializing in malatang—a mouth-numbing Sichuanese hot pot soup—and a pulled-noodle joint. A few impromptu roadside stands are visible, where vendors hawk cheap bedsheets or fruit from baskets on their bikes. Time moves at its own pace here. By 3 o'clock in the afternoon, the day is fading to dusk, and residents leave work at 4:30 p.m. An hour later, the malls close. Half past 6 here feels like midnight anywhere else in China.

In warmer months, however, older residents will go out at night and dance in public squares. Prosperity Street and the park by the river are both home to large dance troupes, a source of vitality in this sprawling but nearly empty city. Sometimes assembling in a square formation, other times into long, snaking lines, the elderly dancers are always happy to share the city's massive public spaces with each other.

Most travelers to Yichun pass through the city on their way to the nearby mountains. The road north leads them through numerous natural parks showcasing the

bleak beauty of northeastern China. In May 2016, President Xi Jinping made an inspection tour of Shangganling, a suburb of Yichun where Xishui National Park is located. This brought the region a much-needed morale boost. Taxi drivers still recall the visit in fawning tones: "Since Uncle Xi came, there have been more tourists," said one, using an affectionate nickname for China's leader. "Business is better for us drivers now." But business must get better still, or else the taxi drivers, too, may follow other locals out of the city. The further north you go, the fewer people you see. "They closed off the mountains to protect them [from deforestation], but we can't plant anything in these parts — so everyone has left," a cab driver told me. In the few years since Yichun banned logging, Shangganling lost a majority of its residents. The area's population now hovers around 10,000.

Li Xiao

Fig. 11.18 "My father drives a taxi. I wish he would take me to visit Beijing one day"

Ma Yongshun Forestry Town is located in Tieli, a city south of Yichun. Officially, the forestry town is known as a "village for ecotourism" and a "model for the beautification of other forestry center construction projects." In the 1950s and '60s, Ma Yongshun was both a model worker in the lumber industry and an avid tree planter—China's Johnny Appleseed, if you like. A former resident of the area, Ma, now has his name emblazoned on the town hall.

Perhaps hoping to capitalize on elderly people searching for summer vacation homes away from the scorching heat, Ma Yongshun Forestry Town officials developed a real estate project known as the Riyue Gorge Scenic Village. Only a few of the homes have found buyers, however, and those tasked with tending to the neighborhood's yards and lawns spend more time discussing work opportunities in the provincial capital of Harbin. Looming over the patch of kitschy Italian-style villas is the forestry center, nestled between the trees and high up in the mountains. The offseason here begins as soon as the summer ends. By September, the forestry center is free of tourists, and the employee compound is covered in signs offering rooms for rent.

Last winter, the popular Chinese television program "Where Are We Going, Dad?" chose Tieli as the location for its season finale. Pieces of the set—clapboard houses hastily thrown together—were left behind in the town after filming finished. Signs declaring "Tian Liang stayed here," a reference to one of the show's stars, can still be seen hanging from village doors. Locals enthusiastically retell stories of how the show's location scouts arrived in the village. Their spare rooms are piled high with discarded props, though it is rare for anyone to come and stay.

Life in Yichun will never resemble that of any of China's major metropolises. Here, the mountains are the residents' only permanent companions. On rainy fall evenings, locals grab their flashlights and head out hunting for the wood frogs that live on the mountainside and provide ingredients for traditional Chinese medicine. Pacing up and down, the hunters look as if searching for something valuable they dropped on the road.

Jiayin, the northernmost town under Yichun's jurisdiction, lies on the border with Russia. Built on flat ground, the town is still thriving, as the impact of the logging ban was felt less keenly here than elsewhere. The region's arable land has given locals more options and economic opportunities than in other parts of Yichun. There are more people on the streets here than to the south, but Jiayin is still largely unpopulated. The town's small shops are mostly stocked with Russian chocolate, cakes, sausages, and alcohol imported from their vast northern neighbor.

The first fossilized dinosaur found in China was unearthed in Jiayin, and dinosaur-themed lamp posts and trash cans line the city's streets. There's also a rarely visited dinosaur amusement park, stocked with huge plastic sauropods nibbling at the trees. Presumably, with so much space available, the park's designers saw no need to use miniatures. But Jiayin is merely a small beacon of hope in the great northeastern wilderness. These days, Yichun looks to be going the way of its prehistoric predecessors, a once-great relic of a former age captured as if in amber, existing without purpose in perpetual isolation.

Chapter 12
While We Are Talking About Urban Expansion and Economy Growth of China, Have You Ever Noticed the Phenomenon of Shrinking Cities?

Ying Long

12.1 Introduction

Today I would like to share something about shrinking cities, literally the cities that are depopulating. Besides my identity as an urban scholar, I am an outdoor enthusiast. As you know, there are three parallel rivers in China, Jinsha River, Lancang River, and Nu River, respectively. Once I took a 3-day trip to venture across the Biluo Snow Mountain from Nu River to Lancang River, including spending two nights in tents. Before that time, Nu River has been reported as the only canyon without hydroelectric development in China. During the adventure, I passed by an area named as Zhiziluo, before arriving at the ultimate destination. It is nearly one kilometer beyond Nu River Canyon in height. You can imagine, it is one kilometer vertically but not horizontally there. From my own perspective, Zhiziluo City seemed to be very weird for its being abandoned.

Why it was abandoned? It was about 40 years ago, some experts predicted that geological disasters would go to take place there, such as mud-rock flow. While the locals believed with this point deeply and scattered in short order, leaving an abandoned and vacant city behind. Actually, I strongly recommend Zhiziluo and Nu River Canyon as destinations for winter vacation. Though it is hard and tedious to get there: first flying to Kunming, then taking a one-night train to Liuku, besides that, taking a shuttle bus to Zhiziluo, after that, arriving in Bingzhongluo and finally reaching Biluo Snow Mountain.

Once upon a time, after the government informing everyone to leave that place to get rid of dangers and unknown risk, there was nobody in Zhiziluo. However,

This chapter was translated and modified from a speech transcript at *YIXI*. The original speech can be watched at http://yixi.tv/speech/606.

Y. Long (✉)
School of Architecture and Hang Lung Center for Real Estate, Tsinghua University, Beijing, China
e-mail: ylong@tsinghua.edu.cn

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_12

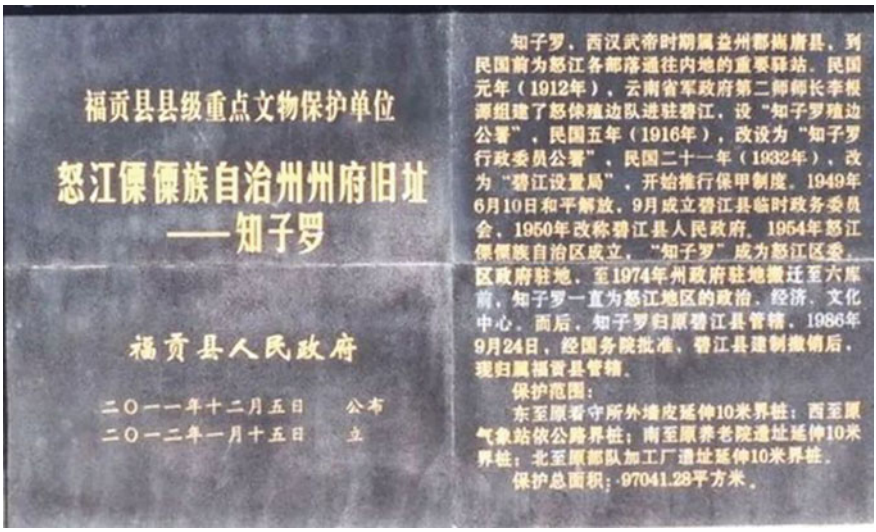

Fig. 12.1 The Zhiziluo historical and cultural site, committed by Fugong County government

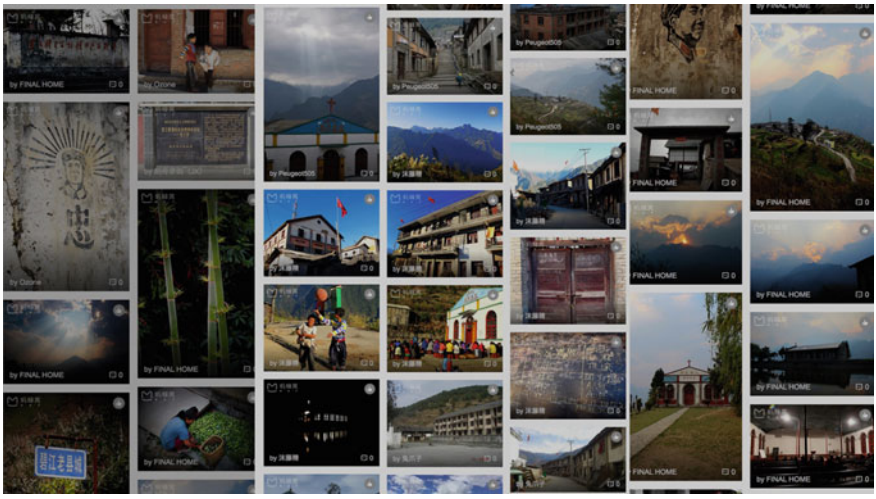

Fig. 12.2 The photographs of Zhiziluo in Mafengwo website, a large online tourism forum

some people gradually returned after that, though the amount was limited compared with its former population scale. Now more and more tourists choose Zhiziluo for tourism. You could search and find out many photographs in Mafengwo Website. These photographs are about gorgeous mountains, traditional churches, and historically socialist vestiges (Fig. 12.1 and 12.2).

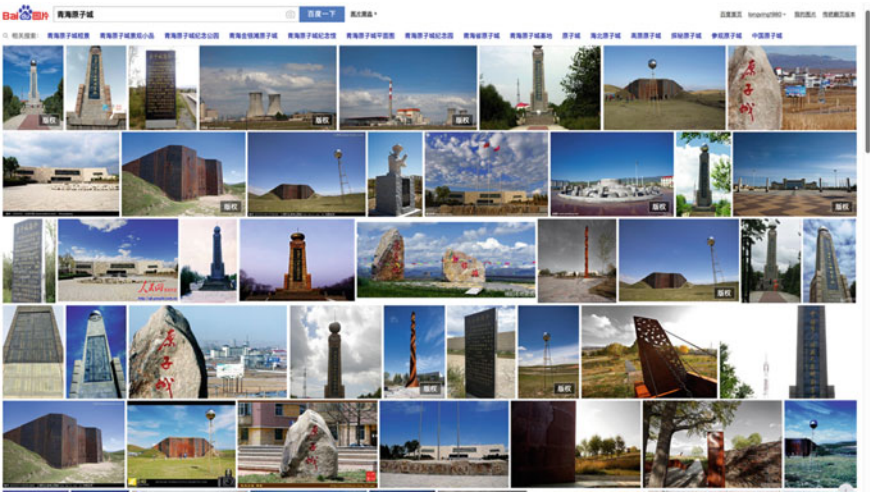

Fig. 12.3 The photographs of Nuclear City in Tsinghai Province

Many people might visit this place when traveling in Tsinghai Province, named Nuclear City (Fig. 12.3).

Though the city is empty now, there were ever many people working in the Nuclear City (Fig. 12.4).

Today I will mainly focus on cities that have experienced population decline, literally the shrinking cities. I drew this map in 2013 that based on the Fifth Population Census of China, when I was an academic visitor to the University of Cambridge in England. Many years ago, the Census Bureau only published demographic data on city scale or county scale. However, we were really surprised to find out that the State Statistical Bureau published detailed demographic data at subdistrict scale and town scale on their website at that time.

And this is from the Sixth Population Census of China (2010) (Fig. 12.5).

The State Statistical Bureau could hardly imagine that there will be someone doing such research with this data: we input every subdistrict and town's demographic data in EXCEL, in the meantime, we searched every precise location and marked its altitude and longitude on map, for example, the Trade Center Street, Chaoyang District, Beijing, China. How many towns and substreets are there in China? More than 50,000. Therefore you could easily see what I did in that night in England, 50,000 times repeating operation Ctrl + C, Ctrl + V, and searching for longitude and latitude for every site.

However, our work was a little bit more technical. My cooperators Doctor Kang Wu and Doctor Jianghao Wang and I utilized the research method of big data, including capturing, pretreating, analyzing, and making it visualized, aiming to transform those complicated work automatically. Obviously, those two maps were easy for us to recognize the Huhuangyong Line, which separated the eastern area with high

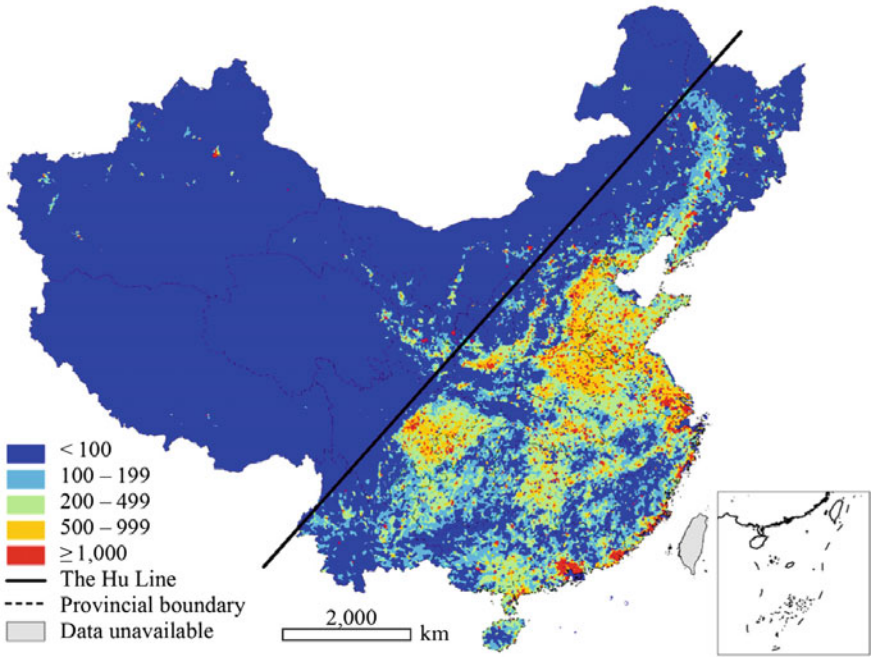

Fig. 12.4 The spatial population distribution of China, data from the Fifth Population Census of China (2000)

population and the western area with low population density. After making a comparison between the two maps, I could not stop asking myself if I had already discovered a secret of China. We realized that the population density on one-third of areas in China is declining, that is to say, in more than 10,000 towns and subdistricts, their population had been declining between 2000 and 2010 (Fig. 12.6).

What is a subdistrict? Actually, it exists as a unit only in the city level. That is to say, the phenomenon of population declining is not only in villages but also in broader urban areas. Moreover, we overlaid boundary lines of almost 600 Chinese cities to the aforementioned map. We found out that around180 Chinese cities have population loss from 2000 to 2010 (Fig. 12.7).

The idea of shrinking cities on such a large scale is rarely reported in China before our study. Well, my dear audience please take a look at these 180 cities and please check whether your living place is on this picture. Larger the letter is, the higher proportion of depopulation happens in the city, instead of referring to the amount of population loss. For instance, at the center of the map is the City of Lv Liang in Shanxi Province. Lv Liang is a city based on mineral resource. It can be seen that there are also some famous tourist cities like the Hulunbuir, Dingxi, Genhe, etc. If you could find your city's name on this picture, you can do some reassessment (Fig. 12.8).

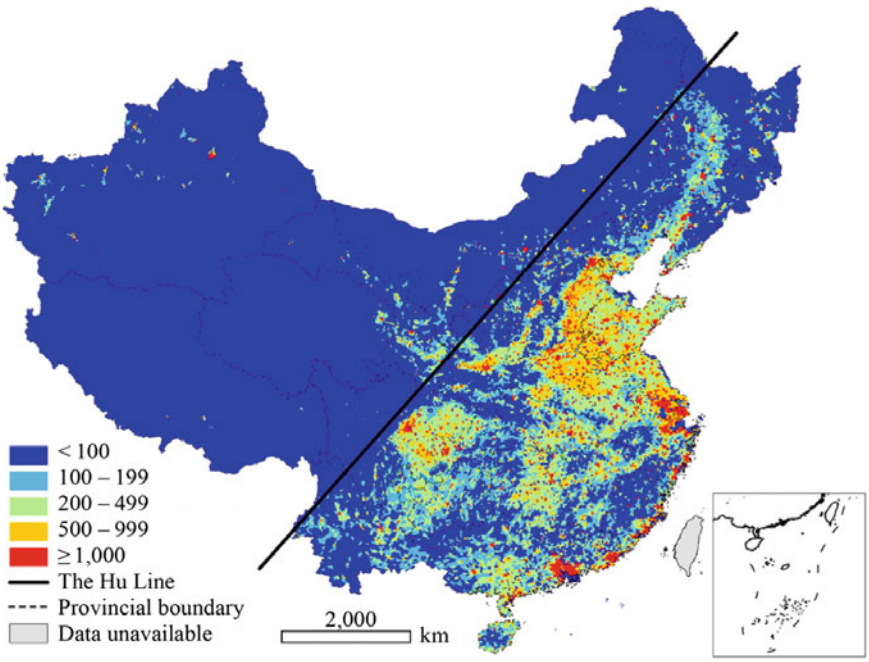

Fig. 12.5 The spatial population distribution of China, data from the Sixth Population Census of China (2010)

The night after confirming180 shrinking cities, I lost sleep. I was wondering why it was us to discover this phenomenon but not any other researchers. Because It had been 3 years after the Sixth Census Data when I drew it in 2013. We ignored the problem that Chinese cities' jurisdictional boundaries have always being changed. We observed the change of population from 2000 to 2010 on the base of the administrative boundary of every Chinese city in 2012. Only then could we dodge unpredictable influence from the frequent boundary adjustment.

Sometimes when I mentioned the decline of population, mayors, planning bureau's directors and those who were working in statistic departments told me that I was wrong, for the reason that the Sixth National Census Population Data represented the permanent residential population instead of the household registered population, and their difference generates from the different statistical method. In other cases, some people claimed it was not feasible to compare the population data between 2000 and 2010, since some cities' administrative boundaries have been constantly adjusted. For example, the border of Beijing City did not include Miyun County or Yanqing County. And now many county-level cities are merged to their nearby prefecture-level cities, which lead to a frequent change of city boundaries.

After receiving these malicious comments, I realized that, if someone wants to object one thing, one simple reason is definitely enough. A phenomenon is that most

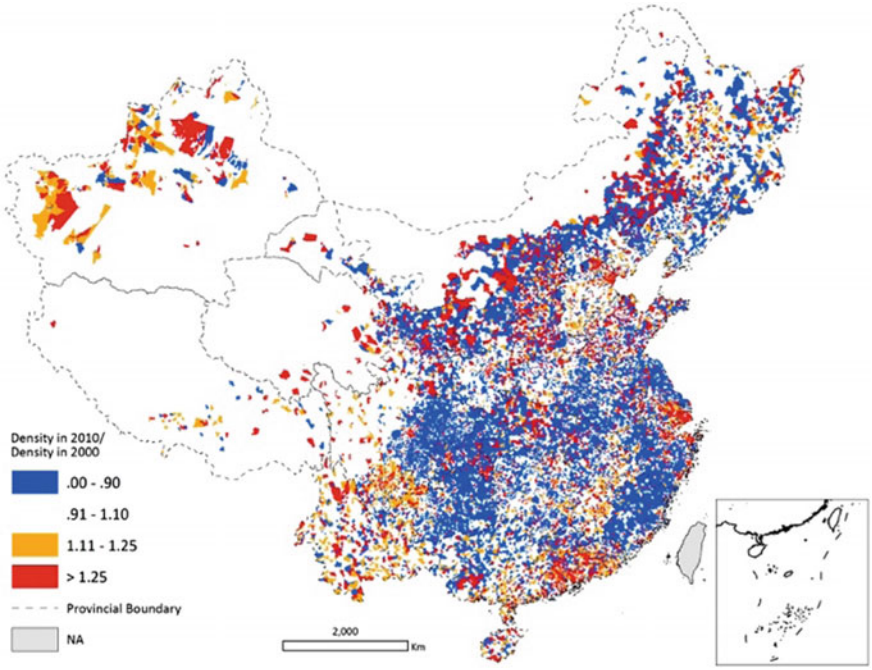

Fig. 12.6 One-third of China's territory endured population density decline between 2000 and 2010

of us are still discussing the Fifth and Sixth Census Data, which represent population status in 2000 and 2010, respectively. It has been 8 years since the Sixth Census Data being released, therefore, is this data a little outdated from today's view?

Fortunately, my cooperator Professor Kang Wu, from Capital University of Economics and Business, utilizes some updated statistic data, and has discovered 80 shrinking cities from 2007 to 2016, after some technical analysis. How could these cities be classified into, including the aforementioned 180 shrinking cities and then the new 80? The first category is structural crisis shrinking cities. For example, in cities like Yichun, many people make a living in the lumber industry, however, it has been passed now (Figs. 12.9 and 12.10).

Yiwu is another shrinking city. You might be surprised by its shrinkage, but it has been discovered by our cooperators. Affected by the 2008 international economy crisis and the industrial upgrading, many companies in Yiwu have to downsize their scale. There are also other shrinking cities around megacities, such as Sanhe and Gaobeidian around Beijing, and Dujiangyan around Chengdu. Besides that, there are many underdeveloped cities and border cities, such as Ereguna, Hami and Genhe. The second category is data-adjusted shrinkage, including Jinjiang, Jingdezhen, and so on.

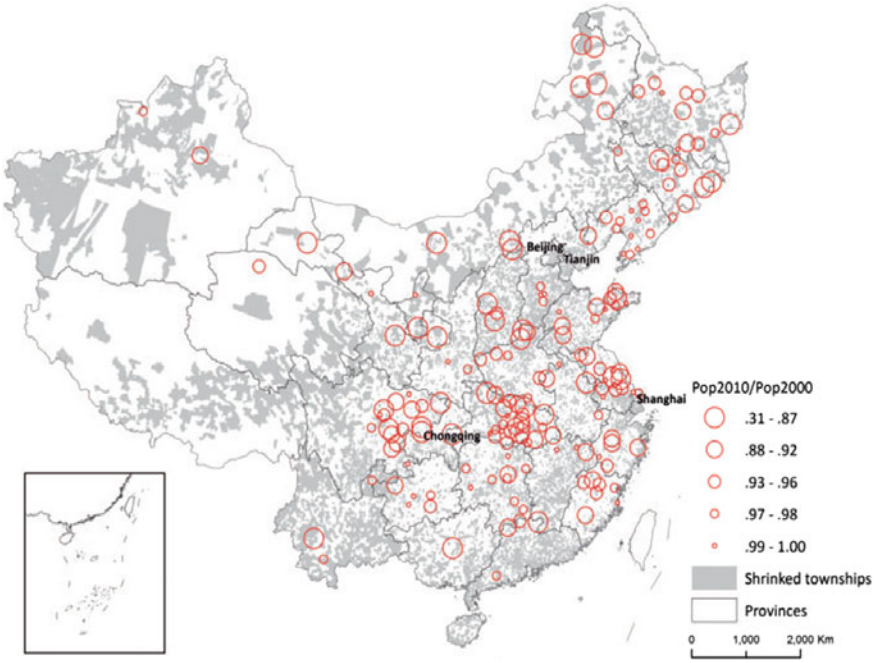

Fig. 12.7 About 180 Chinese cities have population loss from 2000 to 2010

Fig. 12.8 The shrinking Chinese cities' names in the word cloud

Fig. 12.9 Identified shrinking cities in China from analyzing updated population data between 2007 and 2016

Moreover, we are thinking whether only China has shrinking cities. Afterward, we noticed that many foreign researchers are also concerning shrinking cities, and there is also a vast mass media report, like the one following. They made an investigation on cities that have more than 500,000 people in the world from 1950 to 2000, which was 50 years earlier than China's Fifth Census Data. They found out that many American and West European cities with more than 500,000 citizens also experienced population loss. In general, China is experiencing population growth, but some spots are blue, which indicate population shrinkage. This equals the fact that some of our cities have begun to shrink in 60 years ago (Fig. 12.11).

This is our latest preliminary research finding. A week ago, we drew such a map based on night-light image data which photograph our planet at night by satellites. Then we made a comparison between images between 2000 and 2012, and then we composed the following picture, the blue area represents luminosity decreasing, while the red area represents luminosity increasing (Fig. 12.12).

Some researchers have demonstrated that the higher the luminosity is in this place means higher GDP and more people, or more energy consumed there. But this map cannot directly be applied to indicate where the shrinking cities are, we just made an initial investigation on changing condition of the luminosity in China in the past few years as well as all over the world. Obviously, we adjusted luminosity adjustment procedure to make sure images from two comparable periods. We find out that the

Fig. 12.10 A mostly abandoned residential building in Yichun, which is suffering from the structural crisis

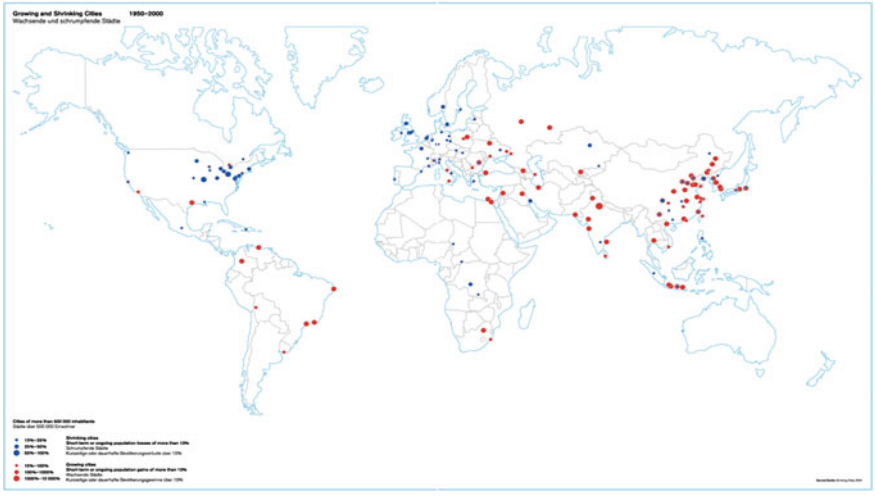

Fig. 12.11 Shrinking and growing cities in the world, 1950 to 2000

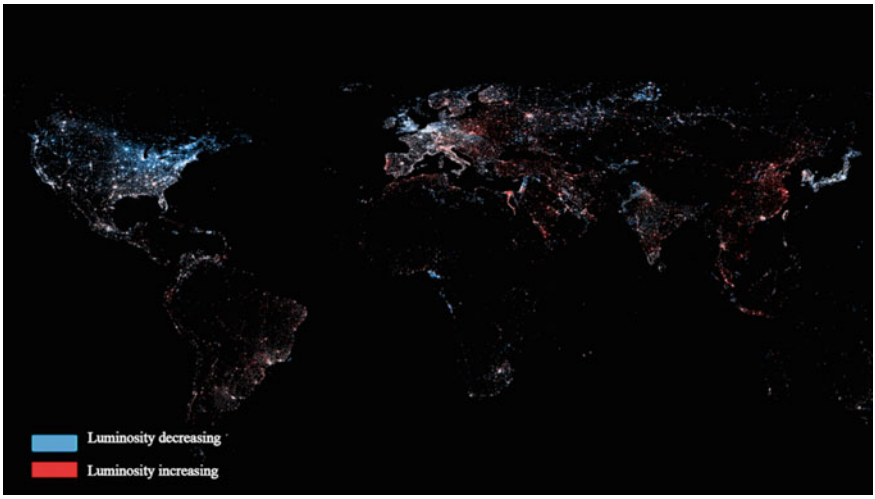

Fig. 12.12 The change of global night lighting from 2000 to 2012

situation in China is not in the most serious while the luminosity condition is in a more notable decline in Western Europe, North America, Korea, and Japan.

Furthermore, we could not actually make judgments about the population shrinkage just depending on luminosity condition, but at least, it can indicate that human activity reduced to some extent. We cannot rule out the possibility that lighting itself has changed, taking a factory for instance. Formerly it was brilliantly illuminated throughout the night before it was replaced by advanced manufacture, which does not need such high luminosity though their productivity increased a lot. However, the employment density is also reduced in such a situation. The figure below shows a contrast between China and the surrounding countries (Fig. 12.13).

In recent 3 years, we did some assessment without the Census Data, discovering that there is still luminosity decline in many areas of China from 2013 to 2016. Most of such luminosity decreasing spots are in the urban area. Therefore, we could preliminarily assume there are more serious urban shrinkage issues after the release of the new census of population in 2020 (Fig. 12.14).

Nowadays some big cities claimed that they do not need so many residents, but from my own perspective, there are only three or four cities in China can claim that. A large amount of population is an advantage for the developing places. Taking Sichuan and Henan province for instance,both of them were less developed and had a large amount of population, but today, their central cities have already shown the backwardness.

Is shrinking city another side of China's urbanization? We are keep on discussing about urban expansion, economy growth, and population increase, how about our shrinking cities? Why do I choose shrinking cities as a topic in Yixi? The reason is that I would like to make more people aware of the urban shrinkage, push more

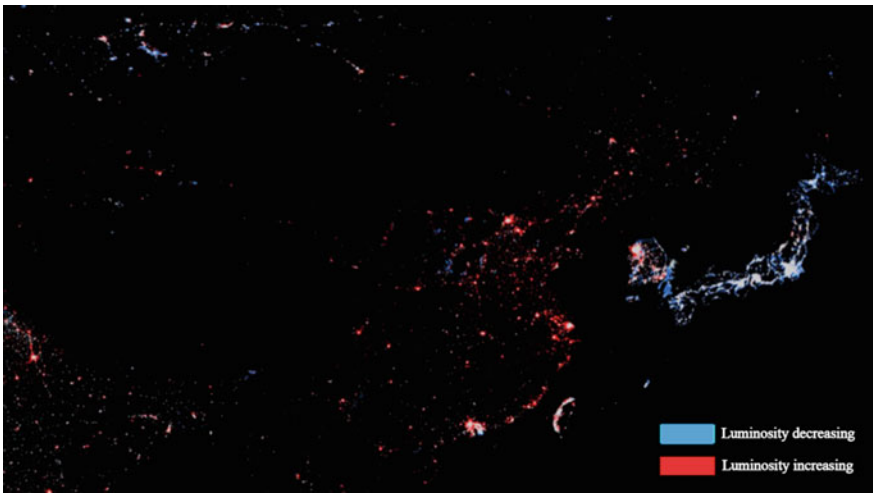

Fig. 12.13 A contrast of night lighting change between China and its surrounding countries from 2000 to 2012

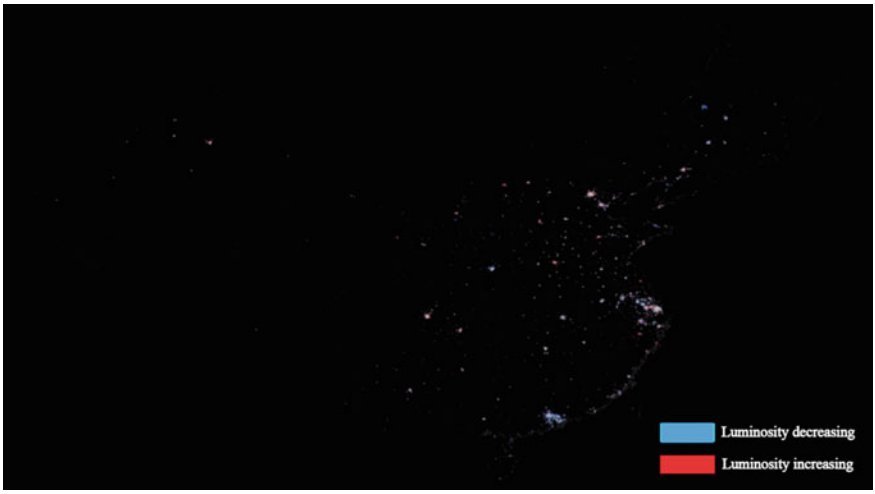

Fig. 12.14 The change of night lighting in China, from 2013 to 2016

city officials and staffs in statistic department to realize it, as well as prevent current rejection towards urban shrinkage (Fig. 12.15).

There are also shrinking cities in foreign countries, then what are the specific features of shrinking cities in China? What are their specialized characteristics? The amount of shrinking cities in China is large, more than 180. And they are widely distributed in China, from west to east, they are not concentrated in one area (Fig. 12.16).

Fig. 12.15 Shrinking city is another aspect of China's urbanization (Yichun, China) (*Source* https://chenronghui.tuchong.com/15063206/)

Fortunately, the extent of urban shrinkage in China is not severe. Urban shrinkage is not a disaster, a geological disaster. Most shrinking cities are not similar to the aforementioned Zhiziluo. The percentage of shrinkage in most of our identified shrinking cities are less than 10%.

There is another paradox of China's shrinking cities, though their population is decreasing, but most of their economic condition is working well and in the meantime, its urban areas have been expanding continuously. We treat this as one unique paradox in the current stage of China's shrinking cities, urban land expansion with population loss. That is to say, there were five people standing on this red carpet, but now only three people are still here and the carpet is bigger. You can imagine such a situation. Then we work out a hypothesis that whether we can divide urban shrinkage into several stages. According to urban life-cycle theory, city begins from nothing, gradually becoming prosperous, entering peak, turning to decay, and then reborn or thoroughly degrades. From another aspect, the decaying process is necessary, at least for some cities (Fig. 12.17).

Then we can understand shrinking cities in China from three dimensions such as population decline. Some cities stay at the stage that economy grows and land

Fig. 12.16 A man plays Chinese Kung Fu in an abandoned park

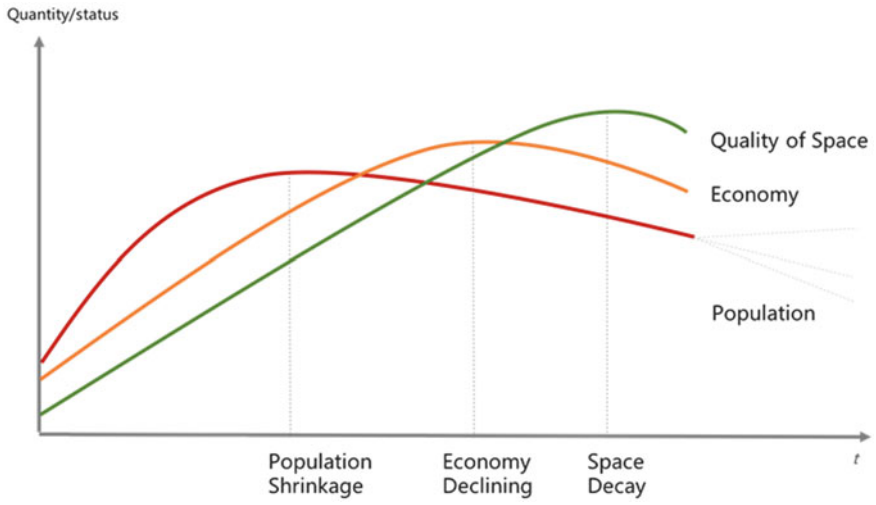

Fig. 12.17 Theory/Hypothesis on decreasing population, economy and quality of space

Fig. 12.18 A rusty amusement facility in an abandoned playground

expands when we think its population is decreasing. But its economy will go downhill in the next stage.

We think the last stage is space quality beginning to decay. What does it mean? When we walk out of the theater approaching streets in Beijing, what kind of space do we experience? How is the spatial quality? Is it beautiful, or is it decaying or in chaos? Just like judging the beauty of the human. If a shrinking city's public space started to decay, its residents may also feel upset or frustrated. Generally speaking, this is at a later stage of development in shrinking cities (Fig. 12.18).

First, let us discuss Qiqihar. Qiqihar is a northeastern city, which is suffering from population loss currently, while its economy remains increasing—according to the statistical data, like its government website and online search engine (Baidu). There is a group of pictures about common space in Qiqihar taken by Ronghui Chen from Pengpai news. I like these pictures describing the population loss in Fulaerji, Qiqihar (Figs. 12.19, 12.20 and 12.21).

The second category is those with population decrease and economic decline as well. But these kinds of cities are "special" in China. These cities have to admit the fact that their GDP already fell, like Yichun. I have been to Yichun several times. These pictures are taken by myself in my own way. Though I am not as skillful as Ronghui Chen, I am well-acknowledged of quantified research. I shot all of these

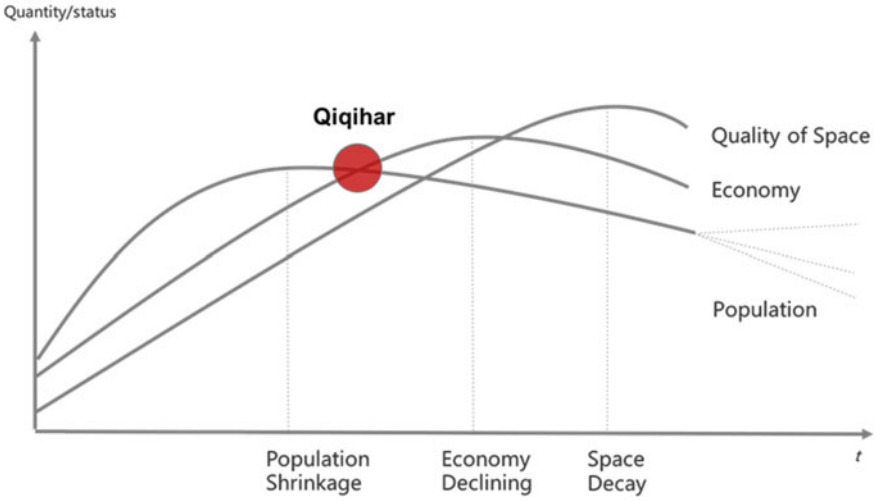

Fig. 12.19 The current shrinking stage of Qiqihar, according to the theory/hypothesis on decreasing population, economy and quality of space

Fig. 12.20 The scenery in Fulaerji, Qiqihar

Fig. 12.21 A long mutual gazing between two girls on the stairs of an abandoned factory (Qiqihar, China)

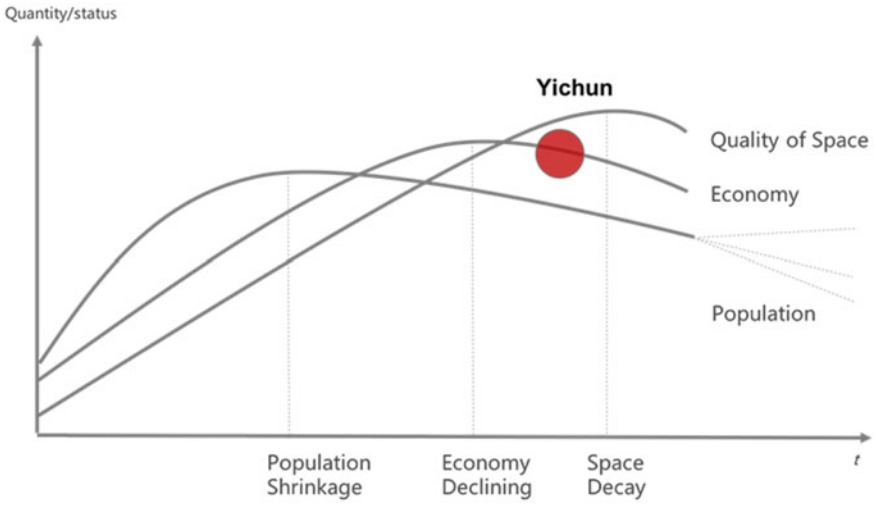

Fig. 12.22 The shrinking stage of Yichun, according to the theory/hypothesis on decreasing population, economy, and quality of space

Fig. 12.23 A grocery store in Yichun: the photo was taken with 10 s' exposure

photos with 10 s' exposure. Most of you might be confused that 10 s exposure in the day might lead to overexposure. I especially equipped an ND filter with a camera, which could create clear photos in 10 s' exposure even if the environment is light enough (Figs. 12.22 and 12.23).

This was one grocery store. While I was taking photos in 10 s, I decided not to tell her what I was doing. In that time she kept talking and complaining, about the

Fig. 12.24 There were too few passengers arrived at this depot in Yichun: the photo was taken with 10 s’ exposure

Fig. 12.25 An abandoned supermarket, today it has illegally occupied by someone: the photo was taken with 10 s’ exposure

bad economic condition, like nearby factory shutting down, job losing, bankruptcy, and fewer customers. It was cold inside without heating (Figs. 12.23 and 12.24).

This was a passenger depot, compared with Liuliqiao Passenger Depot in Beijing. In 10 s, there were no passengers arrived at this depot to purchase tickets, there was only one passenger playing mobile phone—keeping playing a phone in 10 s, what a condition you could imagine (Fig. 12.25).

Fig. 12.26 The vehicle stream in the central square of Yichun: the photo was taken with 10 s' exposure

These were about the situation of Yichun, a shrinking city. What was this place? It was a supermarket before with specialty stores selling bags or socks. After the shop being closed down, what was it transformed to? Apartments. One was renewed by its host to the living room, one for a kitchen, another for a bedroom and maybe his children's bedroom. In the shrinking Yichun, it is unimaginable for us that a shop has been changed to apartments. In current diversified real estate product market, we cannot have an idea about such kind of method (Fig. 12.26).

The only picture made us feel enthusiastic was about the vehicle stream in the central square of Yichun at 10 pm. At least four or five cars passed through in that 10 s, which was good news (Fig. 12.27).

This picture is my favorite one among pictures taken by Ronghui Chen: a shrinking city, frozen and snow-covered Yichun, and colorful lights on the frozen river. It was colorful in a day and riotous with color in a night. It means a lot that such a prosperous artificial landscape exists in such a city.

It is not too bad in domestic shrinking cities' spatial quality, but, many abroad shrinking cities' public space has decayed to a very severe extent. If you asked me a question about which country has the safest street in the world, I vote for China. A single woman would be able to walk around in different streets in Beijing, but not in Buffalo's downtown, USA. Spatial quality in many public spaces in Buffalos is badly decaying, as well as in Detroit, a more known shrinking city. Then we could not stop to question ourselves, how is our public space's quality in Chinese shrinking cities? What is public space? Literally, streets, squares, parks, and green area. Is its quality being better or worse? Decaying or ruined?

This morning I asked one question to the graduate students at Tsinghua University in my Big Data and City Planning course. What is decaying and what is ruined? You

Fig. 12.27 A frozen and snow-covered river with colorful lights: the photo was taken with 10 s' exposure

will see, one is a noun and the other is a verb. Decaying is a process, for instance, one becomes ugly, this is one type of decay. Ruined is described as a condition, like being ugly. And there is one kind of people, becoming beautiful but not beautiful enough. She is improving her look, but not enough. Such kind of space is improved better but still not good enough. Therefore, we utilized some advanced technology to study on shrinking cities' public space. Our job is investigating if one city's public space has changed between different historical photos. This is similar to judging whether someone is becoming more beautiful, based on comparing that with what you look like years ago.

To research on urban public space, we utilize street photos from a different time, including 2013, 2015, and the latest. We appreciate Tencent for taking street photos in nearly everywhere and every corner in almost every city in China, without benefits from the government, especially photographing in big cities like Beijing many times. Fortunately, Qiqihar, which we will do precise research on, has been photographed twice by Tencent (Fig. 12.28).

Our job is simple, firstly collecting street photos from four directions in one single point. We randomly pick out these points, each of which has several meters' distance. The photos were taken by Tencent in 2013 and 2015. Without internet companies, we could only ask people on the roadside: what it looked like three years ago? whether there was a trash can? what color the house was? was there a parking place? and so on. Sometimes people would answer that he could not remember because of bad memory. Therefore, street photos in several years are beneficial for us, through which we can find dirt road turning to the tar road, discovering one simple house transformed into public bath, one of three great Northeast treasure (Fig. 12.29).

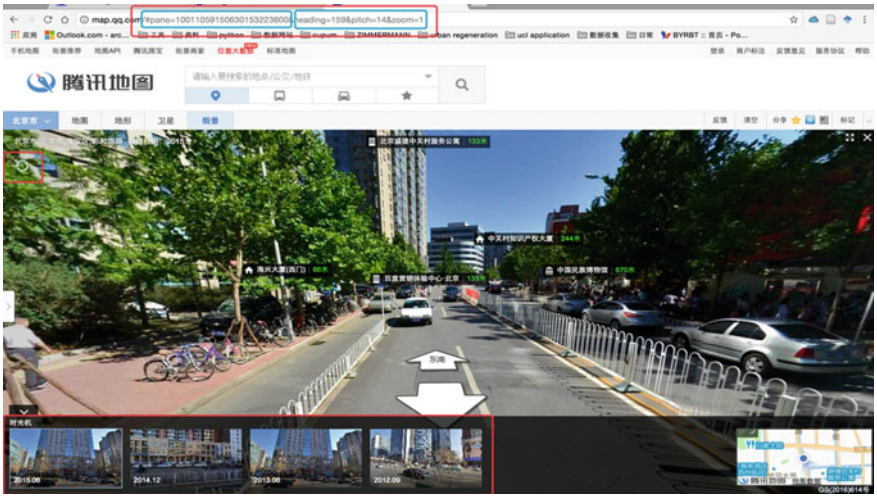

Fig. 12.28 The street-view in Tencent online map that provides historical stacks for tracking the change of built environment

Qiqihar is one kind of city that population decreases while GDP remains rising in its website of Statistic Department. Then what did we do? We did a job that like kids or old ladies would like to do: finding the differences. Actually, we divide the street space into a differential part to find the discrepancy. Let us find out what have changed in a street: more telegraph poles? Or more trash cans? After that, we will see if these changes behave to be beneficial to the city (Figs. 12.30 and 12.31).

In the following pictures, the purple represents turning better.

You can imagine, GDP rises in some degree, while most of the spatial quality is ameliorated but not all in this shrinkage city population is losing (Fig. 12.32).

This indicates that shrinkage level of Qiqihar has not reached the same level as Buffalo and Detroit. However, is the spatial quality good after the shrinking situation becomes better? Or if there is no decaying, is there dilapidated? The dilapidation is a condition. For example, you could have an impression about your hometown, like how spatial quality in your public space is, or whether there is a dilapidated street. Everyone has something to tell. And we did some comparison between Beijing and Shanghai. You can get the latest conclusion by searching it, I would rather not disclose in this speech.

Many of us have the ability to say some opinions about public space like streets. Some would say this space is awful, while others would say they have no sense of design or it disappoints me. In strict and precise research, we get some theory to support us, like Space Disorder. Combined with current China's situation, we could say beauty remains the same but dilapidated things differentiate in many ways. What is the difference? Such as walls beginning to peel, street business going bankrupt, plaque dilapidating, or a gate having not been painted in ten years. Also, the environment could be in bad condition, like weeds springing up, rubbish bins falling

Fig. 12.29 The distribution of street views points in Qiqihar

down and garbage scattering. Besides that, the infrastructure breaks down, such as streetlight crooking. So this black-and-white photograph represents normal space, while the colorful ones are dilapidated scenes (Fig. 12.33).

Certainly, our work is very preliminary, which aims to answer what our space is. Next, we will do research on whether this kind of space would lead to a criminal rate increase, or it would influence people's psychology condition. Or we could verify whether this kind of dilapidated places will increase the possibility that people living around would drink more. In the end, we come to the conclusion that 20% of space is dilapidated, though the whole physical space is becoming better, it is still far from good enough.

To summarize, I will provide you with some examples of how the government officials give feedback after we tell them our research achievement. They refuse

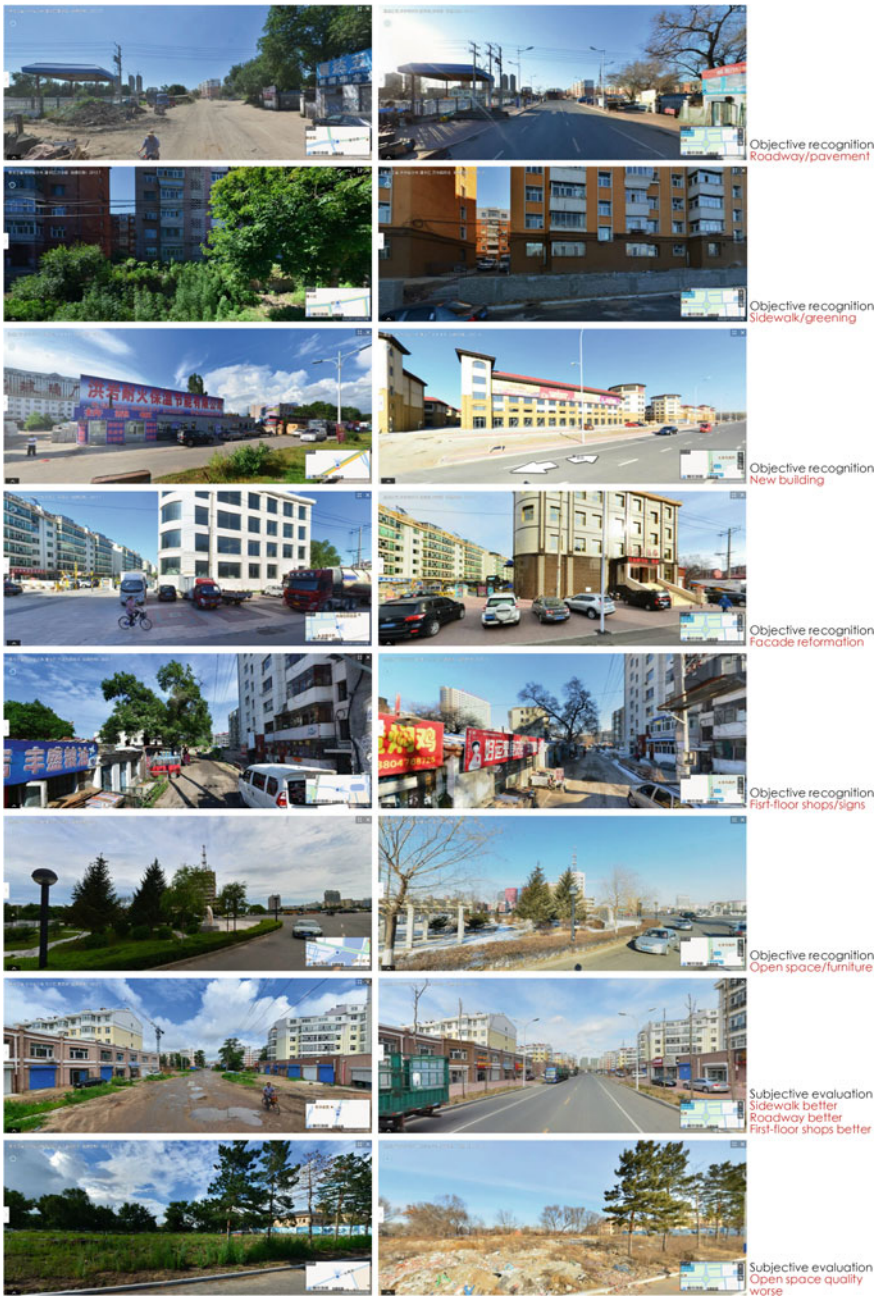

Fig. 12.30 The examples of objective recognitions and subjective evaluations

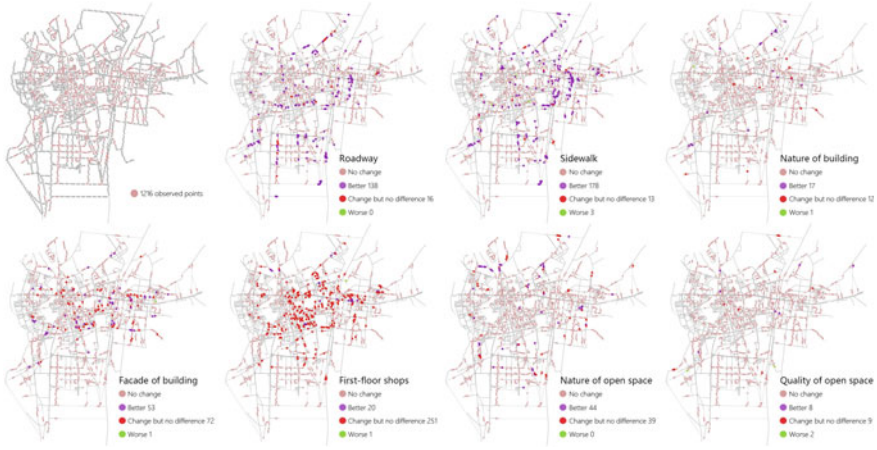

Fig. 12.31 The distribution of subjective evaluations in Qiqihar

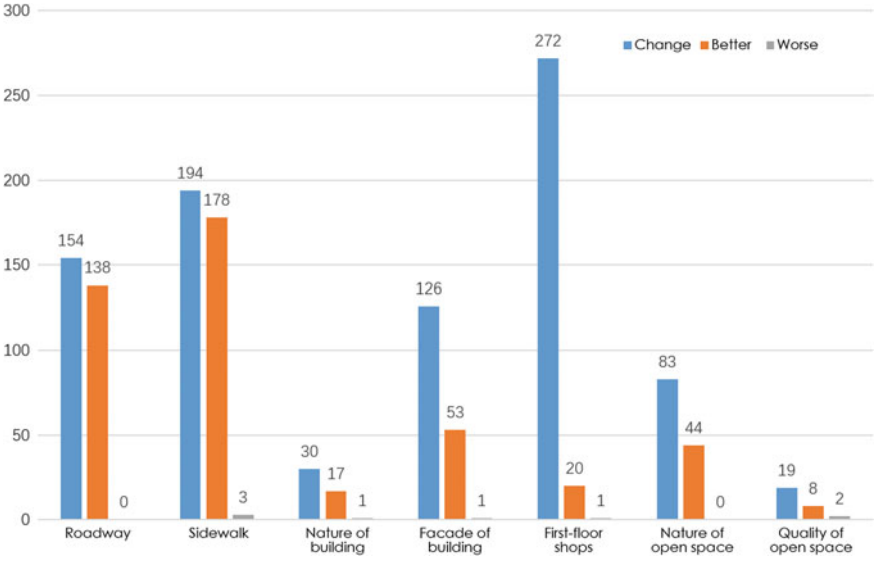

Fig. 12.32 The statistics of subjective changes in Qiqihar

to admit or even reject labeling their cities as shrinking cities. Urbanization takes strong root in China—which represents that our city should be in developing condition, while our population is increasing. That is to say, city shrinking is one kind of decaying or at least a pejorative term. However, shrink remains neutral in the international background, only leading to population decreasing. Considering my role as a researcher in urban planning, we should not only focus on how to recognize and

Fig. 12.33 The photograph of physically order space (in black-and-white) and disorder spaces (in color)

judge shrinking cities, but also turn to how to deal with it, how to make a plan aimed at shrinkage cities.

In urban planning industry, when we are making a comprehensive plan for a city, if we predict that there will be more than 200,000 residents in the future, then this will justify us to plan more square kilometers urban space in the plan. The following steps are to design the road network, to design space layout, to manage urban function, then to plan urban infrastructure, and to ensure urban plan implementation. The comprehensive plan always follows the steps.

The predicted population growth scale in a comprehensive plan fundamentally decides the amount of land resource that this city could obtain for urban development

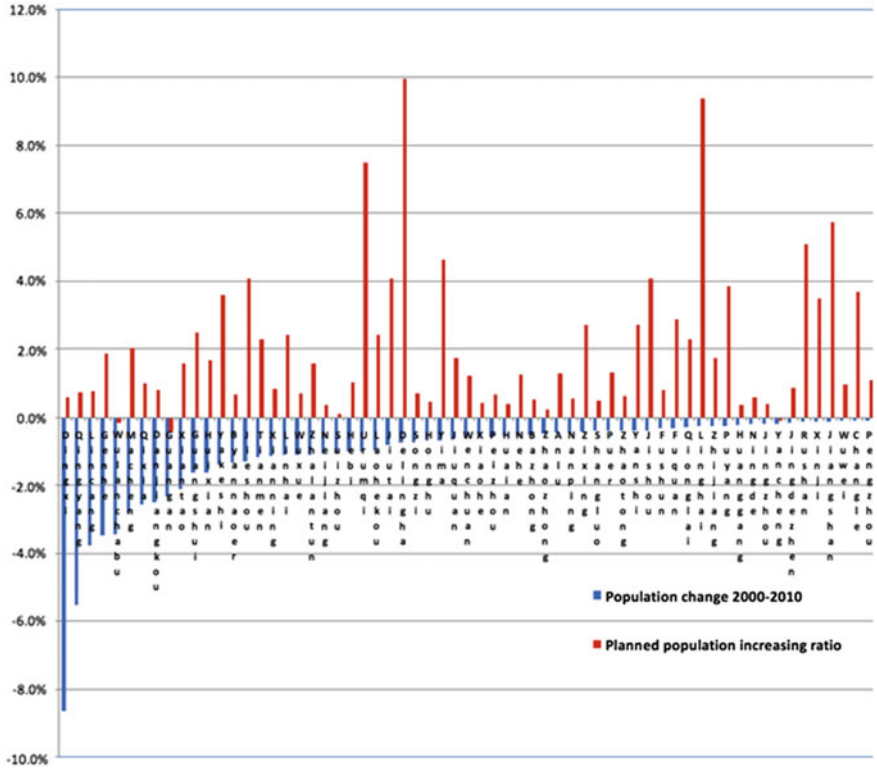

Fig. 12.34 The statistics of real population change and planned population change ratio in 63 cities

legally in the future. Therefore, I believe you could barely receive planning fee if you predict a city will have a population loss in the future.

Our planning method is traditionally growth-oriented. In 180 shrinking cities, we investigated 63 cities' comprehensive plan materials from open sources, discovering that their population is all predicted to be growing with no exception. In this picture, the red columns represent the growth rate of future population in a plan, while the blue columns present the rate of population loss in the last few years (Fig. 12.34).

This phenomenon indicates that the planned population in most shrinking cities also keeps growing. And many of our urban planners could not even be able to make plans without predicting population growth. Actually, this is not their problem, it is because that most standards and technical specifications in urban planning are based on growth-oriented paradigm. Therefore, the current situation is population shrinkage with expanding plans. I would suggest verse the planning for shrinking cities in China into the entrance examination of some official planning institutes. It would be quite challenging but necessary for future planners.

But we have already noticed the recent comprehensive plans of Beijing and Shanghai shows a new tendency on the population scale. So I am eager to find a donation to

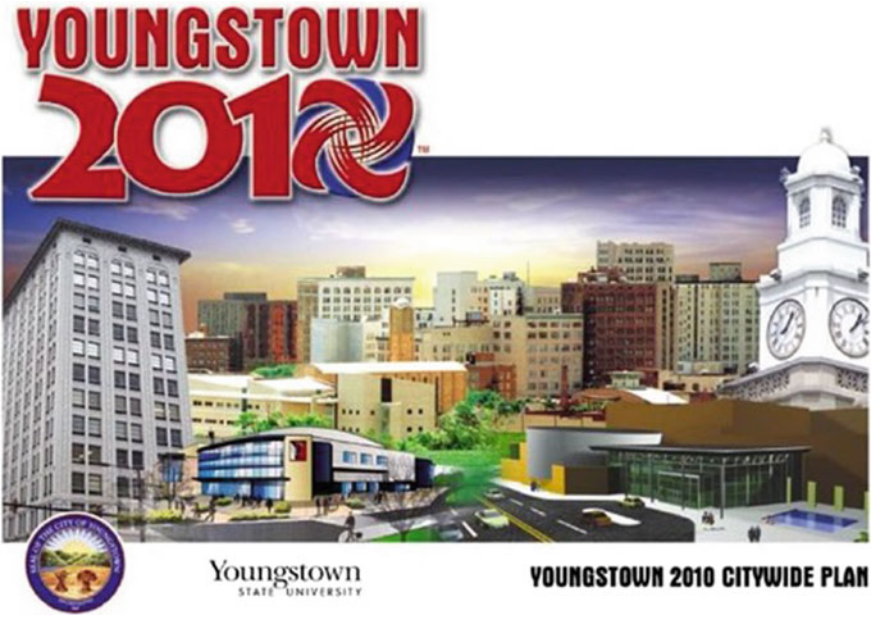

Fig. 12.35 Youngstown 2010 Citywide Plan

organize a workshop about shrinkage city. For example, we can recruit 100 students majoring in urban plan, letting them investigate shrinking city for half a month and do the urban design for it. This is aiming at making them familiar with shrinking cities, and pushing them to investigate proper urban planning strategy about it.

Some urban planning in other countries do not request population growth. For example, currently, Japan takes strategy to compact city— first they admit the fact that shrinking cities exist, then find appropriate way handling with a shrinking city on its features, but not reversing the situation with certainty. Taking Fukuyama, Japan for instance. Their population decreases a lot. The steps their government taking is simple, to collect population, through restricting and controlled public service area in a central city. Daily service remains in the central city or railway station or around traffic hub. Actually, the daily life of residents in shrinkage city should be ensured in order.

Just like the recent comprehensive plan of Beijing and Shanghai, we believe urban planning should come back to concentrate on ameliorating life quality of common people, not a beautiful blueprint. Some of the American cities proposed planning for shrinkage in recent years. But it does not appear in China, which I believe would achieve a bit change in 10 years. So this is the initial reason why I am standing here at this time, in order to provide an appeal, allowing more people to realize it (Fig. 12.35).

Of course,there is another kind of cities: beat shrinkage. At first step, they admit that their population is in low level, but not expecting further reducing. Leipzig in

Fig. 12.36 Photographs of Leipzig after people moving back to this city

German is such a city, whose government put the new policy into practice. They introduced BMW and Porsche into the city, and did other works just timely. In Germany World Cup, Leipzig was set as one of the cities to hold games. During that time, its population gradually rises these years. You can imagine the module that someday we implement such a big policy in one shrinkage city in China (Fig. 12.36).

To imagine more, I suddenly have an idea to create an institute especially for doing planning and design for shrinking cities in China. The institute could also be in charge of more specific and detailed parts, which is necessary and welcomed in shrinking cities in the USA. I guess you all know this work: housing demolition.

Why? In America, housing demolition is in such a situation. For example, I have an asset, a place which is an empty house, with an overgrown lawn and the house was covered by the tree, while another house's window is broken. What a local government generally do is to avoid residents left feeling frustrated by the vacant and decayed house, spending limited money to pull down them and turning them to green and public space. With the development of shrinkage city, the number of vacant buildings in some cities will increase. I believe this would be promising at home, just replacing concrete work from traditional housing removal module.

To summarize, our team not only does research on shrinking cities, but also investigates on many interesting themes about Chinese city system, urban space in Beijing and daily life. All the audiences present today, or prospective online readers and audiences, you are all welcomed to pay close attention to Beijing City Lab, exploring for a better urban life with us.

Chapter 13
Learning About Northeast China from the Close-up View of Shiling Town

Ying Long

Be quick, buy a few more coins. Let's keep this Three Kingdoms game continued.

Okay, I'll go to the boss to buy it. Hold it for a while!

This dialogue, taking place on the summer vacation after the 1995 High school entrance examination between me and my childhood playmates, still did not fade in my mind although it has been more than two decades since then. It was in my hometown, Shiling Town in the Siping City of Jilin Province. The childhood time I spent in the game halls, billiard halls, and video halls (commonly known as the "three halls" in Northeast China) in 1994 and 1995 often appeared in my mind years later.

In early 1994, my family moved to Shiling Town due to my father's work changes. I still remember that from the city of Siping to Shiling Town, there were dozens of kilometers to go over hills and mountains which took more than an hour's journey. Shiling Town is located in the mid-level areas as a branch of the Changbai Mountain and the Hada Ridge. As I used to live in the plain areas before then, the township of Shiling surrounded by low mountains has always been the best memories of the past days—especially the campus life in the white teaching building and the "three halls" entertainment on the street. In 1995, I graduated from the local junior high school to a high school in county and my family moved to Changchun with me. Since then I did not stay long in Shiling Town except for a visit to several junior high school teachers on the sophomore winter vacation in 1999. From 1995 to 1999, the overall social and economic outlook in my hometown did not make significant changes, leaving a few impressions on me.

This chapter was translated and modified from a report by a Chinese online media *The Paper*; its original Chinese version can be retrieved from https://www.thepaper.cn/newsDetail_forward_2009519?_t=t.

Y. Long (✉)
School of Architecture and Hang Lung Center for Real Estate, Tsinghua University, Haidian District, Beijing, China
e-mail: ylong@tsinghua.edu.cn

© Springer Nature Singapore Pte Ltd. 2019

Y. Long and S. Gao (eds.), *Shrinking Cities in China*, The Urban Book Series,
https://doi.org/10.1007/978-981-13-2646-2_13

Fig. 13.1 Relationship between Siping City and Shiling Town: Siping East Railway Station (high-Speed Rail Station) is 26 km away from Shiling Town Highway

Fig. 13.2 Shiling Town's urban spatial structure: The 303 national highway passes through the east and north of the town while the Simei Railway crosses the west of the town

On the winter holiday of 2018, I decided to pay a visit to my hometown, where I spent a year and a half of junior high school life. In the span of two decades, through the interview with two junior high school classmates, I have strongly witnessed, heard, and felt the great changes taking place in my hometown during my visit. These changes took place in cities of Northeast China, where we have experienced urbanization ahead of schedule and are currently experiencing a difficult developing period. It also occurred in small towns which were very close to the central city but were not sufficiently covered by the expansion of the center. According to our long-term research on the urban contraction and urban space quality in China, Shiling

Town is not a special case but reflects the phenomenon of a wide range of areas in Northeast China.

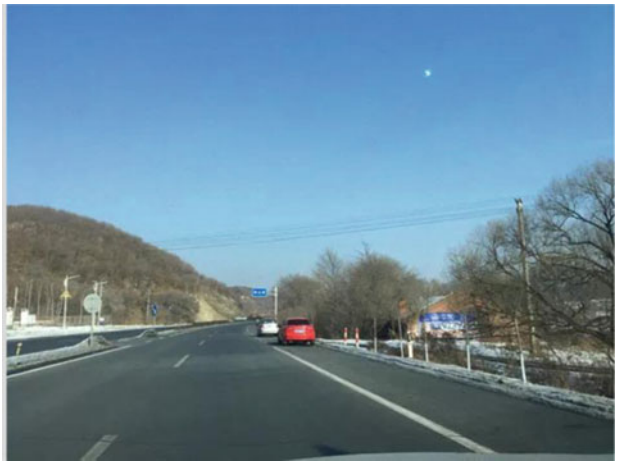

Fig. 13.3 National Road from Siping City to Shiling Town

Fig. 13.4 The entrance of Shiling Town

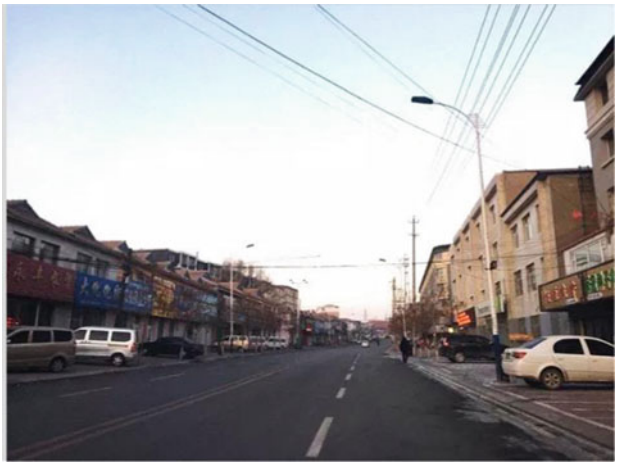

Fig. 13.5 Typical spatial style in Shiling Town

Fig. 13.6 Typical spatial style in Shiling Town

13.1 The Number of Junior High School Students Reduced by Half

The Shiling Town Middle School in Tiedong District, Siping City, which I used to attend, is divided into junior middle school and vocational high school. During the time I studied in the junior middle school in 1994 and 1995, the school included the second grade and third grade and had five classes and six classes, respectively. During this year's visit, I found that the school only has three classes in each grade,

which is less than half of what they used to have. The number of students in the third grade is currently about half of the number of students in grade one and grade two, which might be related to the strict management of the junior high school district. There used to be more than 1000 students when the student amount in my junior high school reached the maximum, but now they have only 400 students.

There are two reasons for the decrease in the number of students. On one hand, the total population appears a significant decreasing trend in the town and a number of villages. According to multisource Internet data, the population is about 50,000 in the whole town in 2006 and about 40,000 in 2012. On the other hand, with Shiling Township being designated in 2010 as the jurisdiction of the administrative district of Tieling City in Siping City, instead of the original Lishu County in Siping City, most students with economic foundations have moved to schools in Siping City. This phenomenon with Shiling Town students moving to Siping City for schooling did not seem to be so popular in the past due to the restrictions in various aspects such as parents' economic conditions, traffic conditions, and so on.

Fig. 13.7 The attendance record board in my junior high school

The decreased number of junior high school students is a direct indicator of the social phenomenon of aging and population shrinkage. After a half-day field survey, I felt that the town was not as lively and dynamic as in my childhood. Except for bus stops near National Highway 303 and the neighborhood around market, we seldom see people anywhere else, even at 2 pm or 3 pm on weekends. When we were visiting the hall of the train station, I found that there was no passenger or even staff and that was the first time I walked into a totally empty train station in my life.

Fig. 13.8 The train station is empty with not even a staff

13.2 Same Physical Space, Different Social Ecology

In addition to the reduction in population, a more significant change takes place in the residents' structure, which is an important characteristic of the social ecology. In the 1990s, most families are rooted in towns with family members engaged in nonagricultural work in the town. Almost all of the population working in town lived in the town.

Now time has changed. Taking my junior high schoolmate Su Minan as an example, after graduating from the Lishu Normal College, she returned to our junior high school as a teacher and now has been the secretary of the school's Communist Youth League committee. Although working in Shiling town, she lives in Siping City. Her child studies in the Siping Tiedong Middle School. Su commutes between the town and the city every day except one night stay at her parents' place in the town.

According to the field interview, people who currently work in institutions in the town such as government and schools, in other word, people who have decent jobs and stable economic income almost all tend to live in Siping City. The estimated proportion of this group of people is about 60–70%, people who work in institutions while still lives in the town mostly have their children already studying in college or engaged in work. Moreover, at the eastern suburbs of Siping City, on the way to Shiling town, there is a place known as Shiling Village. Many people living in Shiling Village are originally residents of Shiling Town and some still work in the town now.

This phenomenon is completely different from two decades ago. There are probably two main reasons: First, the transportation is much more convenient than before. The road winding up the mountain in the past is now straightened, taking only around 20 km ride directly to the center of Siping City. With the widespread use of private cars, driving for half an hour for commuting is no longer an obstacle. Meanwhile, institutions such as schools provide transportation allowance to their employees and pay for the highway charge of a round-trip between Siping City and Shiling Town. Second, the educational resources in Siping City are significantly better than that in Shiling Town. People taking formal jobs in the town but choosing to live in Siping City mostly want to get better education for their children. This has basically become the most important reason. I will further discuss it at the end of the article.

As a result of this phenomenon, most of the students studying in Shiling junior high school come from rural areas under the jurisdiction of Shiling Town. In this respect, the school built a dormitory specifically for rural students in 2013. When I was in school, there were few students who stayed in the school dormitory for schooldays. Nowadays, many rural students whose families are in better economic conditions even rent a house in the town for their rural parents staying with them.

Fig. 13.9 The Siping Prison near the Shiling Town's Railway Station still maintains the style of the past. In the past, there were always rumors of prisoners escaping spreading. Now it is said that the prison will be moved to other places

Fig. 13.10 Siping Prison near the Shiling Town's Railway Station

Nowadays, people who work in Shiling town choose to live in the Siping City, you might wonder who is currently living in the Shiling Town. Part of the residence in town is people who are working in town or already retired, whose children do not need to adopt education in Siping City. The other residents in town, as mentioned above, are people from rural areas around Shiling Town who come along with their children to accompany them for elementary or junior high school. There are also people engaging in trading business in town who rent the house from the original residents or directly buy a house in town by themselves.

This phenomenon of separated living and working in Shiling Town touched me the most. In the passing years, the entire social ecology in Shiling Town has almost completely changed, from the original town life to a partial reappearance of the agricultural society. People live here are not necessarily to be the people who work here, while people who work here mostly no longer live here. As the social ecology has changed, the local lifestyles and the needs of residents have also undergone great changes, suggesting the essential public services provided by the government to be quite different from the past. I am wondering if students in our generation are the last one who receive education in local primary or secondary schools with their parents working in the town. I am also considering the necessity of providing the so-called formal jobs in town in the future when the rural population drops radically and all the original residents in Shiling Town are aging or go to Siping City to spend their late days.

13.3 The Martyrs' Cemetery Is no Longer Being Repaired

When I was in junior high school, every year the school organized the students to sweep the tombs in the Martyrs' Cemetery located on the eastern edge of the town, which has become one of my important memories of junior high. During the visit to my hometown, I made a special trip to the Martyrs' Cemetery in memory of the martyrs and my childhood experiences. As seen from the distance, the monument stood still as ever. Approaching it gradually, I found the steps leading to the cemetery had already been broken. Stepping up through the stairs, I reached the site of cemetery which has been covered with weeds.

The reason is that people no longer worship cemeteries on Ching Ming Festival (also known as the Tomb-Sweeping Day) every year? According to the interviews with local people, the tombs in the Martyrs' Cemetery have been moved to another cemetery in Siping City in the early years. Since we graduated from the junior high school, this kind of activity in sweeping the tombs of the martyrs has been rarely organized. Su organized such an event last year after she became the secretary of the school's Communist Youth League Committee. I also proposed the repair and maintenance of the Martyrs' Cemetery since the social economy and people's living have been greatly improved. A lot of people mentioned that government funds had been an embarrassing topic that everyone consciously avoided talking about in Shiling Town. The current Tiedong District Government has few funds for Shiling

Town, while the Longhu District Government by which Shiling Town will be charged later has even less funding sources. Later observations through the visit to the town also confirmed this situation to some extent.

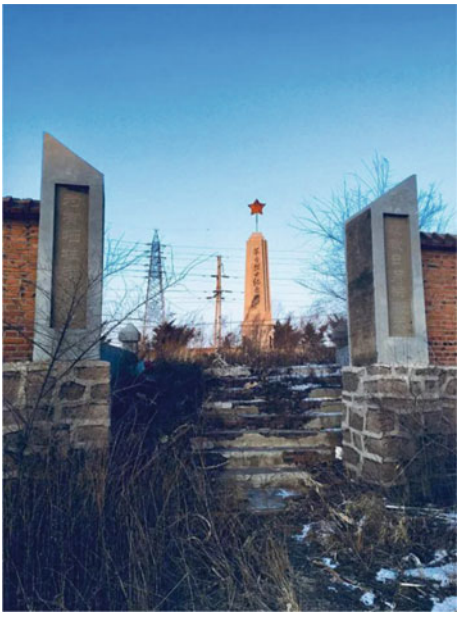

Fig. 13.11 The Martyrs' Cemetery that made the author sentimental

In the 1990s, Shiling Town had a full range of basic urban public services facilities, including cinemas, bus stations, train stations, food markets, shopping malls, different kinds of schools (vocational high schools, junior high schools, and elementary schools), banks, post offices, the three halls (game halls, billiard halls, and video halls), prisons, cement factories, and so on. In those years, the space and life in the town were much more prosperous than a county that I was familiar with in Inner Mongolia. However, through the visit this time, the situation in these two places has been completely reversed—Shiling Town is now falling behind too much in comparison to the other counties.

My research team is currently investing much energy in studying the dilapidation of urban space. Therefore, we also consider to get further supplement for our investigation this year and to treat Shiling Town as a typical subject in our research. On the whole, there are almost no projects under constructing in Shiling Town. Except for some residential buildings and the railway stations, most constructions have remained the same for more than 20 years. For example, the Central Elementary School is still a bungalow after all these years, and most of the buildings around the central intersections in the town were still the same as 20 years ago. The bungalows in the neighborhood of my house, with a relatively good location close to the bus

terminal, are still crowded with squatter settlements that have not been demolished. The food market has been so-called modified, so slightly with only one more railing added.

Fig. 13.12 Each of these residential buildings near the bus terminal has added a temporary part in front of them to increase living space compared with 20 years ago

The spatial style in the town reminded me of some shots in a film named Xiao Wu directed by Jia Zhangke. Su mentioned that the main roads in town were rebuilt last year, which made me start to imagine the shabby conditions of these roads before the renovation. In fact, during the writing process, I noticed that in the early years there had been someone complaining on Weibo about the roads in Shiling Town: "# Shiling Town, Siping City#; this is a street in Shiling town not far from the bus station. It is such a muddy road with rubbish piled up on it. I believe going out is the most painful thing every day for the residents living here. We are not calling for a wide and advanced road like the one in first-tier or second-tier cities. All residents want here is just the road can be as clean and tidy as possible. Please help spread out this situation. Hoping this issue can be reported to relevant departments and be resolved."

There used to be two cement factories in the town named the Siping Prison Cement Factory and the Private Cement Factory, respectively, both of which have now been closed down or relocated. The steel rolling factory owned by my schoolmate's family has also been closed and sold. The buildings on both sides of the streets in the town are rather old and worn out. Walked on the street I found that many shops and apartments are now empty with nobody operated or lived.

Fig. 13.13 The typicalworn-out space in the town: damaged roads, defects of curbs, lack of rubbish bins, wooden packages, and temporary windows

My schoolmate Li showed me around her two set of residences in the town. One set is a large house along the street which is fairly decent. This house is empty most of the time except when her parents return to the town to deal with some issues occasionally. Another set is an apartment in an old building located in the center of the city. The moon-shaped door at the gate of the building was obviously cracked, and the corridor was piled with debris. There are quite a lot of uninhabited households in the building. Li has rented out her apartment for 3000 or 4000 yuan/year. The current local real estate price has already been about 1,500 yuan/m^2, which lead to my suggestion that she should take the opportunity to sell these two residences in the town.

Fig. 13.14 The entrance of a residential area

Fig. 13.15 Internal corridor

As the five top towns in Lishu County and the first batch of the Top Ten Towns in Jilin Province (now also rated as the characteristic towns), Shiling Town was once prosperous with comparatively excellent space quality while now has declined. The developing path of urban spatial quality in Shiling Town is a typical case in representing some cities and towns in Northeast China. When Li was a child, she

used to live in a bungalow in the town, which was the main form of residence at that time (now is called the shanty towns). Later in 1992, Li's family moved to an apartment with better living conditions and heating supply (known as living upstairs in Northeast China as an important developing phase). It is a typical element in the developing path of the urban spatial quality in Northeastern China because of the striking difference between apartment buildings and bungalows in living conditions. As far as I know, the living upstairs movement of the county that I am familiar with in Inner Mongolia took place around 2003. We can probably draw a conclusion that even if we are comparing the small Shiling Town with a county, the development in Jilin Province on this aspect is obviously at least 10 years ahead of Inner Mongolia.

13.4 Blocked Mobility Between Social Classes

Make a living in Shiling Town is not easy. On a cold winter afternoon with temperature about −10 °C, I once again saw a mobile stall selling artificial converting popcorn in the open air, which was a common scene in my childhood. The conditions for the roasted sweet potato stalls are better, sheltered by a shed made by plastic sheets. These informal jobs may be the main source of income for a family, reflecting the hardships of making a living that some of the town residents are undergoing.

On the evening of my visiting day to Shiling Town, I attended a private meeting in Siping City and then visited a friend. I met my high school classmates at the meeting. Most of them have got a decent job in our hometowns, such as government civil servants, the staffs in the city or grass-rooted government mayors. The so-called formal jobs in the judgment of most people in Northeast China have given them a satisfying middle-class life. However, the friend I visited later after the meeting was obviously living in an upper-class style. He lived in a duplex house which is a few 100 m^2 large in a high-end community. There is a courtyard, multiple cameras monitoring both indoor and outdoor, gorgeous carving decoration of dragons and phoenixes inside the house, and a lot of pets to fill the spacious rooms. Lying in the bed that night, I reviewed the daytime activities again in my mind like replaying a movie. I got to know the life of the poor, the middle class and the upper class in Northeast China within a single day. The difference in the living standards between the three social classes was so significant that it profoundly impressed me how giant the gap was between the rich and the poor in Northeast China.

Fig. 13.16 A glimpse of the local informal jobs

Some time ago, a teacher participating in the undergraduate enrollment at Tsinghua University mentioned a characteristic in the sources of students enrolled at Tsinghua University in recent years. The proportion of students from large or medium cities with their parents ever engaged in higher education, fathers working as technical staff/enterprise managers/government civil servants, etc., and mothers being full-time housewives or freelancers has increased dramatically compared to 10 years ago. Conversely, students from rural areas or even small towns with parents in a general educational level and engaging in informal jobs are less likely to be admitted to famous universities.

Combining the social and spatial status I saw in Shiling Town with what I learn through working in Tsinghua University, I would like to talk about the possibility of realizing a promotion in social class in Northeastern China. According to my observations, the jobs that my high school classmates engaged mostly have correlations with their parents' jobs: a government civil servant whose parents are both civil servants, a teacher in the junior high school whose parents are both teachers. In other words, people may be more likely to engage in certain jobs that their parents used to do. As it comes to civil servants, currently there is a way that one can work in the government system first as an informal staff, and then pass the examination to obtain the formal employment, which I privately speculate to be a shortcut for the children of government staff becoming the successor to their parents' career. In fact, the most commonly mentioned topic at a dinner table in Northeastern China might be "getting a favor through social relationships." Our old class leader gave a vivid example at a gathering of my high school classmates in Beijing. He said that once upon a time when he was buying just some bottles of glass water in Northeast China, a person next to him told him not to buy them directly but to mention a certain name to get 1 yuan off for each bottle.

Just like in Beijing, in Siping City or Shiling Town, most families that have children engaged in kindergarten, primary, and secondary schooling revolves their

daily life around the education of the children. To attain better-educating conditions, these families choose to live in more advanced urban areas, send their children to higher level schools, buy houses located in so-called schooling districts(district with better education resources), and let their children participate in a variety of remedial classes. This is also an explanation of the statement above that a large number of mothers of advanced universities undergraduates (such as Tsinghua) do not take a job. In the past, the main duty of parents was to supervise their children to study hard; it now evolves to provide more comprehensive and superior conditions for their children to attain better study opportunities. As education is so closely related to economic conditions, the mobility between different social classes will be faced with great difficulties.

13.5 What Can We Do for Shiling Town Using Our Urban-Planning Profession?

Shiling Town was originally under the jurisdiction of Lishu County, Siping City, and was merged into the adjacent Tiedong District of Siping City a few years ago. It is said that the reason for this adjustment is that Siping City is expanding the urban jurisdiction to reach a certain standard for larger cities. Such spatial adjustments are widespread in all cities of China. What I used to be familiar with is mostly counties altered into cities or the cities altered into district. This is the first time I directly get to know the spatial adjustment at the level of townships and subdistrict offices. Space adjustments exist mostly in some shrinking cities, which make me speculate that these adjusting moves may be a way of covering the reality of the diminishing population at the statistical data level to some extent.

It is said that Shiling will engage in constructing characteristic towns to enhance its appeal. I am wondering whether this developing goal is proposed by the Mayor of the Shiling Town, the instruction of Tiedong District, or professional urban planners. One of my relatives working in the department of Siping City government basically expressed a negative view on this developing goal (it is said that a large urban-planning institute in China is now making a plan for Siping City). I talked with Su about this topic and expressed my worries about the future prospects of Shiling Town considering the shrinking population and the empty residences. As a junior high school teacher, Su suggested that the government should formulate a unified plan for the whole township and take some active measures such as upgrading the bungalow areas using governing forces, integrating the former residents into living in the buildings, and so on.

In turn, if you throw this question to the professional urban planners, how will they make the developing suggestions for Shiling Town? As passers-by who only stay in the townsite for a few days, how can the urban planners understand the prosperity and status of the town in the past as people who have lived here for a few years do? Without firsthand living experience in the town, how can the urban planners

make sure that they have enough knowledge to make a reasonable planning and urban design and to deal with the potential urban depression and decline? Moreover, whether the town has enough governance funds to support the high cost of urban planning and design is also a striking problem. For reference, I found a version of the master plan for Shiling Town on the website http://www.davost.com/case/detail/3859-758442d47b.html.

When I returned to work, I asked myself many times: What can I do to deal with the problem in the reality of Shiling Town by using my profession and discipline? I promised to my classmates that I would write an article reporting the recent status of Shiling through the media and take the chance to research on the worn-out urban spaces of the town. Li questioned me: "What can you do to make an actual change to the town's status?" One of my relative engaged in so-called science researches, who almost know nothing about the profession of urban planning and design, and has also repeatedly questioned and despised the work I was doing. There is a saying in the academia: Publish or perish. A well-known laboratory in a foreign university even believes in the dogma Deploy or Die. At the end of this article, I would like to raise my doubt again: as an intellectual, what can we do for the development of our hometown?

Acknowledgements Through this article, I would like to express my gratitude to the teachers in Shiling Town Junior high School in Tiedong District, Siping City. I still remember some names of my teachers: my Chemistry teacher Liu Xiuying, Geometry teacher Wang Shuming, Political teacher Li Shuhua, Physiological Health teacher Feng Zhongda, Physics teacher Liu Jie, English teacher Zhao Shujie, Chinese teacher Li Yingxin, etc. Their education moistens me like the spring rain in my childhood and continued to benefit me in the later 20 years of life.

I would like to thank my junior high schoolmate Li Ying for her accompany during my visit and her generous sharing of personal experience as a native resident, which reminds me of some memories in the town during junior high school. I would also thank Ms. Su Minnan, another schoolmate from my junior high who continued her teaching career in the high school, for a large amount of information she provided to me. Without the help of these two old friends, the article you are reading might not be formed.