New trends of urbanization in Sichuan and Chongqing: Urban agglomerations and administrative boundaries of cities

Hui Cao

Université Paris Diderot (Paris 7)
Sorbonne Paris Cité

École Doctorale 382
Économies, espaces, sociétés, civilisation, pensée critique, politique et pratiques sociales

Laboratoire CESSMA
Centre d'études en sciences sociales sur les mondes africains, américains et asiatiques

THÈSE DE DOCTORAT

Géographie

AUTEUR

CAO Hui

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devant le jury composé de :

M. DENIS Eric
Directeur de Recherche au CNRS

Mme MARIUS Kamala
Maître de Conférences HDR, Université de Bordeaux 3 (Rapporteur)

Mme MERING Catherine
Professeur des Universités, Université Paris 7-Diderot (Présidente du jury)

M. MORICONI-EBRARD François
Directeur de Recherche au CNRS (Directeur de thèse)

M. REBOUR Thierry
Maître de Conférences HDR, IUFM, Université d'Amiens (Rapporteur)

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Abstract

New trends of urbanization in Sichuan and Chongqing: Urban agglomerations and administrative boundaries of cities

Keywords: Urbanization, Sichuan, Chongqing, Chengdu, China, *e-Geopolis*.

Measuring and comparing urban population in different countries, including China, have been a well-known problem because the national statistical agencies of different countries may use different definitions of "urban populations." In this thesis, we use the *e-Geopolis* urban population statistics to uncover new trends of urbanization in Sichuan and Chongqing, two *shengji* divisions situated in the southwestern part of China, between 2000 and 2010. A novel approach of estimating population statistics, *e-Geopolis* uses a harmonized definition of urban population and thus its population estimates can be compared across different countries over time, irrespective of the actual definitions of urban population used by the national statistical agencies.

Our analysis shows that the urban population statistics estimated by *e-Geopolis* are very different from those reported by the National Bureau of Statistics, the official statistical agency of China. This comparison suggests that the official statistics can be misleading and can portrait an inaccurate picture of the actual extent of urbanization in China. For example, based on the *e-Geopolis* urban population statistics for Chongqing Zhixiashi and Sichuan Sheng, we find that the primacy index at *shengji* is higher. This situation can be explained by the concentration of capital in a labor-intensive economy where economies of agglomerations can reduce the costs of production. However, we cannot see the same patterns when we use the official urban population statistics provided by the National Bureau of Statistics.

Using *e-Geopolis*, we identify the larger urban agglomerations in Chongqing Zhixiashi and Sichuan Sheng and compare the urbanization patterns of the two largest urban agglomerations, Chongqing and Chengdu, between 2000 and 2010. We find that the Chongqing agglomeration was smaller than the Chengdu agglomeration, both in terms of agglomeration population and land area. Besides, between 2000 and 2010, the agglomeration population of Chongqing grew at a lower pace than that of Chengdu. Moreover, Chengdu's urban population was more concentrated within the *qu* whereas Chongqing's urban population scattered around different regions of the *qu*.

We also use the *e-Geopolis* urban population statistics to examine the relationship between urbanization, economic development, and migration. We find that the larger urban agglomerations did not necessarily have larger GDP or secondary sectors. In particular, the Chongqing agglomeration had a smaller population than the Chengdu agglomeration; nevertheless the former had a larger GDP as well as a larger secondary sector. On the other hand, we find that faster growing urban agglomerations seemed to attract more external migrants.

We view our results as the first step of using *e-Geopolis* to understand the urbanization patterns of China. When the complete set of *e-Geopolis* urban population statistics of China is available, it should be very useful for researchers and policy makers to better measure China's urbanization and also compare the urbanization experiences of China and other countries in the world.

Résumé

Nouvelles tendances de l'urbanisation au Sichuan et à Chongqing: Agglomérations urbaines et périmètres administratifs des villes

Mots-clefs : Urbanisation, Sichuan, Chongqing, Chengdu, Chine, *e-Geopolis*.

Mesurer et comparer la population urbaine dans différents pays, dont la Chine, est un problème récurrent lié au fait que les agences statistiques nationales des pays peuvent utiliser différentes définitions des termes « populations urbaines ». Dans cette thèse, nous utilisons la base de données *e-Geopolis* pour découvrir, entre 2000 et 2010, les nouvelles tendances de l'urbanisation au Sichuan et à Chongqing, les deux divisions *shengji* situées dans le sud-ouest de la Chine. Par une nouvelle approche de l'estimation de la population, *e-Geopolis* utilise une définition harmonisée de la population urbaine. Ses estimations de population peuvent être comparées dans différents pays et à différentes périodes, quelles que soient les actuelles définitions de la population urbaine utilisées par les organismes statistiques nationaux.

Notre analyse démontre que l'estimation statistique de la population urbaine réalisée par *e-Geopolis* est très différente des statistiques de la population urbaine réalisées par le National Bureau of Statistics, agence statistique Chinoise officielle. Cette comparaison laisse à penser que les statistiques officielles peuvent être trompeuses et donner une image inexacte de la réalité de l'urbanisation en Chine. Par exemple, selon les statistiques *e-Geopolis* de la population urbaine de Chongqing Zhixiashi et Sichuan Sheng, nous trouvons que l'indice de la primauté à *shengji* est plus élevé. Cette situation peut s'expliquer par la concentration du capital dans une économie de main-d'œuvre où les économies d'agglomérations peuvent réduire les coûts de production. Cependant, il n'est pas possible de retrouver les mêmes modèles, lorsque nous utilisons les statistiques officielles de population urbaine fournies par le National Bureau of Statistics.

En utilisant *e-Geopolis*, nous identifions les grandes zones d'agglomération urbaine à Chongqing Zhixiashi et Sichuan Sheng et comparons les modèles d'urbanisation des deux plus grandes zones d'agglomération urbaine, Chongqing et Chengdu, entre 2000 et 2010. Nous constatons que l'agglomération de Chongqing est plus réduite que celle de Chengdu, à la fois en termes de population et de superficie. Par ailleurs, entre 2000 et 2010, la population de l'agglomération de Chongqing a augmenté à un rythme inférieur à celui de Chengdu. En

outre, la population urbaine de Chengdu était plus concentrée dans le *qu* tandis que celle de Chongqing était dispersée dans différentes régions du *qu*.

Nous utilisons également les statistiques de population urbaine *e-Geopolis* pour examiner la relation entre urbanisation, développement économique, et migration. Nous trouvons que les grandes agglomérations urbaines n'ont pas nécessairement un PIB ou un secteur secondaire plus développé. En particulier, l'agglomération de Chongqing avait une population plus réduite que celle de Chengdu alors que la première avait un PIB supérieur ainsi qu'un secteur secondaire plus développé. D'un autre côté, nous constatons que les agglomérations urbaines en croissance rapide semblent attirer plus de migrants externes.

Nous considérons nos résultats comme la première étape d'une utilisation de *e-Geopolis* pour comprendre les modèles d'urbanisation en Chine. Nous pensons que l'ensemble des statistiques *e-Geopolis* de la population urbaine en Chine devrait être très utile aux chercheurs et aux décideurs afin de mieux mesurer l'urbanisation chinoise et de comparer les expériences d'urbanisation de la Chine avec celles d'autres pays.

摘要

四川与重庆城镇化的新趋势：城市聚集与城市之行政边界

关键词：城镇化、四川、重庆、成都、中国、*e-Geopolis*

鉴于不同国家对“城市人口”的定义有所不同，计算和比较不同国家（包括中国）的城市人口数据是一个众所周知的难题。本论文采用*e-Geopolis*的城市人口数据方法去研究中国西南部两大省级行政区—四川和重庆—在2000年至2010年之间的城镇化新趋势。作为一个新颖的城市人口计算方法，*e-Geopolis*采用一个统一的城市人口定义，因此其城市人口数据能在不同国家不同时期加以比较，且不受不同国家统计机构采用的城市人口定义所影响。

我们的分析显示，*e-Geopolis*统计出来的城市人口数据与国家统计局提供的城市人口数据差别很大。这个比较意味着官方数据可能存在误导性，并且不能反映中国城镇化的实际情况。例如，根据*e-Geopolis*统计的重庆直辖市和四川省的城市人口数据，我们发现省级的首位度比较高。这个现象是由于在一个劳力密集的经济内，资本集中能让聚集经济降低生产成本。但是，当我们利用国家统计局提供的官方城市人口数据，我们观察不到相同的现象。

通过*e-Geopolis*，我们鉴定了重庆直辖市和四川省内较大的城市聚集，并比较了其最大的两个聚集—重庆和成都—在2000年和2010年之间的城镇化模式。我们发现重庆聚集在聚集人口和面积较成都聚集的小。其次，在2000年和2010年之间，重庆的聚集人口增长速度较成都的慢。另外，成都的城市人口集中在市辖区内，而重庆的城市人口则分布不同的市辖区。

我们也采用了*e-Geopolis*的城市人口数据去研究城镇化、经济发展和迁移之间的关系。我们的分析指出人口较大的聚集未必有较大的GDP和第二产业：重庆聚集虽然比成都聚集小，但前者有更高的GDP和第二产业。另外，人口增长较快的聚集看来能吸引更多的外来人口。

我们认为本论文的发现是作为采用*e-Geopolis*数据去分析中国城镇化的第一步。我们相信当整个中国的*e-Geopolis*数据统计出来之后，这些数据将有助研究人员和政策制定者在衡量中国的城镇化及比较中国和其他国家在城镇化的经验上起到很大的作用。

Contents

General Introduction

According to the 2012 version of the China Statistics Yearbook published by the National Bureau of Statistics of China, the share of the Chinese population residing in urban areas has been increasing for the past several decades; for the first time in 2011, the urbanization rate of China exceeded 50%. Being a country with the largest population in the world and the second largest economy after the United States, China's urbanization has attracted a lot of attention from researchers in different disciplines and international organizations. They are interested in a number of different issues about China's urbanization, such as the underlying mechanisms of urbanization, the migration patterns, the institutions that facilitate or deter the realization of urbanization, the relationship between urbanization and economic development or the relationship between urbanization and the environment.

The problem of measuring urban population

To answer questions concerning the urbanization of a city or a country, we need to know how urbanized the city or the country studied is. Therefore it is important for us to have access to high-quality population data. At the international level, researchers often make use of the urban population statistics obtained from the World Urbanization Prospects, a report compiled by the Department of Economic and Social Affairs, Population Division of the United Nations. Strictly speaking, the World Urbanization Prospects is not an original data source; instead, it is just a *recollection* of the urban population statistics provided by the national statistical agencies of different countries. For example, the Chinese population statistics are provided by the National Bureau of Statistics and the French population statistics are provided by the Institut National de la Statistique et des Études Économiques.

Since different countries may use different definitions of "urban population" or the same country may revise the definition over time, it is difficult if not impossible to use the urban population statistics in the World Urbanization Prospects to compare the urbanization trends across different countries and over time. Other similar international urban population databases also suffer from the same data problem. This data problem has raised the concern about the accuracy and the comparability of different urbanization studies. More importantly, the use of these data may lead to wrong conclusions and policy implications for government officials.

The above problem of measuring urban population also exists in China. In fact, compared with other countries, measuring urban population in China is even more complicated because of at least three additional issues. First, there are different definitions of populations, including household registration (*hukou* or *huji*) population (户籍人口), resident population (*changzhurenkou*, 常驻人口), and census populations (*pucharenkou*, 普查人口). In population censuses, the concept of "urban population" is properly defined according to different criteria. For non-census years, "urban population" is defined more informally. For instance, according to China Statistics Yearbook, "urban population" refers to the people residing in cities and towns while "rural population" refers to the population other than urban population. Apart from this simple description, there is no further explanation about how urban population is actually calculated. When "urban population" statistics cannot be found in official statistics yearbooks, some researchers take the non-agricultural population as an estimate of the *de jure* urban population. It is because the non-agricultural population counts the number of people who have the non-agricultural *hukou* status, and most of these *hukou* holders live in urban areas. However, strictly speaking, "urban population" and "non-agricultural population" are not directly comparable.

Second, different definitions of "urban populations" are used in different population censuses. Consider the two most recent population censuses in 2000 and 2010. The definitions of "urban population" were similar in the sense that, in terms of spatial coverage, the basic unit for counting urban population was urban districts with population density over 1,500 persons per square kilometre; in areas with density below 1,500 persons per square kilometre, the basic units for counting urban population were townships (*xiang*, 乡), towns (*zhen*, 镇), and streets (*jiedao*, 街道). Nevertheless, there was a slight difference between the definitions of "urban population" used in the two censuses: The 2010 Population Census included all urban residents meeting the criterion for the 2000 Population Census, plus the residents living in villages or towns in outer urban and suburban areas that were directly connected to municipal infrastructure and receive public services. Given the different definitions of urban population, we cannot directly compare the urban population statistics obtained from these two censuses.

Third, administrative boundaries of geographical units often change. One example, which will be examined in greater details later, is the promotion of Chongqing Shi from a prefecture-level city (*dijishi*, 地级市) to a centrally-administered city (*zhixiashi*, 直辖市) in 1997. The change in administrative hierarchy was coupled with the inclusion of two cities and one district from Sichuan Sheng (namely, Wanxian Shi, Fuling Shi, and Qianjiang Qu). When these units were merged into the "Old" Chongqing Shi to form the "New" Chongqing Shi, there was a large yet mechanical increase in total land area and population: Land area increased from 23,000 square kilometres to 82,000 square kilometres; total population increased from about 15 million to over 30 million. In such a case, it would not be meaningful to compare the urbanization rate of Chongqing Shi in 1996 (i.e., the "Old" Chongqing Shi) and that of Chongqing Shi in 1997 (i.e., the "New" Chongqing Shi). It would also not be meaningful to compare the urbanization patterns of Chongqing Shi and another city, say Chengdu Shi, before and after Chongqing Shi's promotion. Indeed, changes of administrative boundaries are also observed at a more microscopic level. For example, some county-level divisions (*xianji xingzhengqu*, 县级行政区) were converted from counties (*xian*, 县) to county-level cities (*xianjishi*, 县级市) with additional land areas. Therefore, strictly speaking these divisions before and after the conversion were different.

These three additional issues make the estimation of urban population and comparison of such statistics over time much more challenging. Nevertheless, some researchers have proposed various methods of revising the official urban population statistics so as to compute a set of comparable urbanization statistics over time. These methods are based on linear interpolation or assumptions about changes in urban and rural populations. However, the accuracy of these revised urban population statistics relies on the validity of the methods or assumptions used. Even if these assumptions are valid, the revised urban population statistics still may not be able to be compared with other international urban population statistics. Therefore, studies of China's urbanization based on these official statistics (either "urban population" or "non-agricultural population") or the revised versions of these statistics can be problematic, and we need to be cautious when we interpret the findings and policy suggestions of these studies.

Using *e-Geopolis* to estimate urban population

To overcome the problems of measuring and comparing urbanization data in different countries, François Moriconi-Ebrard created the *Geopolis* database in the 1990s, which is further updated and is now under a new name, *e-Geopolis*.[1] It is by far the most comprehensive urban population database among existing databases in terms of its historical scope, its geographical scope, and its level of completeness.

The main idea of *e-Geopolis* is to use a harmonized definition of urban agglomerations in order to produce urban population statistics that are comparable across countries and over time. Human geographers consider an urban agglomeration as a dense contiguous set of

[1] Throughout this thesis, we will use the terms "Geopolis" and "*e-Geopolis*" interchangeably unless otherwise specified.

built-up areas. Under *e-Geopolis*, contiguity is defined using a threshold of 200 metres between buildings, except for water bodies crossed by bridges, parks and major transport infrastructure (such as highway junctions, car parks, and airports, etc.). An agglomeration is considered as urban if the total population of the local units it covers exceeds 10,000 inhabitants. Therefore, an *e-Geopolis* urban agglomeration may be a rural area or an urban area according to the official definition of urban area used by the country where the agglomeration is located.

e-Geopolis requires three kinds of data in order to estimate urban population: Population censuses, gazetteers or maps, and satellite images. The estimation of urban population comprises three basic stages. First, data from population censuses are mapped with geographical coordinates from a database that contains the local units. The populations of these local units are estimated for harmonized dates based on census data. Second, the land surface is systematically analyzed to identify all the agglomerations. Urban perimeters are digitized using recent satellite images (such as Google Earth) of the agglomerations. Third, the polygons so obtained are then superimposed on the database that contains the local units' geographical coordinates with their names and population figures.

By applying the same method in different countries, we can estimate urban population statistics in a consistent way so that these statistics are comparable across countries and over time, irrespective of the actual definitions of "urban population" used by the countries studied.

Focus of this thesis

A large body of research on China's urbanization has focused on the urbanization process of China at the national level. However, China is a large country with a land area over 9 million square kilometres and a population over 13 billion inhabitants. It is reasonable to expect that inequality exists across different parts of the country (such as between coastal and inland areas), in terms of social and economic development. Therefore, to the extent that urbanization of a region is related to its social and economic structure, one would expect that there are huge regional differences in urbanization, migration, and economic development. Unfortunately, national-level studies are unable to provide insights for us to understand these issues.

In the extant literature, few researchers have studied China's urbanization at the sub-national level. One of the main reasons is the lack of high quality data on urban population statistics due to the changing definitions of urban population and urban administrative areas over time. Without high quality data, it would be difficult for researchers to draw conclusions about the relationship between urbanization and other related issues at the sub-national level.

In this thesis, we will apply the *e-Geopolis* method to estimate the urban population of

Chongqing Zhixiashi and Sichuan Sheng, two *shengji* divisions located in the southwestern part of China. We will also compare the urban agglomerations of these two units, including their respective largest agglomerations, namely, the Chongqing agglomeration and the Chengdu agglomeration. This comparison serves the purpose of uncovering new trends of urbanization in these two units and illustrating how the novel way of measuring urban population statistics by *e-Geopolis* can be used in the context of China.

There are two main reasons why we focus on the agglomerations in Chongqing Zhixiashi and Sichuan Sheng. The first reason is about their complicated historical, economic, and political backgrounds. Chongqing Shi and the provincial capital of Sichuan Sheng (i.e., Chengdu Shi) are the two largest cities in the southwestern part of China. These two cities had long histories and had been the political and economic centres of the region for a long period of time. The importance of Chongqing Shi was further emphasized after its promotion in 1997 to Chongqing Zhixiashi, with the equivalent status as a *sheng* in the administrative hierarchy of China. In the initial years since the economic reform era began in 1978, the central government put more emphasis on the development of such coastal areas as Guangdong Sheng and Zhejiang Sheng while the inland provinces received less attention. Since Chongqing Shi and Chengdu Shi were situated in the western part of China, they and other inland areas did not enjoy much from the early economic reforms in China. One impact was that a lot of the people from Sichuan Sheng and Chongqing Shi migrated to the coastal provinces to seek better job opportunities. Only after 2001 when the government introduced the so-called “Open Up the West” campaign did we see a reduced development inequality between the western part and other coastal areas. Chongqing Zhixiashi and Sichuan Sheng together had been one of the most populated areas in China. As of 2010, the combined population of Chongqing Zhixiashi and Sichuan Sheng was about 109.26 million, or about 8.16% of the total population in China. The income inequality between Chongqing Zhixiashi and Sichuan Sheng (at least before the “Open Up the West” campaign) and other coastal areas encouraged the workers there to migrate to other higher-income areas. Between 1995 and 2010, the total migrants moving out of Chongqing Zhixiashi and Sichuan Sheng were over 15 million. However, in the presence of the *hukou* system, people could not migrate freely across the country, especially from rural areas to urban areas. Therefore, the urbanization of Chongqing Zhixiashi and Sichuan Sheng is related to not only the industrialization of these two regions, but also the administrative hierarchy and the *hukou* system. Understanding the urbanization patterns of the agglomerations in Chongqing Zhixiashi and Sichuan Sheng against such a complex background by itself is an interesting research question.

The second reason is more of a practical issue. While *e-Geopolis* uses a standardized way to estimate urban population and in principle it can be used in different countries to obtain comparable urban population statistics, its application in the Chinese context is not straightforward. Our estimation of *e-Geopolis* urban population statistics is based on the official population statistics at the township-level divisions (*xiangji xingzhengqu*, 乡级行政区) in the 2000 and 2010 Population Censuses. One great challenge for our estimation is that there were many changes in the number of *xiangji* division and the compositions of townships (*xiang*, 乡), towns (*zhen*, 镇), and streets (*jiedao*, 街道) over time. The changes in the *xiangji* divisions during this period can be classified into different types, involving cancellation, merging, or renaming of existing divisions or creation of new divisions. These changes complicate the estimation of urban population in *e-Geopolis* because we have to check carefully these changes in order to link the 2000 and the 2010 *xiangji* divisions to generate consistent urban population statistics in these two census years. While many of these changes were promulgated through government documents which in general can be found in the internet, there are cases in which online government documents cannot be located so that secondary sources have to be consulted. Given the complexity of the changes in *xiangji* divisions and the time required for a thorough manual check for the consistency of the official population data from the 2000 and 2010 Population Censuses, we will mainly focus on the larger agglomerations (with population above 200,000 inhabitants as of 2010) in Sichuan Sheng and Chongqing Zhixiashi. We will also do a more elaborated comparison of the Chongqing agglomeration and the Chengdu agglomeration to illustrate how the *e-Geopolis* method is used in the Chinese context.

Two important institutions that affect China's urbanization

To understand the urbanization of Sichuan Sheng and Chongqing Zhixiashi requires some background knowledge about two important institutions, namely the administrative hierarchy (*xingzhengquhua*, 行政区划) and the household registration (*hukou*, 户口) system.

The administrative hierarchy system has strong effects on the development of local territorial units in the country. Under the system, a territorial unit can only directly interact with those that are immediately above or below it in the administrative hierarchy, and a lower-ranked unit is a "subordinate" to the unit above it. As a result, a local county, for instance, can only interact with the central government by going through all the superior units. The rank of a place or a unit in the administrative hierarchy affects how it can carry out its social, economic, and political functions. Generally speaking, the higher a unit rises along the administrative hierarchy, the more decision authority it can obtain. Therefore, during the economic reform era, the local governments have strong incentives to upgrade themselves in order to enhance their economic growth. As urbanization is closely related to economic development, the administrative ranking of a city has a great influence on its urbanization process.

On the other hand, the *hukou* system of China is designed to restrict the mobility of people across the country, especially from rural areas to urban areas, in order to fulfill the different political and economic needs of the government. It is operated by requiring that all internal migrations be subject to approvals from the local authorities at the destinations. This system therefore greatly affects the urbanization process since after all, urbanization is realized through the migration of people from rural areas to urban areas.

These two systems are particularly relevant for our discussions of the urbanization of Sichuan Sheng and Chongqing Zhixiashi because before 1997, Chongqing Shi was part of Sichuan Sheng. Both of Chongqing Shi and Chengdu Shi (the provincial capital of Sichuan Sheng) were *dijishi* in the administrative hierarchy. After 1997, Chongqing Shi was separated from Sichuan Sheng and promoted as Chongqing Zhixiashi, with a status equivalent to a *sheng* in the administrative hierarchy. Such a change inevitably affected the division of administrative powers and economic developments of Sichuan Sheng and Chongqing Zhixiashi. On the other hand, Chongqing Zhixiashi and Sichuan Sheng were inland regions and did not enjoy the initial successes of the economic reform. A lot of the people from these regions migrated to coastal regions to seek better job opportunities. However, under the *hukou* system, the mobility of these migrants was affected, especially when they moved from rural areas to urban areas. Therefore, the urbanization of Sichuan Sheng and Chongqing Zhixiashi was related to not only their industrialization but also the administrative hierarchy and the *hukou* system, and thus it is necessary to understand some background information about these two special institutions.

Summary of the main results

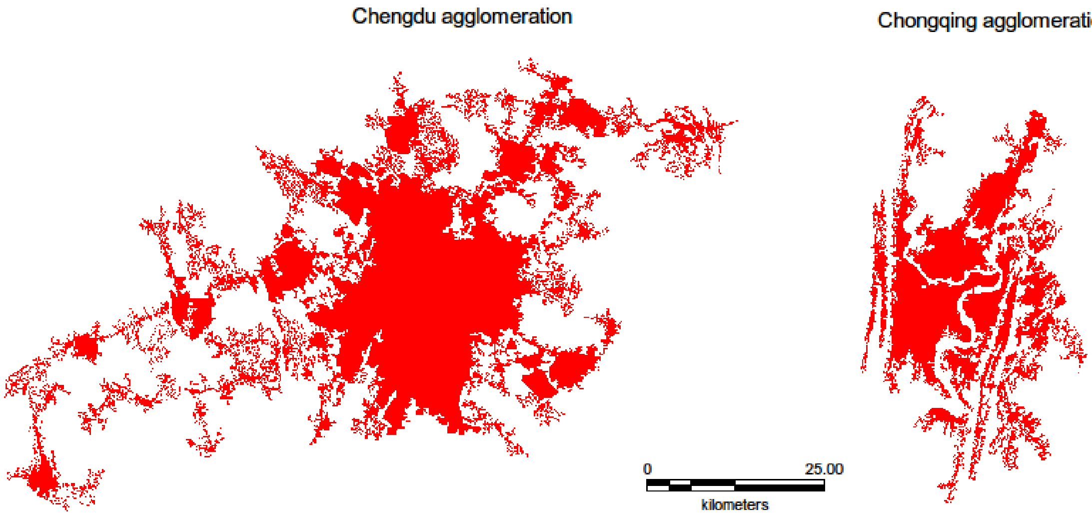
Using the urban population statistics from *e-Geopolis*, we uncover new trends of urbanization in Chongqing and Sichuan. Specifically, we identify 10 urban agglomerations in Chongqing Zhixiashi and another 18 urban agglomerations in Sichuan Sheng, each of which had a population over 200,000 inhabitants in 2010. Among them, the Chongqing agglomeration and the Chengdu agglomeration were the largest. We first compare the agglomeration population estimated by *e-Geopolis* and the official urban population statistics published by the National Bureau of Statistics in 2000 and 2010. We find that, except for Chengdu agglomeration in 2010, there were huge differences between the two sets of urban population statistics for the other agglomerations: There were cases of both over-estimation and under-estimation, and in some cases the differences were quite substantial. Moreover, based on the *e-Geopolis* urban population statistics, we found that the primacy index at *shengji* is higher. This situation can be explained by the concentration of capital in a labor-intensive economy where economies of agglomerations can reduce the costs of production. However, we cannot see the same patterns when we use the urban population statistics provided by the official statistical agency, the National Bureau of Statistics. This comparison suggests that the official population statistics at the sub-national level can be misleading. Therefore the findings by the studies using these sub-national urban population statistics should be interpreted with cautions. In a broader perspective, the comparison of the official and *e-Geopolis* urban population statistics suggest that urbanization studies based on official urbanization data are limited by the administrative boundaries of cities, whereas using *e-Geopolis* data allows us to uncover new trends of urbanization of agglomerations (rather than "cities").

Comparing the two major agglomerations in Chongqing Zhixiashi and Sichuan Sheng, the Chongqing agglomeration and the Chengdu agglomeration, we find some differences in the urbanization patterns between them as of 2010. First, the Chengdu agglomeration was larger, in terms of population and agglomeration area, than Chongqing agglomeration. In 2010, the Chengdu agglomeration had a population of about 9,730,000 inhabitants and occupied about 1,411 square kilometres; in contrast, the Chongqing agglomeration had a population of about 5,025,000 inhabitants and had a land area of about 539 square kilometres. While the "heights" of the two agglomerations were roughly the same, the "widths" of the Chengdu agglomeration was more than double that of the Chongqing agglomeration with signs of urban sprawl. (See Figure 1.) In terms of annualized growth rates between 2000 and 2010, the agglomeration population of Chengdu increased by about 3.30% per year while that of Chongqing increased by about 1.93% per year.

Second, within Chongqing Zhixiashi, there were a few other urban agglomerations in its city district (*shixiaqu*, 市辖区), including the agglomerations of Banan, Wanzhou, Yongchuan, Fuling, Hechuan, and Cheng Jiang (which was within Beibei Qu). On the other hand, within the administrative boundaries of the Chengdu Shi, there was only one other urban agglomeration in Chengdu Shi's city district, which was Pengzhou. In other words, the urban population within the official administrative boundary of Chengdu Shi was more concentrated within two large agglomerations whereas the urban population within the official administrative boundary of Chongqing Zhixiashi was distributed among several large agglomerations.

Third, we also use the *e-Geopolis* urban population statistics to examine the relationship between urbanization, economic development, and migration. Our analysis suggested that

Figure 1: Chongqing and Chengdu agglomerations on a map with the same scale



Source: *e-Geopolis*.

the larger urban agglomerations did not necessarily have larger GDP or secondary sectors. Specifically, the Chongqing agglomeration, being smaller than the Chengdu agglomeration, had a larger GDP as well as a larger secondary sector. On the other hand, faster growing urban agglomerations seem to attract more external migrants.

Outline of this thesis

Chapter 1 is a review of the related literature. In this chapter, we will first discuss some theories of urbanization and international patterns of urbanization. We then discuss a few international urban population databases that are commonly used by researchers, including the World Urbanization Prospects and Global Rural-Urban Mapping Project. These databases are problematic in the sense that they are unable to provide reliable and consistent urban population statistics across countries and over time.

In **Chapter 2**, we will explain the background and the methodology of the *e-Geopolis*, an approach which can overcome the problems of measuring and comparing urban population statistics. We will use the urban population statistics estimated by *e-Geopolis* for our analysis in Chapter 4.

In **Chapter 3**, we will discuss a number of background issues and patterns related to the urbanization in China. Apart from discussing the problems of measuring urban population in the Chinese context, we will also discuss two institutional features of China that affect the urbanization process, migration, and city growth, namely the administrative hierarchy and the household registration (*hukou*) system.

In **Chapter 4**, we will use the *e-Geopolis* urban population statistics to examine the urbanization of Sichuan and Chongqing between 2000 and 2010. We will first discuss the history and geography of Sichuan and the social, economic, and administrative structures of Chongqing Shi and Chengdu Shi. We will then discuss some practical issues related to the application of *e-Geopolis* in the Chinese context. Next, we will present results about the urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi, and focus the attention on the two largest urban agglomerations, the agglomerations of Chengdu and Chongqing. We will also use the urban population statistics estimated by *e-Geopolis* to examine the relationship between urbanization, economic development, and migration for the urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi.

Finally, **Chapter 5** will summarize the results of this thesis. We will also discuss some limitations of our analysis and discuss some possible future extensions.

Chapter 1
Literature Review

1.1. Introduction

Urbanization is the process in which there is an increasing number of people living in urban areas. This phenomenon is strongly linked to income growth and industrialization of the urban areas. In a standard urbanization model, the higher firm productivity and wages in urban areas are usually accompanied by an expansion of the urban populations because workers in rural areas usually get lower wages and they are attracted to the cities to work for more productive and better paid firms. The initial stages of industrialization often appear in larger cities rather than remote rural districts because the former usually have better infrastructure or better access to the international market. However, at a later stage when the initially larger cities grow even larger, the industrial activities usually move to the nearby satellite cities where the firms can reduce the labor and land costs. In Chapter 1.2 we will review several theories of urbanization which have been used by geographers, sociologists, political scientists, and economists. These theories include the modernization theory, the dependency theory, the urban bias theory, and the dual-sector and rural-urban migration models. While these theories focus on different aspects and are based on different assumptions, one common implication is that as the urban areas become more developed, rural-urban differences will be created, attracting rural workers to migrate to the urban areas and resulting in increased urbanization.

How do these theories of urbanization explain the actual urbanization patterns? In Chapter 1.3, we will present some international patterns of urbanization, including the relationship between urbanization and economic development, the evolution of world urbanization, and changes in urban agglomerations. Based on the urbanization data extracted from the World Urbanization Prospects (The 2011 Revision) — a report compiled by the Department of Economic and Social Affairs, Population Division of the United Nations (2012), we do observe a positive relationship between urbanization and economic development (measured by GDP per capita). Besides, we observe an upward trend of urbanization between 1950 and 2010 in the world as regions of different levels of economic development. These trends are expected to persist in the next four decades.

The data contained in the World Urbanization Prospects are based on the population statistics provided by the national statistical agencies in different countries and therefore it is not a data source by itself but is just a *recollection* of data.[2] Other than the World Urbanization Prospects, a number of international urban population databases have been constructed and used by researchers in different disciplines. In Chapter 1.4, we will briefly discuss these databases. First, we will review some urbanization databases mainly used by historians and geographers, including Davis (1969), Chandler and Fox (1974), De Vries (1984), and Bairoch, Batou, and Chèvre (1988). We will then discuss two other more recent international urban population databases: Apart from the World Urbanization Prospects, we also discuss the Global Rural-Urban Mapping Project (GRUMP) by the Center for International Earth Science Information of the Columbia University. Finally, we will discuss a few population databases created by French researchers.

Although different urban population databases are available for use by researchers, studies using these different databases are usually not comparable. There are several issues complicating the comparison of studies using urbanization data from these different sources. For example, what is the unit of analysis? Some researchers prefer to use the "city" as the basic unit while some others prefer "urban agglomerations" or "metropolitan area." Another example is about the definition of "urban" and "rural" areas. The different definitions of the basic unit of analysis suggest that cross-country comparisons of urbanization data are difficult if not impossible. In Chapter 1.5, we will also discuss the problems of measuring and comparing urban population data in greater details.

[2] See Moriconi-Ebrard (1994) for critiques of this data source.

1.2. Theories of urbanization

There is a large literature examining the causes and dynamics of urbanization. Here we review several types of theories used by geographers, sociologists, political scientists and economists, including the modernization theory, the dependency theory, the urban bias theory, and the dual-sector and rural-urban migration models. These theories are useful in understanding the urbanization experience of developing countries such as China.[3]

1.2.1. Modernization theory

The modernization theory of urbanization emphasizes the evolutionary nature of cities. This theory is based on three main assumptions. First, the development and urbanization of any given society is closely related to the situation of the society at the beginning of the modernization process. Second, compared with the society's social organization, technology is a more important determinant of urbanization. Third, cultural diffusion will lead to an eventual convergence in the urbanization patterns in the developed and developing countries, even though it may create uneven development.

While this theory allows for the constraints that were in place prior to the beginning of modernization or other social or cultural differences, it also takes the view that technology can possess a systematic logic that can override the original forms of social organization and set up a new institutional matrix (Kerr et al., 1960; Hawley, 1980).

According to this theory, urbanization is not possible without industrialization (Berliner, 1977). As the society becomes more modernized, there are systematic changes in different aspects of the society such as values and infrastructures. For the developing countries, due to the lack of resources at the initial stages of modernization, emphasis of the development can only be put in one or a few larger cities (Alonso, 1980). Therefore, there are relatively fewer opportunities in rural areas than in the larger cities targeted for development. As a result, rural-urban differences are created and attract people in rural areas to migrate to cities. Although the rural migrants may create a burden to the cities in terms of infrastructure, housing, employment, and social services, this theory treats such conditions as temporary; as modernization continues, there will be better integration among different regions which eventually will smooth the course of social changes.

[3] For a more detailed review of the first three theories, see, for example, Kasarda and Crenshaw (1991).

1.2.2. Dependency theory

A limitation of the modernization theory is its failure to account for the conditions and consequences of urbanization, especially the underdevelopment problem (e.g., Frank, 1967; Wallerstein, 1974, 1980). An alternative theory, known as the dependency theory of urbanization, was proposed. This theory has three main assumptions. First, a unique capitalist development pattern exists. Second, capitalism requires a certain type of social structure characterized by unequal exchange, uneven development, individual inequality, core-periphery hierarchies, and dominance structures. Third, social organization, technology, and population dynamics are endogenous facts in development and urbanization and are constrained by exogenous forces (Timberlake, 1987).

According to this theory, the structures and the processes of capitalism are viewed as the prime causes of the social changes. This pattern can in general be observed in the developing countries. For example, over-urbanization in developing countries are due to such activities as capital-intensive manufacturing owned by foreign investors and enclosure of farm lands for the production of goods exclusive for exports. Therefore, the developed countries and the developing countries are connected through a network where the former countries take advantage of the latter countries. Besides, within the developing countries, the development is skewed in such a way that it can reinforce the highly unequal social structure demanded by the capitalist systems in developed countries (e.g., Cohen, 1981; Douglass, 1988). It will lead to job creation in the urban areas in the developing countries. As a result, rural workers are attracted to the urban areas to fill up these positions.

1.2.3. Urban bias theory

Another approach to understanding the urbanization process is the urban bias theory, pioneered by Lipton (1977). This theory focuses more on political considerations rather than economic considerations. It is based on three basic assumptions. First, the political institutions are more powerful than the economic and other institutions in determining the development of a country. Second, coalitions are organized to exert pressure on the government or to dominate its composition in order to influence the legal system which in turns help divert resources to the members of the coalitions. Third, such kind of coalition building can exist in any kind of economic regime.

According to Lipton (1977), the elites of the developing countries rely heavily on the urban resources and they will prefer policy initiatives that favor the development of urban areas at the expense of the rural areas. They achieve their goals through either political representatives lobbying the government officials or directly participating by becoming government officials themselves. Such urban bias policy initiatives can take many forms. For example, the government may reduce the price for food and other rural inputs so that the urban sectors are subsidized by the rural sectors. Or the government may invest capital on the provision of facilities located in urban areas, although a larger share of the population is in the rural areas. Given the difference in terms of standards of living between the rural and urban areas, people in rural areas tend to migrate to urban areas.

1.2.4. Dual-sector and rural-urban migration models

The dual-sector and rural-urban migration models are two urbanization models that are popular among economists. They focus on the impact of differential income between the rural and urban sectors, which give incentives for workers from the rural areas to migrate to the urban areas. Therefore, these models suggest that there is a close relationship between economic development and urbanization.

The dual-sector model, first proposed by Lewis (1954) and is further extended by Ranis and Fei (1961), is characterized by an under-developed economy consisting of two sectors: A rural agricultural sector and an urban industrial sector. The agricultural sector has a larger population and the wages and productivities are lower. In contrast, the industrial sector has a smaller population but firms have higher productivities and can offer higher wages to the workers. Since the wages of the urban industrial sector are higher than the wages of the rural agricultural sector, the industrial sector can attract workers from the agricultural sector.

Lewis (1954) assumes that there is a surplus of labor in the agricultural sector so that when workers leave the sector, there will be no effect on the output of the agricultural sector and the wages of the remaining workers. Lewis further assumes that firms in the urban industrial sector re-invest the profits into production capital. When the production scale is expanded, the urban industrial sector will require extra workers from the agricultural sector. Therefore, the rural-urban migration and the expansion of the urban industrial sector continue until all the surplus workers in the rural agricultural sector have been absorbed by the urban industrial sector. This point is known as the "Lewis turning point." After that, when additional rural workers move to the urban industrial sector, the output and the wages of the agricultural sector will be affected.

While the Lewis dual-sector model is simple, it is still often used to examine the urbanization experience in China and other developing countries because these countries usually have large rural sectors.[4] The main limitation of the Lewis dual-sector model is that it cannot

[4] For studies about China, see, for example, Cai (2010), Zhang, Wang, and Wang (2011).

explain the evidence in the past several decades that rural workers continue to migrate into urban areas even despite the increasing levels of unemployment and under-employment in the urban areas. To explain this phenomenon, another class of models, known as rural-urban migration model and proposed by Todaro (1969) and Harris and Todaro (1970), have been developed. In these models, workers in rural areas have the incentives to move to the urban areas in response to expected rural-urban income differences. They will consider different labor market opportunities available in the different sectors and choose one that maximizes the expected gains. These models can also incorporate non-financial costs and benefits of migration into the workers' decisions. For example, psychological considerations may be relevant: When the rural workers migrate to the urban areas, they can enjoy the better amenities and infrastructure in the urban areas; yet at the same time there is a risk that they cannot adjust themselves fully into to urban society.

These models assume that the migration decisions of the workers are based on a calculation of long-term incomes. For example, a rural worker may not be able to find a job immediately after migrating to the urban area; but if she expects that she can get a job soon and her future incomes can rise over time, then she may still want to migrate because the total expected income after migration can still be higher than the total expected income she could otherwise get in the rural sector. These models suggest that the growth of the urban labor market can fall short of the growth of rural-urban migration because the decision to migrate depends on expected rather than actual rural-urban income differentials. In particular, these models can explain that rural-urban migration is possible even though there is unemployment or under-employment in the urban sector.

1.3. International patterns of urbanization

After discussing briefly some theories of urbanization, let us examine some international patterns of urbanization, including the relationship between urbanization and economic development, the evolution of urbanization in different regions of the world by their levels of development, and the changes in the number of urban agglomerations and the population living within these agglomerations over time.

Before we proceed, we would like to point out a caveat in the urbanization data we use in this section. A prerequisite for a meaningful analysis of urbanization patterns is the use of comparable urbanization data. For instance, if we want to examine the urbanization patterns of two countries at two different points in time, then the definitions of "urban population" need to be identical in these two countries across the two different time periods. Otherwise, comparing the urbanization rates between these two countries, or within the same country over time, will not be accurate.

Some of the discussions in this section are based on the urbanization data extracted from the World Urbanization Prospects (The 2011 Revision), compiled by the United Nations Department of Economic and Social Affairs/Population Division (DESA). The urbanization data in this report come from the most recently available census or official population estimate provided by the statistical office of each country. As recognized by DESA, the quality of the urbanization data depends on the accuracy of the official data as well as the definitions of urban and rural areas. Since the definitions of urban population can vary country by country, the urbanization data contained in the World Urbanization Prospects may not be reliable.[5] Therefore, the trends and patterns of urbanization presented in this section that are based on these urbanization data have to be interpreted with caution.

As will be discussed in greater detail in Chapter 2, a better way of measuring urban population is to use the *e-Geopolis* database developed by François Moriconi-Ebrard. Since the *e-Geopolis* database uses a harmonized definition of urban agglomeration and urban population, we can estimate urban population in different countries in a consistent manner so that these data can be comparable across countries and over time, irrespective of the actual definitions of "urban population" adopted by individual countries. We will present more results based on the urbanization data from *e-Geopolis* in Chapter 2.

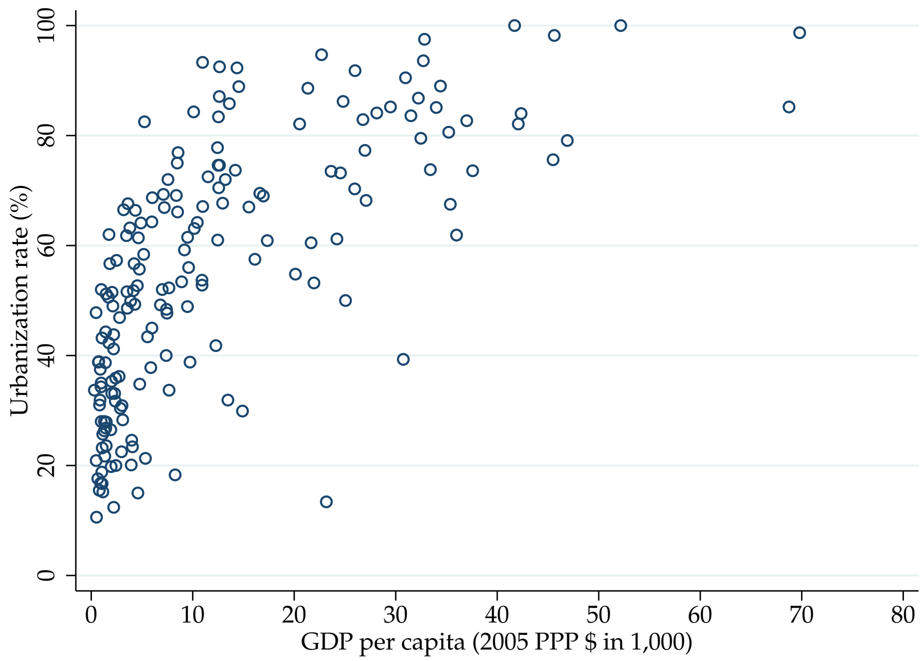
[5]See the Methodology of the World Urbanization Prospects (The 2011 Revision), available at *http://esa.un.org/unup/pdf/WUP2011_Methodology.pdf*.

1.3.1. The relationship between urbanization and economic development

Standard theories of urbanization suggest a positive relationship between urbanization and economic development. Do we observe this relationship from the data? We present evidence along two different but related dimensions. A commonly used indicator for a country's economic development and standard of living is GDP, which stands for Gross Domestic Product. It measures the monetary value of final goods and services produced in a country in a given period of time.[6]

In Figure 1.1 we show the urbanization rates and GDP per capita (in 2005 purchasing power parity dollars) for different countries around the world in 2010. The urbanization data come from the World Urbanization Prospects (The 2011 Revision) and the GDP data come from the World Development Indicators 2012 compiled by the World Bank. This figure shows a clear positive relationship between urbanization rate and GDP per capita. In countries with higher income per capita, the shares of urban population are also higher.

Figure 1.1: The relationship between urbanization rate and GDP per capita in 2010



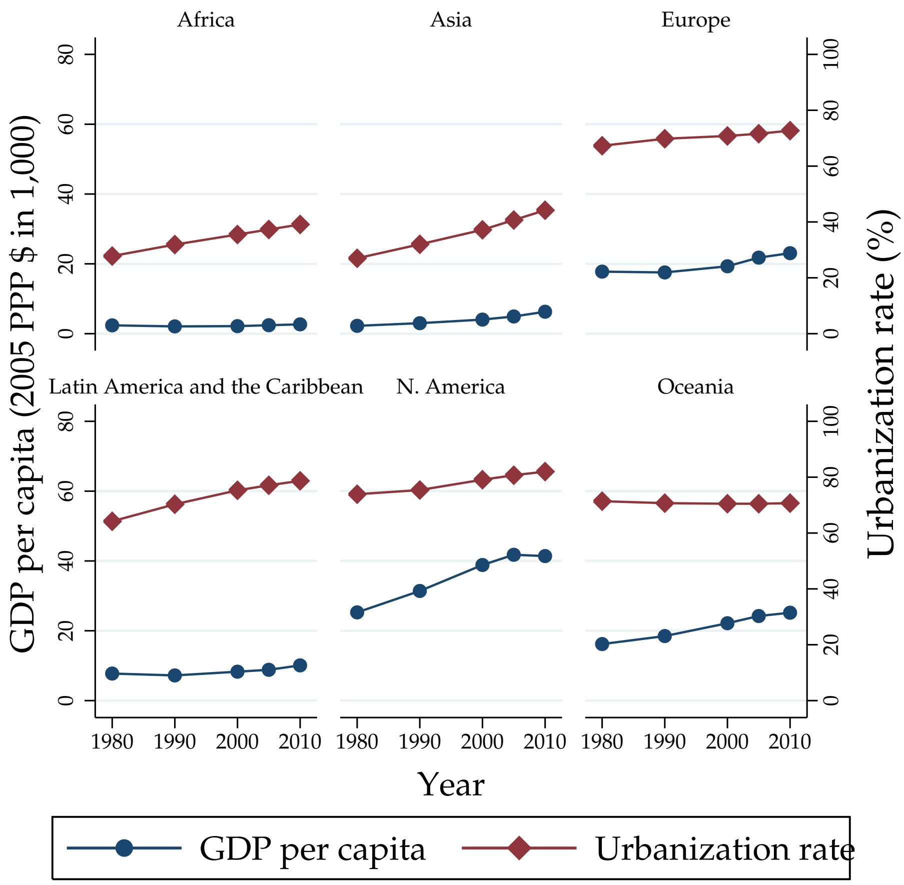
Source: GDP per capita (in constant 2005 purchasing power parity dollars): World Development Indicators 2012; Urbanization rate: World Urbanization Prospects, The 2011 Revision.

Figure 1.1 only shows the relationship between income per capita and urbanization rate in a single year. Does this relationship change over time? In Figure 1.2, we further exam-

[6] There are different ways of counting GDP, including the production approach, the expenditure approach, and the income approach. More information about GDP can be found in, for instance, *https://www.imf.org/external/pubs/ft/fandd/basics/gdp.htm*.

ine the relationship between urbanization and GDP per capita along a different dimension. Specifically, we examine this relationship in different countries, over time (in several selected years between 1980 and 2010) and by regions (including Africa, Asia, Europe, Latin America and the Caribbean, North America, and Oceania). The urbanization and GDP data also come from the World Urbanization Prospects (The 2011 Revision) and the World Development Indicators 2012 respectively. Among these regions, North America and Europe have the highest GDP per capita and they also have higher urbanization rates. In the other extreme, Africa and Asia have both low GDP per capita and urbanization rates. Interesting, in Latin America and the Caribbean, the GDP per capita is relatively low and is similar to the level of Asia but the urbanization rate is much higher than that of Asia.

Figure 1.2: The relationship between urbanization rate and GDP per capita by regions, 1980-2010



Source: GDP per capita (in constant 2005 purchasing power parity dollars): World Development Indicators 2012; Urbanization rate: World Urbanization Prospects, The 2011 Revision.

The trends in these two figures suggest that there is a strong positive link between economic development and urbanization over time and across different countries.

1.3.2. The evolution of world urbanization

Next, we examine the evolution of urbanization of the world and different regions by their levels of economic development between 1950 and 2050.

In Table 1.1 we report the urbanization rates of the world and different regions between 1950 and 2050, obtained from the World Urbanization Prospects (The 2011 Revision). The data between 1950 and 2010 are actual data provided by the national statistical offices of different countries, and those data between 2010 and 2050 are the projections estimated by the United Nations. These data are also visualized in Figure 1.3.

Table 1.1: Urbanization rates of the world and by regions of different levels of economic development, 1950-2050

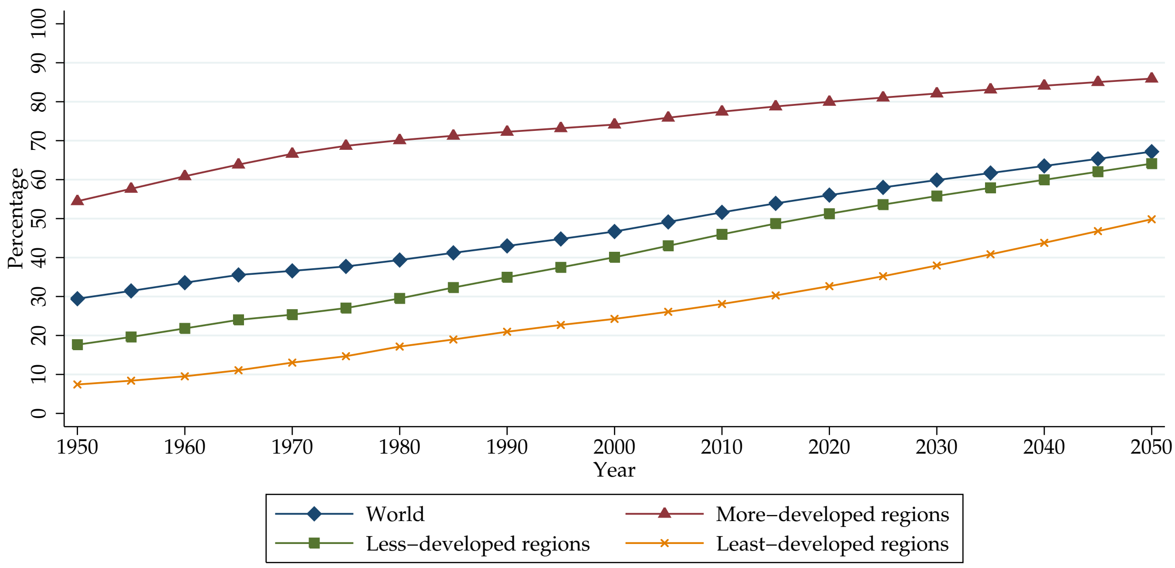
Year	World	More Developed Regions	Less Developed Regions	Least Developed Regions
1950	29.4	54.5	17.6	7.4
1955	31.4	57.7	19.6	8.4
1960	33.6	60.9	21.8	9.5
1965	35.5	63.9	24.0	11.1
1970	36.6	66.6	25.3	13.0
1975	37.7	68.7	27.0	14.7
1980	39.4	70.1	29.5	17.2
1985	41.2	71.3	32.3	19.0
1990	43.0	72.3	34.9	21.0
1995	44.8	73.2	37.5	22.7
2000	46.7	74.1	40.1	24.3
2005	49.1	75.9	43.0	26.1
2010	51.6	77.5	46.0	28.1
2015	53.9	78.8	48.7	30.3
2020	56.0	80.0	51.3	32.7
2025	58.0	81.1	53.6	35.2
2030	59.9	82.1	55.8	38.0
2035	61.7	83.1	57.9	40.8
2040	63.5	84.1	60.0	43.8
2045	65.3	85.0	62.0	46.8
2050	67.2	85.9	64.1	49.8

Source: World Urbanization Prospects, The 2011 Revision.

In the table and the figure, the more developed regions comprise Europe, Northern America, Australia, New Zealand and Japan; the less developed regions comprise all regions of Africa, Asia (excluding Japan), Latin America and the Caribbean plus Melanesia, Micronesia and Polynesia; the least developed countries are 48 countries, 33 in Africa, 9 in Asia, 5 in Oceania plus one in Latin America and the Caribbean.[7]

[7] These least developed countries are defined by the United Nations General Assembly in its resolutions (59/209, 59/210, 60/33, 62/97, 64/L.55) and include Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Djibouti, Equato-

Figure 1.3: Urbanization rates of the world and by regions of different levels of economic development, 1950-2050



Source: World Urbanization Prospects, The 2011 Revision.

We can observe a number of patterns from the table and the figure. In 1950, the world's average urbanization rate was 29.4%. There was a huge difference between the urbanization rates of the more developed regions and the least developed regions: Over half of the population in the more developed regions lived in urban areas while only about 7% of the population in the least developed regions lived in urban areas. Between 1950 and 2010, the world became more and more urbanized. The average urbanization rate of the world increased to 51.6%. The difference between the urbanization rates of the more developed regions and the least developed regions persisted: The urbanization rate of the more developed regions increased to 77.5% whereas that of the least developed regions was 28.1%, which was below the world average in 1950. In the next four decades, urbanization rates of the world and different regions are expected to grow. According to the forecasts by the World Urbanization Prospects, the increase in urbanization rate for the more developed regions is expected to diminish: It will only increase by about 8 percentage points between 2010 and 2050. On the other hand, the urbanization process of the least developed regions will become faster. By 2050, their expected urbanization rate will be 49.8% — an increase of over 20 percentage points from 2010, and close to the world's average urbanization rate in 2005.

rial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, São Tomé and Príncipe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, United Republic of Tanzania, Vanuatu, Yemen and Zambia. Note that these countries are also included in the less developed regions.

1.3.3. Urban agglomerations

Finally, we examine the international patterns about urban agglomerations. In Table 1.2 we show the total number of urban agglomerations (with population of 0.5 million or above) and the total population living in these agglomerations between 1950 and 2025. These data are obtained from the World Urbanization Prospects (The 2011 Revision). These figures are grouped according to the size classes of the urban settlement.

Note that the definitions of "urban agglomerations" used in different countries may be different. In particular, these urban agglomerations are defined in a different way that those defined by *e-Geopolis*, and we will show in Chapter 2 the differences. Therefore, we should interpret the statistics in Table 1.2 with caution.

Table 1.2: The number of urban agglomerations and total population living in these agglomerations, 1950-2050

	Size class of urban settlement							
	≥ 10 Mn		5 Mn to 10 Mn		1 Mn to 5 Mn		0.5 Mn to 1 Mn	
Year	No. of urban agglo.	Pop. (Mn)	No. of urban agglo.	Pop. (Mn)	No. of urban agglo.	Pop. (Mn)	No. of urban agglo.	Pop. (Mn)
1950	2	23.61	4	25.10	69	128.13	102	68.64
1955	2	26.93	9	53.36	75	134.19	121	83.45
1960	2	30.84	10	64.80	94	173.47	128	90.02
1965	2	35.46	12	81.59	114	212.07	149	102.78
1970	2	39.49	15	108.52	128	243.94	186	127.72
1975	3	53.18	14	109.43	144	291.66	224	155.77
1980	4	69.25	19	141.44	173	333.04	245	168.53
1985	7	104.56	20	146.15	197	378.76	278	190.87
1990	10	145.01	19	142.00	237	455.50	299	205.42
1995	13	186.36	19	143.00	270	534.18	338	233.29
2000	17	242.81	27	187.77	311	597.94	396	269.12
2005	19	284.94	33	229.72	340	667.65	463	317.17
2010	23	352.46	38	266.08	388	759.92	513	353.80
2015	29	451.14	40	281.23	449	887.59	587	403.05
2020	35	560.21	48	323.88	506	999.81	647	450.44
2025	37	630.01	59	401.96	572	1127.59	750	515.72

Source: World Urbanization Prospects, The 2011 Revision.

Globally, the number of urban agglomerations and the population living in these agglomerations have increased substantially over time especially in the past 20 years. The changes are summarized as follows. In 1950, there were 177 urban agglomerations. More than half of them were small agglomerations with population between 0.5 million to 1 million (102 or 57.6% of the total number of agglomerations). There were only 2 urban agglomerations with over 10 million population and 4 with populations between 5 million and 10 million.

Over time, the total number of urban agglomerations increased by a lot. In year 2010, there were a total of 962 urban agglomerations around the world. The annualized growth rate between 1950 and 2010 was 2.86%. The growth was biased towards the two largest size classes. In particular, the number of urban agglomerations with population over 10 million increased to 23 (with an annualized growth rate of 4.15%); the number of urban agglomerations with population between 5 million and 10 million increased to 38 (with an annualized growth rate of 3.82%). By 2025, it is estimated that the total number of urban agglomerations will further increase to 1,418, including 37 agglomerations with over 10 million population, 59 with population between 5 million and 10 million, 572 with population between 1 million and 5 million, and 750 with population between 0.5 million to 1 million.

As for the number of people living in these agglomerations, in 1950, there were about 245 million people living in urban agglomerations with population of half a million or above. These people represented roughly 9.7% of the total world population (which was about 2.5 billion).[8] Among different size classes, over 80% of these people were in agglomerations with fewer than 5 million people. In 2010, the total population living in urban agglomerations with population of half a million or above exceeded 1.7 billion, constituting roughly one fourth of the entire world population (6.9 billion). While more people were living in urban agglomerations, the proportion of them living in agglomerations with fewer than 5 million people dropped to about 64%. At the same time, relatively more people were living in larger agglomerations. Specifically, over 20% of the those living in urban agglomerations were in agglomerations with more than 10 million people.

It is expected that by 2025, over 2.6 billion people will live in urban agglomerations with population of half a million or above, which will be about 33% of the world total population (8.1 billion). Besides, the proportion of these people in the largest size class is expected to increase further to 23%.

Focusing on the largest class size (i.e., those urban agglomerations with population above 10 million), it seems that the bigger cities have grown even bigger over time. In particular, in 1950, the average population for the two largest urban agglomerations was about 11.81 million. By 2010, the number of urban agglomerations in this class size and total population both increased. With a higher growth rate in total population, the average population of those urban agglomerations in the largest class size increased to 15.32 million. The increasing trend is expected to continue in the next 15 years. According to the forecast by the World

[8] The world population data are from the World Population Prospects (The 2012 Revision), compiled by the Department of Economic and Social Affairs, Population Division of the United Nations. *http://esa.un.org/unpd/wpp/unpp/panel_population.htm*.

Urbanization Prospects (The 2011 Revision), by 2015, the average population of those urban agglomerations in the largest class size will further increase to 17.03 million.

1.4. Different international urban population databases

The urban population data contained in the World Urbanization Prospects are provided by the national statistical agencies in different countries. Other than the World Urbanization Prospects, a number of international organizations and researchers have compiled and published data on urban population. In this section, we will first discuss four urban population databases mainly used by historians and geographers, including Davis (1969), Chandler and Fox (1974), De Vries (1984), Bairoch, Batou, and Chèvre (1988).[9] We will then discuss briefly two more recent databases. Apart from the World Urbanization Prospects, we will also discuss the Global Rural-Urban Mapping Project (GRUMP). Finally we will discuss some urban population databases created by French researchers.

The discussion of these databases, especially those earlier databases used by historians and geographers, can serve the purpose of illustrating the problems faced by researchers in collecting raw data about population statistics from different sources and the problems they encountered in the study of large-scale research questions about population from the historical and geographical perspectives. For example, various definitions of the objects of interests may be employed by different national statistical agencies; population censuses in different countries were conducted at different times; the definitions of regional and national boundaries can change; gaps could exist between earlier and more recent periods or between smaller and larger cities.

1.4.1. Some earlier databases used by historians and geographers

Davis (1969)

The database of Davis (1969) demonstrates a geographic approach of looking at urban population. The database contains the population of cities in the world with more than 100,000 inhabitants for three years: 1950, 1960, and 1970. The database includes Europe but excludes former Soviet countries and Turkey. The population statistics presented in Davis (1969) are mostly based on data from the United Nations. Thus, these data are extracted from official national statistics which are not necessarily based on the same definitions of the city and therefore are a priori not comparable. The aim of the author is more about analyzing the data and testing its assumptions about the size distribution of cities.

[9] A more detailed summary of these databases can also be found in Chatel (2012).

Chandler and Fox (1974)

The book by Chandler and Fox (1974), entitled *3000 Years of Urban Growth*, presents a database of world cities for a period of over 2,000 years — from 360 B.C. to 1968. Their database covers many major European and international cities. For European, there are 295 cities with over 20,000 inhabitants.

The database of Chandler and Fox (1974) is based on data extracted from second hand materials. They incorporated the works of other historians and geographers who provided population estimates in one or more cities. These different data sources can be quite different, for example, in terms of the dates of the data. These sources highlight the problem of the varying definitions of the population recorded and the definitions of "cities" used by different institutions responsible for population counting. Besides, the way these data are gathered suggests that the issue of standardization is basically ignored. As such, Chandler and Fox (1974) is more a bibliography of previous works.

De Vries (1984)

The database of De Vries (1984) covers European cities that have more than 10,000 people during the modern period of 300 years, from 1500 to 1800. The database covers 379 cities, excluding the part of orthodox Europe. The author uses estimates to track the population of towns consisting of 5,000 to 10,000 inhabitants.

While the historical data sources are very diverse, De Vries (1984) made an effort to harmonize these raw data and align them in periods of 50 years. The data are presented according to a non-national regionalization, because many of the current countries were not yet formed during the study period. Specifically, sixteen units are grouped into four regions: The Mediterranean Europe (Iberian Peninsula, Italy), Central (France, Germany, Austria, Switzerland), western and northern (Scandinavia, the British Isles, the Netherlands), Eastern Europe (Poland, Czechoslovakia).

The database was constructed using a historian approach while the analyses were based on the methods used by quantitative geographers (such as rank-size distribution and transition matrix).

Bairoch, Batou, and Chèvre (1988)

The database of Bairoch, Batou, and Chèvre (1988) traces the population of European cities during the period 800-1850. Between 800 and 1200, data are reported every 100 or 200 years, while between 1700 and 1850, data are reported every 50 years. In total, the database covers 2,206 cities with more than 5,000 inhabitants in Europe (including Russia but excluding Turkey).

The authors use a variety of sources including lists of bishoprics, tour guides, and historical atlases. The database is relatively complete for the most recent periods, but there are gaps in the earlier periods and for smaller cities.

The database indicated a reflection on standardization in that it specified the definitions of the selected cities and the area delimited by the function of the built-up areas. The data for agglomerations are presented according to the 1850 boundaries and mergers taken place after 1850 are not considered. In addition, the problems of standardization (such as the changing names of cities) are indicated. The authors are careful in their comparison of geographic objects. For example, most cities are located by their geographical coordinates and the sources are specified for each figure quoted.

Limitation of these databases

From the above simple discussion, we can see that these databases are historical in nature. Among them, the most recent data were up to the 1970s (Davis, 1969; Chandler and Fox, 1974). Besides, the databases of De Vries (1984) and Bairoch, Batou, and Chèvre (1988) only cover European cities. Therefore, these databases are unable to provide insights for modern urbanization issues. In particular, as we can see from Table 2.2, many of the current largest urban agglomerations in the world are situated in Asia (three of them in China alone). In a way, the urbanization issues in developing countries have attracted a lot of attention. We have to take this big change into account.

1.4.2. More recent international urban population databases

World Urbanization Prospects

The World Urbanization Prospects is a report compiled by the Population Division of the Department of Economic and Social Affairs (DESA) of the United Nations. Revised data have been issued every two years since 1988. The raw population data come from the national statistical agencies in different countries. The report also contains forecasts of the urban and rural populations of different countries around the world. These data are widely used by the United Nations and many other international organizations. Data from the World Urbanization Prospects can be downloaded from: *http://esa.un.org/unup/index.html*.

As acknowledged by DESA, the quality of the estimates of urban population depends crucially on the raw population statistics collected by individual statistical offices in different countries. For the purpose of comparing urban populations across countries, problems can arise when the countries under comparison use different definitions of urban areas, urban populations, and urban agglomerations. When data are not available, the United Nations will make their own adjustment. Thus, in a way there is no warranty for the quality of the data.

Table 1.3, adapted from the methodology document of the World Urbanization Prospects (The 2011 Revision), shows the criteria used by different countries in defining urban area. This table highlights the challenges of comparing urban populations across different countries. Out of the 231 countries or areas covered by the prospects, 121 of them use one single criterion to define urban area; among them, 64 of them use an "administrative" criterion. The problem of comparing urban population across different countries is less severe if two countries are among the latter 64 which use a similar way to define urban areas. However, in other cases where the two countries use completely different sets of criteria, the comparison of urban populations may not be that meaningful.

Table 1.3: Distribution of countries according to the criteria used in defining urban area in World Urbanization Prospects

Criterion		Sole use	Use in conjunction with other criteria
1 criterion	Administrative	64	118
	Economic		33
	Population size/density	48	107
	Urban characteristics	9	43
2 criteria	Administrative and population size/density	24	
	Administrative and economic		
	Administrative and urban characteristics	11	
	Economic and population size/density	15	
	Economic and urban characteristics		
	Population and urban characteristics	15	
3 criteria	Administrative, economic and population size/density	10	
	Administrative, economic and urban characteristics		
	Administrative, urban characteristics and population	1	
	Economic, population and urban characteristics		
4 criteria	Administrative, economic, population size/density and urban characteristics	8	
	Entire population	9	9
	Unclear definition	3	3
	No definition	14	14
	Total number of countries or areas	231	

Source: World Urbanization Prospects, The 2011 Revision

The second potential problem is that the definitions of urban populations can be different in different countries. For example, in France the urban population is counted in "communes with 2,000 inhabitants or more living in houses separated by at most 200 metres; or communes in which the majority of the population is part of a multi-communal agglomeration as defined above."[10] However, other countries may use different definitions. Moreover, some countries may have changed the urban population definition over time, and in such cases, the United Nations will try to make adjustments whenever possible. One example is China, where the definitions of urban population in different censuses were different. Quoting the information in the World Urbanization Prospects (The 2011 Revision), we note that:

> "Up to 1982: total population of cities and towns. Cities had to have a population of at least 100,000 or command special administrative, strategic, or economic importance to qualify as cities. Towns were either settlements with more than 3,000 inhabitants of whom more than 70 per cent were registered as non-agricultural or settlements with a population ranging from 2,500 to 3,000 inhabitants of whom more than 85 per cent were registered as non-agricultural. For the 1990 census, the urban population included: (1) all residents of urban districts in provincial and prefecture-level cities; (2) resident population of 'streets' (*jiedao*) in county-level cities; (3) population of all residents' committees in towns. For the 2000 census, the urban population was composed of population in City Districts with an average population density of at least 1,500 persons per square kilometre, other population in suburban-district units and township-level units meeting criteria such as 'contiguous built-up area,' being the location of the local government, or being a Street or having a Resident Committee. For the 2010 census, urban population included all urban residents meeting the criterion defined by the National Bureau of Statistics of China in 2008, i.e., the criteria used in the 2000 census plus residents living in villages or towns in outer urban and suburban areas that are directly connected to municipal infrastructure, and that receive public services from urban municipalities."[11]

As for urban agglomerations, the United Nations consider the population contained within the contours of a contiguous territory that is inhabited at some urban density levels. This definition usually incorporates the population of a city and its nearby suburban areas. Thus, it takes no regards of the actual administrative boundaries. Besides, some countries do not

[10] See *http://esa.un.org/unup/CD-ROM/Documentation/WUP2011-DataSource-UrbanPopulation1.xls*.

[11] See *http://esa.un.org/unup/CD-ROM/Documentation/WUP2011-DataSource-UrbanPopulation1.xls*.

use the concept of urban agglomeration but instead employ the concept of city proper or metropolitan area. In such cases, the United Nations will also try to adjust the data in order to conform to the urban agglomeration concept. For example, in France, the concept of "urban agglomeration" is used for all the urban agglomerations in the country. However, in China, some agglomerations are defined under the "urban agglomeration" concept while some others used the concept of "city proper."[12]

Global Rural-Urban Mapping Project (GRUMP)

The Global Rural-Urban Mapping Project (GRUMP) is a program run by the Center for International Earth Science Information Network (CIESIN) of Columbia University, in collaboration with the International Food and Policy Research Institute (IFPRI), the World Bank, and the International Center for Tropical Agriculture (CIAT). More information about this database is available at their website: *http://sedac.ciesin.columbia.edu/data/collection/grump-v1*. The GRUMP program builds on the Gridded Population of the World (GPW) program of the Socio-economic Data and Applications Center (SEDAC) at Columbia University, a program supported by the Inter-American Development Bank and the National Aeronautic and Space Administration (NASA).

The aim of the GRUMP program is to understand the patterns of urbanization that incorporates spatial and demographic data, in a systematical way. It provides estimates of population in 1990, 1995, and 2000. Similar to the data from the World Urbanization Prospects, the raw data for GRUMP come from the official population statistics published by the statistical agencies of different countries and such other sources as PopulationData.net (*http://www.populationdata.net/*) (formerly called the World Gazetteer) and City Population (*http://www.citypopulation.de*).

Under the GRUMP system, urban populations are put into different polygons and are automatically detected on satellite imagery. The population data are then made available in a dedicated database which contains the geographic coordinates of each administrative unit, its name, and its population. GRUMP is able to produce relatively coherent maps by including additional data such as the principal highway transportation links. These maps shows on a global scale the changing population dynamics of agglomerations.

The population estimates of GRUMP are made available both in tabular and spatial formats. Specifically, it consists of eight global data sets, including population count grids, population density grids, urban settlement point, urban-extent grids, land/geographical unit area

[12] For more information, see the summary in *http://esa.un.org/unup/CD-ROM/Documentation/WUP2011-DataSource-UrbanAgglomeration-and-CapitalCities1.xls*.

grids, national boundaries, and national identifier grids.

The GRUMP database has been used in many international publications. These data are not only used in maps but also as a means of measuring urban sprawl, designing growth models, and assessing the risks of development aids. Nevertheless, as pointed out by Chatel et al. (2009), the GRUMP database has a number of potential shortcomings. First, in issues related to the territorial scope of the urban areas, the GRUMP database can be inconsistent in that it can exaggerate or underestimate the territorial scope, depending on the surroundings of the urban areas and the type of images used. Second, the basic units in GRUMP are classified by "Urban Extents" and do not always correspond to a population center or such facilities as airports or factories. Instead, these units sometimes refer to forests, irrigated areas, or even lakes. Third, the urban population data in GRUMP contain raw data from population censuses that do not correspond specifically to agglomerations, even though the definition for the latter is known to change from one country to another.

1.4.3. Urban population databases created by French researchers

In France, researchers have also created several urban population databases. Among them the most comprehensive one is the *Geopolis* database created by François Moriconi-Ebrard in the 1990s and was extended with several improvements in 2007 under the new name *e-Geopolis*. While we will discuss the details of the *e-Geopolis* database in Chapter 3, we will briefly discuss some other urban population databases created by French researchers.

In France, the construction of a urban population database is also necessary for quantitative geographers for use in different spatial analyses. In collaboration with G. Dupeux (INED), Denis Pumain was initially responsible for the database on the French cities from 1831 to 1975. The database was later published in 1982 (Pumain, 1982). This database was then updated by France Guérin-Pace (INED) (Guérin-Pace, 1993). François Moriconi-Ebrard became, then, a member of the PARIS team, and the French database had not been updated. The French database had become obsolete in terms of its historical range. *e-Geopolis* continued to update the data up to the present.

Other researchers of the PARIS team have developed databases about France (Paulus, 2004) and the United States (Bretagnolle, Giraud, and Mathian, 2008; Bretagnolle and Delisle, 2010). At the same time, François Moriconi-Ebrard has established the database EGIPTE in Cairo based on the *Century Census Egypt, 1882-1996* published by CAPMAS-CEDEJ, allowing for the first time to trace the evolution of the population of a country of the *South* over a pretty long time period. This experience served as a model for developing the database for South

Africa (Vacchiani-Marcuzzo, 2005). Various studies have been derived from the exploitation of these historical works which, like the *e-Geopolis* database, is based on a morphological definition of agglomeration.

Many countries, laboratories and individual researchers have developed the idea of creating databases which are capable of describing the evolution of the population over a long period of history, showing the interest of this approach for understanding the deep structures of the population distribution and urban dynamics. However, there is almost no international database, because the cross-country dimension creates a lot of problems in the construction of such a database.

1.5. The problems of measuring urban population

While there are different international urban population databases available for use by researchers, the urban population statistics in these databases are usually estimated using different methods so that studies based on these different databases are not comparable. The problem of comparing international urban population data arises at three different levels.

First, it is almost impossible to conduct an international comparison of cities. The United Nations publish data and indicators on urban population using raw data provided by different countries, while acknowledging that these data may be incomparable. Many scholars have indeed pointed out this issue.[13] Nevertheless, many publications, some of them well-recognized, still appear and cite these otherwise criticized institutional sources of data. Only a few studies offer a comparable and harmonized definition of urban population. However, these studies do not always present clearly the data sources, the definitions used, and the methods of data harmonization.[14]

Second, the definition of the city determines the point of view of the urban population and the set of urban indicators (Pumain et al., 1996). There is an erroneous view of the state of the general urbanization because individual data on cities are fuzzy. For example, the rate of urbanization in Italy according to the United Nations was 54.1% in 1950 and 67.2% in 2000, while those estimated by *e-Geopolis* 52.4% and 70.3% respectively. (The city in Italy is defined as places with over 10,000 inhabitants.) For the Netherlands, the United Nations report an urbanization rate of 56.1% in 1950 and 76.8% in 2000 while the estimates of *e-Geopolis* were 85.4% and 94.1% respectively.

Third, three types of definitions of the city, namely, administrative, ecological, and economic, now dominate (Champion et al., 2004). It is possible that the three definition coexist in the same country. In that case, which one shall we choose? Therefore, the variety of definitions casts doubt at the international and national levels, and prevents the comparison of statistics of individual cities. However, the national variety of definitions is a relatively new problem. The primary purpose of the *Geopolis* database was to address this issue.[15]

The different definitions of the basic unit of analysis suggest that estimates of urban population based on these different concepts cannot be directly compared. Thus, these differences highlight the importance of using a harmonized definition of urban spaces before we can do a meaningful international comparison of urban population statistics.

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[13] See, for example, Hall and Hay (1980), Davis (1969), and Champion et al. (2004).

[14] For example: World gazetteer, URL:*http://gazetteer.de/*; City population: *http://www.citypopulation.de/*.

[15] See also the presentation of Moriconi-Ebrard (2012).

In this section, we will first discuss different definitions of urban spaces and then discuss the difficulty of using a harmonized definition by the national statistical agencies in different countries.

1.5.1. The definition of urban spaces

The official definition of urban as we understand refers to the definitions of the city and of the urban set by national statistical agencies. Most of these national statistical agencies adopt different definitions of "urban population." Very often, they do not specify clearly how they measure "urban population."

The World Urbanization Prospects compiled by the United Nations provide a handy summary of the definitions of "urban population" in various countries.[16] For certain countries, the definition of "urban population" is described clearly. We already cited the Chinese case earlier (on page 29). For France, the definition is:

> "Communes with 2,000 inhabitants or more living in houses separated by at most 200 meters; or communes in which the majority of the population is part of a multi-communal agglomeration as defined above."

Another example is the United States, where the following definition of "urban population" is used:

> "Urban areas, defined as densely settled territory that meets minimum population density requirements and encompasses a population of at least 2,500 inhabitants. A change in the definition for the 2000 census from place-based to density-based has a small effect on the comparability of estimates before and after this date."

In contrast, the definitions of "urban population" for some countries are much simpler. For instance, in Argentina, "urban population" includes "Population centres with 2,000 inhabitants or more" and for Denmark, it includes "Localities with 200 inhabitants or more."

The national statistical agencies of different countries produce not only statistics but also categories: The figures published in national censuses are usually classified into such categories as territorial, social, and economic statistics. These figures are known and accepted by the national governments. As such, the formal definitions of the city remain national and the diversity highlights the inherent difficulties in the international measurement of the urban.

The definitions of urban spaces can be grouped into three major types (Hall and Hay, 1980; Pinol, 2003; Moriconi-Ebrard, 2000) which are based on administrative, quantitative,

[16]See *http://esa.un.org/unup/CD-ROM/Documentation/WUP2011-DataSource-UrbanPopulation1.xls*.

and socio-economic criteria. In general, researchers require a delimitation of a space and of a quantifier based on the chosen criteria to define urban spaces. According to Moriconi-Ebrard (2000), the three main different ways of defining urban spaces are political city, urban agglomeration, and metropolitan area.

Political city

The political city corresponds to a legal definition and status. It is defined by a group of people and the space which enjoys such a status. This concept of the city is still present in most national definitions. The political city has a special status in the administrative hierarchy in the sense that it is equipped with more extensive local expertise and has the resources to provide specific services to the people living with the city. According to official statistical categories, the political city can have distinguished meanings.

For example, in Germany, the political city is different from other communities (*Stadt* versus *Gemeinde*). As in many Slavic countries, it is different from places which were once associated with rural areas or qualified as villages. It is different from other territories which appear to be free of localities as in the United States (*place territory* versus *non-place territory*).

The "urban" character of the city defined in such a political or administrative way is hardly compatible with the statistical approach of defining an urban space. For example, the criteria for promotion of cities vary in China and very often changes of city status serve political rather than socioeconomic or anthropological needs. However, the political status of a city can have measurable effects. This point can be illustrated by the promotion of Chongqing Shi from a *dijishi* under the Sichuan Sheng to a *zhixiashi* (with the equivalent administrative status as a province) in 1997. As will be explained in greater details later, there were two major reasons for the separation of Chongqing Shi from Sichuan Sheng. The first reason was to give Chongqing Shi more administrative power to reform the state-owned enterprises within the city; the second reason was to allow Chongqing Shi to administer the central government's plan to build the Three Gorges Dam. Immediately after Chongqing Shi's promotion in 1997, its land area increased mechanically from about 23,000 square kilometres to 82,000 square kilometres and its population from about 15 millions to over 30 millions.

In most other countries, the definition of a political city is based on administrative territories. For example, Italy has a minimalist definition of the city where a common threshold of 10,000 inhabitants is used. The population threshold is certainly relevant, but it refers more to a communal area of variable size which does not ensure the urban character of the population within that space.

Note that the criteria for defining a political city are not necessarily fixed since after all, it is the administrative authority that has the power to grant or withdraw the status. Besides, the political and administrative boundaries may cut through built-up areas and separate a city from its suburbs. Conversely, these boundaries may group together a city and its suburbs or even different cities of similar sizes.

Urban agglomeration: A morphological city

According to Moriconi-Ebrard (2001), the urban agglomeration is a "geographical area" which is distinguished by its inscription on the ground (from Greek: *geo* means earth and *grafein* means writing). He identifies the following three notions of the urban agglomeration.

First, the urban agglomeration is the result of a process of population movements. Therefore, two concepts of temporalities confront each other. On the one hand, the space makes durable the establishment by its materiality. On the other hand, the population is mobile in accessing a long temporality.

Second, the urban agglomeration is characterized by its density and its concentration of the elements of the built-up areas, assembled as a result of the agglomeration process. The density of the built-up areas corresponds to a density of population. The urban agglomeration is the place where we practice the idea of a "city" (Paquot, 1996) and respond to its own social and economic organization. On the one hand, the urban agglomeration meets the grouping needs of the people and their activities. On the other hand, it also meets the various advantages and disadvantages associated with the city and a dense environment, including interactions, diversity, and saturation of space. The urban agglomeration opposes the dispersed habitat as we see nowadays: The former is more associated with the metropolitan mode of urban life. Moreover, the urban quality of buildings and establishments shall be specified by the relative criteria for the type of the built-up areas, the form and the unity of the land. These criteria vary in the urban agglomeration definitions according to the view adopted.

Third, from the external point of view, the agglomeration is a form of distinctive land in the landscape which has its unity and coherence and stands in its environment. Literally, agglomerating means "putting things into a compact mass" and, in a technical sense, "uniting into a cohesive unit with a binder." Therefore, the agglomeration refers to the assembly of heterogeneous elements. Indeed, according to its etymology, the agglomeration comes from the Latin word *glomeris*, meaning a ball. For example, a wire rope is an heterogeneous object formed by putting together textiles of different colors. In the case of agglomeration, the link will hide the heterogeneity of the constituent parts of the whole structure.

The agglomeration is by excellence a geographic definition. It starts from the observation of the territory. It is replicable, checkable, and directly visible. The definition of agglomeration starts with the identification of its scope, which then corresponds to the front of buildings and also a threshold in the coherence of the built-up area. In fact, associating the agglomeration and urban space has limitations in the sense that the morphology is a necessary but not sufficient criterion to describe the urban agglomeration.

The metropolitan area: A network approach

The metropolitan area is a socio-economic system. The perimeter of the city is defined by the economic and social functions that qualify the urban area. This functional definition has emerged in recent decades. The preferred measure is the economic and commuter flows, suggesting the extent of the polarization exerted by the centre of the metropolitan area.

The extent of the metropolitan area echoes a neo-liberal approach that aims to evaluate economic efficiency, market access and its scope. Its success is concomitant of the globalization phenomenon. The population of the metropolitan area, as a global social and economic system is diffuse. The metropolitan area is not a separate territory. Unlike the political city and the agglomeration, the measurement tools of the metropolitan area tend to demonstrate the magnitude of globalization.

The city under the metropolitan area definition is no longer opposed to rural, and almost everybody can claim to be living in urban areas if we consider only the integration of the area with globalized networks. Thus in a way, the meaning of the term "urban" loses its substance.

"Urban" versus "rural" spaces

On top of the different definitions of urban spaces, most of the current statistical definitions only distinguish between "agricultural" and "non-agricultural" but not between "urban" and "rural."

Definitions based on cities as political entities tend to separate trades and crafts from land-owners and farm workers, whereas the agglomeration-based definition explicitly excludes all things agricultural from the urban area, which is defined as a continuum of built-up space whether it is used for residential, industrial, administrative, or commercial ends. However, public parks (where agricultural production is not allowed) are included in this definition. The definition of metropolitan areas is based on the concept of mobility, which means that, compared to commuters travelling to and from urban areas, farm workers are viewed essentially as "static" — even if they are highly mobile in their work in the fields.

1.5.2. The difficulty of using a harmonized definition by statistical agencies

In principle, different national statistical agencies can use a harmonized definition of urban population, and by doing so, international comparison of urban population statistics will be possible. In fact, the United Nations (1978) advised the national statistical agencies to adopt as much as possible the definition of agglomeration.

The creator of the *Geopolis* database, François Moriconi-Ebrard, has opted the "agglomeration" as the geographical definition of the city. This definition in fact dominated the administrative and geographical definitions in the 1980s.

The concept of agglomeration was already the official definition of the city adopted in France, which was used by INSEE given the long statistical history in the country. Also, D. Pumain and the PARIS team proposed a harmonized definition of the city in the 1990s under the umbrella of the European statistical institutions. They also agree on the effectiveness of the agglomeration: This definition allows the evaluation of the best size of the city and the implementation of international comparison (Eurostat et al., 1992).

Yet today, harmonization is not always achieved. For example, according to some recent information published by the United Nations, Chongqing was the largest city in the world. However, it was refuted by many researchers. The administrative definition of Chongqing Shi (or more precisely, the Chongqing Zhixiashi) assumes an area of over 82,000 square kilometres, accounting for more than 31 million people, more than 200 villages forming settlements, and other villages and hamlets as well as vast rural areas. However, the central district of Chongqing Shi forms an agglomeration of barely 3.5 million (see, for example, the discussion in Rebour, 2004). Based on our estimation using *e-Geopolis*, the urban agglomeration of Chongqing had a population of about 5 million in 2010, which was not large relative to the most populated urban agglomerations of the world.

1.6. Conclusion

In this Chapter, we first presented some theories of urbanization, including the modernization theory, the dependency theory, the urban bias theory, and the dual-sector and rural-urban migration models. These theories have been used by researchers in different areas such as geography, sociology, political science, and economics. These different theories of urbanization share a common prediction: When the urban areas become more and more developed, rural-urban differences are created and will attract the migration of workers from rural areas to urban areas.

We then discussed some urbanization patterns at the international level. Some of the international evidence was based on the data contained in the World Urbanization Prospects, compiled by the Population Division of the Department of Economic and Social Affairs of the United Nations. Using these data, we showed that the world as a whole and countries in different regions became more and more urbanized in the past decades. It is also expected that these urbanization trends will continue in the next few decades.

A key prerequisite for understanding the urbanization patterns of different countries accurately and consistently is the availability of high-quality data on urbanization. In this Chapter, we also discussed several international urban population databases, including the World Urbanization Prospects. The World Urbanization Prospects database deserves some attention because it is frequently used by international organizations and researchers in different disciplines. Strictly speaking, it is not an original source of urban population statistics. Instead, it is a recollection of urban population statistics provided by the national statistical agencies in different countries. Although the World Urbanization Prospects database provides a handy way for users to retrieve the population statistics of different countries, one key limitation of this database is that the accuracy of its data depends on the quality of the raw population statistics provided by the national statistical agencies of different countries. Since different countries may adopt different methods in counting urban population and defining urban agglomerations, it is very difficult to compare the urbanization data contained in the World Urbanization Prospects database. To deal with these problems, François Moriconi-Ebrard created the *Geopolis* database in the 1990s. The background and methodology of this database will be presented in the next chapter.

Chapter 2
Methodology

2.1. Introduction

In the previous Chapter, we discussed some international urbanization databases and we emphasized that the urban population statistics from these databases may not be comparable across countries. To overcome the problems of measuring and comparing urbanization data in different countries, François Moriconi-Ebrard created the *Geopolis* database in the 1990s, which is further updated and is now under a new name, *e-Geopolis*. This database uses a harmonized definition of urban agglomerations and a standard way of counting urban population. It is by far the most comprehensive urban population database among existing databases in terms of its historical scope, its geographical scope, and its level of completeness. By using a harmonized definition of urban agglomerations and a standardized way of counting population, the *e-Geopolis* database can generate comparable urban population statistics, both across different countries and across time, irrespective of the actual definitions of urban population used by the official statistical agencies.

In this Chapter, we will discuss in greater details the background and the methodology of the *e-Geopolis* database. Chapter 2.2 is a discussion about the harmonized definition of urban agglomerations used by *e-Geopolis*. In Chapter 2.3, we will explain the data requirements and the actual estimation of *e-Geopolis* urban population statistics. In Chapter 2.4, we will present some results about the 30 largest urban agglomerations identified by *e-Geopolis*. We will also discuss some advantages and limitations of *e-Geopolis* and compare it with two commonly used international urban population databases, namely the World Urbanization Prospects and the Global Rural-Urban Mapping Project. Finally in Chapter 2.5, we will discuss the transformation of the old *Geopolis* database to the current *e-Geopolis* database.

2.2. *e-Geopolis*: An harmonized definition of urban agglomeration

In this section, we will discuss the background of the *e-Geopolis* database and how it defines an urban agglomeration. Further details can be found in Moriconi-Ebrard (1994).

2.2.1. Background of the *Geopolis* database

Since the end of the Second World War, urban cities have grown disproportionally in sizes. The meaning of the term "urban" is diverse and sometimes highlights the quasi-monstrous character of the city. It reflects the population or the activities of the people they focus on. The neologism used by Gottman (1961), the *megalopolis*, indicates a common phenomenon nowadays.

In Table 1.2 we use the data contained in the World Urbanization Prospects (The 2011 Revision) to show the number of urban agglomerations by size class of urban settlement. As we explained earlier, the World Urbanization Prospects is a recollection of official population statistics reported by the statistical agencies in different countries. For example, the Chinese population statistics are provided by the National Bureau of Statistics and the French population statistics are provided by the Institut National de la Statistique et des Études Économiques. Therefore, the quality of these data, especially the comparability of the urban population statistics, is subject to questions. Nevertheless, we can still see a noticeable trend that bigger cities become bigger. Besides, the average population of the largest urban agglomerations was about 11.81 million in 1950; it grew to about 15.32 million in 2010, and is expected to increase further to 17.03 million by 2025. This growth has never been achieved before.

To obtain a better understanding of the growth of these cities, we need a population database. In an ideal situation, a population database, or in fact any database, should be a complete collection or archiving of raw information. It should also apply a set of clearly-defined and error-free rules to process such raw information. The construction of the database requires standardization and systematization in terms of data collection and matching. Ultimately, all the raw information collected should be able to be processed automatically by computers, and each piece of information is linked to one another through a structural relationship. Put it another way, the construction of the database needs a rigorous classification of all information.

The philosophy behind the original *Geopolis* and the current *e-Geopolis* databases follows the same approach and the database has its originality and richness. It aims at fulfilling the objective of comparing urban population statistics internationally, a goal set by the creator of the database, François Moriconi-Ebrard, in the 1980s. The database enhances the comparability of data over time, allowing us to better understand the process of agglomerations around the world.

François Moriconi-Ebrard argued that the statistical figures serve an ideology, rather than to provide a tool for urban planning. Following this logic, it implies that no single tool can provide a clear vision of the urban phenomenon because there is no harmonized definition. Therefore, the figures provided in different international databases are disparate and incomparable. They are based on national definitions of the city which vary quite substantially across countries. As mentioned earlier, there are a number of urban population databases used by historians and geographers. However, it is difficult to obtain comparable urban population statistics across different countries by using these databases.

2.2.2. Harmonizing the definition of urban agglomeration

The *e-Geopolis* database uses a unique definition of the "city," which can be applicable worldwide. Its construction is in a particular context: In the 1980s, the growth of cities was frightening because there did not seem to be a limit of growth. To verify whether this claim was valid requires the use of scientific data.

The harmonized definition of urban agglomeration in *e-Geopolis* is based on the cohesion and urban character of the building and population size. Specifically, the definition of urban agglomeration in *e-Geopolis* mirrors the urban unit of INSEE,[17] and it is based on two criteria.

Morphological criterion

The first criterion is morphological. According to this criterion, the agglomeration is a separate population unit distinct by the continuity of built-up areas without any construction that is separated from one another by more than 200 metres. When this threshold is exceeded, there is a discontinuity which indicates the boundary of the agglomeration. In addition, the built-up area must have urban qualities. This definition was recommended by the United Nations in 1978 to the different national statistical agencies.

Demographic criterion

The second criterion is demographic. For the population unit to be qualified as urban, it must contain at least 10,000 inhabitants agglomerated according to the definition of *e-Geopolis*. Note that according to the INSEE definition, the threshold is 2,000 inhabitants. This minimum threshold is used regardless of the definition used by different national statistical agencies.

[17] URL: *http://www.insee.fr/fr/methodes/default.asp?page=definitions/unite-urbaine.htm*.

Therefore, there are three discriminating variables about the urbanity of a place of settlement, namely the agglomerated form, urban character of the land, and the quantitative threshold of population.

2.2.3. The rules for identifying an urban agglomeration

The two criteria mentioned earlier assume a strict set of rules (Moriconi-Ebrard, 1994). There are two major rules, including the identification of the population unit and the use of statistical information. The key points are summarized below.

Identification of the population unit

The criterion to identify the population unit is based on two perspectives: The first is an internal perspective, which is that the land should be classified as urban. The second is an external perspective, which is that discontinuity is indicated by the 200-metre threshold.

According to Moriconi-Ebrard (1994), the following built-up areas are considered as urban:

- Inhabited buildings of all habitat types are included despite variations in density they imply. For example, the buildings that house a large number of households in limited areas correspond to a high concentration and a compact urban fabric. It is different from a land loose, indicated by urban sprawl, an habitat of consumer space.

- Unmanned buildings that are business and non-residential places and are therefore deserted periodically everyday. These buildings include those dedicated to the administration, services, businesses, offices, religious buildings, historic monuments, industrial areas, commercial areas, factories, warehouses, and shops.

- Plots around these buildings and subjects for their use, such as car parks, lawns, and private gardens included in the plot of a building, mines, dumps, and other deposits associated with mining, industrial wasteland, and unconverted mining site.

- Public facilities related to urban life (cemetery), the areas dedicated to recreation (parks and urban forests, sports equipment, stadiums, golf courses), green belts surrounded by buildings on both sides, planted areas.

- Non-linear infrastructures related to transport, including airports, marshalling yards, facilities for crossing routes and waterways, such as bridges and highway interchanges.

- Linear infrastructures related to transport (communication channels and waterways), including roads, highways, railways, such as rivers and streams which do not break the continuity of the built-up area in width but do not form continuity in length.
  - If their width is less than 200 metres, then there is continuity of the built-up area on either side of the track or river unless the cumulative distance at each side of the track, the track, and between built-up areas exceeds 200 metres.
  - If the width is greater than 200 metres, then there is continuity of the built-up area if there is a bridge, a highway interchange, or infrastructure to move from one side to the other side of the built-up area, and the distance accumulated on both sides of the track, at the passage to the inlet and the outlet of the bridge, to the first building, is less than 200 metres.

  When identifying the boundaries of the agglomeration, the buildings and infrastructure assume a continuation of the built-up area, while buildings and other types of land indicate the discontinuity are excluded from the identified agglomeration.

In Figure 2.1, we show an example of identifying agglomerations in Sichuan Sheng using *e-Geopolis*. The areas surrounded by red lines are urban agglomerations. The agglomeration in the bottom-right part of the map is Chengdu Shi.

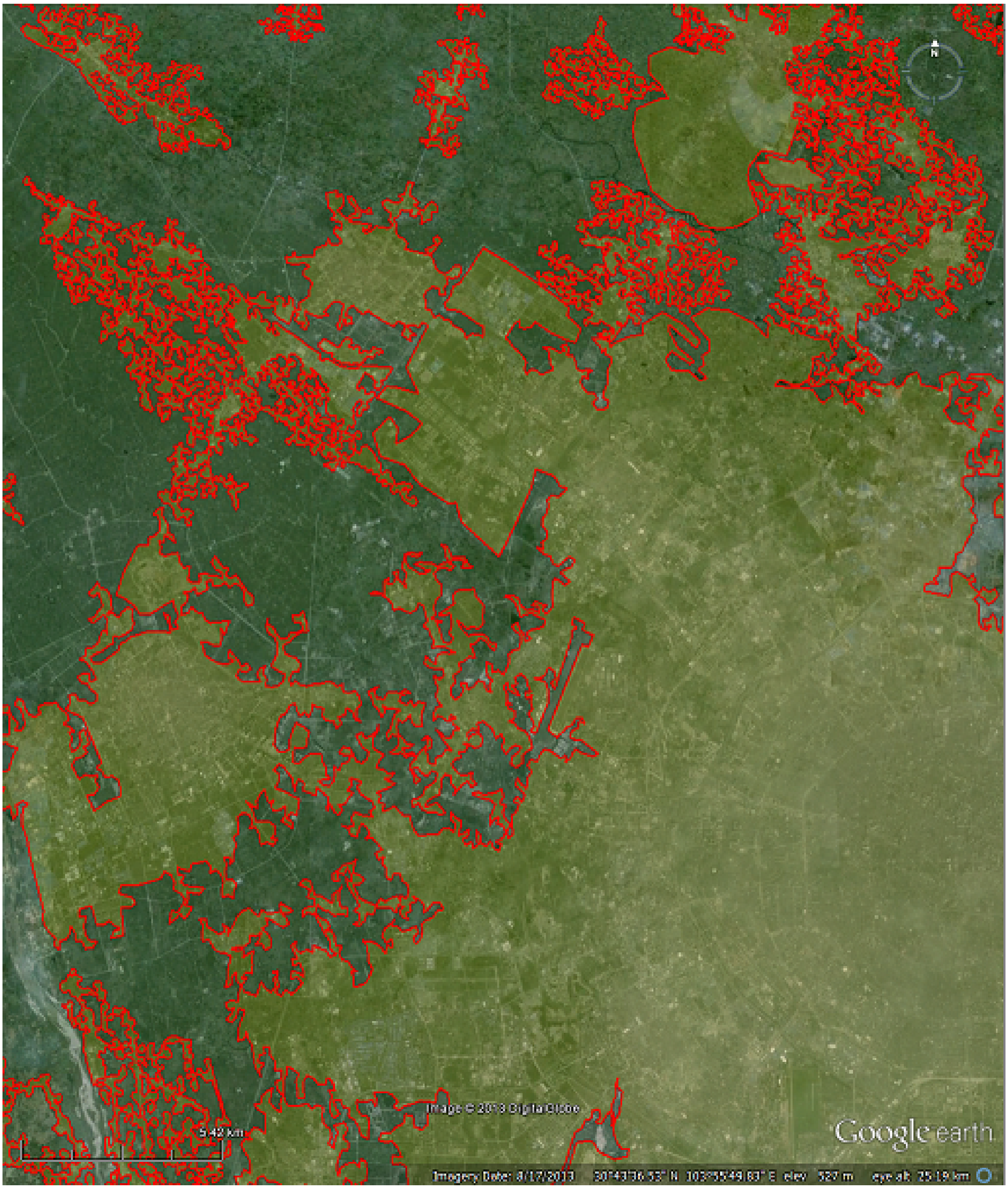
The use of statistical information

The second criterion requires the use of statistical information. The morphological agglomeration is adjusted to the contours of the local units. These local units are the lowest level administrative units. In the case of China, the lowest level administrative units are the township-level divisions (*xiangji xingzhengqu*, 乡级行政区) consisting of townships (*xiang*, 乡), towns (*zhen*, 镇), and streets (*jiedao*, 街道). These units together with other units in the administrative hierarchy of China will be discussed in Chapter 3.

Indeed, the statistical information is available for local territorial units which are administrative in nature for the most part, but can be electoral, religious units, statistics, etc. They do not have the same limitations as the population unit previously defined. The adjustment involves a loss of information.

The morphological agglomeration covers one or more local units, and the sum of the population of these local units gives the population of the adjusted agglomeration. Then the threshold of 10,000 inhabitants (i.e., the threshold for urban) will be checked.

Figure 2.1: An example of identifying urban agglomerations using *e-Geopolis*



Note: The areas surrounded by red lines are urban agglomerations. The agglomeration in the bottom-right is Chengdu.
Source: *e-Geopolis* and Google Earth.

However, the agglomeration is adjusted on the whole local unit. The following two rules are used. The first one is the rule of 50% of the population of the agglomerated local unit. Under this rule, the local unit is a component of the adjusted agglomeration if at least 50%

of its built-up area is located in the morphological agglomeration, a priori corresponding to 50% of the total population of the local unit. Indeed, the local unit may consist of several built-up areas. Despite the discontinuity of settlement in the area of the local unit, we have an obligation to make or exclude the entire territorial unit.

The second one rule is about the shape of the agglomeration and the relevance of the built-up area continuity. Moriconi-Ebrard (1994) lists 10 forms of contact among populated units considered in their own envelope for the local unit. These forms of contact assume a differentiation in the relevant links that perform construction. On the one hand, the differentiation is in terms of units of common stand at two local units and following the 50% rule. On the other hand, it is in terms of the forms of these buildings when they rely on the linearity of infrastructure. Typically, two rows of building borders a line linking two local units; a single row does not ensure continuity.

2.3. The estimation of *e-Geopolis* urban population statistics

Having explained the harmonized definition of urban agglomerations used by *e-Geopolis*, we will now explain how urban population statistics are actually estimated under *e-Geopolis*.

2.3.1. Data requirements

To construct the *e-Geopolis* database, three kinds of data are required, including data from population census, gazetteers or maps, and satellite images.

Population censuses

Population figures for all the local units (including villages and towns) in a country are collected. These data are collected for each known population census, starting from the latest available series to the oldest one. In the case of China, the Township (*xiang*, 乡), Towns (*zhen*, 镇), and Streets (*jiedao*, 街道) units are the lowest levels of geographical units where population data are available (from Population Censuses 2000 and 2010).

Note that most countries conduct a population census in each decade. However, the number of series, and the number of local units could vary. Historical changes (such as creation and merger of local units) are traced according to all available documents. If the raw data sources are not in computer-readable formats, then they will be scanned and digitalized. All these raw data are later formatted and coded.

Gazetteers

We need to use gazetteers or maps to associate all the local units with their geographical coordinates. In practice, not all national statistical agencies provide population census data with geographical coordinates. In such a case, we check national or international gazetteers, geographical survey, census files, or others digitized maps. Once geographical coordinates are identified, Geographic Information System (GIS) files are prepared for all the local units, using their $X - Y$ geographical coordinates in the World Geodetic System (WGS84) format.

Satellite images

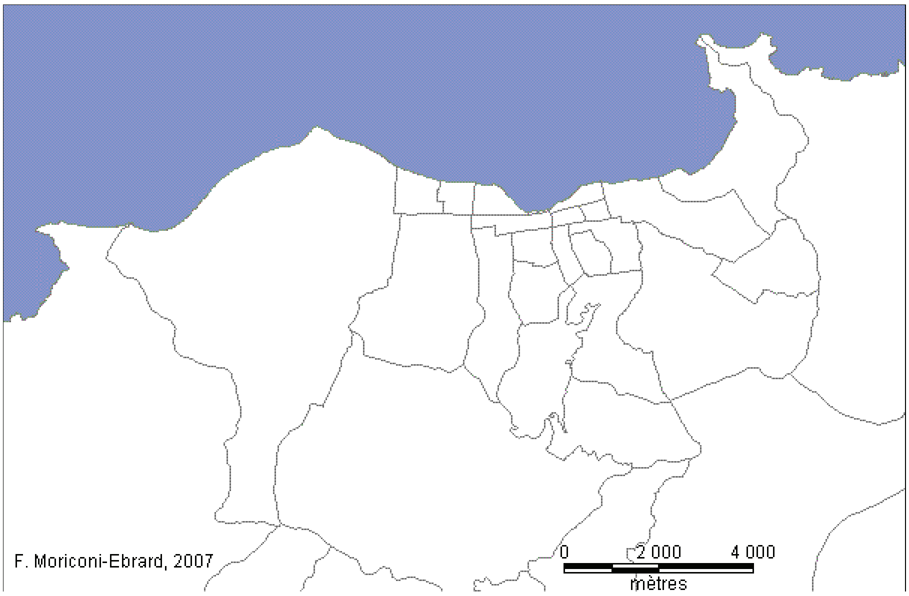
Finally, we need to use satellite images. In the original version of *Geopolis*, agglomerations were identified in maps. In the *e-Geopolis* project, urban/rural demarcation is revised using high definition satellite images.

2.3.2. The procedures to define urban agglomerations using data

In practice, urban agglomerations in the *e-Geopolis* database are defined through a number of steps. It combines information from different sources, including population data and detailed images showing the geographical boundaries of the agglomerations.[18]

Step 1 In the first step, we make use of the information from official agency to identify the boundaries of the local units. In case such data are not available as a map, we can use the centroids as a mapping tool. The centroid in this case is defined as the point where the barycenter or the center of a local community, such as a city hall, a church, or a mosque is located.

Figure 2.2: Using *e-Geopolis* to define urban agglomerations: Step 1



Source: *e-Geopolis* and Chatel et al. (2009).

Step 2 The second step is to access the satellite images or topographical maps. Most of these images can be downloaded freely from the internet. When the image quality is not satisfactory, then other complementary sources have to be consulted.

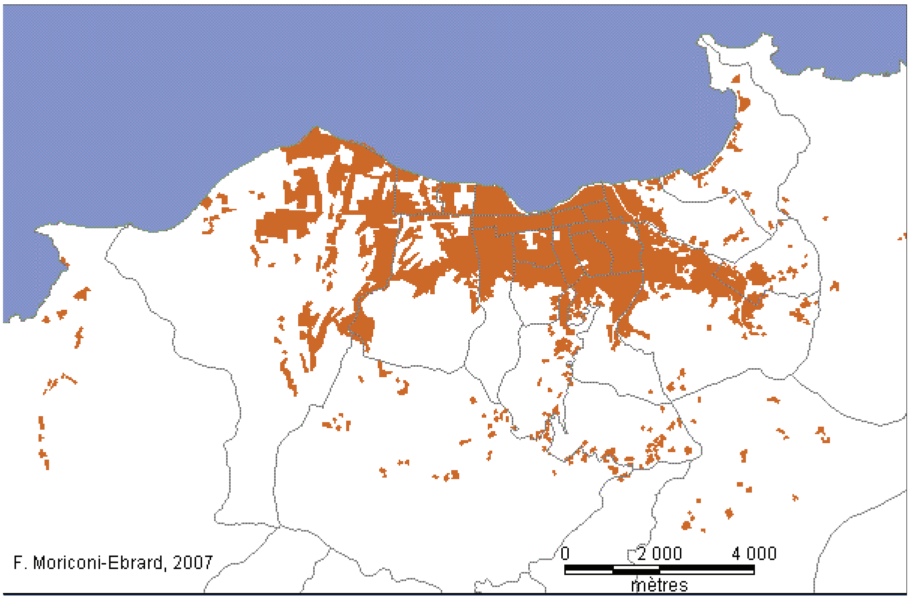
[18]The following discussion is adapted from Chatel et al. (2009).

Figure 2.3: Using *e-Geopolis* to define urban agglomerations: Step 2

Source: *e-Geopolis* and Chatel et al. (2009).

Step 3 In the third step, we draw built-up areas as polygons. These polygons are then superimposed on the map from Step 1.

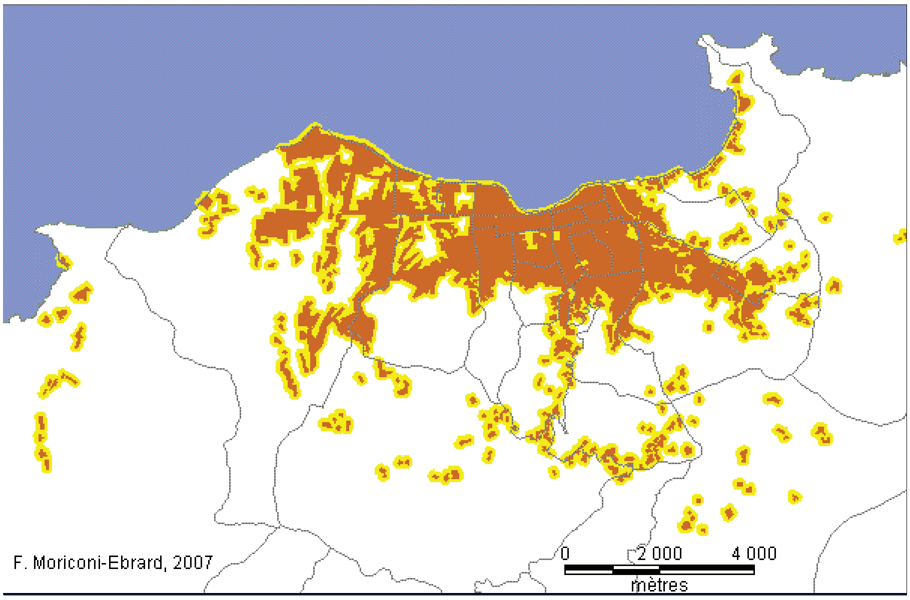
Figure 2.4: Using *e-Geopolis* to define urban agglomerations: Step 3



Source: *e-Geopolis* and Chatel et al. (2009).

Step 4 The fourth step requires that buffer zones of 100 metres be created around the built-up areas. This step is to allow the extent of the built-up areas to be assessed by using the definition based on a figure of less than 200 metres between different buildings.

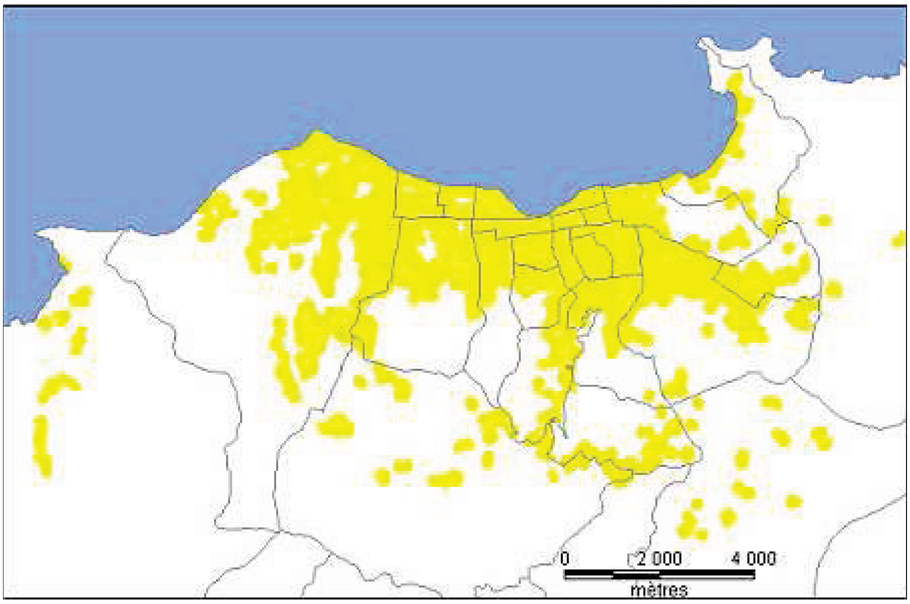
Figure 2.5: Using *e-Geopolis* to define urban agglomerations: Step 4



Source: *e-Geopolis* and Chatel et al. (2009).

Step 5 The fifth step is to merge different blocks to remove any overlaps to create contiguous zones of less than 2,500 metres. The edges of these blocks are also cleaned up to match the boundaries of the ares that are actually inhabited.

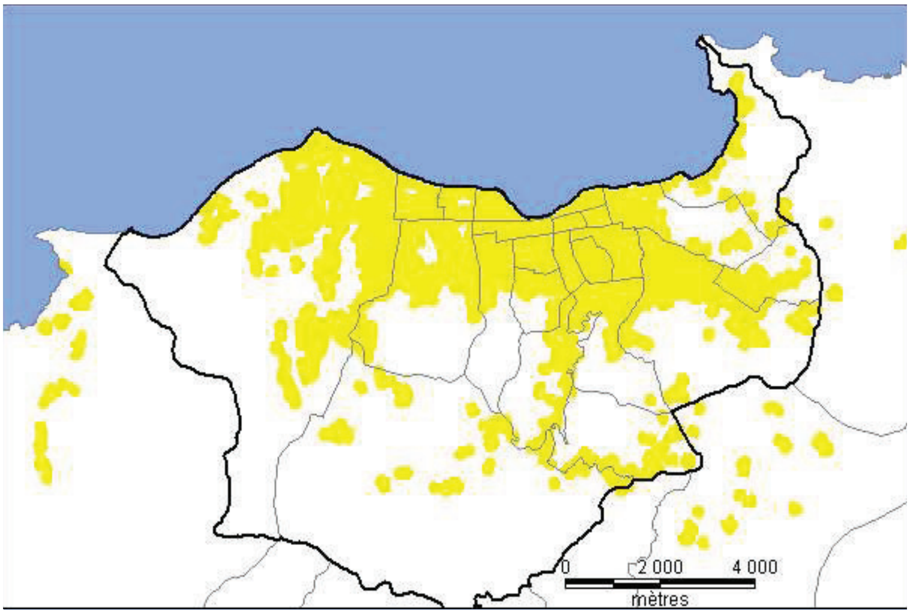
Figure 2.6: Using *e-Geopolis* to define urban agglomerations: Step 5



Source: *e-Geopolis* and Chatel et al. (2009).

Step 6 In the sixth step, we clean up the edges of the blocks to match the boundaries of those areas that are actually inhabited. Then we adjust the boundaries according to the whole local units. Specifically, the contours of the agglomeration are to be matched to the local administrative units. It is required that at least 50% of the local units' built-up areas are within the main agglomeration. Therefore, the resulting agglomeration will cover a number of different administrative units. In certain cases, the agglomeration will cover parts of the administrative units located on the margins of surrounding local units. Note that the margin of error created by this adjustment should be minor for large agglomerations. However the error could be larger for smaller agglomerations, especially those with a population of about 10,000 people.

Figure 2.7: Using *e-Geopolis* to define urban agglomerations: Step 6



Source: *e-Geopolis* and Chatel et al. (2009).

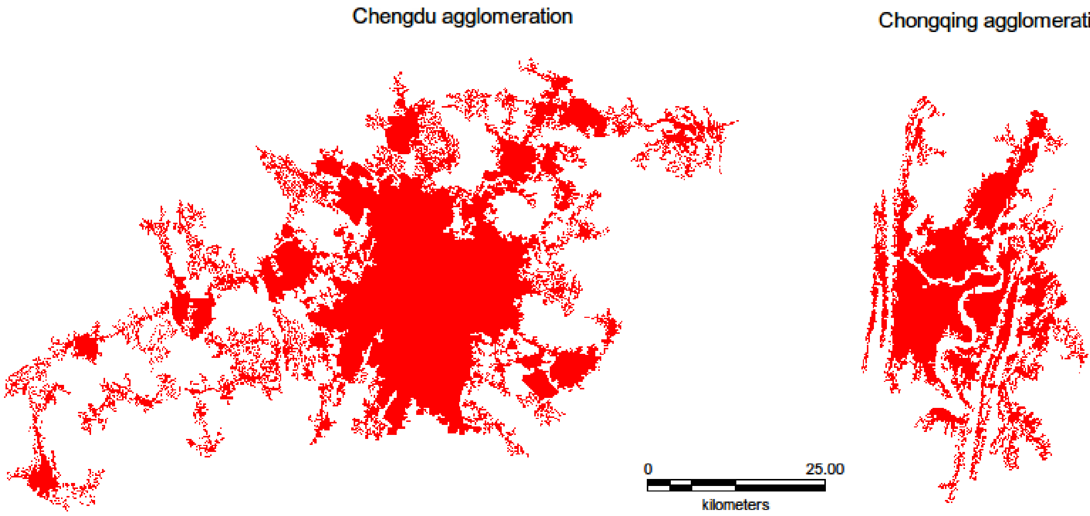
2.3.3. Outputs from *e-Geopolis*

Once the urban agglomerations are identified, *e-Geopolis* can generate different results. First, we can generate maps on the same scale so that we can compare the urbanization patterns in different cities. For example, the map shown in Figure 2.8 compares the urban agglomerations of Chongqing Shi and Chengdu Shi in 2010, using the same scale. We can, for instance, compare the extent of urban sprawl of different urban agglomerations.[19]

Second, *e-Geopolis* can also generate a number of basic variables and other statistical indicators, as shown in Table 2.1. These variables can also be used to calculate a wide range of statistical indicators, such as urban hierarchy, urbanization rate, rank-size distribution, urban sprawl, and population distribution, etc.

[19] See more discussion in Chapter 4.

Figure 2.8: Comparing urbanization patterns in different cities



Source: *e-Geopolis*.

Table 2.1: List of *e-Geopolis* variables

Variable name	Description
Name1	Name of agglomeration
Name2	Alternative names or native name
Name_nat	Native name (character sets)
Name_old	Ancient name (obsolete)
Location	Geo-coordinates (X longitude, Y latitude in 0.000 degrees)
Status	Administrative status (commune, city, town, parish)
CL	Territorial function (capital, county seat, headquarter)
Cc1	Administrative unit level 1 (supra national entity)
Cc2	Administrative unit level 2 (country)
Cc3	Administrative unit level 3 (like : U.S. state)
Cc4	Administrative unit level 4 (like : E.U. region)
Cc5	Administrative unit level 5 (like : French "departement")
Cc6	Administrative unit level 6 (like : German Krei)
Cc7	Administrative unit level 7 (like : Spanish "municipio")
Cc8	Administrative unit level 8 (like : French "commun")
U_Area (sq km)	Surface of digitalized polygon (urban area)
S_Area (sq km)	Administrative area (sum of areas of the local units)
NbU [year 1]	Number of local units included in the agglomeration
PTC [year 1]	Population estimate for the central local unit - Year 1
PTU [year 1]	Population estimate for the agglomeration - Year 1
2NbU [year 1]	Number of local units included in the agglomeration
PTC [year 2]	Population estimate for the central local unit - Year 2
PTU [year 2]	Population estimate for the agglomeration- Year 2

2.4. Main findings and limitations of *e-Geopolis*

In this section, we will present some results about the 30 largest urban agglomerations identified by *e-Geopolis*. Then we will discuss the advantages and limitations of *e-Geopolis* and compare it with two other databases, namely the World Urbanization Prospects and the Global Rural-Urban Mapping Project.

2.4.1. The 30 largest urban agglomerations identified by *e-Geopolis*

The figures reported in Table 1.2 (on page 22) only show the aggregate distributions of the urban agglomerations. But what are the most populated urban agglomerations of the world? Instead of using the data from the World Urbanization Prospects, we use the *e-Geopolis* population statistics estimated by Moriconi-Ebrard and Chatel (2013). These statistics were calculated on July 1, 2010. Compared with the official population statistics, these *e-Geopolis* population statistics can portrait a better picture about the populations and areas of these urban agglomerations.

We show in Table 2.2 the 30 largest urban agglomerations identified by *e-Geopolis*. For each urban agglomeration, we report the population, agglomeration area, and population density.

Note that the urban agglomerations reported in Table 2.2 do not necessarily share the same administrative boundaries of the cities. For example, the Shanghai agglomeration includes the nearby cities of Hangzhou and Nanjing; the Shenzhen agglomeration includes Guangzhou and the northern part of Hong Kong; the Tokyo agglomeration includes Yokohama, Kawasaki, and Chiba; the New York agglomeration includes Philadelphia; the Delhi agglomeration includes parts of Utta Pradesh and Haryana; the Thiruvananthapuram agglomeration includes a large part of the Kerala coast; the Hochiminh agglomeration includes a large part of Mekong delta. This distinction will be emphasized again in Chapter 4 when we compare the urban population statistics of Sichuan Sheng and Chongqing Zhixiashi estimated by *e-Geopolis* and those reported by the National Bureau of Statistics.

From the table we can see that three of the largest urban agglomerations were located in China, including the Shanghai agglomeration, Shenzhen agglomeration, and Beijing agglomeration. Shanghai agglomeration and Shenzhen agglomeration were the two largest urban agglomerations in the world, and Beijing ranked 14th. As of 2010, Shanghai agglomeration had a population of about 94.5 million inhabitants; Shenzhen agglomeration had a population of about 44.4 million inhabitants; Beijing agglomeration had a population of about 16.7 million inhabitants. The combined population of Shanghai agglomeration and Shenzhen ag-

Table 2.2: The 30 most populated urban agglomerations of the world

Rank	Name	Country	Pop. (1,000)	Agglo. area (Sq.km)	Pop. density (Person /Sq.km)	Last source used for the estimates (Year)
1	**Shanghai**(1)	**China**	**94,500**	**22,630**	**4,176**	**2010**
2	**Shenzhen**(2)	**China**	**44,409**	**5,321**	**8,346**	**2010**
3	Tokyo(3)	Japan	39,800	4,201	9,474	2010
4	New York(4)	U.S.	27,764	20,388	1,362	2010
5	Delhi(5)	India	23,300	1,411	16,513	2011
6	Jakarta	Indonesia	22,551	2,199	10,255	2010
7	Seoul	Korea	20,500	1,179	17,388	2010
8	Manila	Philippines	20,078	1,092	18,386	2010
9	Karachi	Pakistan	19,589	807	24,274	2010
10	São Paulo	Brazil	18,890	2,008	9,407	2010
11	Mexico City	Mexico	18,050	1,746	10,338	2010
12	Thiruvananthapuram(6)	India	17,950	9,033	1,987	2011
13	Kolkata	India	17,200	1,852	9,287	2011
14	**Beijing**	**China**	**16,700**	**2,400**	**6,958**	**2010**
15	Mumbai	India	16,500	465	35,484	2011
16	Cairo	Egypt	15,691	1,328	11,816	2006
17	Dhaka	Bangladesh	15,680	1,077	14,559	2011
18	Los Angeles	U.S.	15,449	7,099	2,176	2010
19	Osaka	Japan	14,500	2,900	5,000	2010
20	Bangkok	Thailand	14,160	3,150	4,495	2010
21	Moscow	Russia	14,009	1,901	7,369	2010
22	Hochiminh(7)	Vietnam	13,750	3,000	4,583	2009
23	Istanbul	Turkey	13,460	1,126	11,954	2011
24	Tehran	Iran	12,135	1,917	6,330	2011
25	Rio de Janeiro	Brazil	11,350	1,568	7,239	2010
26	Buenos Aires	Argentina	11,200	2,500	4,480	2010
27	Lagos	Nigeria	10,590	863	12,271	2006
28	Paris	France	10,518	1,867	5,634	2009
29	London	U.K.	10,223	2,190	4,668	2011
30	Lahore	Pakistan	10,000	367	27,248	1998
	Total		610,496	109,585	5,571	2010
	Rest of World Population		6,220,091	135,890,415	46	2010

Note: Total population figures were calculated on July 1, 2010. (1): Include Hangzhou and Nanjing. (2): Include Guangzhou and north of Hong Kong Special Administrative Region. (3): Include Yokohama, Kawasaki and Chiba. (4): Include Philadelphia. (5): Include parts of Utta Pradesh and Haryana. (6): Include a large part of Kerala coast. (7): Include a large part of Mekong delta.
Source: Moriconi-Ebrard and Chatel (2013), using *e-Geopolis*.

glomeration was about 138.9 million. Since the total population of China in 2010 was about 1,340 million, it means that around 1 out of 10 people in China lived in the two largest agglomerations in the world.

The third largest agglomeration is Tokyo, the capital of Japan, having a population of 39.8 million inhabitants in 2010. The other agglomerations all had at least 10 million inhabitants. Many of them are located in such developing countries as Indonesia, Pakistan, and Vietnam.

These 30 agglomerations accounted for roughly 9% of the total world population in 2010.

In terms of areas, two urban agglomerations, namely Shanghai and New York, were extremely large: Each of these two agglomerations occupied an area over 20,000 square kilometres. In the other extreme, some urban agglomerations only occupied a few hundred square kilometres. These smaller agglomerations included Lahore, Mumbai, Karachi, and Lagos. Therefore, the population densities in these small agglomerations were exceptionally high.

Overall, these 30 urban agglomerations contained 610 million people and a combined land area of about 109,585 square kilometre. In other words, they occupied only about 0.1% of the total world area but had about 10% of the world population.

2.4.2. The advantages and limitations of *e-Geopolis*

The definition of urban considered by the *e-Geopolis* approach, the agglomeration, enjoys a widespread recognition. It has been used for 50 years by many national and international statistical agencies. It has also supported the ambition of harmonizing the definition of city in the world, incited by the United Nations and in Europe (through the Eurostat initiative). In addition, it has generated numerous studies in basic and applied research among geographers and historians.

The advantage of the agglomeration definition in *e-Geopolis* is its simplicity. On the one hand, researchers need to consider fewer criteria to define an agglomeration. On the other hand, the definition requires information which is among the more accessible. Therefore, the data computed by *e-Geopolis* are verifiable and the definition of agglomeration under *e-Geopolis* is generalizable, offering a possibility of a comparison.

Since the *Geopolis* database was originally intended to include European cities, the two chosen criteria for harmonization are particularly suitable in the European case. Certainly, they are also suitable in the global context. The agglomeration model corresponds readily to the history and the form of European cities (Paquot, 1996). It shows a concentric development where the buildings characterize the periods of their construction. However, this model loses its significance in Eastern Europe and in the current extensions of cities, because the historical centres become less and less structuring in such cases. Therefore, the agglomeration model is now less and less relevant to the reality of European cities, and the cities in general, as they are structured more by road networks.

Besides, the threshold of 10,000 habitants to fix the limits of agglomerations is adapted to the European context which is characterized by the density of the medium and small cities. Indeed, most of the existing databases are limited to major cities (Pumain et al., 1996). However, this threshold reflects a compromise solution. In Europe, this threshold is insufficient in the case of densely populated rural villages like those in Italy and Hungary (Bairoch et al., 1988). Conversely, the threshold is too high, even in the case of Europe, where some towns have a certain urban characteristics. Nevertheless, this threshold cannot be overwhelmed by too many small towns. Finally, the criterion of demographic threshold implies a fairly arbitrary and admittedly a bit simplistic division of spaces between urban and rural areas. However, this criterion is still often used. On the one hand, because it is synthetic, the concentration of the population in a place indicates a range of activities and a form of organization specific to the city (Lepetit, 1988). On the other hand, because it is convenient, the demographic source is more accessible (Pinol, 2003).

Another limitation of *e-Geopolis* is the scope of data availability in that it provides urban population statistics only. Other demographic and socio-economic indicators that are commonly considered in urbanization studies, such as age, employment, education, income, marital status, and migration etc., are missing from the *e-Geopolis* database. Whether or not we can incorporate these indicators into the *e-Geopolis* database depends on the level of aggregation. For instance, if the number of migrants in an agglomeration is available at the level of local units, then we can use the same methodology to incorporate these information into the *e-Geopolis* database. However, if such data are published at a more aggregate level, say, the provincial level, then we cannot integrate these migration data into the *e-Geopolis* database. Therefore, this problem can only be overcome when statistical agencies of different countries publish such indicators which are measured in a consistent way and are at a detailed level.

2.4.3. *e-Geopolis* versus World Urbanization Prospects

As mentioned earlier, the quality of the urban population statistics from the World Urbanization Prospects depends on the accuracy of the raw data provided by the national statistical office of each country. To illustrate the potential problem of using the data in the World Urbanization Prospects, we can compare the urban population statistics documented in World Urbanization Prospects and those estimated by *e-Geopolis*.

In Table 2.2 (on page 55) we showed the populations of the 30 most populated urban agglomerations of the world, based on *e-Geopolis* definitions. The World Urbanization Prospects (The 2011 Revision) also provides information about the largest urban agglomerations of the world. Table 2.3 shows a comparison of the largest urban agglomerations according to data in *e-Geopolis* and those according to the data contained in the World Urbanization Prospects (The 2011 Revision).

Table 2.3: The 30 largest urban agglomerations of the world in 2010 identified by the World Urbanization Prospects: A comparison between the World Urbanization Prospects and *e-Geopolis*

			Population (Mn)	
Rank	Urban agglomeration	Country	WUP	*e-Geopolis*
1	Tokyo	Japan	36.93	39.80
2	Delhi	India	21.94	23.30
3	Ciudad de México (Mexico City)	Mexico	20.14	18.05
4	New York-Newark	U.S.	20.10	27.76
5	São Paulo	Brazil	19.65	18.89
6	Shanghai	China	19.55	94.50
7	Mumbai (Bombay)	India	19.42	16.50
8	Beijing	China	15.00	16.70
9	Dhaka	Bangladesh	14.93	15.68
10	Kolkata (Calcutta)	India	14.28	17.20
11	Karachi	Pakistan	13.50	19.59
12	Buenos Aires	Argentina	13.37	11.20
13	Los Angeles-Long Beach-Santa Ana	U.S.	13.22	15.45
14	Rio de Janeiro	Brazil	11.87	11.35
15	Manila	Philippines	11.65	20.08
16	Moskva (Moscow)	Russia	11.47	14.01
17	Osaka-Kobe	Japan	11.43	14.50
18	Al-Qahirah (Cairo)	Egypt	11.03	15.69
19	Istanbul	Turkey	10.95	13.46
20	Lagos	Nigeria	10.79	10.59
21	Paris	France	10.52	10.52
22	Guangzhou, Guangdong*	China	10.49	44.41
23	Shenzhen*	China	10.22	
24	Seoul	Korea	9.75	20.50
25	Chongqing	China	9.73	5.03
26	Jakarta	Indonesia	9.63	22.55
27	Chicago	U.S.	9.54	
28	Lima	Peru	8.95	
29	London	U.K.	8.92	10.22
30	Wuhan	China	8.90	8.00

Note: In *e-Geopolis*, Guangzhou and Shenzhen are within one urban agglomeration.
Source: World Urbanization Prospects, The 2011 Revision, and Moriconi-Ebrard and Chatel (2013).

While the largest urban agglomerations identified by the World Urbanization Prospects and *e-Geopolis* are very similar, the populations and the rankings in the two lists are quite different. The most notable differences can be seen in Shanghai and Shenzhen. As described earlier, the Shanghai agglomeration under the *e-Geopolis* definition includes the nearby Hangzhou and Nanjing cities, so that the total population under this definition is much higher than that reported in the World Urbanization Prospects.

The case for Shenzhen is similar: Under the *e-Geopolis* definition, the Shenzhen agglomeration includes Guangzhou and the northern part of Hong Kong. Even if we combine the populations of Guangzhou and Shenzhen reported in World Urbanization Prospects, the population in Shenzhen according to *e-Geopolis* definition is still much higher. For the other agglomerations, the populations estimated by *e-Geopolis* are usually higher than those reported by the World Urbanization Prospects.

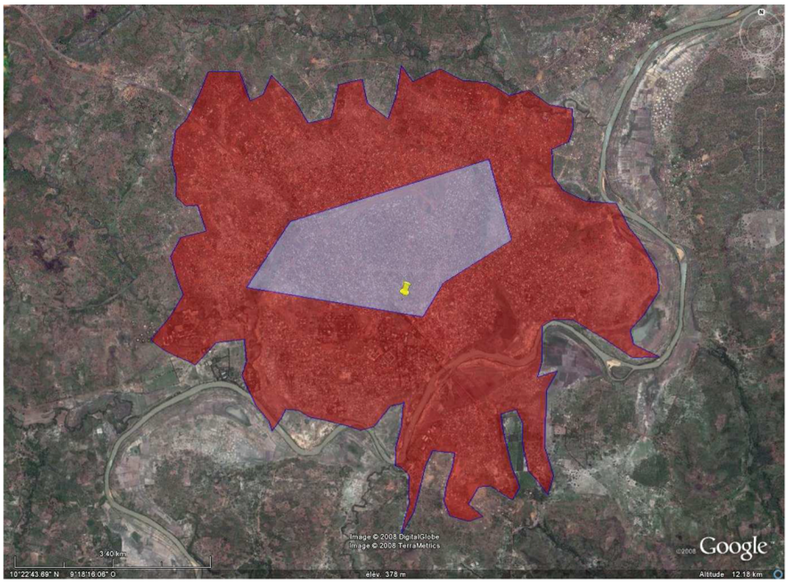
2.4.4. *e-Geopolis* versus GRUMP

We mentioned earlier that the Global Rural-Urban Mapping Project (GRUMP) can provide incorrect estimations of urban areas. Here we show some examples in West Africa, adapted from Chatel et al. (2009), to illustrate the differences between GRUMP and *e-Geopolis*.

According to the GRUMP database, there are 780 areas with more than 5,000 inhabitants in West Africa. However, the *Africapolis* (the *e-Geopolis* database for West Africa) estimates that there are 2,558 inhabited areas with areas between 4 hectare (0.04 square kilometre) to 1,030 square kilometre. Among these inhabited areas, 1,915 had a population above 5,000 in year 2000. Chatel et al. (2009) superimpose the Urban Extents data from GRUMP onto Google Earth images, which are used in *Africapolis* and find the following discrepancies.

Under-estimation The image below shows Kankan, Guinea, which had 108,700 inhabitants in 2000. The area in blue is the Urban Extents data from GRUMP whereas the area in red is the urban sprawl identified by *Africapolis*.

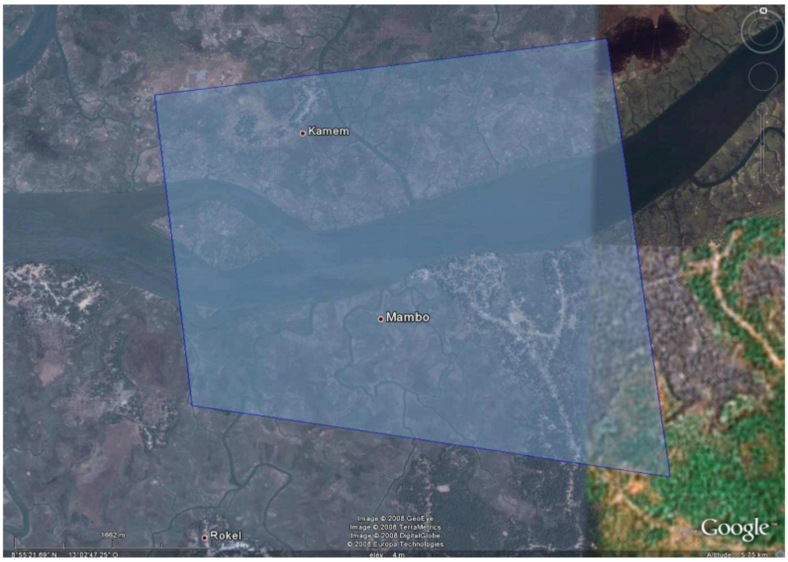
Figure 2.9: *e-Geopolis* versus GRUMP: Under-estimation in GRUMP



Source: Chatel et al. (2009).

False agglomeration GRUMP identifies a virtually uninhabited area in the north of Sierra Leone, as shown in the following image.

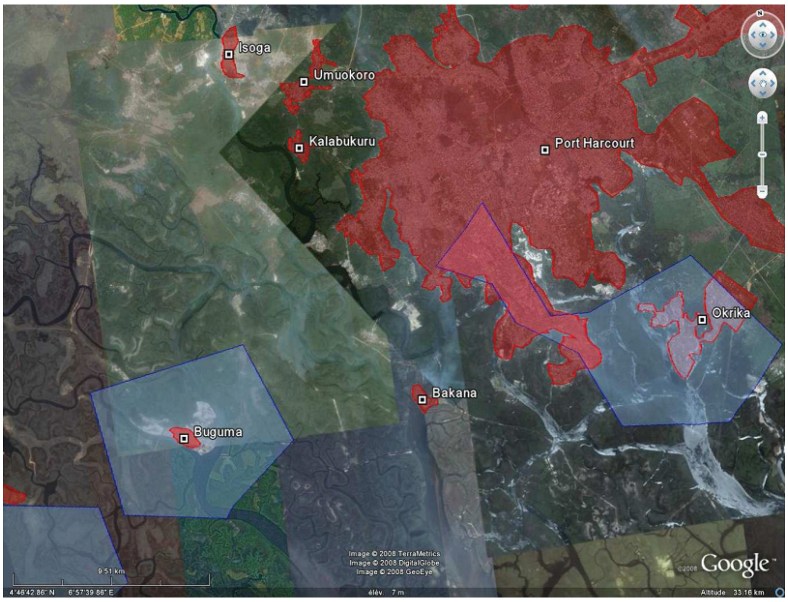
Figure 2.10: *e-Geopolis* versus GRUMP: False agglomeration in GRUMP



Source: Chatel et al. (2009).

Under-estimation, over-estimation, and incorrect location In the following image, the red area in the top-right is the agglomeration of Port-Harcourt identified by *Africapolis*. In contrast, the blue area is the agglomeration identified by GRUMP, which is located much further south and is smaller in size. In the same image, *Africapolis* identifies the agglomeration of Buguma as a small one whereas that estimated by GRUMP is 50 times larger than its actual size.

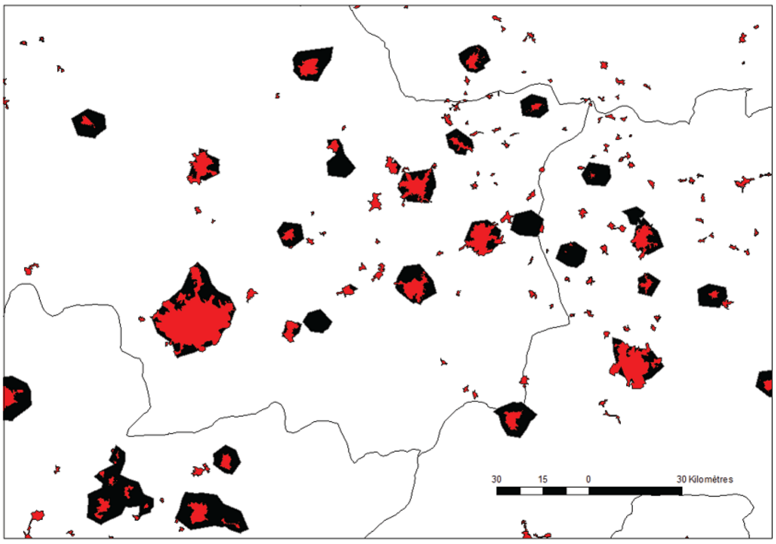
Figure 2.11: *e-Geopolis* versus GRUMP: Under-estimation, over-estimation, and incorrect location in GRUMP



Source: Chatel et al. (2009).

Incorrect identification of urban sprawl In the following figure, the black areas are the morphological units identified by GRUMP for the Oyo, Ondo, and Ekiti regions, to the north-east of Ibadan in Nigeria, whereas the red areas are those morphological units identified by *Africapolis*.

Figure 2.12: *e-Geopolis* versus GRUMP: Incorrect identification of urban sprawl in GRUMP



Source: Chatel et al. (2009).

2.5. From *Geopolis* to *e-Geopolis*: Inheritance and renewal

The original work of *Geopolis* was conducted during the 1980s and presented in the thesis of François Moriconi-Ebrard in 1993. In 2007, the *Geopolis* database was integrated into the *e-Geopolis* program and it is the new name of the database.

The *e-Geopolis* program is created with the financial and institutional support of l'Agence Nationale de la Recherche (ANR) in France under the "Corpus et outils de la recherche en Sciences sociales" project. The aim of the program is to make available to the public through the website *http://e-Geopolis.eu* the data on urban agglomeration around the world and the tools that are required to understand and use these data. The program led to the establishment of a research team and an association of the same name.

Receiving support from other public and private institutions for studies on specific regions of the world, on topics requested or in forms of publication and original dissemination, the team chose to divide the *e-Geopolis* program into regional sub-programs whose names are taken from the regions considered. These regional sub-programs include *Africapolis* (containing sub-databases covering West Africa, Central and East Africa, and South Africa), *Indiapolis*, *Menapolis* (covering Egypt, Jordan, Lebanon, Morocco, and Tunisia), *Europolis*, *Chinapolis*, and *Americapolis*.[20] In the case of *Chinapolis*, it is still in its planning stage. One purpose of this thesis is to apply the *Geopolis* methodology in studying Chinese urbanization in order to demonstrate the potential of *Chinapolis*.

On the one hand, each subdivision offers a certain independence in research funding for increased visibility versus funding agencies that are rarely interested in the entire world. On the other hand, there is a division of labor through the decentralization of the program leader, the author of the database. This decentralization required a rigorous focus point of architecture, nomenclature, and concepts.

Geopolis versus *e-Geopolis*

The improvements in *e-Geopolis* can be illustrated by the example of the *Europolis* database. The *Europolis* database stands out from the *Geopolis* database as its heir in Europe. In *Europolis*, the objectives of harmonizing data on urban population and defining urban areas and the methodology are kept. However, the *Europolis* has several major improvements over *Geopolis*. These improvements are a result of a process of reflection and critique about the data, their sources, the methodology. These changes are necessary in the process of scientific analysis.

[20] For applications of *Africapolis*, see Chatel et al. (2009) and Denis and Moriconi-Ebrard (2009). For an application of *Indiapolis*, see Denis and Marius-Gnanou (2011).

First of all, the viewpoint about the urban phenomenon has change by taking into account the spatial evolution of the agglomeration. Second, the *Europolis* database has been enhanced by covering the entire population for a period of two centuries. Third, the objective of data comparability at the international level in Europe has gained a drastic standardization of the recorded information, such as the steps to construct the database and the dissemination of the data. The major improvements are summarized in Table 2.4.

Table 2.4: *Geopolis* versus *Europolis*

		Geopolis	*Europolis*
1	Delimitations of agglomerations	Constant (1990)	Evolutionary (1800-2010)
2	Period	1950-1990 (40 years)	1800-2010 (210 years)
3	Use of population census data	Local units integrated in an agglomeration or data on agglomerations	Exhaustive and systematic for all local units
4	Cartography	Points (agglomeration centers)	Polygons (spatial extension in 2010)
5	Cross-country agglomeration	Split by national boundaries	National boundaries ignored
6	Computer files	Heterogeneous	Unified at national level and standardized at international level
	Calculations	Manual	Automatic
	Data dissemination	Not provided	Internet

Source: Chatel (2012).

2.6. Conclusion

The discussion in Chapter 1 about the problems of measuring urban population statistics highlighted the importance of using a harmonized definition of urban population and urban agglomeration. In this Chapter, we discussed the background and the methodology of the *Geopolis* database, created by the French researcher François Moriconi-Ebrard. This database is designed to overcome such problems by using a harmonized way of measuring urban population to generate a consistent set of urban population statistics, irrespective of the actual definition of urban population used by the country of interest.

The urban population data in *e-Geopolis* database will be used to examine the urbanization patterns of China in the next two chapters. Specifically, we will first use some data about urban agglomerations in Chapter 3 to give an overall idea about the largest urban agglomerations in China. Then in Chapter 4, we will use the *e-Geopolis* urban population statistics in 2000 and 2010 to examine the urban agglomerations in Chongqing Zhixiashi and Sichuan Sheng. Besides, we will focus on the two largest agglomerations, namely the agglomerations of Chongqing and Chengdu, and discuss their urbanization patterns between 2000 and 2010.

Chapter 3
Urbanization in China: Background and Issues

3.1. Introduction

Since the establishment of the People's Republic in 1949, the urbanization process of China has undergone substantial changes. As discussed in Chapter 1, a prerequisite of understanding accurately the urbanization process of a city or a country is to have high-quality urbanization data. The problems discussed in the previous chapter about the problems of measuring urban population are also relevant in China. But the case of China is even more complicated because of at least three additional issues. First, there are different definitions of populations and these definitions are used in different contexts. Second, different definitions of urban populations are used in different population censuses. Third, administrative boundaries of geographical units often change. These three additional issues make the estimation of urban population and comparison of such statistics over time much more challenging. Nevertheless, some researchers have proposed various methods of revising the official urban population statistics so as to compute a set of comparable urbanization statistics over time. These methods rely on assumptions about changes in urban and rural populations, and even if these assumptions are valid, the revised urban population statistics still may not be able to be compared with other international urban population statistics. Therefore, we argue that the use of the *e-Geopolis* should provide a better way of measuring urban population allowing us to understand China's urbanization. These different issues will be discussed in Chapter 3.2.

In Chapter 3.3, we will examine some urbanization patterns in China. Some of these discussions are based on data from official sources. But whenever possible, we will make use of population data estimated by *e-Geopolis*. We will first discuss some historical patterns of urbanization in China between 1949 and 2010, using the official population data. In the early 1950s, only about 1 in 10 people in China resided in urban areas. The urbanization level of China at that time was among the least developed regions in the world. However, China's urbanization started to accelerate after the introduction of economic reforms in 1978. Thirty years after the economic reform, China has become the second largest economy in the world (only after the United States), and her urban population constituted almost half of the total population. In the next 40 years to come, it is expected that China will continue to urbanize and her urbanization level will get closer and closer to the more developed regions in the world.

Besides, we will show some satellite images of the same places over time to illustrate the extent of urbanization in China in the past 10-15 years. We will also compare the urbanization trends of China with other regions in the world between 1950 and 2050, based on the population data obtained from the World Urbanization Prospects. We will also discuss some trends about the urban clusters having populations above 1 million based on population statistics estimated by *e-Geopolis*.

The urbanization process of China is distinctive due to its special institutions. We focus on two important aspects, namely the administrative hierarchy (*xingzhengquhua*, 行政区划) and the household registration (*hukou*, 户口) system. These two systems are particularly relevant for our discussions of the urbanization of Sichuan Sheng and Chongqing Zhixiashi in Chapter 4. It is because before 1997, Chongqing Shi was part of Sichuan Sheng. Both of Chongqing Shi and Chengdu Shi (the provincial capital of Sichuan Sheng) were *dijishi* in the administrative hierarchy. After 1997, Chongqing Shi was separated from Sichuan Sheng and promoted as Chongqing Zhixiashi, with a status equivalent to a *sheng* in the administrative hierarchy. Such a change inevitably affected the division of administrative powers and economic developments of Sichuan Sheng and Chongqing Zhixiashi. On the other hand, as we will also discuss in Chapter 4, Sichuan Sheng and Chongqing Zhixiashi were inland regions and did not enjoy the initial successes of the economic reform. A lot of the people from these regions migrated to coastal regions to seek better job opportunities. However, under the *hukou* system, the mobility of these migrants was affected, especially when they moved from rural areas to urban areas. Therefore, the urbanization of Sichuan Sheng and Chongqing Zhixiashi was related to not only their industrialization but also the administrative hierarchy and the *hukou* system.

Administrative hierarchy (*xingzhengquhua*, 行政区划)

Compared with many other Western countries, China has one of the most rigid administrative hierarchies in the world. This system has strong effects on the development of local territorial units in the country. Under the system, a territorial unit can only directly interact with those that are immediately above or below it in the administrative hierarchy, and a lower-ranked unit is a "subordinate" to the unit above it. As a result, a local county, for instance, can only interact with the central government by going through all the superior units. The rank of a place or a unit in the administrative hierarchy affects how it can carry out its social, economic, and political functions. For example, it determines the decision authority it has in relation to attracting foreign investment, acquiring land for development, and it also determines the size of the government offices and the number of staff members. Generally speaking, the higher a unit rises along the administrative hierarchy, the more decision authority it can obtain. Therefore, during the economic reform era, the local governments have strong incentives to upgrade themselves in order to enhance their economic growth. As urbanization is closely related to economic development, the administrative ranking of a city has a great influence on its urbanization process. In Chapter 3.4, we will discuss briefly the history of China's administrative hierarchy and its current structure (as of 2010).

***Hukou* (户口) system**

Another important factor affecting China's urbanization is its household registration (*hukou*) system. In the long history of China, the system of registering population has existed in various forms. Historically, the household registration system was used mainly for the purposes of taxation and conscription. However, the *hukou* system of the People's Republic is designed to restrict the mobility of people across the country, especially from rural areas to urban areas, in order to fulfill the different political and economic needs of the government. It is operated by requiring that all internal migrations be subject to approvals from the local authorities at the destinations. This system therefore greatly affects the urbanization process since after all, urbanization is realized through the migration of people from rural areas to urban areas. In recent years there are different reforms in the *hukou* system under which people get more freedom to relocate across the country. In Chapter 3.5, we will discuss the historical background of the *hukou* system, recent reforms, and its impact on urbanization and migration.

3.2. The problems of measuring urban population in China

In Chapter 1, we discussed the general problems of measuring urban population. The case of measuring urban population in China is no less complicated than the cases in other countries. In the Chinese context, there are at least three additional issues.

The first issue is about the multiple definitions of "populations," which are used in different contexts. These different definitions include household registration (*hukou* or *huji*) population (户籍人口), resident population (*changzhurenkou*, 常驻人口), and census populations (*pucharenkou*, 普查人口).[21] The second issue, which is more problematic, is about the changing definitions of urban populations used in different population censuses. Therefore, the official urban population statistics published in different censuses may not be directly comparable. Although several methods have been proposed to revise these official statistics, it is hard for users of these revised statistics to tell whether they are accurate or not because these methods depend on certain assumptions about the changes in urban and rural populations over time. The third issue is about the changing boundaries of administrative areas. Thus, even if the same definitions of urban population are used over time, when the administrative boundary of a geographical unit has changed, it is still difficult to compare the urban populations of this unit across time.

In view of these problems, it is therefore crucial for researchers to use a robust and reliable way to measure urban population in China.

3.2.1. Distinction among *hukou* population (户籍人口), resident population (常驻人口), and census population (普查人口)

Before we can understand the different issues and processes about China's urbanization, it is important to first understand the meaning of the term "urban" in the context of China. As far as measuring urban population is concerned, different definitions have been used in different contexts.

On the one hand, urban administrative districts or city districts are the basis for urban population counting. However, these urban administrative areas very often include farmland and rural areas, and by doing so the urban population figures are likely to be over-estimated. On the other hand, the *hukou* system creates the *de facto* versus *de jure* distinction of the population. This kind of distinction is used in several countries of the world. In China, the *de facto* approach counts a person as a resident irrespective of his *hukou* status as long as he is physically

[21] More about the *hukou* system will be presented in Chapter 3.5.

living in the place. In contrast, the *de jure* approach only treats a person as a resident if he has the *hukou* of the place. In terms of measuring urban population, the *hukou* system treats *de facto* residents without local *hukou* as outsiders. These residents are in some cases excluded from the annual official population statistics, therby under-estimating the urban population figures.

In China, there are different types of "populations" which are used in different contexts. These types include *hukou* population, resident population, and census population. Strictly speaking, the populations of *hukou*, resident, and census are different.

***Hukou* population** It is the *de jure* population including all the people with official *hukou* status regardless of their physical locations.

Census population It does not include the entire *hukou* population but it only counts the *hukou* population present at the time of the census. Nevertheless, the census population for a place includes the people without local *hukou* status but currently reside in that particular location, and people with unknown *hukou* status, as well as foreign migrants and visitors.

Resident population It includes most of the census population except the foreign migrants and visitors. Besides, it includes people with local *hukou* status but have been away under half or one year, and those people living abroad and have their *hukou* canceled. It can also be further divided into resident *hukou* population and resident *non-hukou* population.

These differences are summarized in Table 3.1.

3.2.2. Defining urban population in different population censuses

Another challenge in the context of China is that the method of defining urban population has changed regularly since the early 1950s and different definitions are used in the different censuses.[22]

Between 1964 and 1981, only those people living in urban areas with valid local *hukou* were counted as urban population (i.e., the *de jure* approach was used). From 1982, basically all people physically residing in urban area were treated as urban population (i.e., the *de facto* approach was used). Moreover, before the 2000 Population Census, administrative areas such as cities and towns were used as the basic units to measure urban population. As the number of cities and towns has increased rapidly since the early 1980s, many people resided in rural areas were included in the urban population simply because of changes in administrative

[22]See Shen (2005) for a detailed comparison of the definitions used in the censuses between 1953 and 2000. See also Sanjuan (1996) for a related discussion based on the example of the Pearl Rivier Delta of Guangdong Province.

Table 3.1: *Hukou*, resident, and census populations in China: A comparison

	Hukou population (户籍人口)	Resident *hukou* population (常驻户籍人口)	Resident non-*hukou* population (常驻非户籍人口)	Census population (普查人口)
Hukou population away over half or one year	✓			
Hukou population away under half or one year	✓	✓		
Hukou population present	✓	✓		✓
Population with unknown *hukou*			✓	✓
Non-*hukou* population away from *hukou* location over half or one year			✓	✓
Non-*hukou* population away from *hukou* location under half or one year				✓
Foreign migrants			✓	✓
Foreign visitors				✓
Population abroad with *hukou* cancelled			✓	

Source: From Shen (2005).

boundaries during this period. To overcome this problem, smaller spatial units were used to count urban population in the 2000 Population Census. The 2010 Population Census followed basically the same approach as in 2000 (the National Bureau of Statistics, 2008) with some minor adjustments.

In the population censuses, the basic area units for counting urban population were different in cities and in towns.

Cities (*shi*, 市) In cities, the basic area units were *xiang*, *zhen*, and *jiedao*. Within these cities, the city proper (*shiqu*, 市区) included:

- All *jiedao*.
- All *xiang* or *zhen*, where the prefecture administrations, the city or the urban district governments were located (the government "seats" (*zhengfu zhudi*, 政府驻地)).
- All *xiang* or *zhen* contiguous to the seat of a government of an urban district (or a city without an urban district).

Towns (*zhen*, 镇) The basic area units for counting urban population in *zhen* within counties were *jumin weiyuanhui* (居民委员会) and *cunmin weiyuanhui* (村民委员会). Within these towns, the town proper (*zhenqu*, 镇区) included:

- All *jumin weiyuanhui* or *cunmin weiyuanhui* that were the seat of a town government.
- All *jumin weiyuanhui* or *cunmin weiyuanhui* that were contiguous to the above seats.
- All special areas (*teshuqu*, 特殊区) outside a city or a town, with usual resident populations over 3,000 persons. Such special areas included tourism zones (*lvyouqu*, 旅游区), universities and colleges (*dazhuan yuanxiao*, 大专院校), or development zones (*kaifaqu*, 开发区), etc.

Spatial and population coverages of urban population

Based on the above discussion, we can compare the spatial and population coverages of the different population censuses.[23]

Spatial coverage There were different changes in the spatial coverage of urban population in the past different censuses. Table 3.2 summarizes such differences for the 1982, 1990, 2000 and 2010 Population Censuses.

Some major differences are highlighted as follows. The basic unit for counting urban population at various levels of the administrative hierarchy was different. At the *shi* level, for instance, the whole city was considered as a basic unit in 1982, whereas in 1990 and 2000 only urban districts within a city were considered. Besides, before 2000, *zhen* were considered as single units.

In the 2000 Population Census, the concepts of city proper (*shiqu*, 市区) and town proper (*zhenqu*, 镇区) were introduced the National Bureau of Statistics, 2000). Besides, urban districts were differentiated into high- and low-density districts using a population density of 1,500 persons per square kilometre as the threshold. Only the high-density urban districts were considered as the city proper and their populations were counted towards the urban population. In low-density urban districts and *xianjishi*, the basic units for counting urban population were *xiang*, *zhen*, and *jiedao*. The 2010 Population Census included all urban residents meeting the criterion for the 2000 Population Census, plus the residents living in villages or *zhen* in outer urban and suburban areas that were directly connected to municipal infrastructure and receive public services. In the 1982 Population Census, the basic units for counting urban population included urban districts, *jiedao* in *xianjishi*, and *zhen* in *xianjishi*, whereas in the 1990 Census, urban districts, *jiedao* in *xianjishi*, *jumin weiyuanhui* in *zhen* were used as the basic units for counting urban population.

[23] See Shen (2005) for further discussion.

Table 3.2: Spatial coverage of urban population in 1982, 1990, 2000, and 2010 Population Censuses in China

	Census			
	1982	1990	2000	2010
shi/ shiqu				
Shiqu with population density over 1,500 persons per sq. km.	✓	✓	✓	✓
Shiqu with population density less than 1,500 persons per sq. km.	✓	✓		
Cities without districts	✓			
xiang/ zhen/ jiedao/ teshuqu				
jiedao in cities that are not wholly covered	✓	✓	✓	✓
zhen in counties	✓			
zhen in cities that are not wholly covered	✓			
xiang or *zhen* as, or contiguous to, the government seat of its urban district	✓	✓	✓	✓
xiang or *zhen* as, or contiguous to, the government seat of a city without districts	✓		✓	✓
xiang or *zhen* as government seat of prefecture in a city not wholly covered	✓		✓	✓
Special area with population over 3,000 persons			✓	✓
Villages or *zhen* in outer urban and suburban areas that are directly connected to municipal infrastructure and have access to public services				✓
jumin weiyuanhui/ cunmin weiyuanhui in zhen in xian and shi that are not wholly covered				
jumin weiyuanhui in *zhen*	✓	✓	✓	✓
cunmin weiyuanhui as or contiguous to the seat of its town government	✓		✓	✓

Source: Shen (2005) and the National Bureau of Statistics (2008).

Population coverage In addition to spatial coverage, the population coverage also changed substantially in the different censuses. Table 3.3 summarizes these differences for the 1982, 1990, and 2000 Population Censuses. Below are some key differences:

The 2000 Population Census counted as urban population all the agricultural population in villagers' committees in cities that were wholly covered. Besides, it included the non-*hukou* population that had left their place of registration over half a year. The method used by 1990 Population Census was similar except that it included the non-*hukou* population that had left their place of registration over a year. The 1982 Population Census adopted a similar approach as in 1990 but it also included agricultural population in villagers' committees in towns of counties and cities that were not wholly covered.

Table 3.3: Population coverage of urban population in 1982, 1990, and 2000 Population Censuses in China

	Census			
	1982	1990	2000	2010
Including all agricultural population in *cunmin weiyuanhui* in *shi* that are wholly covered	✓	✓	✓	✓
Including all agricultural population in *cunmin weiyuanhui* in *zhen* of *xian* and in *shi* that are not wholly covered	✓			
Including non-*hukou* population (i.e., excluding *hukou* population) that has left their place of registration over one year	✓	✓	✓	✓
Including non-*hukou* population (i.e., excluding *hukou* population) that has left their place of registration for half to one year			✓	✓

Source: Adapted from Shen (2005).

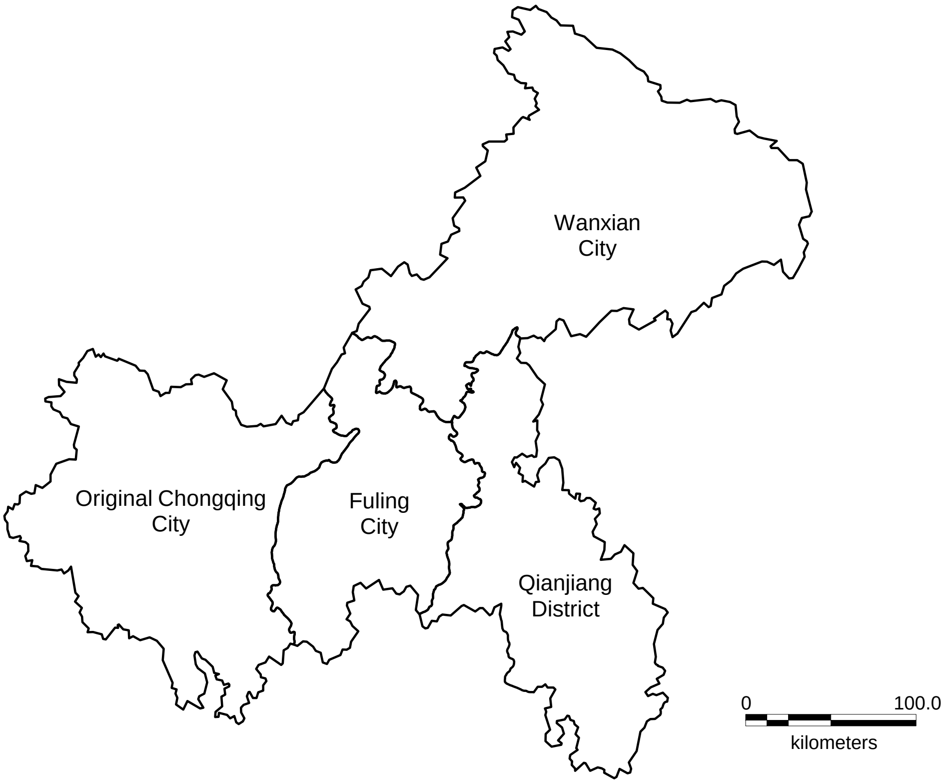
3.2.3. Changing boundaries of administrative areas

In China, the administrative boundaries of geographical units often change over time. Such changes make comparisons of urban population for the same unit over time difficult, even if the definitions of urban population and urban areas are the same. It is because once the administrative boundary of a unit has changed, it can lead to mechanical changes in population as well as population density immediately.

One example, which will be examined in greater details in Chapter 4, is the promotion of Chongqing Shi from a *dijishi* to a *zhixiashi* in 1997. The change in administrative hierarchy was coupled with the inclusion of two cities and one district from Sichuan Sheng (namely, Wanxian Shi, Fuling Shi, and Qianjiang Qu) (see Figure 3.1).

When these units were merged into the “Old” Chongqing Shi to form the “New” Chongqing Shi (i.e., Chongqing Zhixiashi), there was a large yet mechanical increase in total land area and population: Land area increased from 23,000 square kilometres to 82,000 square kilometres; total population increased from about 15 million to over 30 million. In such a case, it would not be meaningful to compare the urbanization rate of Chongqing Shi in 1996 (i.e., the “Old” Chongqing Shi) and that of Chongqing Shi in 1997 (i.e., the “New” Chongqing Shi). It would also not be meaningful the compare the urbanization processes of Chongqing Shi and another city, say Chengdu Shi, before and after Chongqing Shi’s promotion.

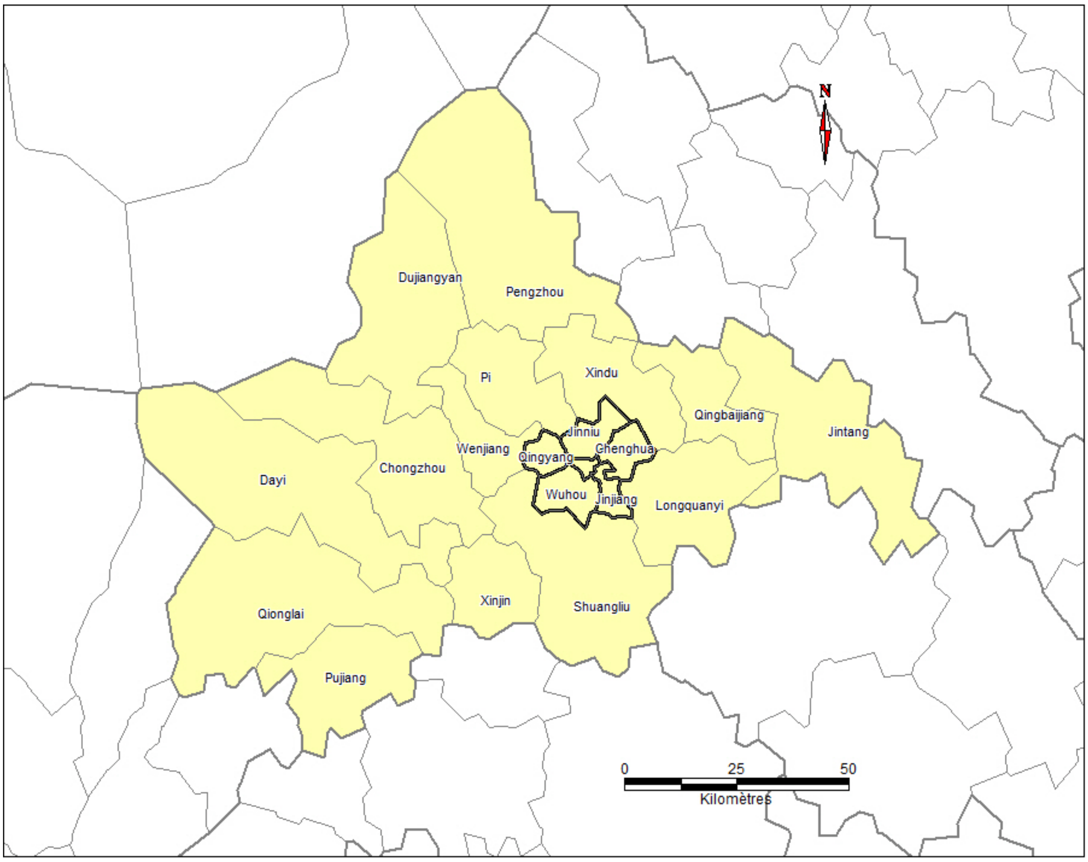
Figure 3.1: The formation of Chongqing Zhixiashi



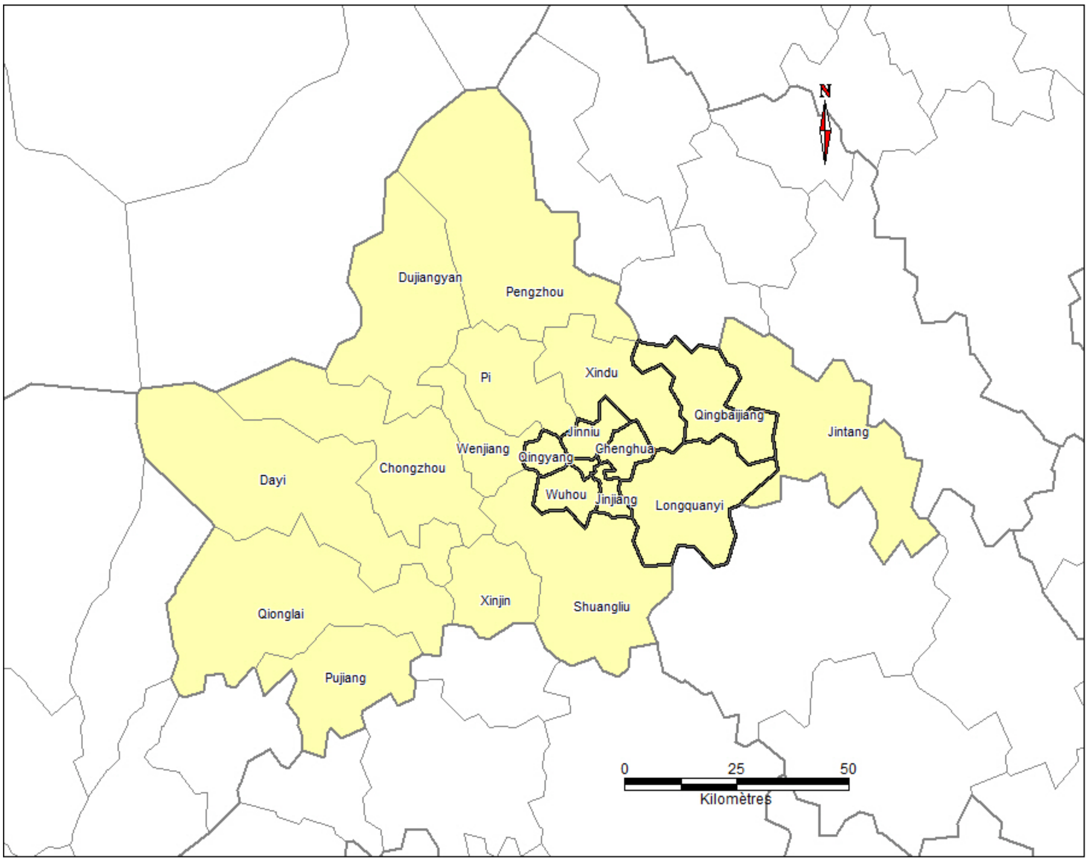
Source: *e-Geopolis*.

Another type of changes in boundaries can take place within a city even though the administrative boundary of the city has remained unchanged. For example, although the administrative boundary of Chengdu Shi is fixed, its *qu* has expanded over time. In Figure 3.2 we show the boundaries of the city districts (in thick black lines) in 1990, 2000, and 2010 respectively. The land area of the *qu* of Chengdu Shi in 2010 was more than double its land area in 1990. In other words, the "*qu*" in 1990 was different from the "*qu*" of 2010. If we are interested in comparing the urbanization processes of the *qu* of Chengdu Shi over time, or the urbanization processes of the *qu* of Chengdu Shi versus the *qu* of another city, then we need to take into account the changes the administrative boundaries of the *qu*.

Figure 3.2: The boundaries of the *qu* of Chengdu Shi

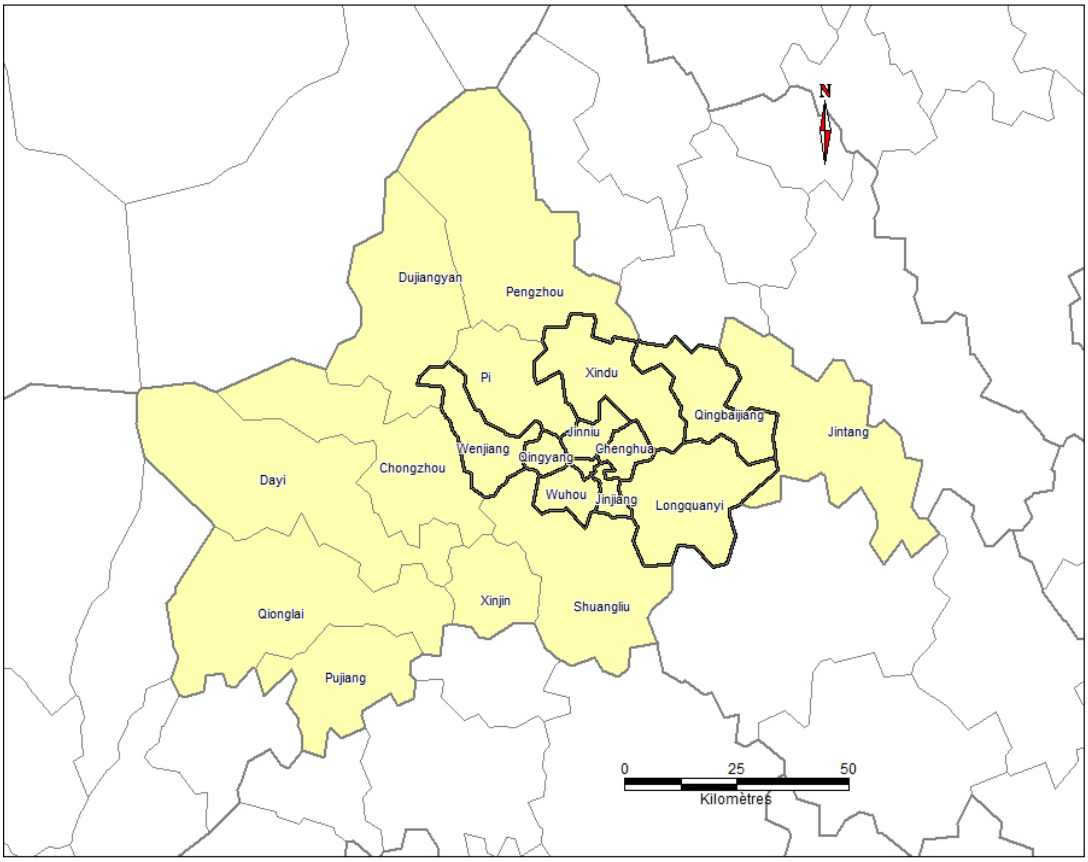


(a) 1990



(b) 2000

Figure 3.2: The boundaries of the *qu* of Chengdu Shi (Continued)



(c) 2010

Note: The boundaries of the *qu* are in thick black lines.

Source: *e-Geopolis*.

Even at a more microscopic level, we can also observe changes of administrative boundaries. For example, some *xianji* divisions were converted from *xian* to *xianjishi* with additional land areas. Therefore, strictly speaking these divisions before and after conversion were different.

3.2.4. Correction of the official urban population statistics

For the 2000 Population Census, the National Bureau of Statistics of China adopted a new definition of urban population. To obtain consistent urban population statistics based on the new definition of urban population, several approaches have been proposed to re-estimate the urbanization levels between 1982 and 2000. Here we discuss four of them.

Method 1: Linear interpolation

First, the National Bureau of Statistics (2002) used a linear interpolation approach to revise the urbanization levels between 1990 and 2000. They take the urbanization levels from the 1990 Population Census, the 1995 Population Survey and the 2000 Population Census as given. They then interpolate linearly the urbanization levels in the years between 1990 and 1995 and between 1995 and 2000.

To illustrate this approach, let UR_{1990}, UR_{1995} and UR_{2000} be the urbanization rates obtained from official statistics in 1990, 1995, and 2000, respectively. Then for any year t between 1990 and 1995, the urbanization rate is estimated as:

$$UR_t = UR_{1990} + \frac{UR_{1995} - UR_{1990}}{5} \times (t - 1990).$$

Similarly, for any year t between 1995 and 2000, the urbanization rate is estimated as:

$$UR_t = UR_{1995} + \frac{UR_{2000} - UR_{1995}}{5} \times (t - 1995).$$

An advantage of this approach is that it is simple and can be computed without extra data. However, an obvious drawback of this approach is that it assumes a constant change in urbanization level between each of the two 5-year periods.

Method 2: Constant difference between the growth rates of urban and rural populations

A second method is to follow the United Nations (1980) by assuming that there is a constant difference between the growth rates of the urban population and rural population. This method was used by Chan and Hu (2003) and Zhou and Ma (2003).

To illustrate the idea of this method, we follow the discussion of Zhou and Ma (2003). We can write the urban-rural growth difference between the two census years as:

$$URGD = \frac{1}{n} \times \log \left[\frac{UR_2/(1 - UR_2)}{UR_1/(1 - UR_1)} \right],$$

where $URGD$ is the urban-rural growth difference between two census years, UR_1 is the urbanization rate in the earlier census year, UR_2 is the urbanization rate of the later census year, and n is the number of years between the two censuses. Then, for any year t between the two census years, the urbanization rate UR_t can be estimated by:

$$\frac{UR_t}{1 - UR_t} = \frac{UR_1}{1 - UR_1} \times e^{(URGD \times t)}.$$

This method in general can produce a smooth trend, similar to the one obtained by using linear interpolation. However, as argued by Shen (2005), the assumption under this approach, that the difference between the growth rates of urban and rural populations, is not valid in the case of China because the urbanization process in China has become faster since the 1980s while the growth rates of the total population and rural population have stabilized.

Method 3: Constant ratio of urban and urban non-agricultural populations

The third method is to assume that urban population can be expressed as a fraction of the urban non-agricultural population reported in official statistics. This method was used by Wu (1994) and Zhang and Zhao (1998).

Specifically, Wu (1994) assumes that:

$$UNAP_t^* = UNAP_{t,i}(1 + u_{t,i}),$$

where $UNAP_t^*$ is the adjusted urban non-agricultural population in year t, $UNAP_{t,i}$ is the official non-agricultural population in year t and i is a phase (1964-1970, 1971-1983, and 1984-1990), and $u_{t,i}$ is the under-reporting rate. For example, the under-reporting rate is assumed to be 1% during the 1964-1970 period and 5% during the 1984-1990 period. Then Wu (1994) assumes that about 10% of the urban population engaged in agricultural activities, so that the estimated urban population in year t, UP_t^* is:

$$UP_t^* = \frac{UNAP_t^*}{1 - 10\%}.$$

Zhang and Zhao (1998) use a similar approach but further distinguish the following two cases in their estimation: Permanent agricultural population living in urban areas, and migrants who had lived in cities for more than one year. The adjustment factors used in different cases ranged from 25% to 40%, and revised urbanization rates were calculated for different provinces and the entire country in 1980, 1985, 1988, 1990, 1993, and 1995.

Method 4: Constant ratio of the growth rates of urban and rural populations

A fourth approach, proposed by Shen (2005), is based on the concept of dual-track urbanization because urban population can include both agricultural and non-agricultural populations. This approach is similar to the second one but assumes that the growth rate of urban agricultural population is proportional to the growth rate of the urban non-agricultural population.

Specifically, Shen (2005) adjusts the urbanization levels through the following steps. First, the urban non-agricultural population statistics are obtained from official sources. Then its annual growth rates can be computed. Second, the agricultural population in urban area between 1982 and 2000 are estimated. The estimation is under the assumption that the ratio between the growth rates of urban agricultural population (D_t) to that of urban non-agricultural population (C_t) is a constant, i.e.,:

$$\frac{D_t}{C_t} = O \text{ (a constant).}$$

Let F_t be the urban agricultural population in year t. From data, F_{1982}, F_{2000} and C_t (t between 1982 and 2000) are known. Therefore, an estimate of O can be obtained from the following equation:

$$F_{2000} = F_{1982} \times \prod_{j=1983}^{2000} (1 + O \times C_j).$$

Once O is estimated, the urban agricultural population in year t can be estimated by:

$$F_t = F_{1982} \times \prod_{j=1983}^{t} (1 + O \times C_j).$$

Therefore, the urban population, as a sum of urban non-agricultural population and urban agricultural population, in each year can be estimated. Third, the total populations are estimated by setting an annual growth rate that can match the changes in total population between 1982 and 2000. Finally, the urbanization rates between 1982 and 2000 can be found by using the estimated urban and total populations.

Comparison of the four methods

Do the four methods of revising the official urban population statistics generate similar results? In Table 3.4, we summarize the official urbanization rates between 1982 and 2000, computed using data obtained from the National Bureau of Statistics (downloaded from *China Data Online*) and the other correction methods, namely linear interpolation, Wu (1994), Zhang and Zhao (1998), Zhou and Ma (2003), and Shen (2005). For the linear interpolation method, we take the official urbanization rates in 1982, 1990, and 2000 as given and estimate the urbanization rates between these census years.

The figures in Table 3.4 show that the revised urbanization rates based on the linear interpolation method were smaller than the official urbanization rates between 1982 and 1990 but were larger between 1990 and 2000. These differences depend a lot on the incremental changes of urbanization between census years. For example, China's urbanization was faster in the late 1990s than in the late 1980s. The higher urbanization rate in 2000 makes the linearlyinterpolated urbanization rates between 1990 and 2000 higher than the official counterparts. On the other hand, the estimates of Wu (1994) were substantially lower than the official urbanization rates and the other revised estimates while those of Zhang and Zhao (1998) were slightly lower than the official figures in the 1980s but were higher in the 1990s. Furthermore, both the revised urbanization estimates computed by Zhou and Ma (2003) and Shen (2005) were higher than the official estimates.

Table 3.4: The urbanization rates in China between 1982 and 2000: A comparison of the official statistics and other revised estimates

	Urbanization rate (%)					
	(1)	(2)	(3)	(4)	(5)	(6)
Year	Official statistics	Linear interpolation	Wu (1994)	Zhang and Zhao (1998)	Zhou and Ma (2003)	Shen (2005)
1982	21.13	21.13	16.57		21.22	21.39
1983	21.62	21.79	16.93		21.91	21.77
1984	23.01	22.45	18.66		23.52	22.93
1985	23.71	23.11	19.81	23.47	24.44	24.62
1986	24.52	23.77	20.09		25.50	25.56
1987	25.32	24.43	20.75		26.55	26.20
1988	25.81	25.09	21.45	25.63	27.28	27.09
1989	26.21	25.75	21.72		27.93	27.87
1990	26.41	26.41	21.97	26.59	28.35	28.36
1991	26.94	27.39			28.53	28.73
1992	27.46	28.37			30.12	29.49
1993	27.99	29.35		28.92	30.90	30.66
1994	28.51	30.33			31.65	31.96
1995	29.04	31.32		31.88	32.33	33.32
1996	30.48	32.30			32.91	34.24
1997	31.91	33.28			33.75	34.82
1998	33.35	34.26			34.51	35.35
1999	34.78	35.24			35.28	35.89
2000	36.22	36.22			36.25	37.04

Note: The official statistics are obtained from China Statistics Yearbook (various years), which are downloaded from *China Data Online*. The linear interpolation method takes the urbanization rates in 1982, 1990, and 2000 as given.

Which method of measuring urban population should we use?

The comparison of the urban population statistics presented in Table 3.4 highlights a number of issues. First, these different methods for revising the official population statistics share one common characteristics: They rely on either linear interpolation or certain assumptions about the changes in urban and rural population over time. Therefore, the accuracy of these revised population statistics depends heavily on the validity of the underlying assumptions. By merely examining these urbanization figures, it is hard to tell which method should preferably be used.

A second issue is that the above studies (except Zhang and Zhao, 1998) provide only urban population statistics for the entire country. Sometimes, researchers are interested in understanding the urbanization patterns at a sub-national level. For example, in this thesis we want to examine the urbanization patterns of Chongqing Shi and Chengdu Shi. The national-level urban population statistics are unable to shed light on such kind of sub-national comparisons. To do so we need to follow such approach as that of Zhang and Zhao (1998) to revise the sub-national official population statistics if we are interested in provincial-level comparisons or devise our own method if we are interested in even finer comparisons.

For our purpose, we need to compute the urban population statistics for Chongqing Shi and Chengdu Shi. In principle, we can still apply the same methods to generate the required urban population statistics. However at city-level, the underlying assumptions used by the above methods are unlikely to be valid. Take the method by Zhou and Ma (2003) as an example. In order to apply this method for our purpose, we need to assume that the growth rates of urban and rural populations are constant in each of the cities. This assumption may be realistic when the cities under comparison have similar demographic structures. However it may be less realistic when we compare, say, a coastal city and an inland city. Therefore, the comparison is only meaningful when the same assumption can reasonably be applied in both cities.

3.2.5. Concluding remarks

In this section we discussed the general problems of measuring urban population in China. While several methods have been proposed to correct the official urban population statistics published by the National Bureau of Statistics and the accuracy of these methods depend on the validity of the assumptions used. Indeed, a more serious problem that may affect the accuracty of these methods is the changing administrative boundaries of cities. As we already mentioned, the boundaries of Chongqing Shi expanded mechanically after its promotion in 1997. Therefore, it would not be meaningful to compare the urbanization rate of Chongqing Shi in 1996 and that of Chongqing Shi in 1997. Even if all of the underlying assumptions of the above methods are valid, the urban population statistics can only be compared across different periods *within* China. As discussed earlier, the definitions of “urban population” used by different national statistical agencies may vary. To the extent that the definitions used in China and other countries are different, a direct implication is that the urban population statistics computed under any of the above approaches are still not necessarily comparable at the international level.

Given these problems of measuring urban population, we need to use an approach such that on the one hand, urban population statistics are correctly estimated, and on the other hand, such population statistics can be compared internationally, so that we can evaluate the performance of China's urbanization from an international perspective.

The above problems of measuring urban population in China provide a motivation for using the *Geopolis* approach to compute urban population statistics for Chongqing Shi and Chengdu Shi. These statistics should be comparable not only within China at different points of time, but also across different countries. As we will demonstrate in Chapter 4, the urban population statistics estimated by *e-Geopolis* and those published by the National Bureau of Statistics can be very different. The official statistics can under-estimate or over-estimate the urban population, sometimes by a large margin.

3.3. Urbanization patterns in China

The urbanization patterns of China have changed quite a lot since 1949. In this section, we will first discuss the evolution of urbanization in China based on the official statistics compiled by the National Bureau of Statistics. We will also show several sets of satellite images, obtained from Google Earth, for several areas in China. Each set refers to a particular location in China and the different satellite images were taken at various points in time. These satellite images can illustrate the extent of urbanization of China in the past 10-15 years. Then we will compare the urbanization patterns of China and other countries using the data in the World Urbanization Prospects (The 2011 Revision). This comparison is for reference only as we already discussed in Chapter 1, the urbanization data contained in the World Urbanization Prospects may not be comparable across countries and over time. Finally, we discuss some patterns related to the number of cities and urban agglomerations in China. Some of the analysis is based on data from the *e-Geopolis* database.

3.3.1. Evolution of urbanization, 1949-2010

We first use official statistics, downloaded from *China Data Online*, to show the evolution of urbanization at the national level between 1949 and 2010. In Table 3.5, we show the total population, urban population (城镇人口), rural population (乡村人口), urbanization rate, and their respective changes. In this table, total population refers to the total number of people within a given area. Urban population refers to the people residing in cities and towns while rural population refers to the population other than urban population.[24]

Table 3.5: Population and urbanization rate in China, 1949-2010

	Total pop. (Mn)	Growth (%)	Urban pop. (城镇人口) (Mn)	Growth (%)	Rural pop. (乡村人口) (Mn)	Growth (%)	Urban. rate (%)	Change (%)
1949	541.67		57.65		484.02		10.64	
1950	551.96	1.90	61.69	7.01	490.27	1.29	11.18	0.53
1951	563.00	2.00	66.32	7.51	496.68	1.31	11.78	0.60
1952	574.82	2.10	71.63	8.01	503.19	1.31	12.46	0.68
1953	587.96	2.29	78.26	9.26	509.70	1.29	13.31	0.85
1954	602.66	2.50	82.49	5.41	520.17	2.05	13.69	0.38
1955	614.65	1.99	82.85	0.44	531.80	2.24	13.48	−0.21
1956	628.28	2.22	91.85	10.86	536.43	0.87	14.62	1.14
1957	646.53	2.90	99.49	8.32	547.04	1.98	15.39	0.77
1958	659.94	2.07	107.21	7.76	552.73	1.04	16.25	0.86
1959	672.07	1.84	123.71	15.39	548.36	−0.79	18.41	2.16

[24]See the explanatory notes of the 2011 edition of the China Statistical Yearbook at *http://www.stats.gov.cn/tjsj/ndsj/2011/html/zbe03.htm*.

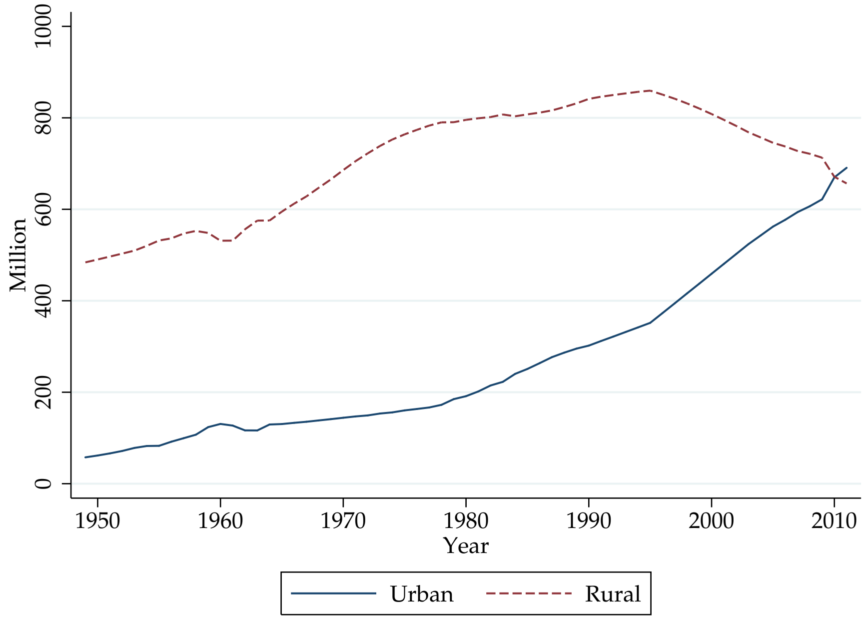
Table 3.5: Population and urbanization rate in China, 1949-2010 (Continued)

	Total pop. (Mn)	Growth (%)	Urban pop. (城镇人口) (Mn)	Growth (%)	Rural pop. (乡村人口) (Mn)	Growth (%)	Urban. rate (%)	Change (%)
1960	662.07	−1.49	130.73	5.67	531.34	−3.10	19.75	1.34
1961	658.59	−0.53	127.07	−2.80	531.52	0.03	19.29	−0.45
1962	672.96	2.18	116.59	−8.25	556.36	4.67	17.32	−1.97
1963	691.72	2.79	116.46	−0.11	575.26	3.40	16.84	−0.49
1964	704.99	1.92	129.50	11.20	575.49	0.04	18.37	1.53
1965	725.38	2.89	130.45	0.73	594.93	3.38	17.98	−0.39
1966	745.42	2.76	133.13	2.05	612.29	2.92	17.86	−0.12
1967	763.68	2.45	135.48	1.77	628.20	2.60	17.74	−0.12
1968	785.34	2.84	138.38	2.14	646.96	2.99	17.62	−0.12
1969	806.71	2.72	141.17	2.02	665.54	2.87	17.50	−0.12
1970	829.92	2.88	144.24	2.17	685.68	3.03	17.38	−0.12
1971	852.29	2.70	147.11	1.99	705.18	2.84	17.26	−0.12
1972	871.77	2.29	149.35	1.52	722.42	2.44	17.13	−0.13
1973	892.11	2.33	153.45	2.75	738.66	2.25	17.20	0.07
1974	908.59	1.85	155.95	1.63	752.64	1.89	17.16	−0.04
1975	924.20	1.72	160.30	2.79	763.90	1.50	17.34	0.18
1976	937.18	1.40	163.41	1.94	773.76	1.29	17.44	0.09
1977	949.74	1.34	166.69	2.01	783.05	1.20	17.55	0.11
1978	962.59	1.35	172.45	3.46	790.14	0.91	17.92	0.36
1979	975.43	1.33	184.95	7.25	790.47	0.04	18.96	1.05
1980	987.06	1.19	191.40	3.49	795.65	0.66	19.39	0.43
1981	1,000.72	1.38	201.71	5.39	799.01	0.42	20.16	0.77
1982	1,016.54	1.58	214.80	6.49	801.74	0.34	21.13	0.97
1983	1,030.08	1.33	222.74	3.70	807.34	0.70	21.62	0.49
1984	1,043.57	1.31	240.17	7.83	803.40	−0.49	23.01	1.39
1985	1,058.51	1.43	250.94	4.48	807.57	0.52	23.71	0.69
1986	1,075.07	1.56	263.66	5.07	811.41	0.48	24.52	0.82
1987	1,093.00	1.67	276.74	4.96	816.26	0.60	25.32	0.79
1988	1,110.26	1.58	286.61	3.57	823.65	0.91	25.81	0.50
1989	1,127.04	1.51	295.40	3.07	831.64	0.97	26.21	0.40
1990	1,143.33	1.45	301.95	2.22	841.38	1.17	26.41	0.20
1991	1,158.23	1.30	312.03	3.34	846.20	0.57	26.94	0.53
1992	1,171.71	1.16	321.75	3.12	849.96	0.44	27.46	0.52
1993	1,185.17	1.15	331.73	3.10	853.44	0.41	27.99	0.53
1994	1,198.50	1.12	341.69	3.00	856.81	0.39	28.51	0.52
1995	1,211.21	1.06	351.74	2.94	859.47	0.31	29.04	0.53
1996	1,223.89	1.05	373.04	6.06	850.85	−1.00	30.48	1.44
1997	1,236.26	1.01	394.49	5.75	841.77	−1.07	31.91	1.43
1998	1,247.61	0.92	416.08	5.47	831.53	−1.22	33.35	1.44
1999	1,257.86	0.82	437.48	5.14	820.38	−1.34	34.78	1.43
2000	1,267.43	0.76	459.06	4.93	808.37	−1.46	36.22	1.44
2001	1,276.27	0.70	480.64	4.70	795.63	−1.58	37.66	1.44
2002	1,284.53	0.65	502.12	4.47	782.41	−1.66	39.09	1.43
2003	1,292.27	0.60	523.76	4.31	768.51	−1.78	40.53	1.44
2004	1,299.88	0.59	542.83	3.64	757.05	−1.49	41.76	1.23
2005	1,307.56	0.59	562.12	3.55	745.44	−1.53	42.99	1.23
2006	1,314.48	0.53	577.06	2.66	737.42	−1.08	43.90	0.91
2007	1,321.29	0.52	593.79	2.90	727.50	−1.35	44.94	1.04
2008	1,328.02	0.51	606.67	2.17	721.35	−0.85	45.68	0.74
2009	1,334.50	0.49	621.86	2.50	712.88	−1.17	46.60	0.92
2010	1,340.91	0.48	669.78	7.71	671.13	−5.86	49.95	3.35

Source: China Statistics Yearbook (various years), downloaded from *China Data Online*.

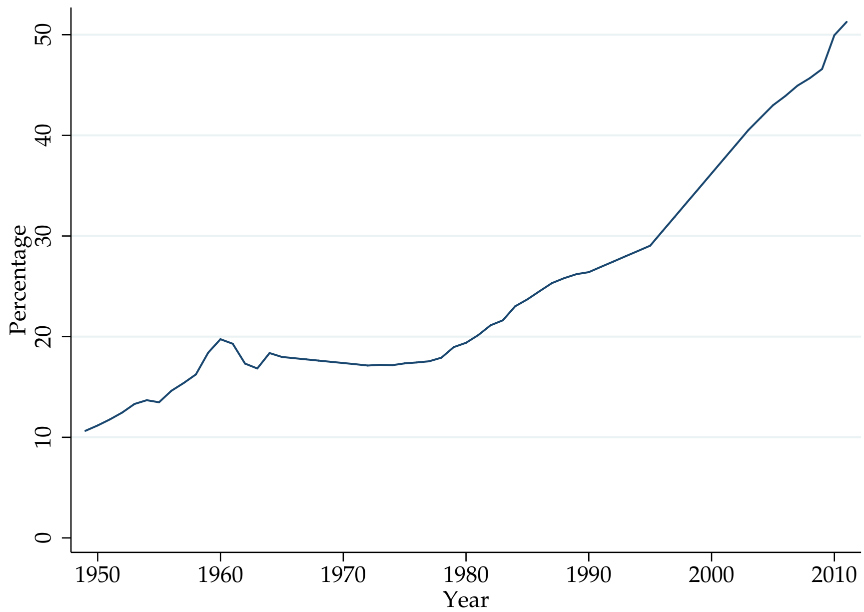
The statistics in Table 3.5 are also visualized in Figures 3.3 and 3.4. Figure 3.3 depicts the evolution of urban and rural populations between 1949 and 2010 while Figure 3.4 depicts the evolution of urbanization rate between 1949 and 2010.

Figure 3.3: Urban and rural populations of China, 1949-2010



Source: China Statistics Yearbook (various years), which are downloaded from *China Data Online*.

Figure 3.4: Urbanization rates of China, 1949-2010



Source: China Statistics Yearbook (various years), which are downloaded from *China Data Online*.

The table and the two figures show several general trends. In the early 1950s, most of the people in China resided in rural areas, and only about 10% of the total population lived in urban areas. Since then, urban population has displayed an upward trend with faster growth after the mid-1990s. On the other hand, rural population also increased between 1950s and mid-1990s. However, it started to decline in the mid-1990s. By 2010, the two populations were almost the same and urbanization rate was about 50%.

The evolution in the urbanization rates between 1949 and 2010 can be examined in different subperiods, which will be discussed briefly below.[25]

1949-1957: A period of industrialization under the command economy

When the People's Republic was established in 1949, the government already put a lot of emphasis on the development of the industrial sector. Within this period, the Chinese government implemented the First Five-Year Plan (1953-1957). Among the different policy initiatives was the development of the industrial sector, following the development model of the Soviet Union. It was estimated that during each of these 5 years, 3 million rural workers migrated to cities (Aubert, 1996), which provided labor for these different large-scale industrialization projects under the First Five-Year Plan. During this period, a number of existing industrial cities, such as Chongqing in the west, were re-developed. At the same time, other new industrial cities were established. Since the new industrialization processes required a lot of labor, many workers from the rural areas migrated to industrial cities.

There was a huge increase in the urban population and the urbanization level during this period: The urban population increased from 57.65 million in 1949 to 99.49 million in 1957, and the urbanization rate increased from 10.64% in 1949 to 15.39% in 1957.

1958-1965: A period of unstable urbanization

In 1958, Chairman Mao launched the Great Leap Forward (大跃进) campaign. The aim of this campaign was to transform China, within a short period of time, from an agricultural country to a communist regime through rapid and parallel developments of the agricultural and industrial sectors. The government invested heavily in the industrial sector and also tried to put a "steel blast furnace in every backyard." Besides, early campaign was concentrated in urban areas and therefore urbanization during these few years accelerated. Specifically, between 1958 and 1960, the urbanization rate of China increased quickly from 16.25% to 19.75%.

[25]See also other surveys of China's urbanization, for example, Kamal-Chaoui et al. (2009), Chan, Henderson, and Chui (2008).

Unfortunately, the massive industrial investment were later found to be both economically and technically inefficient, and the Great Leap Forward campaign ended in 1961 in catastrophe and led to the Great Chinese Famine. According to official statistics, there was a drop of 15 million in total population between 1959 and 1961. The estimated deaths due to famine were much larger. For example, Dikötter (2010) estimated that between 1958 and 1962, there were at least 45 million deaths due to famine.

The expansion of the urban population during the early years of the People's Republic exerted a lot of pressure to urban cities. In 1958, the government introduced the household registration (*hukou*, 户口) system as a means of controlling the mobility of people across the countries, especially from rural areas to urban areas. Besides, in 1962, the government started to revoke the designations of some cities and change them back to counties. Following this policy change, the *hukou* types of over 20 million residents in these downgraded counties were converted from non-agricultural *hukou* (非农业户口) to agricultural *hukou* (农业户口) and they were sent back to rural areas. As a result, the urbanization rate in China between 1960 and 1965 dropped, from 19.75% to 17.98%. In particular, between 1960 and 1965, the size of the urban population were roughly the same but the size of the total population increased.

1966-1976: A pause in urbanization during the Cultural Revolution

The Cultural Revolution took place between 1966 and 1976. Urbanization rate stayed more or less the same at around 17%: In 1966, the urbanization rate was 17.86% whereas in 1976, the urbanization rate dropped slightly to 17.44%. Part of this reduction was due to the so-called "Up to the Mountains and Down to the Countryside Movements" (上山下乡) where around 17 million of youths and workers from urban areas were sent to the countryside to be "re-educated." (Bernstein, 1977). Had these people stayed in urban areas, then by 1976, the urbanization rate of China could have been about 19.25% (= (163.41 + 17)/937.18)), which was 1.8% higher than the actual urbanization rate in 1976.[26]

1978-2000: Resumption of urbanization after the start of economic reform

After the Cultural Revolution, the Chinese government introduced economic reforms in 1978. The reforms implemented in rural areas released a lot of labor force from farming, which could be used in industrial cities. Besides, the youth who were sent to rural areas during the Cultural Revolution were allowed to return to their cities of origin. During the early years of economic reforms, the central government introduced a number of policies to support the

[26] From Table 3.5, we can see that in 1976, the urban population was 163.41 and the total population was 937.18.

development of the township and village enterprises (TVEs, 乡镇企业). These enterprises were collectively-owned and attracted a lot of surplus labor from the rural areas. Besides, the government also implemented another policy to develop small town to support the idea that "leaving the land but not the villages, entering the factories but not cities." Overall, the aim of different policies of the government was to encourage growth of smaller cities while controlling the growth of bigger cities. The share of total population living in urban areas increased substantially in the first 10 years after the economic reforms: From 17.92% in 1978 to 25.81% in 1988 while total population increased from 962.59 million in 1978 to about 1.11 billion in 1988.

However, the rapidly expanding scale of rural-urban migration soon became a major issue. To address this issue, the government for the first time, in the 8th Five Year Plan (1991-1995), explicitly considered the "urbanization" problem. However, the policy was conservative and was in the same spirit as the policy in the 1980s which encouraged the growth of smaller cities but restricted the growth of larger cities. A similar urbanization policy was repeated during the 9th Five Year Plan (1996-2000). Between 1989 and 2000, the urbanization rate increased from 26.21% to 36.22%; and the total population increased from about 1.13 billion to about 1.27 billion over the same period.

2001-2005: Town-based urbanization under the 10th Five Year Plan

By the end of the 1990s, the government recognized that there were the rapid economic growth led to huge regional (coastal versus inland) and rural-urban disparities. In the 10th Five Year Plan (2001-2006), the government put more emphasis on city and town-based urbanization. It was achieved through three policy measures. The first measure was the conversion of *hukou* type from agricultural to non-agricultural for those rural residents who relocated permanently to towns within their counties. The second measure was about the land reforms which allowed farmers to sell their farming rights to others in order to have economies of scale in agricultural production. The third measure was to promote the industrialization in towns by allowing for the conversion of agricultural land to industrial land. However, these measures did not lead to their intended results but created other side effects such as massive illegal conversion of farm lands. Overall, during this five-year period, the share of total population in urban areas increased from 37.66% in 2001 to 42.99% in 2005.

2006-2010: The emergence of metropolitan regions under the 11th Five Year Plan

In the 11th Five Year Plan (2006-2010), the Chinese government put more emphasis on the development of larger metropolitan regions. After China's accession into the World Trade Organization (WTO) in 2001, the economy of China continued to grow and many of the manufacturing firms became even more export-oriented. To exploit the economies of scale and to lower the production costs for these firms, there was a need to develop larger metropolitan regions. The strategy of developing larger metropolitan regions includes a better integration of cities into larger metropolitan areas so as to sustain the economic growth of the country in the long-term. For example, in larger cities like Beijing, Shanghai, and Chongqing, the government identified a number of towns and converted them into satellite cities with strong connections to the metropolitan centers. Under this strategy, there is a dual-track urbanization: The urbanization of the larger metropolitan cities as well as the urbanization of the surrounding satellite cities of these metropolitan centers. During this period, the increase in urbanization rate was over 6 percentage points: From 43.90% in 2006 to 49.95% in 2010.

3.3.2. Evidence of urbanization from satellite images

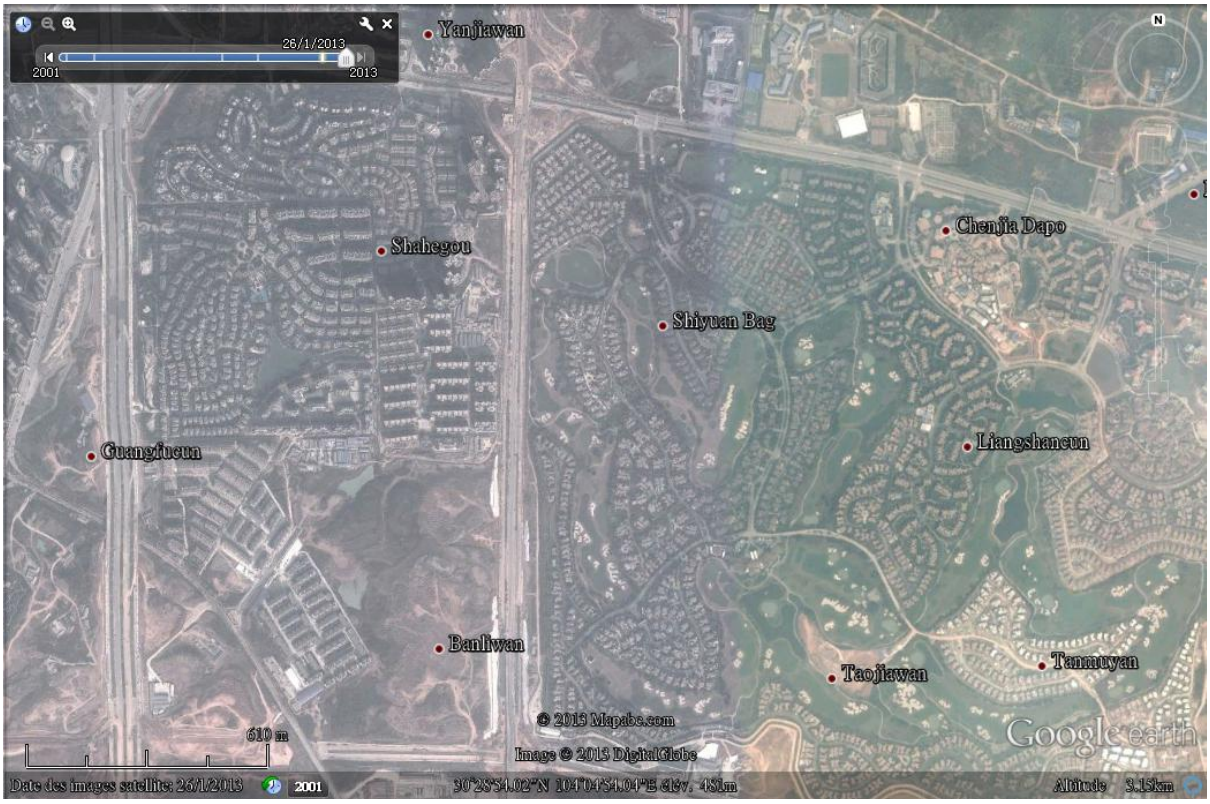
The discussion in the previous section about the urbanization patterns of China relies on the official population statistics provided by the National Bureau of Statistics, the quality of which, as we argue, is subject to questions. Nevertheless, even without using these official statistics, we can still get an idea about the rapid urbanization of China in recent years through a comparison of satellite images of the same area over time. Specifically, in Figures 3.5 to 3.9 we show some satellite images, taken from Google Earth, of five different locations. The images for each case cover exactly the same location but were taken at different points of time.

Case 1: Shuangliu Xian, Chengdu Shi, Sichuan Sheng

We first consider the case of Shuangliu Xian in Chengdu Shi of Sichuan Sheng. The two images in Figure 3.5 were taken on October 28, 2001 and January 26, 2013, respectively. We can see that in 2001, the region was made up of entirely farmland. But 10 years later, all the farmland was converted into residential areas. Besides, the road network was substantially improved.

Figure 3.5: Evidence of urbanization in China from satellite images
Case 1: Shuangliu Xian, Chengdu Shi, Sichuan Sheng

(a) October 28, 2001



(b) January 26, 2013

Source: Google Earth.

Case 2: Chengdu airport and its surrounding regions

In the second case, we consider the airport of Chengdu and its surrounding regions. The two satellite images in Figure 3.6 were taken on May 2, 2000 and January 26, 2013 respectively.

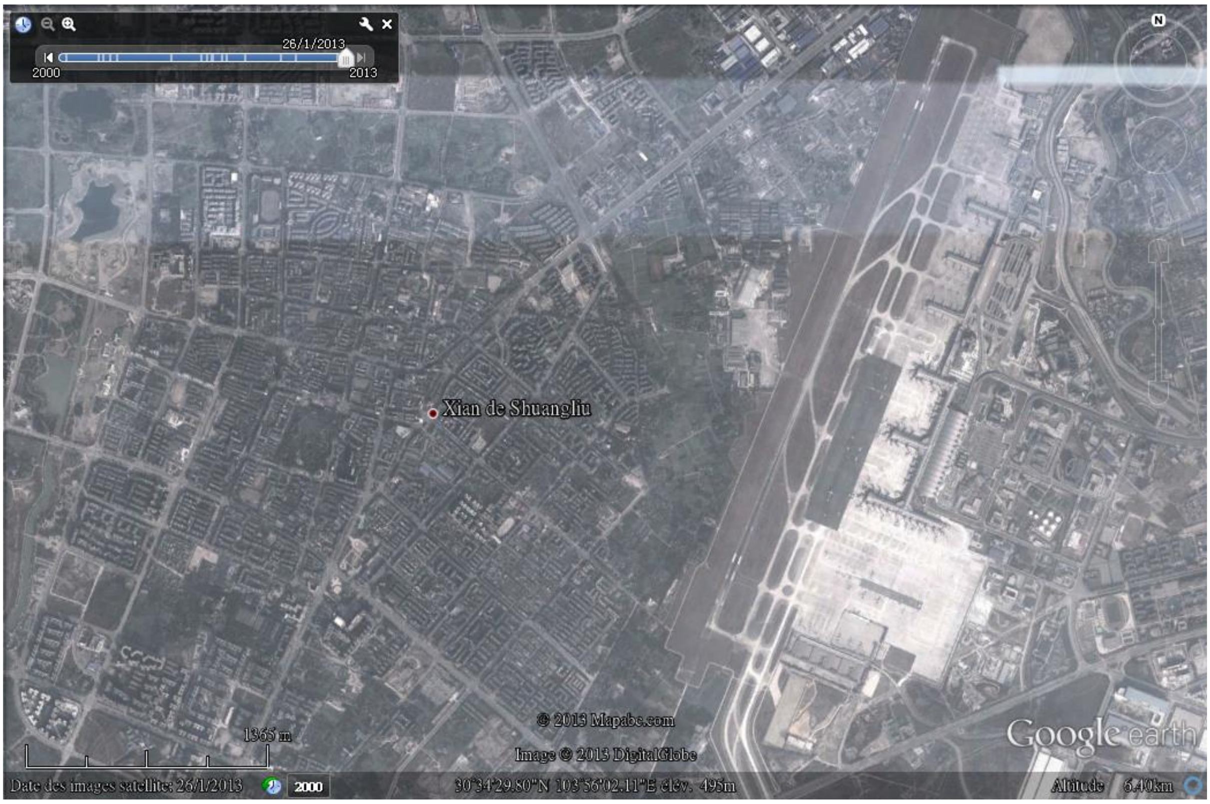
Chengdu airport (in full name, Chengdu Shuangliu International Airport) is the major international airport in Sichuan, and is located in Shuangliu Xian. The airport originally had one runway. To cope with the rapid development in the region, a second runway was built between 2008 and 2009 and the airport was expanded. According to the report of the Civil Aviation Administration of China, Chengdu airport was the fifth busiest airport in China in 2013.[27] We can also see that between 2000 and 2013, the surrounding regions of the airport were under rapid development as well, with most of the farmland converted into residential and commercial buildings.

Figure 3.6: Evidence of urbanization in China from satellite images
Case 2: Chengdu airport and its surrounding regions

(a) May 2, 2000

[27]URL: *http://www.caac.gov.cn/I1/K3/201403/P020140324403180721900.xls*.

Figure 3.6: Evidence of urbanization in China from satellite images: Case 2 (Continued)



(b) Janary 26, 2013

Source: Google Earth.

Case 3: Shuangliu Xian, Chengdu Shi, Sichuan Sheng

In the third case, we also consider a place in Shuangliu Xian of Chengdu Shi in Sichuan Sheng. This area was in fact very close to Chengdu airport. The four satellite images in Figure 3.7 were taken on October 28, 2001, June 26, 2007, March 17, 2010, and January 26, 2013, respectively.

These images illustrate a different kind of development, in which the farmland (in image (a)) was converted into industrial buildings (the buildings with blue roofs in images (b) to (d)). In particular, within 6 years (between 2001 and 2007), the region was converted quickly into an industrial area with an extensive road network. Besides, between 2007 and 2010, the industrial area further expanded. Note that some of the villages were still kept inside and outside the industrial area. With the proximity to the airport, manufacturers can ship their products to other parts of China or abroad very efficiently.

Figure 3.7: Evidence of urbanization in China from satellite images
Case 3: Shuangliu Xian, Chengdu Shi, Sichuan Sheng

(a) October 28, 2001

(b) June 26, 2007

Figure 3.7: Evidence of urbanization in China from satellite images
Case 3: Shuangliu Xian, Chengdu Shi, Sichuan Sheng (Continued)

(c) March 17, 2010

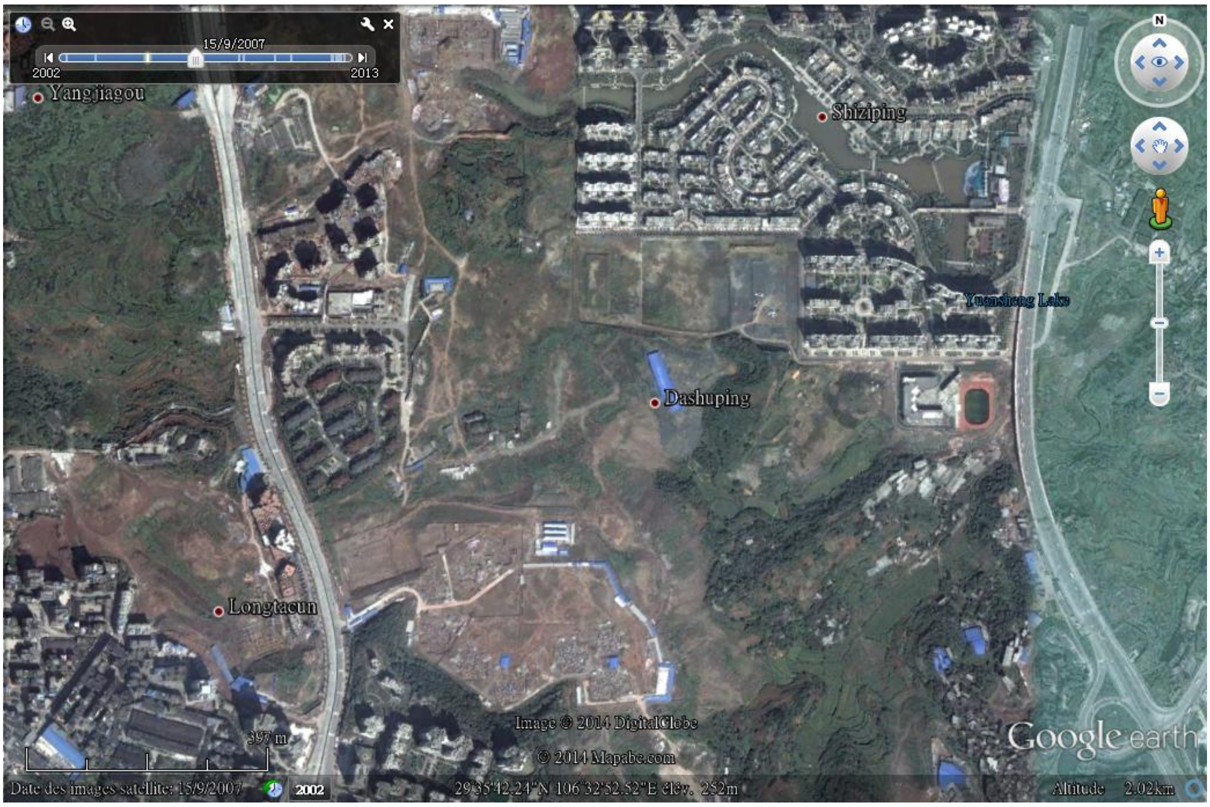
(d) January 26, 2013
Source: Google Earth.

Case 4: Yubei Qu, Chongqing Zhixiashi

Next, we consider a case of Chongqing. The satellite images in Figure 3.8 show a place in Yubei Qu, Chongqing Zhixiashi. They were taken on August 23, 2003, September 15, 2007, August 31, 2009, August 19, 2011, and October 13, 2013, respectively.

Figure 3.8: Evidence of urbanization in China from satellite images: Case 4: Yubei Qu, Chongqing Zhixiashi

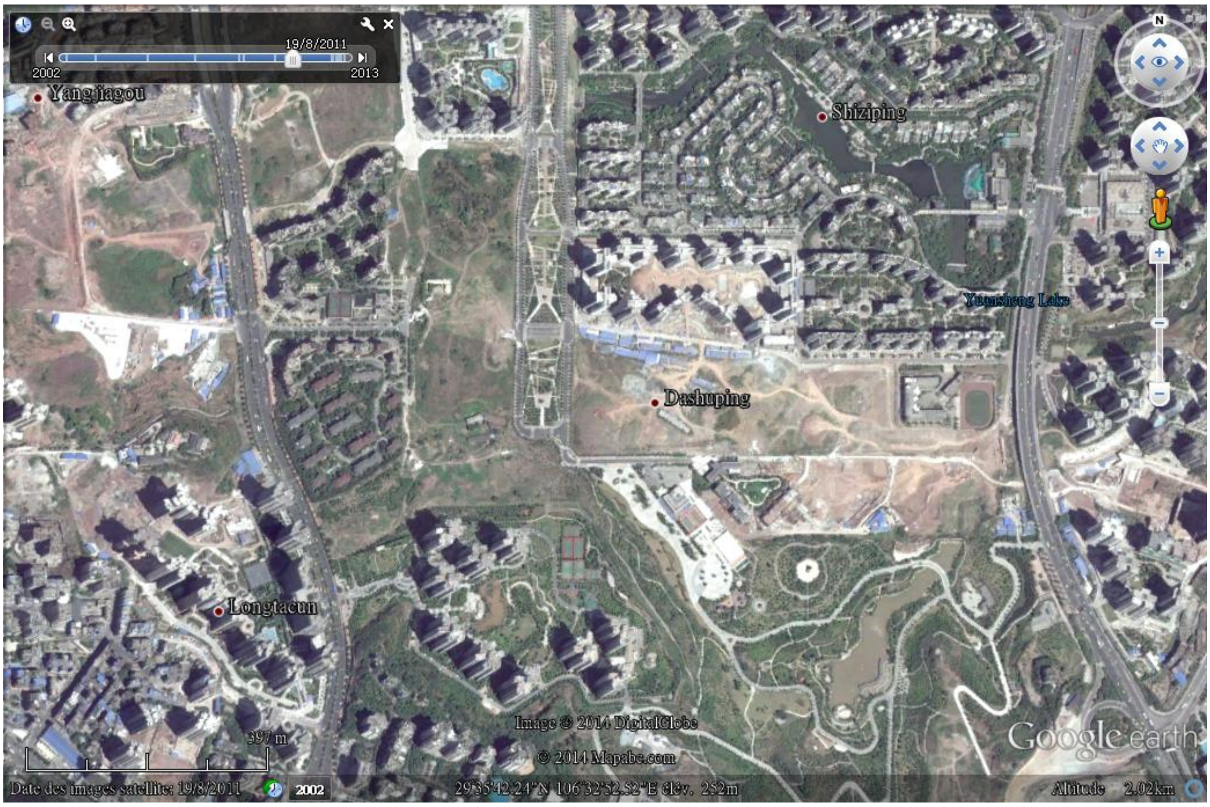
(a) August 23, 2003



(b) September 15, 2007

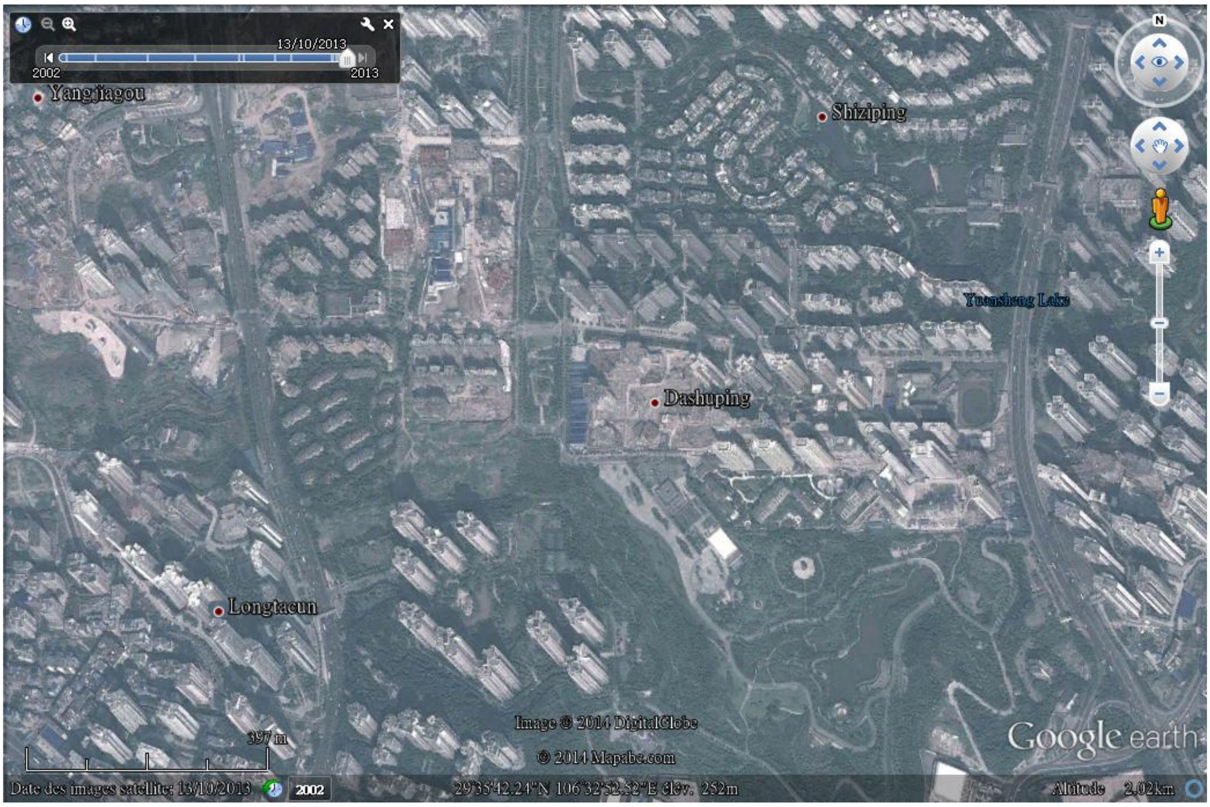
Figure 3.8: Evidence of urbanization in China from satellite images: Case 4: Yubei Qu, Chongqing Zhixiashi (Continued)

(c) August 31, 2009



(d) August 19, 2011

Figure 3.8: Evidence of urbanization in China from satellite images:
Case 4: Yubei Qu, Chongqing Zhixiashi (Continued)



(e) October 13, 2013
Source: Google Earth.

In 2003, this area was barely inhabited but we began to see signs of development as a road was under construction (left of the photo). In the course of 10 years, many apartment buildings were erected in this area. This type of development was very common in the *qu* of Chongqing.

Case 5: Wuzhong Qu, Suzhou Shi, Jiangsu Sheng

The previous cases were in Sichuan Sheng and Chongqing Zhixiashi. In the final case, we show the development of Wuzhong Qu in Suzhou Shi of Jiangsu Sheng. The images in Figure 3.9 were taken on March 30, 2002, September 6, 2003 and April 16, 2012, respectively. This case was similar to Case 4 above, where in the course of 10 years, a piece of barely inhabited agricultural land was turned into a huge residential area with blocks of apartment buildings and a well-developed road network.

Figure 3.9: Evidence of urbanization in China from satellite images
Case 5: Wuzhong Qu, Suzhou Shi, Jiangsu Sheng

(a) March 30, 2002

(b) September 6, 2003

Figure 3.9: Evidence of urbanization in China from satellite images
Case 5: Wuzhong Qu, Suzhou Shi, Jiangsu Sheng (Continued)

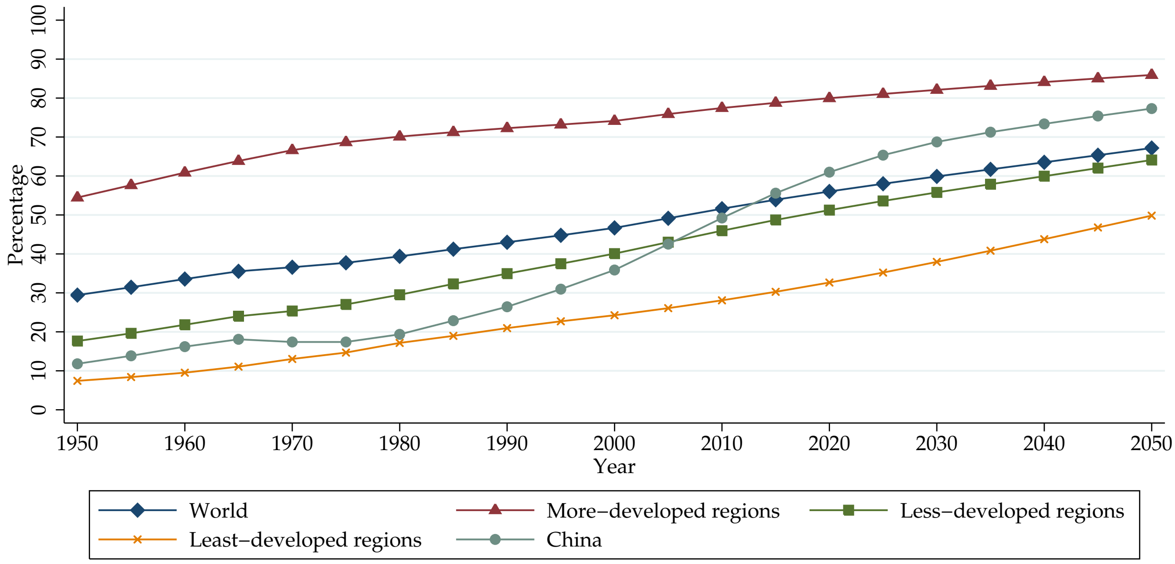
(c) April 16, 2012
Source: Google Earth.

3.3.3. Urbanization: China versus other countries, 1950-2050

After examining some urbanization patterns of China, the natural question to ask is: How do the urbanization patterns of China differ from those in other countries? In Figure 3.10, we compare the urbanization rate of China with the averages of the world and other regions. We use data from the World Urbanization Prospects (The 2011 Revision), compiled by the United Nations (2012), to draw this figure. A similar figure was presented in Chapter 1. Here we add the time series for China. Like what we mentioned earlier, the urbanization data from the World Urbanization Prospects come from the national statistical offices of different countries and they are compiled under different definitions of urban population. Therefore, the comparison here needs to be interpreted with caution.

In 1950, China's urbanization rate was quite low relative to other parts of the world. Not only that it was well below the average of the more developed regions (above 50%) and that of the world (about 30%), it was also below the average of the less developed regions (about 18%). It was only higher than the average urbanization rate of the least developed countries (below 10%). In the 1960s and the 1970s, China's urbanization was stagnant mainly due to the Cultural Revolution. However, the other parts of the world continued their urbanization

Figure 3.10: Urbanization rates of China and other regions, 1950-2050



Source: World Urbanization Prospects, The 2011 Revision.

process. By 1980, China's urbanization rate was only 19.4% which was below most parts of the world and was only slightly above the average of the least developed countries (17.2%). But China caught up rapidly during the economic reform era. By 2005, China's urbanization rate was almost the same as that of the less-developed regions (42.5% versus 43.0%). By 2010, three decades after the economic reform, almost half of the population of China lived in cities, which surpassed the average urbanization rate of the less developed regions (46%) for the first time and almost reached the world average (51.6%).

The World Urbanization Prospects also provide forecasts about the urbanization rates of different countries up to 2050. In the next 40 years, the urbanization rates of the world and other regions continue to grow steadily. However, it is expected that in the next 15 years, China becomes urbanized more quickly. By 2015, China's urbanization is expected to reach 55.6%, which exceeds the world average of 53.9%. By 2050, the expected urbanization rate of China will be 77.3%, which is very close to the average of the more developed regions in 2010 (77.5%).

3.3.4. Cities and urban agglomerations in China

At a sub-national level, we can also observe different urbanization patterns. For example, the number of cities and their sizes change substantially in the past decades.

Number of *xian* and *shi*

In China, a *shi* (市) can refer to geographical units at different administrative ranking: A *shi* can be at *shengji* (省级), *diji* (地级), or *xianji* (县级) level. In Table 3.6, we show the numbers of *xian* and *shi* in China between 1949 and 2010, including a breakdown of the number of *shi* at different administrative ranking since 1983, including *shengjishi*, *dijishi*, and *xianjishi*. These statistics are obtained from Chen (2007) and the China Statistics Yearbooks (2007-2011).

Table 3.6: Number of *xian* and *shi* in China, 1949-2010

Year	*xian**	*shi*	Year	*xian*	*shengjishi*	*dijishi*	*xianjishi*	*shi*
1949	2,204	145	1983	2,080	3	145	141	289
1950	2,204	145	1984	2,069	3	148	149	300
1951	2,163	156	1985	2,046	3	163	158	324
1952	2,149	156	1986	2,017	3	166	184	353
1953	2,173	164	1987	1,986	3	170	208	381
1954	2,152	166	1988	1,936	3	183	248	434
1955	2,099	164	1989	1,919	3	185	262	450
1956	2,082	174	1990	1,903	3	185	279	467
1957	2,092	176	1991	1,894	3	187	289	479
1958	1,748	185	1992	1,848	3	191	323	517
1959	1,688	179	1993	1,795	3	196	317	570
1960	1,706	199	1994	1,735	3	206	413	622
1961	1,962	208	1995	1,716	3	210	427	637
1962	2,075	194	1996	1,696	3	218	445	666
1963	2,101	177	1997	1,693	4	222	442	668
1964	2,110	169	1998	1,689	4	227	437	668
1965	2,125	169	1999	1,682	4	236	427	667
1966	2,127	172	2000	1,674	4	259	400	663
1967			2001	1,660	4	265	393	662
1968			2002	1,649	4	275	381	660
1969			2003	1,642	4	282	374	660
1970	2,131	177	2004	1,636	4	283	374	661
1971	2,134	180	2005	1,636	4	283	374	661
1972	2,134	181	2006	1,635	4	283	369	656
1973	2,135	181	2007	1,635	4	283	368	655
1974	2,135	181	2008	1,635	4	283	368	655
1975	2,136	185	2009	1,636	4	283	367	654
1976	2,136	188	2010	1,633	4	283	370	657
1977	2,137	190						
1978	2,138	193						
1979	2,137	216						
1980	2,137	223						
1981	2,136	233						
1982	2,133	245						

Note: * — Including *zizhixian*, *qi*, and others.
Source: Chen (2007) and China Statistics Yearbook, 2007-2011.

From this table we can observe two trends. First, in the first three decades of the People's Republic, the administrative structure remained relatively stable. There were roughly 150 to 200 *shi* at various levels and about 2,000 *xian*, except that the number of *xian* dropped to about 1,700 between 1958 and 1961. The situation started to change since the economic reform.

Between 1979 and 1983, the total number of *shi* increased dramatically by almost 50%, from 193 in 1978 to 289 in 1983. These *shi* were either former *xian* or were newly created. The number of *shi* continued to grow in the 1980s and 1990s and reached a peak of 668 in 1997 and 1998. On the other hand, the number of *xian* continued to reduce: from about 2,000 *xian* in the 1980s to about 1,700 to 1,800 *xian* in the 1990s and to about 1,600 in the 2000s.

The second trend was that, since the 1980s, composition of cities at the *diji* and *xianji* level changed. There were more *dijishi* and *xianjishi* in 2010 than in 1983. However, the trends were different: The number of *xianjishi* increased from 141 in 1983 and peaked at 445 in 1996 but started to decline to about 370 throughout the 2000s. On the other hand, the number of *dijishi* increased steadily from 145 in 1983 to 283 in 2010. In other words, some of the original *xian* were first converted to *xianjishi* and then upgraded to *dijishi*.

Shi by size

The sizes of the Chinese cities have also changed substantially. Table 3.7 shows the distribution of *shi* by size. These figures are obtained from the New China's Cities 50 Years, published by that the National Bureau of Statistics in 1999 to celebrate the 50th anniversary of the establishment of the People's Republic. In the table, size of *shi* is determined by the non-agricultural population in the *shi*. Extra-large *shi* are those with a non-agricultural population over 1 million; large *shi* are those with a non-agricultural population between half and a million; medium *shi* are those with a non-agricultural population between 0.2 and 0.5 million; small *shi* are those with a non-agricultural population below 0.2 million. Note that this classification is different from that used by the United Nations in their World Urbanization Prospects (see Table 1.2).

In 1949, there were a total of 132 *shi*. Among them, only 5 were extra-large, and the majority were small *shi*. Over time, the composition of the *shi* by city size also changed a lot. By 1998, out of the total 668 *shi*, 37 were extra-large and 378 were small *shi*. Therefore, the number of extra-large *shi* were over 7 times than that in 1949 while the number for small *shi* were only about 3 times than that in 1949. Note that the growth of the number of medium *shi* was even more spectacular: In 1949, there were only 18 medium *shi* while in 1998, the number increased more than 10 times to 205.

Urban clusters

So far we have been using the official population statistics compiled by the National Bureau of Statistics to examine the urbanization patterns in China. Now we use the population

Table 3.7: Number of *shi* in China by size, 1949-1998

		Size			
Year	Total	Extra-large	Large	Medium	Small
1949	132	5	7	18	102
1952	153	7	8	21	117
1957	176	10	14	37	115
1958	184	10	18	48	108
1961	208	13	18	48	129
1962	194	12	18	40	124
1963	177	12	18	43	104
1964	167	13	18	42	94
1965	168	13	18	42	95
1970	177	11	21	48	97
1975	185	13	25	52	95
1978	193	13	27	60	93
1980	223	15	30	72	106
1985	324	21	31	93	179
1986	353	23	30	95	205
1987	381	25	30	103	223
1988	434	28	30	110	266
1989	450	30	28	116	276
1990	467	31	28	117	291
1991	479	31	30	121	197
1992	517	32	31	141	313
1993	570	32	36	159	343
1994	622	32	42	173	375
1995	640	32	43	192	373
1996	666	34	44	195	393
1997	668	34	47	205	382
1998	668	37	48	205	378

Note: City size is determined by the non-agricultural population in city proper: extra-large ($>$ 1 Mn), large ($0.5 - 1$ Mn), medium ($0.2 - 0.5$ Mn), and small ($<$ 0.2 Mn).
Source: New China's Cities 50 Years.

statistics estimated by *e-Geopolis* to examine the urban clusters in China.

In Figure 3.11 we show 66 urban clusters in China with population above 1 million (as of 2010). To identify these urban clusters, we first select all "urban areas" according to *e-Geopolis* morphological definition (see Chapter 2). We then obtain the population figures from official sources. The figures of the most populated of these urban areas are then adjusted on an integer number of *xianji* units, including *qu*, *xianjishi*, and *xian*, as well as area figures. After obtaining these population figures, we then select those clusters having at least 1,000,000 inhabitants in 2010. The retrospective population figures are then calculated according to the three previous official population censuses in 1982, 1990, and 2000.

Note that these clusters satisfied the following four conditions. First, they had at least 1 million inhabitants (as of 2010). Second, the population density was at least 950 inhabitants per square kilometre. (One exception was Nanning, where no breakdown was available inside the area.) Third, these clusters had a positive growth of population between 2000 and 2010. Fourth, these clusters had to enclose an *e-Geopolis* agglomeration with at least 800,000 inhabitants.

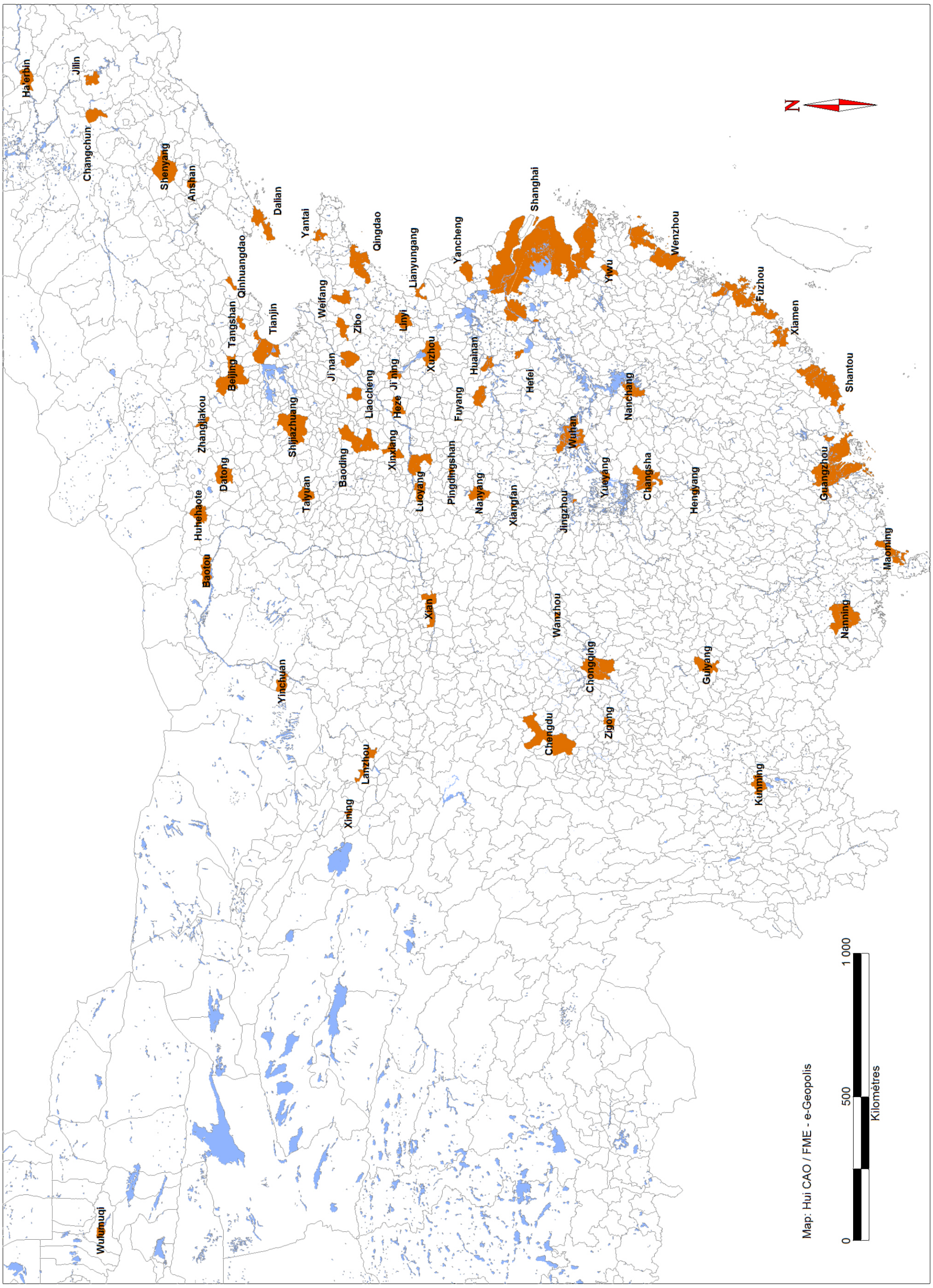
The data for these 66 urban clusters are also shown in Table 3.8. Note that the figures do not refer to current "*e-Geopolis*" agglomerations. This difference is due to the fact that the geographical units which are currently used to adjust the population figures of Chinese agglomerations encountered too many boundary changes between two consecutive censuses, especially between 2000 and 2010. And we did not have the 2010 data at the time when we wrote this study. Note also that the areas of these clusters do not necessarily correspond to the areas defined by their administrative boundaries. For example, the area of Shanghai Shi, according to its official administrative boundary, is only about 8.24 thousand square kilometres. However, the Shanghai urban cluster spans into the adjacent Zhejiang Sheng and Jiangsu Sheng and includes Hangzhou Shi and Nanjing Shi. The total area of this cluster is about 47 thousand square kilometres.

From the table and the map we can see that these urban clusters include all the *zhixiashi* (直辖市) and almost all of the provincial capitals (except Lhasa of Tibet Zizhiqu). Note that the provincial capitals of Jiangsu Sheng (Nanjing Shi) and Zhejiang Sheng (Hangzhou Shi) are embedded in the Shanghai urban cluster. Many other clusters are located along coastal areas, for instance, the urban clusters of Qingdao, Lianyuangang, Wenzhou, Fuzhou, Xiamen, Shantou, and Maoming.

The total populations of these 66 clusters in 2010 were about 381 million, which constituted about 28% of the total population of the country. However, these clusters only occupied about 210 thousand square kilometres, a mere 2% of the land area of the country. Therefore, the average population density of these urban clusters was much higher than that of the national average: In 2010, the average density of these clusters was 1,816.36 inhabitants per square kilometre while the national average was only 139.39 inhabitants per square kilometre. The average population density of these urban clusters was even higher than that of the area outside these clusters. In particular, outside these 66 clusters, the population density was just 102.39 inhabitants per square kilometre.

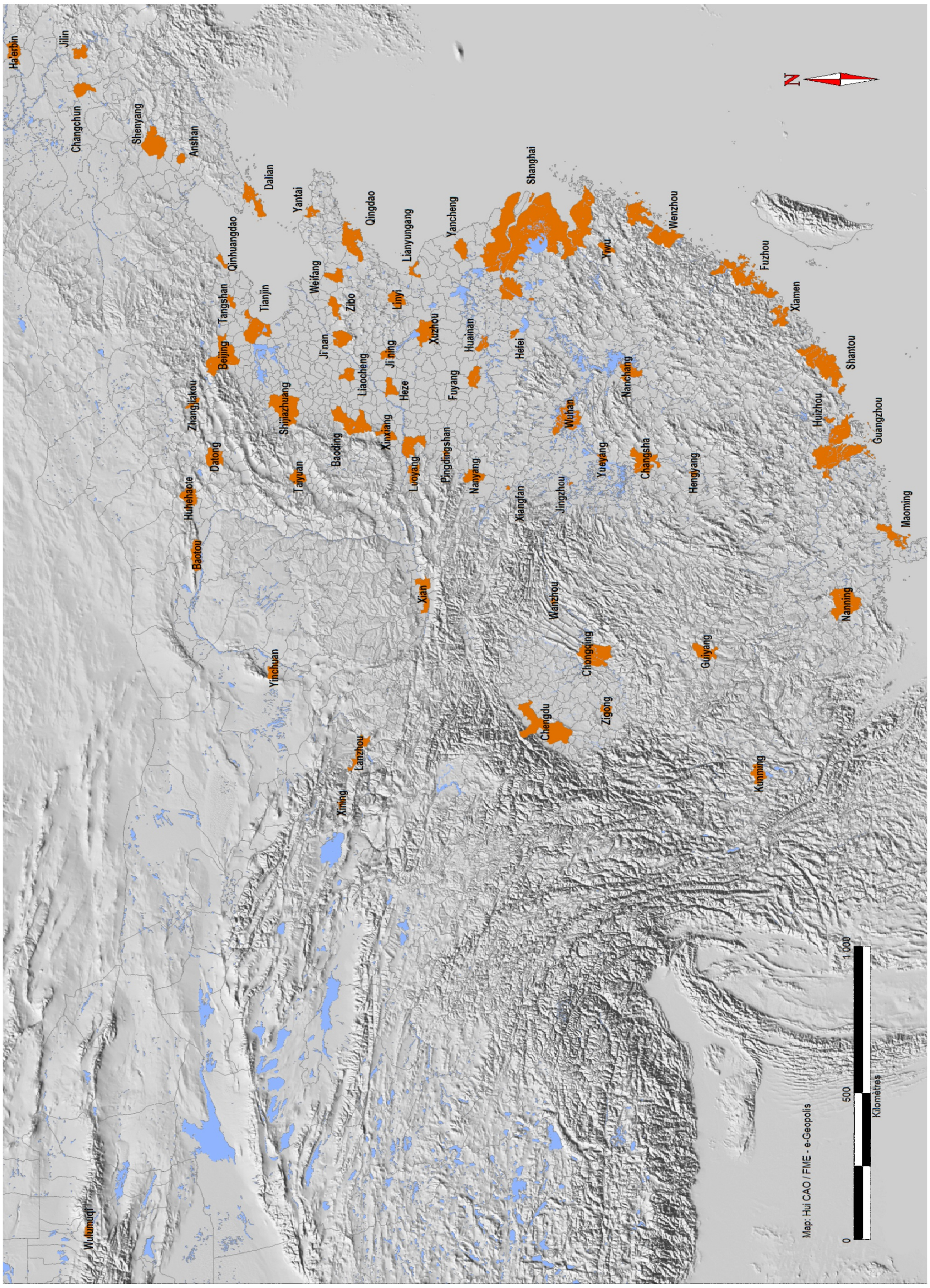
Besides, the growth of the total population of the whole country slowed down (the annualized growth rate decreased from 1.42% between 1982 and 1990 to 0.76% between 2000 and 2010). If we only consider the non-cluster area, the total population increased at an even slower pace: The annualized growth rate of population decreased from 1.27% between 1982 and 1990 to 0.46% between 1990 and 2000 and further to 0.15% between 2000 and 2010. In

Figure 3.11: Locations of the 66 urban clusters in China



(a) The urban clusters and the boundaries of *xianji* division

Figure 3.11: Locations of the 66 urban clusters in China (Continued)



(b) The urban clusters and the surrounding terrain

Source: *e-Geopolis*, using data from Population Censuses 1982, 1990, 2000 and 2010.

Table 3.8: List of 66 urban clusters in China with population above 1 million (as of 2010)

			Area	Population				Annualized growth			Density (2010)
Rank	IDINT	Name	(Sq. Km)	PT1982_07	PT1990_11	PT2000_12	PT2010_11	1982-1990	1990-2000	2000-2010	(Per./Sq. Km)
1	CHN310112	Shanghai	47,504	49,344,935	54,612,667	63,704,871	83,815,247	1.23%	1.55%	2.78%	1,764.39
2	CHN440113	Guangzhou	13,921	14,732,088	19,657,464	37,844,843	49,929,964	3.52%	6.77%	2.81%	3,586.73
3	CHN110112	Beijing	5,346	6,999,500	8,267,727	10,920,484	16,578,042	2.02%	2.82%	4.26%	3,101.12
4	CHN440515	Shantou	9,019	8,528,399	9,787,949	12,142,413	14,054,251	1.67%	2.18%	1.47%	1,558.36
5	CHN510601	Chengdu	8,483	7,859,677	8,758,339	10,925,945	13,974,348	1.31%	2.24%	2.49%	1,647.32
6	CHN350182	Fuzhou	7,608	6,723,100	7,909,531	10,300,902	12,153,362	1.97%	2.68%	1.67%	1,597.45
7	CHN330304	Wenzhou	8,164	6,920,311	7,495,784	9,308,975	11,685,400	0.96%	2.19%	2.30%	1,431.42
8	CHN120116	Tianjin	3,854	4,607,600	5,245,252	6,684,429	9,341,844	1.57%	2.45%	3.40%	2,423.83
9	CHN420106	Wuhan	4,115	5,010,991	6,064,941	7,525,509	9,290,860	2.32%	2.18%	2.13%	2,257.79
10	CHN130123	Shijiazhuang	5,818	4,412,400	5,867,990	6,897,655	7,809,009	3.48%	1.63%	1.25%	1,342.18
11	CHN210401	Shenyang	4,187	5,196,400	6,057,748	6,737,500	7,686,935	1.86%	1.07%	1.33%	1,835.93
12	CHN500105	Chongqing	5,308	4,789,792	5,337,009	6,200,823	7,507,700	1.31%	1.51%	1.93%	1,414.38
13	CHN610481	Xi'an	2,568	3,705,856	5,035,770	5,959,071	6,993,793	3.75%	1.70%	1.61%	2,722.97
14	CHN430101	Changsha	4,184	3,339,759	4,090,726	5,171,708	6,611,810	2.46%	2.37%	2.49%	1,580.23
15	CHN130400	Baoding	4,917	4,092,382	4,865,819	5,266,199	6,159,607	2.10%	0.79%	1.58%	1,252.74
16	CHN370281	Qingdao	4,148	3,449,172	3,828,053	4,615,652	5,739,100	1.26%	1.89%	2.20%	1,383.43
17	CHN410101	Zhengzhou	2,856	2,452,100	2,948,359	3,818,400	5,625,467	2.24%	2.62%	3.95%	1,969.58
18	CHN350201	Xiamen	2,214	1,517,756	1,821,010	2,856,459	4,618,629	2.21%	4.60%	4.92%	2,086.46
19	CHN230101	Harbin	1,609	2,542,900	2,990,921	3,481,504	4,517,549	1.97%	1.53%	2.64%	2,806.91
20	CHN210212	Dalian	2,590	2,061,278	2,483,776	3,245,191	4,087,733	2.26%	2.71%	2.34%	1,578.20
21	CHN370101	Jinan	2,048	1,954,707	2,403,946	2,999,934	3,757,200	2.51%	2.24%	2.28%	1,834.94
22	CHN440883	Maoming	2,746	1,898,200	2,362,168	2,817,448	3,748,319	2.66%	1.78%	2.90%	1,364.81
23	CHN220101	Changchun	1,525	1,757,083	2,192,320	2,865,599	3,530,115	2.69%	2.71%	2.11%	2,314.75
24	CHN450101	Nanning	6,341	1,594,100	1,993,607	2,875,335	3,437,171	2.72%	3.73%	1.80%	542.05
25	CHN360101	Nanchang	2,251	1,965,100	2,305,183	2,782,614	3,376,513	1.93%	1.90%	1.95%	1,499.93
26	CHN140101	Taiyuan	1,449	1,654,713	2,051,558	2,558,382	3,359,508	2.61%	2.23%	2.76%	2,317.94
27	CHN340101	Hefei	448	821,900	1,110,778	1,659,075	3,352,076	3.68%	4.09%	7.29%	7,474.47
28	CHN530112	Kunming	1,984	1,525,779	1,611,969	2,759,842	3,272,586	0.66%	5.52%	1.72%	1,649.71
29	CHN320300	Xuzhou	2,968	2,194,300	2,690,789	2,942,115	3,053,778	2.48%	0.90%	0.37%	1,028.88
30	CHN520101	Guiyang	2,353	1,319,432	1,664,709	2,374,270	3,037,159	2.83%	3.61%	2.49%	1,291.02
31	CHN650101	Urumqi	811	956,843	1,217,316	1,753,298	3,029,372	2.93%	3.72%	5.62%	3,735.77
32	CHN620101	Lanzhou	1,687	1,416,371	1,617,761	2,087,703	2,628,426	1.61%	2.58%	2.33%	1,558.37
33	CHN371301	Linyi	1,764	1,303,800	1,590,160	1,938,510	2,600,200	2.41%	2.00%	2.98%	1,474.43
34	CHN410301	Luoyang	1,367	1,649,000	1,952,013	2,307,706	2,592,598	2.05%	1.69%	1.17%	1,896.80
35	CHN360101	Nanchang	503	1,061,500	1,369,171	1,844,253	2,357,838	3.10%	3.02%	2.49%	4,686.71

Table 3.8: List of 66 urban clusters in China with population above 1 million (as of 2010) (Continued)

			Area	Population				Annualized growth			Density (2010)
Rank	IDINT	Name	(Sq. Km)	PT1982_07	PT1990_11	PT2000_12	PT2010_11	1982-1990	1990-2000	2000-2010	(Per./Sq. Km)
36	CHN150201	Baotou	2,156	1,070,500	1,248,391	1,671,181	2,096,851	1.86%	2.96%	2.30%	972.79
37	CHN150101	Huhhot	2,055	742,200	947,677	1,406,955	1,980,774	2.98%	4.03%	3.48%	964.11
38	CHN220201	Jilin	1,132	1,079,400	1,320,208	1,953,134	1,975,803	2.45%	3.99%	0.12%	1,745.76
39	CHN410701	Xinxiang	1,510	1,206,000	1,453,739	1,664,450	1,882,655	2.27%	1.36%	1.24%	1,247.20
40	CHN411301	Nanyang	1,965	1,238,872	1,460,867	1,584,715	1,811,732	2.00%	0.82%	1.35%	922.02
41	CHN370301	Zibo	1,360	1,219,013	1,357,048	1,646,648	1,785,900	1.30%	1.95%	0.82%	1,312.72
42	CHN340401	Huainan	968	1,025,100	1,239,952	1,357,228	1,769,582	2.31%	0.91%	2.69%	1,827.44
43	CHN341201	Fuyang	1,789	1,290,700	1,529,301	1,719,057	1,768,947	2.06%	1.18%	0.29%	988.85
44	CHN370601	Yantai	817	665,836	847,285	1,225,405	1,760,100	2.94%	3.76%	3.69%	2,155.45
45	CHN140201	Datong	2,067	967,700	1,277,310	1,526,744	1,737,517	3.39%	1.80%	1.30%	840.48
46	CHN130201	Tangshan	565	1,338,300	1,517,758	1,547,258	1,675,612	1.52%	0.19%	0.80%	2,967.73
47	CHN320901	Yancheng	1,704	1,204,600	1,366,779	1,534,182	1,615,717	1.53%	1.16%	0.52%	948.01
48	CHN441302	Huizhou	399	166,600	274,689	591,686	1,579,691	6.19%	7.98%	10.32%	3,960.81
49	CHN500101	Wanzhou	237	1,186,800	1,236,183	1,648,870	1,563,100	0.49%	2.92%	-0.53%	6,587.58
50	CHN210301	Anshan	615	1,214,600	1,442,220	1,556,285	1,544,084	2.08%	0.76%	-0.08%	2,510.09
51	CHN370701	Weifang	1,485	987,600	1,151,762	1,380,300	1,521,600	1.86%	1.83%	0.98%	1,024.35
52	CHN371701	Heze	1,420	954,200	1,154,798	1,280,031	1,346,700	2.32%	1.03%	0.51%	948.56
53	CHN420601	Xiangfan	106	316,100	554,046	871,388	1,294,732	6.97%	4.63%	4.04%	12,162.82
54	CHN640101	Yinchuan	1,324	363,509	502,080	807,487	1,290,170	3.95%	4.87%	4.80%	974.17
55	CHN510301	Zigong	805	875,400	977,147	1,051,384	1,262,062	1.33%	0.73%	1.84%	1,568.03
56	CHN330782	Yiwu	1,115	568,400	609,246	912,670	1,234,000	0.84%	4.12%	3.06%	1,107.06
57	CHN430601	Yueyang	694	380,747	529,843	912,993	1,232,133	4.05%	5.59%	3.04%	1,776.20
58	CHN371501	Liaocheng	1,270	678,700	838,309	950,319	1,229,800	2.57%	1.26%	2.61%	968.55
59	CHN630101	Xining	340	589,987	697,780	854,466	1,198,304	2.03%	2.05%	3.44%	3,527.12
60	CHN421001	Jingzhou	113	243,800	372,216	1,177,150	1,154,086	5.21%	12.20%	-0.20%	10,214.05
61	CHN430401	Hengyang	313	527,100	711,004	879,051	1,135,166	3.66%	2.14%	2.59%	3,632.53
62	CHN370801	Jining	915	734,500	871,170	1,050,522	1,115,300	2.07%	1.89%	0.60%	1,218.60
63	CHN130701	Zhangjiakou	388	605,906	720,814	903,348	1,060,605	2.11%	2.28%	1.62%	2,734.50
64	CHN320701	Lianyungang	691	395,800	551,524	536,816	1,049,831	4.06%	-0.27%	6.94%	1,519.71
65	CHN410401	Pingdingshan	321	476,000	700,039	900,903	1,033,975	4.74%	2.55%	1.39%	3,223.82
66	CHN130301	Qinhuangdao	494	403,800	521,142	817,487	1,029,670	3.11%	4.61%	2.33%	2,086.04
		Total "top 66"	209,788	196,076,994	231,242,610	298,094,730	381,049,708	2.00%	2.57%	2.49%	1,816.36
		Outside these areas	9,363,112	812,098,294	902,439,891	944,517,496	958,675,144	1.27%	0.46%	0.15%	102.39
		Whole country	9,572,900	1,008,175,288	1,133,682,501	1,242,612,226	1,339,724,852	1.42%	0.92%	0.76%	139.95

Source: *e-Geopolis*, using data from Population Censuses 1982, 1990, 2000 and 2010. See the map in Figure 3.11 for locations.

contrast, the population growth in these clusters remained high over the past three decades (the annualized growth rate between 1982 and 1990 was 2.00%; and that between 2000 and 2010 was 2.49%).

As of 2010, there are seven “mega” urban clusters with total populations above 10 million. These clusters are Shanghai, Guangzhou, Beijing, Shantou, Chengdu, Fuzhou, and Wenzhou. If the populations of these clusters grow at the same rates as their annualized growth rates between 2000 and 2010, then by 2020, the Shanghai cluster will have over 100 million inhabitants and there will be two more clusters with populations above 10 million.

3.4. Administrative hierarchy (*xingzhengquhua*, 行政区划) in China

The urbanization patterns presented in the previous section show substantial variation across different regions in the country. For instance, the sizes of *zhixiashi* (直辖市) and provincial capitals are among the largest clusters, and their sizes are expected to grow further. Why do people want to move to these cities? One obvious explanation is that there are more opportunities in these cities than elsewhere. But the next question is: what makes these cities so abundant of opportunities? In fact, a key underlying reason is because these cities are at a higher administrative level.

In China, the administrative hierarchy (*xingzhengquhua*, 行政区划) of a geographical unit has an important role to play in its urbanization process because its ranking determines its administrative power over different political and economic decisions. As reviewed in Chapter 1, theories of urbanization predict that political and economic considerations are relevant determinants of a geographical unit's urbanization process. Therefore, given that cities of higher administrative rankings have more power in deciding their different political and economic priorities, these cities are usually more urbanized. It is thus useful to understand the administrative hierarchy in China in order to have a better idea about China's urbanization process.

In this section, we will discuss the evolution of the administrative structure of China and its current structure. We will also compare some population figures at various levels, based on official statistics compiled by the National Bureau of Statistics of China.

3.4.1. Evolution of the administrative structure of China

While the system of administrative division in China is necessarily complex due to its large area and its various population, it has remained relatively stable in its history in terms of the units, the boundaries, and the echelon hierarchy. Table 3.9 summarizes the administrative divisions for some major dynasties and the pre-1949 Republic of China. In various periods, the county (*xian*, 县) has been at the bottom level. Its structure in modern China has basically been the same as those established in the Qin Dynasty (221 B.C. - 206 B.C.) over 2,000 years ago.

Due to the large number of these local units, it was infeasible for the central government to administer all these local units directly. To facilitate the central administration of local governments, different intermediate levels such as Commandery (*jun*, 郡), Province (called *zhou* (州) in Han and Jin Dynasties and *sheng* (省) since Yuan Dynasty), Circuit (*dao*, 道) and Prefecture (called *zhou* (州) or *fu* (府) or *jun* (郡) in various times) emerged in different eras.

Table 3.9: Historical administrative divisions in China: From Qin (221 B.C. - 206 B.C.) to Republic of China (1912-1949)

Dynasty/Period	Administrative structure
Qin (221 B.C. - 206 B.C.)	Commandery (*jun*, 郡) - County (*xian*, 县)
Han (206 B.C. - 220)	Province (*zhou*, 州) - Commandery (*jun*, 郡) - County (*xian*, 县)
Jin (265 - 420)	Province (*zhou*, 州) - Commandery (*jun*, 郡) - County (*xian*, 县)
Sui (581 - 618)	Prefecture (smaller *zhou*, 州) - County (*xian*, 县)
Tang (618 - 907)	Circuit (*dao*, 道) - Prefecture (*zhou*, 州, or *fu*, 府) - County (*xian*, 县)
Song (960 - 1279)	Circuit (*lu*, 路) - Prefecture (*zhou*, 州, or *fu*, 府, or *jun*, 郡) - County (*xian*, 县)
Yuan (1271 - 1368)	Province (*sheng*, 省) - Circuit (*dao*, 道) - Prefecture (*zhou*, 州, or *fu*, 府) - County (*xian*, 县)
Ming (1368 - 1644)	Province (*sheng*, 省) - Circuit (*dao*, 道) - Prefecture (*zhou*, 州, or *fu*, 府) - County (*xian*, 县)
Qing (1644 - 1912)	Province (*sheng*, 省) - Circuit (*dao*, 道) - Prefecture (*zhou*) - County (*xian*, 县)
Republic of China (1912 - 1949)	Province (*sheng*, 省) and Special Municipality (*yuanxiashi*, 院辖市) - Circuit (*dao*, 道) - Prefecture (*zhou*, 州) - Provincial City (*shengxiashi*, 省辖市) and County (*xian*, 县)

While these different divisions were established and abolished, the county system remained basically unchanged. And since the Yuan Dynasty (1271 - 1368), the province has emerged as the institution that helps the central administration of local units. This level of administrative hierarchy was the second-most constant institution, after the county, in the history of administrative hierarchy of China.

The history of province can be traced to the Han Dynasty (206 B.C. - 220) when the Chinese word for province, *sheng* (省), was used to refer to the inner quarters of imperial court and was later attached to the three imperial government boards, namely *zhongshusheng* (中书省) (responsible for drafting orders of the emperor), *shangshusheng* (尚书省) (responsible for executing government policies), and *menxiasheng* (门下省) (responsible for approving government policies). At that time, there were three levels in the administrative hierarchy: Province (*zhou*, 州), Commandery (*jun*, 郡) and County (*xian*, 县). The Jin Dynasty (265 - 420) basically followed the administrative structure of Han by having a similar three-level Province-Commandery-County hierarchy.

In the Sui Dynasty (581 - 618), the administrative hierarchy was simplified to a two-level system: Prefecture (which consisted of many smaller *zhou*, 州) and County (*xian*, 县). But such a system was reverted back to a three-level structure in the Tang Dynasty (618 - 907) in which the top level was Circuit (*dao*, 道), Prefecture (called *zhou*, 州, or *fu*, 府) in the middle level, and County (*xian*, 县) in the bottom level. In the Song Dynasty (960 - 1279), the two-level system was initially adopted: Prefecture (*zhou*, 州) and County (*xian*, 县), but later added another level of Circuit (*lu*, 路) above Prefecture in order to strengthen the central control of the local administrative units. In fact, the level of *lu* in Song was neither a territorial unit nor an administrative unit; rather, it only referred to a network of territorial divisions under the direction of different imperial officers whose authority was delegated by the central imperial boards. Therefore, through the *lu* the discretionary decision authority of local governments were taken away by the central government.

The Yuan Dynasty initially continued the administrative structure of the Song Dynasty. It also introduced the level of Province (*xingsheng*, 行省) as a horizontal echelon of local administration. At the beginning the province was used to serve local defense needs. But later, it was extended to other aspects of local administration and formed the integral parts of the administrative system. The administrative divisions in the Ming Dynasty (1368 - 1644) and Qing Dynasty (1644 - 1912) basically followed the Yuan model by having a four-level administrative hierarchy. The Republic of China during the pre-1949 era added a few more structures by creating Special Municipality (*yuanxiashi*, 院辖市) at the top level and Provincial City (*shengxiashi*, 省辖市) below the Prefecture level.

While the population of China increased over time, the number of counties did not increase proportionally. For example, in the Han dynasty, there were about 1,200 counties and a population of about 60 million; on average there were about 50,000 people in each county. In the middle of the Qing Dynasty, the population grew to about 425 million but the number of counties only increased to 1360, so that each county on average had about 300,000 people.[28] By 2010, China's population was over 1.3 billion and there were about 2,800 county-level divisions. In other words, the average number of people in each county-level unit is about 450,000. As for provinces, the structure also remained relatively constant. In the Yuan Dynasty, there were about 10 provinces. In the Ming Dynasty, the number increased to 15, including two provincial-level cities (Beijing and Tianjin) and 13 regional provinces. The Qing Dynasty initially had 18 provinces by dividing the three largest provinces into six. Until the 1880s, 5 more provinces were created, one of which (Taiwan) was surrendered to Japan in 1895.

During the Republic of China period (1912-1949), there were a number of changes in the provincial-level administrative divisions. The major structures at various times are summarized in Table 3.10. At first there were 28 such divisions, including 22 provinces (*sheng*, 省) and 6 areas (*difang*, 地方). Later in 1928, the number expanded to 38, including 28 provinces (*sheng*,

[28]See Fitzgerald (2002) and his footnote 18.

省), 6 municipalities (*yuanxiashi*, 院辖市), 2 administrative regions (*xingzhengqu*, 行政区), and 2 areas (*difang*, 地方). After the Second World War and before the People's Republic of China came to power, there were 49 provincial-level units, including 35 provinces (*sheng*, 省), 12 municipalities (*yuanxiashi*, 院辖市), 1 special administrative region (*tebiexingzhengqu*, 特别行政区), and 1 area (*difang*, 地方).

Table 3.10: Provincial-level divisions in Republic of China, 1912-1949

Period	Divisions
1912	Provinces (*sheng*, 省) (22): Zhili, Fengtian, Jilin, Heilongjiang, Shandong, Henan, Shanxi, Jiangsu, Anhui, Jiangxi, Fujian, Zhejiang, Hubei, Hunan, Shaanxi, Gansu, Xinjiang, Sichuan, Guangdong, Guangxi, Yunnan, Guizhou
	Area (*difang*, 地方) (6): Outer Mongolia, Inner Mongolia, Qinghai, Tibet, Altay, Tarbagatay
1928	Provinces (*sheng*, 省) (28): Hebei, Liaoning, Jilin, Heilongjiang, Shandong, Henan, Shanxi, Jiangsu, Anhui, Jiangxi, Fujian, Zhejiang, Hubei, Hunan, Shaanxi, Gansu, Xinjiang, Sichuan, Guangdong, Guangxi, Yunnan, Guizhou, Suiyuan, Chahar, Rehe, Chuanbian, Qinghai, Ningxia
	Municipalities (*yuanxiashi*, 院辖市) (6): Nanjing, Shanghai, Beiping, Qingdao, Tianjin, Hankou
	Administrative regions (*xingzhengqu*, 行政区) (2): Weihaiwei, Dongsheng
	Areas (*difang*, 地方) (2): Tibet, Mongolia
1945-1949	Provinces (*sheng*, 省) (35): Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan, Sichuan, Fujian, Taiwan, Guangdong, Guangxi, Yunnan, Guizhou, Hebei, Shandong, Henan, Shanxi, Gansu, Ningxia, Suiyuan, Chahar, Rehe, Liaoning, Andong, Liaobei, Jilin, Songjiang, Hejiang, Heilongjiang, Nenjiang, Xing'an, Xikang, Qinghai, Xinjiang
	Municipalities (*yuanxiashi*, 院辖市) (12): Nanjing, Shanghai, Beiping, Qingdao, Tianjin, Chongqing, Dalian, Harbin, Hankou, Guangzhou, Xi'an, Shenyang
	Special administrative region (*tebiexingzhengqu*, 特别行政区) (1): Hainan
	Area (*difang*, 地方) (1): Tibet

3.4.2. The administrative structure of China, 1949-present

In the first few years after the establishment of the People's Republic, the administrative structure changed a number of times, with additions, removal and re-organization of different administrative regions, provinces, and municipalities. For example, in 1949 the government introduced 6 Greater Administrative Regions (*daxingzhengqu*, 大行政区) which were above the provincial-level units in the administrative hierarchy. These regions included Huabei, Xibei, Dongbei, Huadong, Zhongnan, and Xinan. But five years later in 1954, the Greater Administrative Regions were abolished and the provincial-level units were again the highest level divisions in the administrative hierarchy.

According to Article 30 of the current Constitution of the People's Republic,

"The administrative division of the People's Republic of China is:

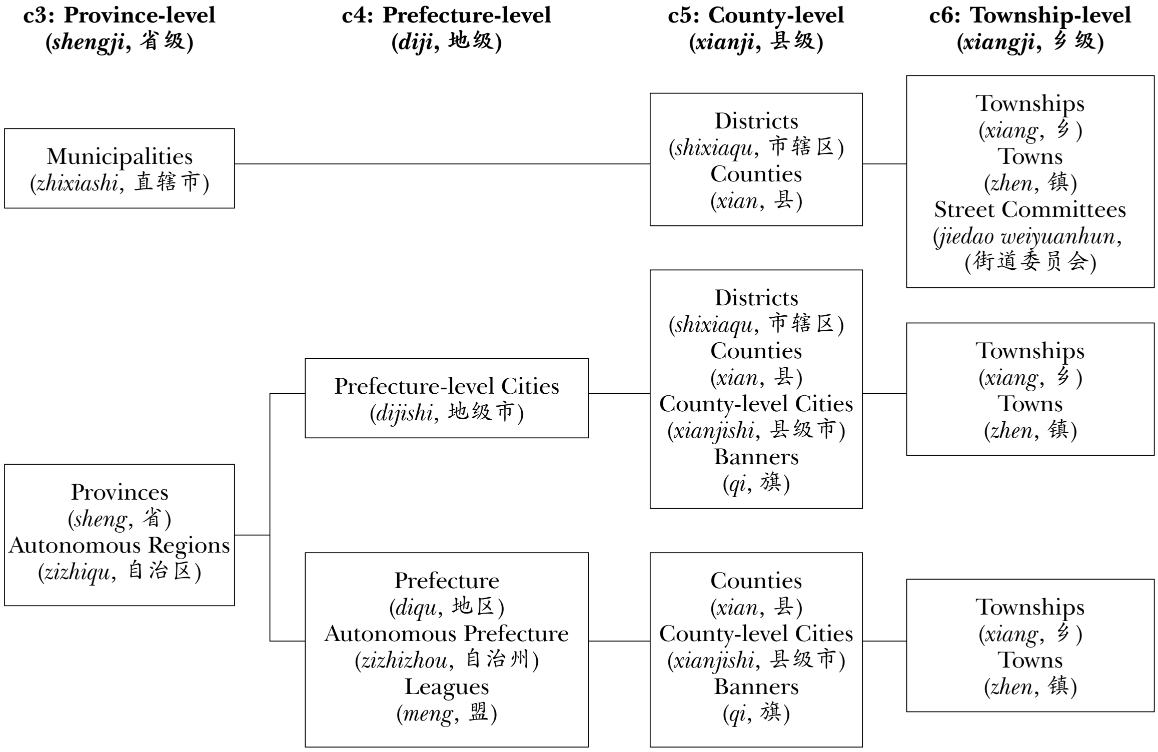
1. The country is divided into provinces (*sheng*, 省), autonomous regions (*zizhiqu*, 自治区) and municipalities (*zhixiashi*, 直辖市) directly under the Central Government;
2. Provinces and autonomous regions are divided into autonomous prefectures (*zizhizhou*, 自治州), counties (*xian*, 县), autonomous counties (*zizhixian*, 自治县), and cities (*shi*, 市);
3. Counties and autonomous counties are divided into townships (*xiang*, 乡), ethnic townships (民族乡), and towns (*zhen*, 镇).

Municipalities directly under the Central Government and other large cities are divided into districts (*qu*, 区) and counties (*xian*, 县). Autonomous prefectures are divided into counties (*xian*, 县), autonomous counties (*zizhixian*, 自治县), and cities (*shi*, 市).

All autonomous regions, autonomous prefectures and autonomous counties are ethnic autonomous areas."

In general, a territorial unit of a higher administrative ranking is headed by an official of a higher rank so that the unit has more decision powers compared with other territorial units of lower administrative rankings. While the administrative structure has not been mentioned in detail within the Constitution, its major structures of the divisions in mainland China can be represented by four levels: province (*shengji*, 省级), prefecture (*diji*, 地级), county (*xianji*, 县级), and township (*xiangji*, 乡级) (see Figure 3.12). In *zhixiashi*, there are three levels, namely *shenji*, *xianji*, and *xiangji*. In a typical *sheng* and *zizhiqu*, there is an additional level of *diji*, which is between *sheng* and *xian*.

Figure 3.12: Major structures of the current administrative hierarchy of China



Note: The structures of the Hong Kong and Macau Special Administrative Regions are excluded.

3.4.3. *Shengji* divisions (省级行政区)

A *sheng*, or formally known as *shengji* division, is the highest level administrative unit in the administrative hierarchy. In principle, the provincial units are subordinates of the central government. But in practice, the provincial government officials have large decision authority on various social and economic policies. Figure 3.13 shows the administrative divisions at *shengji*. The regions in red are the four centrally-administered cities (also called municipalities), namely Beijing Shi, Tianjin Shi, Shanghai Shi, and Chongqing Shi.

There are four different types of divisions at *shengji*, namely *zhixiashi* (直辖市), *sheng* (省), *zizhiqu* (自治区), and *tebiexingzhengqu* (特别行政区).

***Zhixiashi* (直辖市)** Literally, a *zhixiashi* means a centrally-administered city. It is a higher level city which is directly under the central government. While these cities have the same status as that of *sheng*, their political status in practice are higher than other *sheng*. There are currently 4 such cities, namely, Beijing Shi, Tianjin Shi, Shanghai Shi, and Chongqing Shi.

***Sheng* (省)** As explained earlier, the provincial unit in China has a long history and serves as the bridge between the central government and the local territorial units. There are 22 *sheng*

Figure 3.13: *Shenji* divisions (省级行政区, c3) in China

Note: The shaded regions are the four *zhixiashi* (Beijing Shi, Tianjin Shi, Shanghai Shi, and Chongqing Shi) and the two *tebiexingzhengqu* (Hong Kong and Macau).

Source: *e-Geopolis* and *China Data Online*.

in the People's Republic (excluding Taiwan which is governed by the Republic of China): Hebei Sheng, Shanxi Sheng, Liaoning Sheng, Jilin Sheng, Heilongjiang Sheng, Jiangsu Sheng, Zhejiang Sheng, Anhui Sheng, Fujian Sheng, Jiangxi Sheng, Shandong Sheng, Henan Sheng, Hubei Sheng, Hunan Sheng, Guangdong Sheng, Hainan Sheng, Sichuan Sheng, Guizhou Sheng, Yunnan Sheng, Shaanxi Sheng, Gansu Sheng, and Qinghai Sheng.

***Zizhiqu* (自治区)** A *zizhiqu* has a large population of a particular minority ethnic group. There are currently 5 such *zizhiqu* in China, including Xinjiang Uyghur Zizhiqu, Inner Mongolia Zizhiqu, Tibet Zizhiqu, Ningxia Hui Zizhiqu, and Guangxi Zhuang Zizhiqu.

***Tebiexingzhengqu* (特别行政区)** It is a highly autonomous and self-governing division. Currently there are two *tebiexingzhengqu*, namely Hong Kong and Macau, established in 1997 and 1999 respectively. Each region has a provincial level chief executive as the head of the government.

Table 3.11 shows the area, population and population density for the *shengji* divisions of China (excluding Hong Kong and Macau) in 2000 and 2010. Among these divisions, Xinjiang Zizhiqu, Tibet Zizhiqu, and Inner Mongolia Zizhiqu have the largest land areas and together they occupy over 40% of the total area of China. In terms of population, Guangdong Sheng, Shandong Sheng, and Henan Sheng are the three most populated provinces, each having over 80 million people in 2000 and 90 million people in 2010; and the three divisions with the highest population densities are Shanghai Shi, Beijing Shi, and Tianjin Shi.

In terms of population growth over this 10-year period, we can see that most of the *sheng* have larger populations. In particular, three of the four *zhixiashi*, namely Beijing Shi, Tianjin Shi, and Shanghai Shi, experienced the largest population growth, ranging from about 30% to over 40%. However, unlike the other *zhixiashi*, there was a drop of about 6.6% in population in Chongqing Shi. Apart from Chongqing Shi, Anhui Sheng, Hubei Sheng, Sichuan Sheng, Guizhou Sheng, and Gansu Sheng also recorded reduced total populations between 2000 and 2010.

Table 3.11: *Shenji* divisions (省级行政区, c3) in China: Some statistics

	Provincial capital	Area (1,000 Sq Km)	2000 Pop. (Mn)	2000 Density (Sq Km)	2010 Pop. (Mn)	2010 Density (Sq Km)	Pop. growth (%)
Beijing		16.41	13.82	842.17	19.62	1,195.51	41.97
Tianjin		11.92	10.01	839.77	12.99	1,090.25	29.77
Hebei	Shijiazhuang	188.43	67.44	357.90	71.94	381.76	6.67
Shanxi	Taiyuan	156.71	32.97	210.39	35.74	228.07	8.40
Inner Mongolia	Hohhot	1,145.12	23.76	20.75	24.72	21.59	4.04
Liaoning	Shenyang	148.06	42.38	286.24	43.75	295.47	3.23
Jilin	Changchun	191.12	27.28	142.74	27.47	143.71	0.70
Heilongjiang	Harbin	452.65	36.89	81.50	38.33	84.69	3.90
Shanghai		8.24	16.74	2,031.55	23.03	2,794.83	37.57
Jiangsu	Nanjing	106.74	74.38	696.83	78.69	737.23	5.79
Zhejiang	Hangzhou	105.4	46.77	443.74	54.47	516.76	16.46
Anhui	Hefei	140.13	59.86	427.17	59.57	425.10	−0.48
Fujian	Fuzhou	124.02	34.71	279.87	36.93	297.79	6.40
Jiangxi	Nanchang	166.89	41.40	248.07	44.62	267.37	7.78
Shandong	Jinan	157.13	90.79	577.80	95.88	610.20	5.61
Henan	Zhengzhou	165.54	92.56	559.14	94.05	568.18	1.61
Hubei	Wuhan	185.89	60.28	324.28	57.28	308.14	−4.98
Hunan	Changsha	211.85	64.40	303.99	65.70	310.12	2.02
Guangdong	Guangzhou	179.81	86.42	480.62	104.41	580.66	20.82
Guangxi	Nanning	237.56	44.89	188.96	46.10	194.06	2.70
Hainan	Haikou	35.35	7.87	222.63	8.69	245.67	10.42
Chongqing		82.27	30.90	375.59	28.85	350.63	−6.63
Sichuan	Chengdu	484.06	83.29	172.07	80.45	166.20	−3.41
Guizhou	Guiyang	176.15	35.25	200.11	34.79	197.50	−1.30
Yunnan	Kunming	383.19	42.88	111.90	46.02	120.09	7.32
Tibet	Lhasa	1,202.07	2.62	2.18	3.01	2.50	14.89
Shaanxi	Xi’an	205.79	36.05	175.18	37.35	181.50	3.61
Gansu	Lanzhou	404.09	25.62	63.40	25.60	63.35	−0.08
Qinghai	Xining	717.48	5.18	7.22	5.63	7.85	8.69
Ningxia	Yinchuan	51.95	5.62	108.18	6.33	121.83	12.63
Xinjiang	Urumqi	1,664.90	19.25	11.56	21.85	13.12	13.51
	Total	9,506.93	1,262.28	132.77	1,340.91	141.05	6.23

Note: The two *tebiexingzhengqu*, Hong Kong and Macau, are excluded.
Source: China Statistics Yearbook, 2001 and 2011.

3.4.4. *Diji* divisions (地级行政区)

While not mentioned in the constitution, the *diji* divisions are one of the *de facto* administrative divisions below *shengji*. As shown in Figure 3.12, this level is only present in *shengji* divisions. There are different types of *diji* divisions, including *dijishi* (地级市), *diqu* (地区), *zizhizhou* (自治州), and *meng* (盟).

***Dijishi* (地级市)** *Dijishi* is the second type of cities in China. *Dijishi* form the largest group at *diji*. Each *dijishi* generally consists of an urban district with large surrounding rural areas.

***Diqu* (地区)** *Diqu* used to be the dominant group at *diji* but most of them were replaced by *dijishi* since the 1980s. Nowadays, they exist mostly in Xinjiang Zizhiqu and Tibet Zizhiqu.

***Zizhizhou* (自治州)** *Zizhizhou* have one or more designated ethnic minorities and are mostly located in western *sheng*.

***Meng* (盟)** *Meng* are essentially the same as *diqu*, but they are found only in Inner Mongolia. Like *diqu*, many of the *meng* have been replaced by *dijishi*. At present, there are only three *meng* remaining, namely Hinggan (*xing'an*, 兴安), Xilingol (*xilinguole*, 锡林郭勒), and Alxa (*alashan*, 阿拉善).

Figure 3.14 shows the *diji* divisions in different *sheng*. The numbers of these *diji* divisions by *sheng* and some related statistics in 2000 and 2010 are shown in Table 3.12. From the table, we can see that while the total number of *diji* divisions stayed the same (333) in 2000 and 2010, there were more *dijishi* but fewer other types of *diji* units in 2010 than 2000: The number of *dijishi* increased from 259 in 2000 to 283 in 2010. Note that in the four *zhixiashi*, there are no *diji* divisions. Besides, most of the *sheng* are partitioned into *dijishi* only and do not contain other administrative units at this level. Among the 27 *shengji* units (22 *sheng* and 5 *zizhiiqu*), only 3 *sheng* (namely Yunnan Sheng, Guizhou Sheng, and Qinghai Sheng) and 2 *zizhiiqu* (namely Xinjiang Zizhiqu and Tibet Zizhiqu) contain more than three types of *diji* other than *dijishi*.

Among the *diji* divisions are the *fushengjishi* (副省级市), officially named on February 25, 1994. Most of these cities are either current provincial capitals or used to be the so-called "centrally planned cities" or "cities specially designated in the state plan" (*jihuadanlieshi*, 计划单列市), a special status designated in the 1980s to allow them more independence in their social and economic planning. These cities are governed by their respective provinces but are administered independently in regard to economy and law. Therefore, while these deputy-provincial level cities and other prefecture-level divisions are at the same administrative level, the former are superior than the latter in practice.

Figure 3.14: *Diji* divisions (地级行政区, c4) in China

Note: The grey lines are the boundaries of the *diji* divisions.
Source: *e-Geopolis* and *China Data Online*.

Table 3.12: *Diji* divisions (地级行政区, c4) in China: Some statistics

	2000			2010		
	Shi (市)	Others	Total	*Shi* (市)	Others	Total
Beijing	0	0	0	0	0	0
Tianjin	0	0	0	0	0	0
Hebei	11	0	11	11	0	11
Shanxi	10	1	11	11	0	11
Inner Mongolia	5	7	12	9	3	12
Liaoning	14	0	14	14	0	14
Jilin	8	1	9	8	1	9
Heilongjiang	12	1	13	12	1	13
Shanghai	0	0	0	0	0	0
Jiangsu	13	0	13	13	0	13
Zhejiang	11	0	11	11	0	11
Anhui	17	0	17	17	0	17
Fujian	9	0	9	9	0	9
Jiangxi	11	0	11	11	0	11
Shandong	17	0	17	17	0	17
Henan	17	0	17	17	0	17
Hubei	12	1	13	12	1	13
Hunan	13	1	14	13	1	14
Guangdong	21	0	21	21	0	21
Guangxi	9	5	14	14	0	14
Hainan	2	0	2	2	0	2
Chongqing	0	0	0	0	0	0
Sichuan	18	3	21	18	3	21
Guizhou	4	5	9	4	5	9
Yunnan	4	12	16	8	8	16
Tibet	1	6	7	1	6	7
Shaanxi	9	1	10	10	0	10
Gansu	5	9	14	12	2	14
Qinghai	1	7	8	1	7	8
Ningxia	3	1	4	5	0	5
Xinjiang	2	13	15	2	12	14
Total	259	74	333	283	50	333

Source: Manual of the Administrative Division of China, 2001; China Statistics Yearbook, 2011.

The are currently 15 *fushengjishi*, including: Dalian Shi (in Liaoning Sheng), Ningbo Shi (in Zhejiang Sheng), Qingdao Shi (in Shandong Sheng), Shenzhen Shi (in Guangdong Sheng), Xiamen Shi (in Fujian Sheng), Harbin Shi (in Heilongjiang Sheng), Changchun Shi (in Jilin Sheng), Shenyang Shi (in Liaoning Sheng), Jinan Shi (in Shandong Sheng), Nanjing Shi (in Jiangsu Sheng), Hangzhou Shi (in Zhejiang Sheng), Guangzhou Shi (in Guangdong Sheng), Wuhan Shi (in Hubei Sheng), Chengdu Shi (in Sichuan Sheng), and Xi'an Shi (in Shaanxi Sheng). The geographical locations of these cities are shown in Figure 3.15.

Figure 3.15: *Fushengjishi* (副省级市) in China

Note: The shaded regions are the *fushengjishi*.
Source: *e-Geopolis* and *China Data Online*.

3.4.5. *Xianji* divisions (县级行政区)

The *xianji* level is the second official administrative level mentioned in the Constitution. As we can see from Figure 3.12, within *zhixiashi* (i.e., Beijing, Tianji, Shanghai, and Chongqing), *xianji* is the second level in the administrative hierarchy. In all other *shengji* divisions, *xianji* is the *de facto* third level and is below the *diji* level in the hierarchy.

The *xianji* level has the longest history in the administrative hierarchy of China. There are different forms of *xianji* divisions, including *shixiaqu* (市辖区), *xianjishi* (县级市), *xian* (县), *zizhixian* (自治县), *qi* (旗), *zizhiqi* (自治旗), *linqu* (林区), and *tequ* (特区).

***Shixiaqu* (市辖区)** Literally, a *shixiaqu* means a city-administered district. *Shixiaqu* used to be subdivisions of urban areas which consist of built-up areas only. They exist within *zhixiashi* and other larger *dijishi*. The main difference between *shixiaqu* and other types of *xianji* divisions is that *shixiaqu* form the main part of a city (i.e., either *zhixiashi* or *dijishi*) and they have higher population densities with larger shares of urban populations.

***Xianjishi* (县级市)** *Xianjishi* is the third type of cities in China. Similar to *dijishi*, *xianjishi* also cover both urban and rural areas.

***Xian* (县) and *zizhixian* (自治县)** *Xian* are the most common group of *xianji* divisions. As explained earlier, these divisions have a long history in China's administrative structure. Similar to *zizhiqu*, *zizhixian* contain one or more designated ethnic minorities.

***Qi* (旗) and *zizhiqi* (自治旗)** *Qi* are the same as *xian* except that they bear a different name. They are located in Inner Mongolia Zizhiqu. *Zizhiqi* are the same as *zizhixian* and they exist in Inner Mongolia Zizhiqu.

***Linqu* (林区)** *Linqu* is a special *xianji* unit situated in Hubei Sheng.

***Tequ* (特区)** *Tequ* is a special *xianji* unit exclusively located in Guizhou Sheng and Tibet Zizhiqu.

Figure 3.16 shows the *xianji* divisions in different *sheng*. The numbers of *xianji* divisions by *sheng* and some related statistics in 2000 and 2010 are shown in Table 3.13.

Figure 3.16: *Xianji* divisions (县级行政区, c5) in China

Note: The grey lines are the boundaries of the *xianji* divisions.
Source: *e-Geopolis* and *China Data Online*.

Table 3.13: *Xianji* division (县级行政区, c5) in China: Some statistics

	2000							2010						
	qu	*xianjishi*	*xian*	*zizhixian*	Others	Total	Pop. Per *xian* (Mn)	*qu*	*xianjishi*	*xian*	*zizhixian*	Others	Total	Pop. Per *xian* (Mn)
Beijing	13	0	5	0	0	18	0.77	14	0	2	0	0	16	1.23
Tianjin	14	0	4	0	0	18	0.56	13	0	3	0	0	16	0.81
Hebei	35	23	109	6	0	173	0.39	36	22	108	6	0	172	0.42
Shanxi	22	12	85	0	0	119	0.28	23	11	85	0	0	119	0.30
Inner Mongolia	17	15	17	0	52	101	0.24	21	11	17	0	52	101	0.24
Liaoning	56	17	19	8	0	100	0.42	56	17	19	8	0	100	0.44
Jilin	19	20	18	3	0	60	0.45	20	20	17	3	0	60	0.46
Heilongjiang	64	19	46	1	0	130	0.28	64	18	45	1	0	128	0.30
Shanghai	16	0	3	0	0	19	0.88	17	0	1	0	0	18	1.28
Jiangsu	51	28	30	0	0	109	0.68	55	26	24	0	0	105	0.75
Zhejiang	26	24	37	1	0	88	0.53	32	22	35	1	0	90	0.61
Anhui	45	5	56	0	0	106	0.56	44	5	56	0	0	105	0.57
Fujian	25	14	46	0	0	85	0.41	26	14	45	0	0	85	0.43
Jiangxi	19	10	70	0	0	99	0.42	19	11	70	0	0	100	0.45
Shandong	47	31	61	0	0	139	0.65	49	31	60	0	0	140	0.68
Henan	48	21	89	0	0	158	0.59	50	21	88	0	0	159	0.59
Hubei	35	24	39	2	1	101	0.60	38	24	38	2	1	103	0.56
Hunan	34	16	65	7	0	122	0.53	34	16	65	7	0	122	0.54
Guangdong	45	31	43	3	0	122	0.71	54	23	41	3	0	121	0.86
Guangxi	29	10	59	12	0	110	0.41	34	7	56	12	0	109	0.42
Hainan	3	7	4	6	0	20	0.39	4	6	4	6	0	20	0.43
Chongqing	14	4	18	4	0	40	0.77	19	0	17	4	0	40	0.72
Sichuan	40	14	123	3	0	180	0.46	43	14	120	4	0	181	0.44
Guizhou	9	9	56	11	2	87	0.41	10	9	56	11	2	88	0.40
Yunnan	8	11	80	29	0	128	0.34	12	11	77	29	0	129	0.36
Tibet	1	1	71	0	0	73	0.04	1	1	71	0	0	73	0.04
Shaanxi	20	4	83	0	0	107	0.34	24	3	80	0	0	107	0.35
Gansu	10	9	60	7	0	86	0.30	17	4	58	7	0	86	0.30
Qinghai	4	2	30	7	0	43	0.12	4	2	30	7	0	43	0.13
Ningxia	7	2	15	0	0	24	0.23	9	2	11	0	0	22	0.29
Xinjiang	11	17	62	6	0	96	0.20	11	19	62	6	0	98	0.22
	787	400	1,503	116	55	2,861	0.44	853	370	1,461	117	55	2,856	0.47

Source: Manual of the Administrative Divisions of China, 2001; China Statistics Yearbook, 2011.

Between 2000 and 2010, the total number of *xianji* divisions decreased from 2,861 to 2,856. While the total number did not change much, there were more *qu* but fewer *xian* over time: The former increased from 787 in 2000 to 853 in 2010; the latter decreased from 400 in 2000 to 370 in 2010. In 2010, there were 2,856 *xianji* divisions in total, including 853 *qu*, 370 *xianjishi*, 1,461 *xian*, 117 *zizhixian*, and 55 other divisions. In *zhixiashi*, most of the *xianji* divisions were in the form of *qu*, except in Chongqing Shi where there were *xian* and *zizhixian*. As will be explained later, many of these *xian* were formerly in the Sichuan Sheng and were merged into Chongqing Shi after its promotion from a *dijishi* to a *zhixiashi* in 1997.

In other *shengji* units, the distributions of *xianji* divisions are quite different. For example, in 2010, Sichuan Sheng had the largest number of *xianji* divisions (181) and two thirds of them (12) are *xian*; but Hainan Sheng had the fewest *xianji* divisions (20). In most *shengji* divisions, the average size of a *xianji* division is about 1 to 3 square kilometres. In some *shengji* divisions such as Inner Mongolia Zizhiqu, Tibet Zizhiqu, Qinghai Zizhiqu, and Xinjiang Zizhiqu have very large *xian*. For example, the average *xian* size in Inner Mongolia Zizhiqu in 2010 was larger than the size of Shanghai Shi and was as big as the whole Tianjin Shi; and the average *xian* in Tibet Zizhiqu, Qinghai Zizhiqu, and Xinjiang Zizhiqu was as large as Beijing Shi.

Nationally, the average population per *xianji* division was about 0.44 million in 2000, which increased to about 0.47 million in 2010. Among different *shengji* units, the *zhixiashi* had more populated *xian* while the inland *sheng* and *zizhiqu* such as Tibet Zizhiqu, Xinjiang Zizhiqu, and Inner Mongolia Zizhiqu had fewer inhabitants per *xian*.

3.4.6. *Xiangji* divisions (乡级行政区)

The *xiang* divisions form the basic level of political divisions in China. They are similar to communes and municipalities in other countries. There are also different types of units at this level, including *xiang* (乡), *minzuxiang* (民族乡), *zhen* (镇), *jiedao* (街道), *qugongsuo* (区公所), *sumu* (苏木), and *minzusumu* (民族苏木).

***Xiang* (乡)** *Xiang* usually appear in small rural areas.

***Minzuxiang* (民族乡)** *Minzuxiang* are rural areas divisions which contain one or more designated ethnic minorities.

***Zhen* (镇)** *Zhen* are located in larger rural areas.

***Jiedao* (街道)** *Jiedao* are found within small urban areas.

***Qugongsuo* (区公所)** *Qugongsuo* form an extra level of government between *xianji* and *xiangji*. There are very few of them nowadays.

***Sumu* (苏木)** *Sumu* are the same as *xiang* and they are unique to Inner Mongolia Zizhiqu.

***Minzusumu* (民族苏木)** *Minzusumu* are the same as *minzuxiang* and they are unique to the Inner Mongolia Zizhiqu.

Within these *xiangji* divisions there are *cunji* divisions (村级行政区). Apart from serving as an organizational division (for census and mail system), the *cunji* does not have much importance in political representative power. These divisions include *jumin weiyuanhui* (居民委员会), *cunmin weiyuanhui* (村民委员会), *cun* (村), and *gacha* (嘎查) which are located in Inner Mongolia Zizhiqu.

Table 3.14 shows the number of *xiangji* divisions by *sheng* in 2000 and 2010. In 2000, there were 50,769 *xiangji* units, including 24,555 *xiang*, 20,312 *zhen*, and 5,902 *jiedao*. In 2010, the total number of *xiangji* units dropped significantly to 40,906. Among them there were 14,571 *xiang*, 19,410 *zhen*, and 6,923 *jiedao*. In other words, there was a large reduction in *xiang* but the reduction in *zhen* was only modest. Some of these units were cancelled and merged while others were changed to *jiedao*. As a result, although the total number of *xiangji* divisions dropped, there were more *jiedao* in 2010 than in 2000.

Among the different *shengji* divisions, Sichuan Sheng had the largest number of *xiangji* divisions whereas Hainan Sheng has the smallest number. The average number of *xiangji* divisions within each *xianji* division varied by different *sheng*, ranging from 10 to 20 divisions in most *sheng*. There were two exceptions, namely Chongqing Shi and Sichuan Sheng, each having on average over 25 *xiangji* divisions per *xian* in 2010.

As for the average population per *xiangji* division, the national average was 24.15 thousands in 2000 which increased to 32.78 thousand in 2010. Among the top 6 *shengji* divisions with the highest average populations per county in 2010, Beijing Shi, Shanghai Shi, Tianjin Shi, Guangdong Sheng, and Jiangsu Sheng also had the highest average populations per *xiangji* division. The exception is Chongqing Shi because there were many *xianji* divisions.

Table 3.14: *Xiangji* (乡级行政区, c6) China: Some statistics

	2000							2010						
	xiang	*zhen*	*jiedao*	Others	Total	No. of *xiang* per *xian*	Pop. Per *xiang* (1,000)	*xiang*	*zhen*	*jiedao*	Others	Total	No. of *xiang* per *xian*	Pop. Per *xiang* (1,000)
Beijing	76	139	127	0	342	19.00	40.41	40	142	140	0	322	20.13	60.93
Tianjin	100	114	90	0	304	16.89	32.93	20	115	108	0	243	15.19	53.47
Hebei	1,127	900	229	0	2,256	13.04	29.89	953	1,007	266	1	2,227	12.95	32.30
Shanxi	1,225	559	168	0	1,952	16.40	16.89	633	563	201	0	1,397	11.74	25.58
Inner Mongolia	1,170	416	197	0	1,783	17.65	13.33	179	463	221	0	863	8.54	28.65
Liaoning	554	656	519	0	1,729	17.29	24.51	324	581	602	0	1,507	15.07	29.03
Jilin	430	459	232	0	1,121	18.68	24.34	194	426	277	0	897	14.95	30.62
Heilongjiang	800	479	1031	0	2,310	17.77	15.97	423	473	382	0	1,278	9.98	30.00
Shanghai	3	171	93	0	267	14.05	62.70	2	109	99	0	210	11.67	109.65
Jiangsu	272	1203	317	0	1,792	16.44	41.51	98	877	332	0	1,307	12.45	60.21
Zhejiang	787	970	106	0	1,863	21.17	25.10	443	728	341	0	1,512	16.80	36.02
Anhui	885	973	209	0	2,067	19.50	28.96	349	912	262	0	1,523	14.50	39.11
Fujian	385	628	113	0	1,126	13.25	30.83	334	595	173	0	1,102	12.96	33.51
Jiangxi	1,040	759	98	0	1,897	19.16	21.82	610	788	141	0	1,539	15.39	28.99
Shandong	633	1351	319	0	2,303	16.57	39.42	156	1,118	600	0	1,874	13.39	51.16
Henan	1,303	844	287	0	2,434	15.41	38.03	929	949	493	0	2,371	14.91	39.67
Hubei	478	860	283	0	1,621	16.05	37.19	199	741	290	0	1,230	11.94	46.57
Hunan	1,408	1,055	209	0	2,672	21.90	24.10	1,052	1,109	258	0	2,419	19.83	27.16
Guangdong	40	1556	337	0	1,933	15.84	44.71	11	1,134	436	0	1,581	13.07	66.04
Guangxi	679	745	67	0	1,491	13.55	30.11	424	702	108	0	1,234	11.32	37.36
Hainan	120	205	19	0	344	17.20	22.88	21	183	18	0	222	11.10	39.12
Chongqing	868	675	87	0	1,630	40.75	18.96	252	587	175	0	1,014	25.35	28.45
Sichuan	3,378	1,790	205	0	5,373	29.85	15.50	2,585	1,821	262	0	4,668	25.79	17.23
Guizhou	1,016	692	75	0	1,783	20.49	19.77	757	689	114	0	1,560	17.73	22.30
Yunnan	1,291	496	55	0	1,842	14.39	23.28	689	597	80	0	1,366	10.59	33.69
Tibet	614	112	8	0	734	10.05	3.57	542	140	10	0	692	9.48	4.35
Shaanxi	1,103	919	116	0	2,138	19.98	16.86	648	922	175	0	1,745	16.31	21.41
Gansu	1,326	267	109	0	1,702	19.79	15.05	761	466	124	0	1,351	15.71	18.95
Qinghai	473	49	28	0	550	12.79	9.42	229	137	30	0	396	9.21	14.23
Ningxia	233	72	37	0	342	14.25	16.43	93	99	43	0	235	10.68	26.93
Xinjiang	738	198	132	0	1,068	11.13	18.02	621	237	162	1	1,021	10.42	21.40
	24,555	20,312	5,902	0	50,769	17.75	24.15	14,571	19,410	6,923	2	40,906	14.32	32.78

Note: * — including *minzuxiang*.

Source: Manual of the Administrative Divisions of China, 2001; China Statistics Yearbook, 2001 and 2011.

3.5. The household registration (*hukou*, 户口) system in China

While the administrative structure determines the decision authorities of different geographical units according to their rankings along the hierarchy, the urbanization process of China is also affected by another special institution known as the household registration (*hukou*, 户口) system. Under this system, mobility of people across the country, especially from rural areas to urban areas, is subject to different regulations. Therefore, even though rural-urban disparities are present to attractive rural migrants into urban areas, the urbanization cannot be fully realized when the rural workers are prohibited from migrating.

As such, the *hukou* system has important impact on the urbanization process. In this section we discuss some background information and recent reforms of the system. More discussion can be found in, for example, Chan and Zhang (1999), Chan and Buckingham (2008), and Chan (2009).

3.5.1. Early implementation

Historically, the household registration system in the pre-People's Republic era has been mostly used for the purposes of taxation and conscription. During the unrest time in the pre-1949 era, the system was also used by the Nationalist government to monitor certain groups of the population (Wang, 2006). However, this system was never meant to be a comprehensive way to control the social and economic activities of the entire population.

In the first few years after the establishment of the People's Republic in 1949, people were still able to enjoy free mobility across the country, as granted by the constitution. Before the formal implementation of the *hukou* system, the rural-urban migration constituted about 70 to 80% of the growth of urban population (Cai and Lin, 2003). With the introduction of the command economic system in the 1950s, the Chinese government needed to have complete control of all the macro and micro aspects of the economy. In particular, the industrialization strategy (or the "traditional socialist development strategy") created huge differences between the industrial and agricultural sectors. If people were allowed to move freely, many of them would have left the countryside and moved to the urban areas where they could find better-paid jobs. Therefore, the need of having a more sophisticated household registration system emerged to prevent massive outflows of people from rural to urban areas. Moreover, the government could also use the system to better allocate the labor force in various industrial and agricultural sectors to fulfill different economic goals.

The *hukou* system was first introduced in 1951. It resembled the *Propiska* (internal passport) system used in the former Soviet Union and other communist countries to keep track of the residence of the urban population.[29] It was further expanded in 1955 to cover both the rural and urban populations. In 1958, the Household Registration Regulation was formally promulgated as a national policy.[30] In essence, the regulation required that all migration be subject to approvals from the local authorities at the destinations. Besides, under the regulation, each individual was classified into different *hukou* types, and that newborns were assigned a *hukou* following that of the mother. The *hukou* status of an individual, once assigned, could not be changed without a formal *hukou* conversion.

Under the *Hukou* System, each individual was categorized by two related classifications: *hukou* type and *hukou* location.

***Hukou* type** The *hukou* type of an individual can be classified into either "agricultural" (*nongye hukou*, 农业户口) or "non-agricultural" (*feinongye hukou*, 非农业户口). This distinction basically originated from the occupational division within the Chinese economy in the 1950s. However, as the system develops, such a distinction does not necessarily reflect the actual occupation of the *hukou* holders.

Before the recent reforms (to be discussed below), the *hukou* type determined the individual's entitlements to different kinds of state-provided goods and services. For example, non-agricultural *hukou* holders were entitled to state-provided housing, employment, state-subsidized food, education, access to medical services and other social welfare benefits. On the other hand, the agricultural *hukou* holders were expected to be self-sustained and only received very limited benefits from the government.

People with non-agricultural *hukou* status were automatically entitled to various benefits regardless of where they resided, and those with agricultural *hukou* status could not obtain such benefits even though they moved to cities. These differential benefits further discouraged people with agricultural *hukou* status from migrating to cities. Since people with non-agricultural *hukou* usually lived in urban cities, the non-agricultural *hukou* was loosely considered as urban *hukou*. Besides, the non-agricultural *hukou* status was much sought after due to the superior benefits available to holders with such a status.

***Hukou* location** On top of the *hukou* type, an individual was also classified according to his or her location of *hukou* registration (*hukou dengjidi*, 户口登记地), which was the individual's official and permanent residential location. The local *hukou* registration determined an indi-

[29]See, for example, Chan (1994) for further discussion.

[30]See Tien (1973: 378-383) for the full text of the regulation in English.

vidual's eligibility for different services provided by the local authorities. Before the reforms, the *hukou* type determined the kind of benefits the individual could obtain, and the *hukou* location determined where the person could receive them.

Since the *hukou* type and *hukou* location refer to two different concepts, the two classifications defined four types of people:

1. Agricultural *hukou* holders residing in urban areas: People in this group are mainly rural migrants and their dependents.

2. Agricultural *hukou* holders residing in rural areas: People in this group are mainly rural workers and farmers and their dependents.

3. Non-agricultural *hukou* holders residing in urban areas: People in this group are mainly urban workers, state officials, professionals, and their dependents.

4. Non-agricultural *hukou* holders residing in rural areas: People in this group are mainly state-employed workers, officials, and professionals, and their dependents.

3.5.2. The conversion of *hukou* status and the effect on internal migration

Before the reforms of the *hukou* system in the 1980s, it was not easy for people to move across the country and so internal migration was not common. There were two broad categories of internal migration: One that involved a formal transfer of local residency (known as *hukou* migration); and another that did not involve any transfer of local residency (known as non-*hukou* migration), i.e., the migrants did not have official status of residency in the destination. In China, only the *hukou* migration is officially recognized as migration and the non-*hukou* migration is only considered as "population movement" or "population floating" (*fudongrenkou*, 浮动人口). In the past three decades, the majority of the floating population were the people with an agricultural *hukou* status residing in rural areas moving to urban areas.

Prior to the late 1990s, when an individual with an agricultural *hukou* living in rural areas wanted to migrate officially to cities, he or she was required to seek approval from the state to change the *hukou* status from agricultural to non-agricultural first. The process of converting an agricultural *hukou* status to a non-agricultural one is known as agricultural-to-non-agricultural conversion (the so-called "*nongzhuangfei*," 农转非).

The qualifications for *nongzhuangfei* were set by the central government. In the 1970s and 1980s, permission was usually granted to the following cases:[31]

- People recruited by state-owned enterprises as permanent workers.

[31] For details, see Chan and Zhang (1999).

- People displaced due to land expropriation initiated by the state.
- People admitted by an institution of higher education.
- People promoted to higher administrative positions.
- People conscripted who were demobilized to cities.

In exceptional cases, people were granted a non-agricultural *hukou* status due to family reasons (for instance, taking care of sick parents in a city) or contribution to the state. Conversely, people may also be stripped of their non-agricultural *hukou* if they committed certain serious crimes.

Once the application for *nongzhuangfei* was approved, the applicant then needed to change the *hukou* location from the current village to the destination city and to obtain a migration permit by presenting appropriate documentation to the public security authorities. Every year, the central government assigned a *nonzhuangfei* quota to each local authority, which was about 0.2% of the non-agricultural population. Given the difficulty for agricultural *hukou* holders to convert their status, a more likely scenario was that they moved to a city but could not convert to a non-agricultural *hukou* so that they could not gain access to the local services and welfare. These people were referred to as non-*hukou* urban population: they were *de facto* residents but not *de jure* residents. This group was also commonly called the "mobile population." and increased in size from less than 30 millions in the 1980s to about 150 millions in the 2010s (Chan, 2012).

3.5.3. Reforms of the *hukou* system

Starting from the 1980s, there have been different reforms to the *hukou* system. For example, in 1984, there was a breakthrough in the *hukou* system with the introduction of the "*hukou* with self-supplied food grain" category in small towns (Chan and Zhang, 1999). This new category of *hukou* status was granted to those migrants who moved from rural areas to small towns but without the official *hukou* conversion. In 1985, the policy of allowing temporary residences was made a national policy. People could temporarily move and stay in a location different from the registered *hukou* location but they were still ineligible for the benefits entitled to local-*hukou* holders (Solinger, 1999).

Also starting from 1980s, the central government gradually implemented various policy changes to empower the more fiscal and administrative powers to lower-level governments, including changes in the management of the *hukou* system. In particular, the local governments began to have more controls over both *hukou* and non-*hukou* migrations.

In the 1990s, local governments were even allowed to grant local *hukou* status to other investors and professionals who had a stable job and residence within the city (Chan and Zhang, 1999). Around the same period, the *hukou* management authority was further decentralized to local governments. For example, they were allowed to manage the *nongzhuangfei* quotas and have the power to admit migrants. In the late 1990s, some locales even tried to experiment with eliminating the distinction between agricultural and non-agricultural *hukou* types within the local *hukou* population.

In 2005, there were news stories suggesting that the *hukou* system was to be abolished in that the local government could decide the criteria for admitting migrants without local *hukou* and the distinction between agricultural and non-agricultural *hukou* classification was eliminated (Chan and Buckingham, 2008). While the *hukou* system is still currently in place, it is expected that further reforms will be put forward in future.

3.5.4. *Hukou* system and migration in China

In the past 30 years, the "Great Migration" in China has involved about 200 to 250 million rural residents moving to cities and towns (Chan, 2012). This migrant population formed the cheap labor force in various sectors of the economy and helped China achieve the great economic development.

The migration patterns in the past several decades have been greatly influenced by the *hukou* system. As explained earlier, the main purpose of this system was to limit the mobility of people across the country, especially from rural to urban areas. During the Maoist era, internal migration was virtually impossible and the rural and urban areas were completely segregated by "invisible walls" (Chan, 1994).

After the economic reform in 1978, China started to witness increasing migration within the country. In the mid-1980s, rural workers were allowed to move to cities to work in factories, which by mid-1990s, these workers constituted the majority of the labor force for the exporting manufacturing firms. In the 2000s, they served most of the jobs in the low-end service sectors in urban areas. In many coastal cities (such as Shenzhen Shi and Dongguan Shi), the migrant labor constituted up to 80 percentage of the labor force.

Hukou migration

Since the economic reform, the majority of migrants has been rural migrants, i.e., those who move from rural areas to urban areas. There are two broad categories of this kind of migrants. The first type is *hukou* migrants. These are the migrants who managed to convert their *hukou* status from agricultural to non-agricultural (*nonzhuangfei*) so that they had local residency rights. This kind of migration is officially recognized. The second type is non-*hukou* migrants. These are the migrants without *hukou* residency rights, i.e., they did not obtain the *nongzhuangfei* permission. This kind of moves are considered as population movements or "floating" population.

Table 3.15: *Hukou* migration in China, 1982-2010

Year	*Hukou* migrants (Mn)	Urban pop. (Mn)	*Hukou* migrants/ Urban pop. (%)	Total migration (Mn)	*Hukou* migrants/ Total migration (%)
1982	17.30	214.80	8.05		
1990	19.20	301.95	6.36		
1995	18.50	351.74	5.26		
2000	19.10	459.06	4.16	32.30[(1)]	59.13
2005	19.30	562.12	3.43	50.41[(2)]	38.29
2010	17.00	669.78	2.54	55.22[(3)]	30.79

Note: (1): Between 1995 and 2000; (2): Between 2000 and 2005; (3): Between 2005 and 2010.
Source: From Chan (2012) and official statistics downloaded from *China Data Online*.

In Table 3.15, we show some aggregate migration statistics between 1982 and 2010. The numbers for *hukou* migrants come from Chan (2012) who analyzes the migrant statistics obtained from the Ministry of Public Security (i.e., the police). The data for urban population come from the official statistics downloaded from *China Data Online*. Total migration is the total number of people who moved into a province. (This number is the same as the "In migration" defined below and in Table 3.16). Note that the number of *hukou* migrants includes all types of officially approved conversions of *hukou* residence from one place to another. But they exclude relocation within the same administrative unit. Similarly, the total migration flow also excludes the within-province migration. Therefore, the migration figures in this table can potentially underestimate the actual extent of migration.

Over the past 30 years, the numbers of official *hukou* migrants were relatively stable, about 17 to 19 million per year. During the same period, the size of the urban population increased by more than three times. Thus, the number of *hukou* migrants as a fraction of total urban population dropped from about 8% in 1982 to just about 2.5% in 2010. Besides, in the past 15 years, the size of migration flow increased from about 32 million between 1995 and 2000 to 55 million between 2005 and 2010. The number of *hukou* migrants as a fraction of total migration flow also fell: From 59.13% in 1995-2000 to just 30.79% in 2005-2010. Both trends suggest that officially-approved migration becomes less and less common.

Interprovincial migration, 1995-2010

The spatial dimension of internal migration also shows some noticeable changes over time. In Table 3.16, we report some migration statistics over three different periods, 1995-2000, 2000-2005, and 2005-2010. The statistics for the 1995-2000 and 2005-2010 periods are obtained from the Long Tables of the 2000 and 2010 Population Censuses, and those for the 2000-2005 period are obtained from the 2005 Population Survey.

Note that the Long Tables of the 2000 and 2010 Population Censuses are 10% random samples of the national population, whereas the 2005 Population Survey is a 1% random sample of the population. To facilitate comparison, the figures reported in Table 3.16 have been re-scaled to represent the migration patterns of the whole country.

In each of the period, "In migration" refers to the number of people who were in a given *sheng* (or more precisely, a *shengji* division) at the time of the census but lived elsewhere five years before. Similarly, "Out migration" refers to the number of people who resided in a certain *sheng* five years before the census year but moved to another *sheng* in the census year. "Net migration" is simply the difference between "In migration" and "Out migration." A positive number means that there is a net inflow of migrants into the *sheng* and a negative number indicates a net outflow of migrants.

This table reveals the following trends. The total migration flow increased substantially over time. Specifically, the total in migration between 1995 and 2000 was about 32 million. It increased to over 50 million between 2000 and 2005, and further to over 55 million between 2005 and 2010. Therefore, there was a growth of about 72%.[32] Besides, some *sheng* were consistently "net importers" of migrants, i.e., they had net inflows of migrants, while some other *sheng* were consistently "net exporters" of migrants, i.e., they had net outflows of migrants. For example, Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang, and Guangdong had net inflows of migrants over the three periods. The first three are municipalities and the other are coastal provinces. On the other hand, Chongqing was the only *zhixiashi* with a net outflow of migrants over the three periods. Other *sheng* with net outflows of migrants include Sichuan, Anhui, Jiangxi, Henan, Hebei, Hunan, and Hubei, etc. There were a few exceptions. For example, Shanxi, Shandong, Yunan, and Guizhou experienced net inflows of migrants between 1995 and 2000, but between 2005 and 2010, these *sheng* had net outflows. In contrast, Inner Mongolia and Qinghai had net outflows of migrants between 1995 and 2000 but between 2005 and 2010, there were net inflows.

[32]Note that theoretically, the total in migration should be equal to the total out migration. The small but non-zero total net migration reflects measurement errors.

Table 3.16: Interprovincial migration in China, 1995-2010

	1995 – 2000			2000 – 2005			2005 – 2010			Total		
	In migration	Out migration	Net migration	In migration	Out migration	Net migration	In migration	Out migration	Net migration	In migration	Out migration	Net migration
Beijing	1,892,250	174,360	1,717,890	2,975,100	437,200	2,537,900	3,851,270	405,950	3,445,320	8,718,620	1,017,510	7,701,110
Tianjin	492,360	104,280	388,080	1,203,700	141,300	1,062,400	1,499,450	213,360	1,286,090	3,195,510	458,940	2,736,570
Hebei	770,040	872,210	−102,170	810,700	1,310,900	−500,200	925,210	2,017,390	−1,092,180	2,505,950	4,200,500	−1,694,550
Shanxi	382,730	333,570	49,160	278,500	457,400	−178,900	498,580	793,680	−295,100	1,159,810	1,584,650	−424,840
Inner Mongolia	325,560	441,060	−115,500	522,100	552,700	−30,600	828,590	647,590	181,000	1,676,250	1,641,350	34,900
Liaoning	755,430	379,870	375,560	892,800	551,900	340,900	1,180,710	685,420	495,290	2,828,940	1,617,190	1,211,750
Jilin	254,280	529,310	−275,030	288,600	705,600	−417,000	345,370	853,890	−508,520	888,250	2,088,800	−1,200,550
Heilongjiang	301,350	939,820	−638,470	258,700	1,351,400	−1,092,700	322,920	1,463,210	−1,140,290	882,970	3,754,430	−2,871,460
Shanghai	2,171,430	162,940	2,008,490	4,008,200	496,700	3,511,500	4,933,620	401,010	4,532,610	11,113,250	1,060,650	10,052,600
Jiangsu	1,909,240	1,240,980	668,260	4,360,200	1,759,300	2,600,900	4,895,110	1,893,540	3,001,570	11,164,550	4,893,820	6,270,730
Zhejiang	2,715,430	969,800	1,745,630	6,707,400	1,379,500	5,327,900	8,406,500	1,339,400	7,067,100	17,829,330	3,688,700	14,140,630
Anhui	313,820	2,892,960	−2,579,140	888,600	5,082,800	−4,194,200	823,790	5,525,590	−4,701,800	2,026,210	13,501,350	−11,475,140
Fujian	1,348,860	624,530	724,330	2,562,500	1,063,100	1,499,400	2,514,770	1,113,660	1,401,110	6,426,130	2,801,290	3,624,840
Jiangxi	236,240	2,680,600	−2,444,360	661,400	3,280,700	−2,619,300	699,030	3,483,280	−2,784,250	1,596,670	9,444,580	−7,847,910
Shandong	904,740	878,200	26,540	1,223,600	1,487,900	−264,300	1,341,250	2,014,990	−673,740	3,469,590	4,381,090	−911,500
Henan	470,070	2,308,960	−1,838,890	370,400	4,549,300	−4,178,900	431,530	5,430,370	−4,998,840	1,272,000	12,288,630	−11,016,630
Hubei	606,500	2,210,200	−1,603,700	664,000	3,597,100	−2,933,100	845,840	3,804,200	−2,958,360	2,116,340	9,611,500	−7,495,160
Hunan	363,140	3,261,220	−2,898,080	663,900	4,409,200	−3,745,300	689,730	4,591,910	−3,902,180	1,716,770	12,262,330	−10,545,560
Guangdong	11,502,950	438,000	11,064,950	15,895,200	2,272,500	13,622,700	13,889,930	1,612,900	12,277,030	41,288,080	4,323,400	36,964,680
Guangxi	287,750	1,838,140	−1,550,390	526,300	2,813,100	−2,286,800	599,990	2,820,530	−2,220,540	1,414,040	7,471,770	−6,057,730
Hainan	217,750	129,590	88,160	252,800	209,000	43,800	338,750	235,900	102,850	809,300	574,490	234,810
Chongqing	448,100	1,103,130	−655,030	566,000	1,904,400	−1,338,400	736,590	1,844,060	−1,107,470	1,750,690	4,851,590	−3,100,900
Sichuan	590,120	4,395,500	−3,805,380	1,011,300	5,221,400	−4,210,100	1,055,350	4,988,090	−3,932,740	2,656,770	14,604,990	−11,948,220
Guizhou	261,630	1,231,920	−970,290	703,700	2,339,400	−1,635,700	592,440	2,680,750	−2,088,310	1,557,770	6,252,070	−4,694,300
Yunnan	735,800	398,140	337,660	621,600	796,400	−174,800	632,150	1,089,070	−456,920	1,989,550	2,283,610	−294,060
Tibet	70,710	35,350	35,360	33,700	41,600	−7,900	91,970	62,490	29,480	196,380	139,440	56,940
Shaanxi	423,040	719,320	−296,280	337,700	1,095,700	−758,000	734,760	1,347,490	−612,730	1,495,500	3,162,510	−1,667,010
Gansu	203,690	560,820	−357,130	156,000	654,900	−498,900	260,320	1,046,860	−786,540	620,010	2,262,580	−1,642,570
Qinghai	76,930	123,150	−46,220	97,500	113,100	−15,600	182,740	149,980	32,760	357,170	386,230	−29,060
Ningxia	128,820	87,420	41,400	98,800	89,700	9,100	239,220	150,660	88,560	466,840	327,780	139,060
Xinjiang	1,142,320	216,780	925,540	765,100	240,800	524,300	840,500	286,690	553,810	2,747,920	744,270	2,003,650
Total	32,303,080	32,282,130	20,950	50,406,100	50,406,000	100	55,227,980	54,993,910	234,070	137,937,160	137,682,040	255,120

Source: Based on data from 2000 and 2010 Population Censuses; 2005 Population Survey.

Overall, between 1995 and 2010, there were a total of at least 137 million inter-provincial migrants. The spatial distribution of the total net migrations of different *sheng* is also shown in Figure 3.17. In the figure, a red circle indicates a net in-migration whereas a blue circle indicates a net out-migration. Among these different *sheng*, Guangdong attracted the largest number of migrants — over 36 million. The municipalities of Beijing, Tianjin, and Shanghai, and such other coastal *sheng* as Jiangsu, Zhejiang, and Fujian also had net inflows of migrants. Interestingly, Xinjiang, being an inland *sheng*, recorded a net inflow of over 2 million migrants. On the other hand, Sichuan, Henan, and Anhui were the three largest net exporters of migrants, each having a net outflow of over 10 million migrants. Chongqing Zhixiashi had a net outflow of about 3 million migrants. Other inland *sheng* such as Jiangxi, Guangxi, and Guizhou also had large net outflows of migrants.

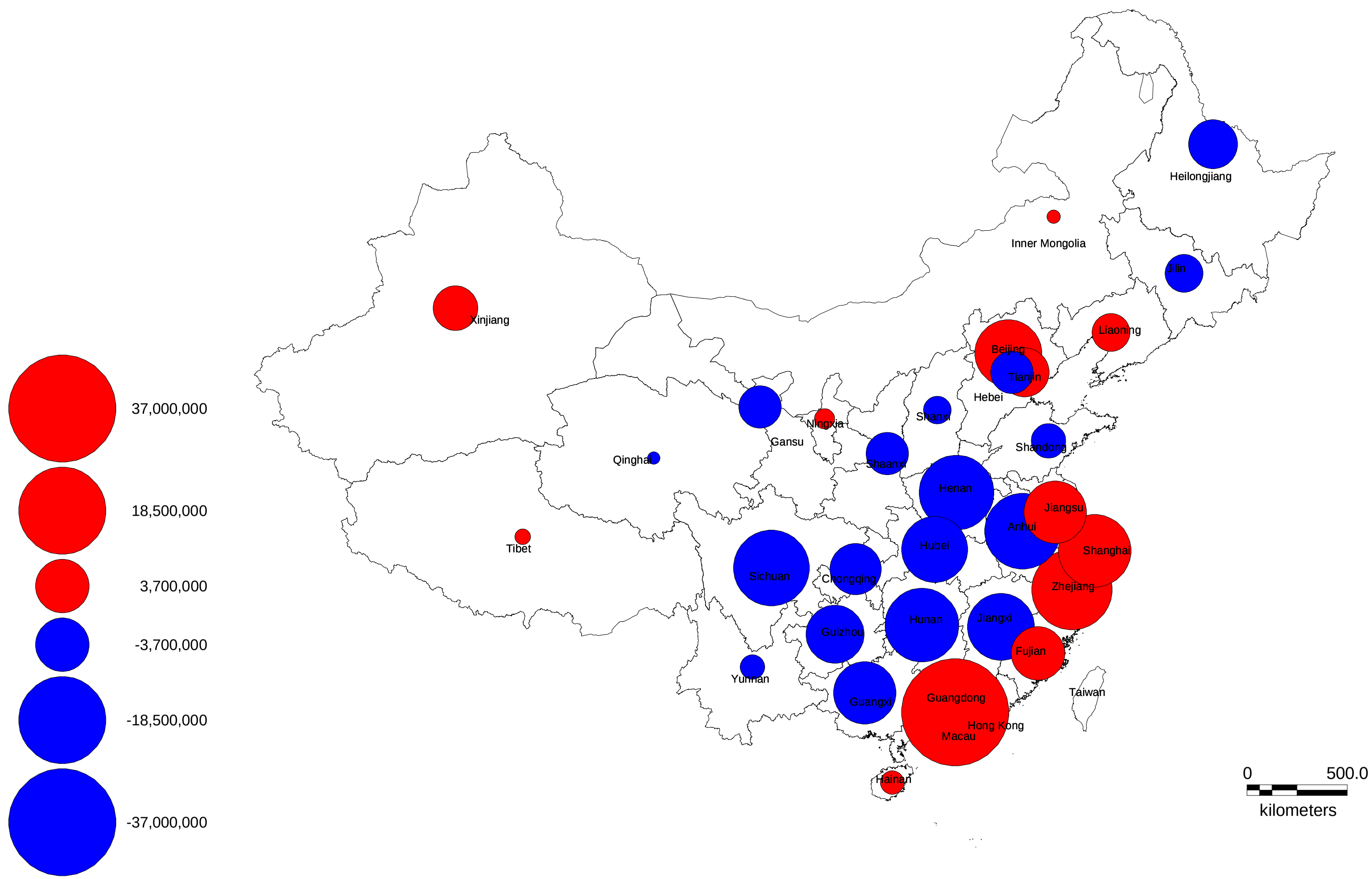
Even in the presence of the *hukou* system, we can still observe a huge flow of migration across the country between 1995 and 2010. This pattern can be explained by the huge differences in economic developments between the coastal and inland provinces, so that the people from the relatively poorer inland provinces migrated to the relatively richer coastal provinces.

The cases of Chongqing Zhixiashi and Sichuan Sheng deserve further discussion. As we will explain in Chapter 4, Chongqing, Sichuan, and many other inland provinces did not benefit much from the economic reform which begain in 1978 because the central government emphasized the development of coastal regions. One consequence was that the combined net migration out of Chongqing and Sichuan was the highest among other provinces. However, under the "Open Up the West" campaign introduced in 2001, the development of the western part of China was again emphasized. From Table 3.17, we do observe a smaller net migration out of Chongqing and Sichuan between 2005 and 2010, relative to that between 2000 and 2005, suggesting the possibility that the "Open Up the West" campaign reduced the inequality between Chongqing and Sichuan and other coastal regions so that fewer people wanted to migrate out of the two divisions.

3.5.5. Rural-*hukou* population in urban areas

The above discussion of *hukou* migrants is also related to the trend that the non-*hukou* residents constitute a larger fraction of the *de facto* urban population. In Table 3.17, we show some relevant figures between 1978 and 2010. Apart from the total population and urban population, we also show a series of non-agricultural population (*feinongye renkou*, 非农业人口). The difference between urban population and non-agricultural population is as follows: The former is the *de facto* urban population, i.e., the number of people who physically stayed in

Figure 3.17: Net migration in China, 1995-2010



Source: 2000 and 2010 Population Censuses; 2005 Population Survey.

urban areas even though they may not have the local *hukou*. The latter counts the number of people who have the non-agricultural *hukou* status. Since it is believed that most of them live in urban areas, non-agricultural population is usually used as an estimate of the *de jure* urban population.[33]

Based on these figures, we define "Rural-*hukou* population in urban area" (在城市的农村户籍人口) as the difference between urban population and non-agricultural population. Since the beginning of the economic reform, this number has increased quite dramatically: In 1978, roughly 20 million rural-*hukou* residents lived in urban areas and it constituted about 11% of the total *de facto* urban population. By 2010, this number increased more than 10 times to 210 million and the share of rural-*hukou* population in urban areas increased to about 31%.

A recent study conducted by the China Data Center of Tsinghua University also reveals a similar trend. In 2012, they sampled about 20,000 individuals (12,540 adults and 7,517 children) throughout China and they estimated that the non-agricultural *hukou* population was only about 27.6% of the total population of the country.[34]

As mentioned earlier, non-*hukou* residents in general do not enjoy the same benefits received by the *hukou* residents. Therefore, the large fraction of rural-*hukou* population in urban areas could become a social problem.

3.5.6. Impact of the *hukou* system on the process of urbanization and rural-urban differences

Urbanization is closely related to industrialization. When the economy becomes more and more industrialized, workers from the lower-productivity rural areas are attracted to the higher-productivity (and higher-wage) urban areas. However, in China, under the *hukou* system, workers are not freely mobile between the rural and urban areas even under rapid industrialization. In other words, the inter-relationship between urbanization and industrialization usually observed in other countries has been cut off by the *hukou* system.

Under-urbanization

During the Maoist era, the *hukou* system was a strategy to stop peasants from moving to the cities. Rural workers were unable to move to cities and work in higher-productivity factories. Therefore, the level of urbanization in China, relative to the degree of industrialization, was

[33]See, for example, Chan (2012).

[34]See the press release by China Data Center, Tsinghua University (in Chinese) on October 31, 2013 at *http://www.chinadatacenter.tsinghua.edu.cn/news.php?id=309* or the *Wall Street Journal* coverage entitled "Chinese Push for Urban Growth Carries Social Costs " on October 30, 2013 available at *http://online.wsj.com/news/articles/SB10001424052702303843104579167422223721620*.

Table 3.17: Rural-*hukou* population in urban areas, 1978-2010

Year	Total Pop. (Mn)	Growth (%)	Urban pop. (城市人口) (Mn)	Growth (%)	Non-agri. pop. (非农业人口) (Mn)	Growth (%)	Rural-*hukou* Pop. in urban areas (在城市的农村户籍人口) (Mn)	Growth (%)	Rural-*hukou* pop. in urban areas/ urban pop. (%)	Change (%)
1978	962.59		172.45		152.30		20.15		11.68	
1979	975.43	1.33	184.95	7.25	161.86	6.28	23.09	14.59	12.48	0.80
1980	987.06	1.19	191.40	3.49	168.01	3.80	23.39	1.30	12.22	−0.26
1981	1,000.72	1.38	201.71	5.39	178.37	6.17	23.34	−0.21	11.57	−0.65
1982	1,016.54	1.58	214.80	6.49	183.34	2.79	31.46	34.79	14.65	3.08
1983	1,030.08	1.33	222.74	3.70	188.02	2.55	34.72	10.36	15.59	0.94
1984	1,043.57	1.31	240.17	7.83	201.10	6.96	39.07	12.53	16.27	0.68
1985	1,058.51	1.43	250.94	4.48	214.78	6.80	36.16	−7.45	14.41	−1.86
1986	1,075.07	1.56	263.66	5.07	212.22	−1.19	51.44	42.26	19.51	5.10
1987	1,093.00	1.67	276.74	4.96	215.88	1.72	60.86	18.31	21.99	2.48
1988	1,110.26	1.58	286.61	3.57	225.87	4.63	60.74	−0.20	21.19	−0.80
1989	1,127.04	1.51	295.40	3.07	233.71	3.47	61.69	1.56	20.88	−0.31
1990	1,143.33	1.45	301.95	2.22	238.87	2.21	63.08	2.25	20.89	0.01
1991	1,158.23	1.30	312.03	3.34	246.93	3.37	65.10	3.20	20.86	−0.03
1992	1,171.71	1.16	321.75	3.12	252.98	2.45	68.77	5.64	21.37	0.51
1993	1,185.17	1.15	331.73	3.10	263.44	4.13	68.29	−0.70	20.59	−0.79
1994	1,198.50	1.12	341.69	3.00	276.38	4.91	65.31	−4.36	19.11	−1.47
1995	1,211.21	1.06	351.74	2.94	285.63	3.35	66.11	1.22	18.80	−0.32
1996	1,223.89	1.05	373.04	6.06	294.59	3.14	78.45	18.67	21.03	2.23
1997	1,236.26	1.01	394.49	5.75	302.11	2.55	92.38	17.76	23.42	2.39
1998	1,247.61	0.92	416.08	5.47	304.65	0.84	111.43	20.62	26.78	3.36
1999	1,257.86	0.82	437.48	5.14	312.42	2.55	125.06	12.23	28.59	1.81
2000	1,267.43	0.76	459.06	4.93	322.49	3.22	136.57	9.20	29.75	1.16
2001	1,276.27	0.70	480.64	4.70	332.02	2.95	148.62	8.83	30.92	1.17
2002	1,284.53	0.65	502.12	4.47	349.34	5.22	152.78	2.80	30.43	−0.50
2003	1,292.27	0.60	523.76	4.31	374.27	7.14	149.49	−2.15	28.54	−1.89
2004	1,299.88	0.59	542.83	3.64	391.40	4.58	151.43	1.30	27.90	−0.65
2005	1,307.56	0.59	562.12	3.55	408.98	4.49	153.14	1.13	27.24	−0.65
2006	1,314.48	0.53	577.06	2.66	420.71	2.87	156.35	2.10	27.09	−0.15
2007	1,321.29	0.52	593.79	2.90	430.77	2.39	163.02	4.27	27.45	0.36
2008	1,328.02	0.51	606.67	2.17	439.71	2.08	166.96	2.41	27.52	0.07
2009	1,334.50	0.49	621.86	2.50	450.29	2.40	171.57	2.76	27.59	0.07
2010	1,340.91	0.48	669.78	7.71	459.64	2.08	210.14	22.48	31.37	3.78

Source: *China Data Online*.

Table 3.18: Spatial inequality in the world and some selected regions/countries, 1960 versus 2000

	Gini Coefficient	
	1960	2000
World	0.5848	0.5619
Developed countries	0.6125	0.5791
Soviet bloc	0.5117	0.4451
All other countries	0.5659	0.5605
Brazil	0.6618	0.6536
China	0.4719	0.4234
India	0.5561	0.5821
Indonesia	0.5239	0.6140
Japan	0.6161	0.6597
USA	0.5768	0.5385
Russia	0.5301	0.4598

Source: From Henderson and Wang (2007).

below the world standards, leading to the "under-urbanization" problem (Chan, 1994).

In the post-Maoist era, physical controls on rural-urban migration was gradually eliminated due to various reforms to the *hukou* system. The urbanization growth rate increased substantially. For example, Chan and Hu (2003) find that the annual rate of urbanization growth during the era of economic reform since 1978 has been about 4% to 5% per year. However, the differential benefits available to agricultural and non-agricultural *hukou* holders were basically unchanged. Therefore, while the migration rates of peasants to cities increased over the past several decades, the majority of these migrants did not possess local *hukou* in the urban destination. These people formed the huge "mobile population" in the cities. In a way, the urbanization of China in recent decades is of more a demographic term (measured by the *de facto* urban population size) but not a fully legal term (defined under the *hukou* system) (Chan, 2009).

One consequence of the *hukou* system is the lack of urban concentration. Henderson and Wang (2007) study the spatial inequality of China and a number of other countries. They use data from 1960 and 2000 to compute the spatial Gini coefficient for these countries by ranking all cities from smallest to largest and looking at the cumulative share of the total sample population. The higher the Gini coefficient is, the more uneven the population distribution is among cities. They find that the spatial Gini for China was 0.47 in 1960 and 0.42 in 2000. The respective world values were 0.58 and 0.56 respectively. (See also Table 3.18.) The smaller Gini coefficients in China suggest that its population was relatively evenly distributed across different cities, which is a sign of the lack of urban concentration.

Under-agglomeration

Under-concentration also caused the under-agglomeration problem of individual cities. In the ideal situation, rural workers should move from lower-productivity rural areas to higher-productivity urban areas. However, in the presence of the *hukou* system, not only that rural workers cannot freely move to urban areas, they also do not enjoy the same benefits as the non-agricultural *hukou* holders.

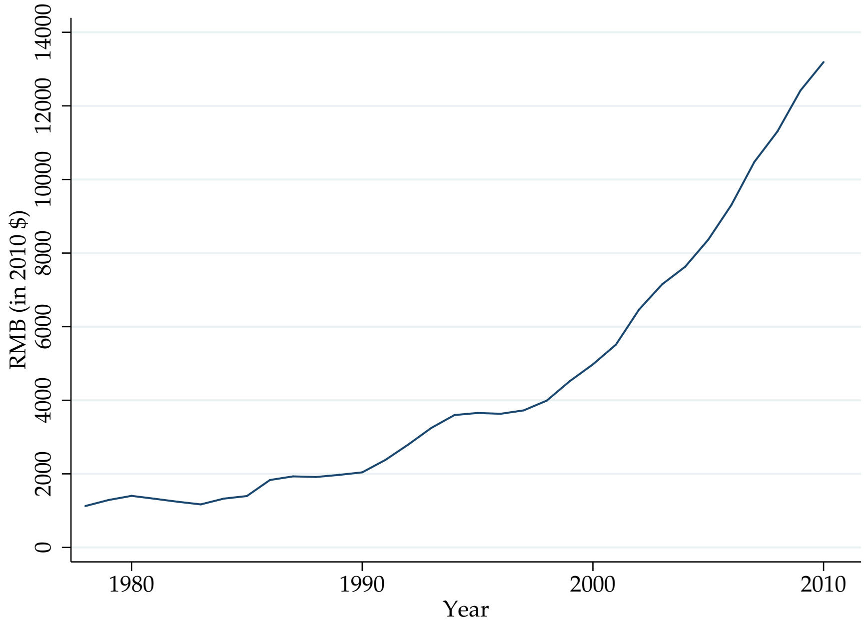
Au and Henderson (2006) argue that these *hukou* restrictions have limited the entire population from agglomerating sufficiently and permanently in cities so as to fully exploit the economies of scales relevant to the local activities. They support their argument by examining the relationship between the real income per worker and the employment level for each city. In theory there should be an inverted-U relationship because initially the scale economies in production will increase worker income when city employment becomes larger; it reaches a peak and starts to decline with city employment because diseconomies start to arise when the city is too large. Au and Henderson (2006) find that, in China, most of the prefecture-level cities are to the left of the peak, suggesting that these cities have not fully exhausted all the urban scale economies and are under-sized.

Rural-urban income difference

The *hukou* system also created a huge rural-urban income difference. Figure 3.18 shows the changes in rural and urban income differences between 1978 and 2010. Data for this figure are obtained from *China Data Online*. Rural and urban income difference is defined as urban income minus rural income in constant 2010 RMB, where urban income is the per capita annual disposable income and rural income is the per capita annual net income. This figure shows that before 1990, the rural-urban income difference was relatively stable and was below 2,000 RMB. However, the difference began to increase. By 2000, it increased to about 5,000 RMB, and by 2010, it increased even more substantially to over 13,000 RMB.

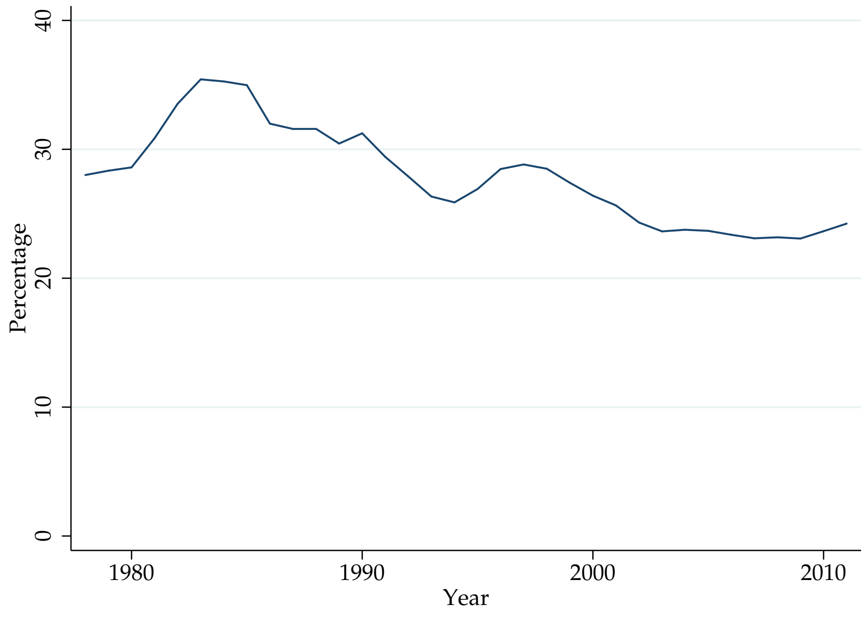
Another way to understand the rural-urban inequality is to look at the income of rural households as a fraction of the income of urban households. This trend is shown in Figure 3.19. In 1978, the income of rural households was below 30% of that of the urban households. The rural-urban gap narrowed slightly in the early 1980s. For example, by 1985, the rural households earned about 35% of the income of the urban household. However the gap gradually widened again. In early 1990s, the rural households earned only about 30% of the income of urban households. Throughout the 2000s, the rural-urban income ratio remained below 30%.

Figure 3.18: Rural and urban income differences in China, 1978-2010



Source: *China Data Online*.

Figure 3.19: Share of rural income in China, 1978-2010



Source: *China Data Online*.

3.6. Conclusion

In this Chapter, we discussed some background information and related issues of urbanization in China. We first discussed the challenges of measuring urban population accurately in China, due to the different definitions of "urban population" adopted by the National Bureau of Statistics in different contexts. Even though researchers have proposed different methods to adjust the official population statistics, the quality of these revised estimates is still not guaranteed because these methods are based on some assumptions about the changes of urban and rural populations. Therefore, to better understand the urbanization process of China, we argued that it is more appropriate to use the urban population statistics estimated by *e-Geopolis* since these statistics are based on a harmonized definition of "urban population."

We then examined some urbanization trends of China since 1949 using the official urban population statistics provided by the National Bureau of Statistics and the urban population statistics estimated by *e-Geopolis*. Based on the official population statistics, we observed that, in the 1950s, the urbanization level of China was low and was among the least developed countries in the world. Over time, and especially after the economic reforms in 1978, China has become more and more urbanized. By 2010, the urban population in China constituted almost half of the total population, an urbanization level close to that of the world average. Using the urban population estimates provided by the World Urbanization Prospects (The 2011 Revision), we could anticipate that the urbanization process of China will continue and the urbanization level of China will become closer to the level of the more developed countries. Finally, using the population statistics estimated by *e-Geopolis*, we examined the changes of the populations of the 66 largest urban clusters in China which had populations over 1 million as of 2010.

We also discussed two important institutions in China that have important implications on its urbanization process, including the administrative hierarchy and the household registration ("*hukou*") system. On one hand, the administrative hierarchy defines the authority of different cities over various economic and social decisions. Therefore, cities of different rankings can have different levels of economic developments, leading to different levels of urbanization. On the other hand, the *hukou* system restricts the mobility of people across the countries, especially from rural areas to urban areas. As a result, urbanization cannot be fully realized even though workers from rural areas wish to move to other industrialized cities.

The urbanization patterns presented in this Chapter were mainly at the national level. In Chapter 4, we will conduct a sub-national analysis of the urbanization patterns in Sichuan and Chongqing using both official statistics (on population and other socio-economic indicators) provided by the National Bureau of Statistics, and the urban population statistics estimated by *e-Geopolis*. Using the *e-Geopolis* data, we can understand more deeply the changes in urbanization patterns of the two cities over time. We can also compare the urbanization processes of these two cities, or more accurately, urban agglomerations with other agglomerations of similar sizes in other countries.

Chapter 4
The Case of Sichuan and Chongqing, 2000-2010

4.1. Introduction

After discussing the related literature in Chapter 1, the methodology of *e-Geopolis* in Chapter 2, and some background issues associated with the urbanization of China in Chapter 3, in this Chapter we will use *e-Geopolis* to examine the case of Sichuan and Chongqing and compare their respective largest urban agglomeration, namely Chengdu agglomeration and Chongqing agglomeration.

There are two main reasons why we focus on the agglomerations in Sichuan Sheng and Chongqing Zhixiashi. The first reason is about their complicated historical, economic, and political backgrounds. Chongqing Shi and the provincial capital of Sichuan Sheng (i.e., Chengdu Shi) are the two largest cities in the southwestern part of China. These two cities had long histories and had been the political and economic centres of the region for a long period of time. The importance of Chongqing Shi was further emphasized after its promotion in 1997 to Chongqing Zhixiashi, with the equivalent status as a *sheng* in the administrative hierarchy of China. In the initial years since the economic reform era began in 1978, the central government put more emphasis on the development of such coastal areas as Guangdong Sheng and Zhejiang Sheng while the inland provinces received less attention. Since Chongqing Shi and Chengdu Shi were situated in the southwestern part of China, they and other inland areas did not enjoy much from the early economic reforms in China. One impact was that a lot of the people from Sichuan Sheng and Chongqing Shi migrated to the coastal provinces to seek better job opportunities. Only after 2001 when the government introduced the so-called “Open Up the West” campaign did we see a reduced development inequality between the western part and other coastal areas. Chongqing Zhixiashi and Sichuan Sheng together had been one of the most populated areas in China. As of 2010, the combined population of Chongqing Zhixiashi and Sichuan Sheng was about 109.26 million, or about 8.16% of the total population in China. The income inequality between Chongqing Zhixiashi and Sichuan Sheng (at least before the “Open Up the West” campaign) and other coastal areas encouraged the workers there to migrate to other higher-income areas. From our discussion in Chapter 3, we note that between 1995 and 2010, the total migrants moving out of Chongqing Zhixiashi and Sichuan Sheng were over 15 million. However, in the presence of the *hukou* system, people could not migrate freely across the country, especially from rural areas to urban areas. Therefore, the urbanization of Chongqing Zhixiashi and Sichuan Sheng is related to not only the industrialization of these two regions, but also the administrative hierarchy and the *hukou* system. Understanding the urbanization patterns of the agglomerations in Chongqing Zhixiashi and Sichuan Sheng against this complex background by itself is an interesting research question.

The second reason is more of a practical issue. While *e-Geopolis* uses a worldwide standardized way to estimate urban population and in principle it can be used in different countries to obtain comparable urban population statistics, its application to estimate urban population in China is not straightforward. One great challenge is that there were many changes in the number of township-level divisions (*xiangji xingzhengqu*, 乡级行政区) and the compositions of townships (*xiang*, 乡), towns (*zhen*, 镇), and streets (*jiedao*, 街道) over time, especially since the 1980s. As will be shown later, between 2000 and 2010, there were fewer *xiang* but more *zhen* and *jiedao* in Sichuan Sheng whereas in Chongqing Shi, there were fewer *xiang* and *zhen* but more *jiedao*. The changes in the *xiangji* divisions during this period can be classified into different types, involving cancellation, merging, or renaming of these divisions. These different scenarios complicate the estimation of urban population in *e-Geopolis* because we have to check carefully these changes in order to link the 2000 and the 2010 *xiangji* divisions. While many of these changes were promulgated through government documents which can in general be found in the internet, there are cases in which online government documents cannot be located. Given the complexity of the changes in *xiangji* divisions and the time required for a thorough manual check for the consistency of the official population data from the Population Censuses 2000 and 2010, we will mainly focus on the larger agglomerations (with population above 200,000 as of 2010) in Sichuan Sheng and Chongqing Zhixiashi. We will also do a more elaborated comparison of the Chongqing agglomeration and the Chengdu agglomeration to illustrate how the *e-Geopolis* method can be used in the Chinese context.

This chapter is organized as follows. In Chapter 4.2, we will present some background information. We will first discuss the history and geography of Sichuan Sheng, the province that contains Chongqing Shi (until 1997) and Chengdu Shi. We will then briefly review the development of Chongqing Shi and Chengdu Shi. Then, we will discuss some background information related to Chongqing Shi's promotion from a prefecture-level city (*dijishi*, 地级市) to a centrally administered city (*zhixiashi*, 直辖市) in 1997 and how this "New" Chongqing Shi was formed. We will also discuss the administrative structures of Sichuan Sheng, Chongqing Shi and Chengdu Shi since 1997. In particular, we will show that there were many changes in the *xiangji* divisions in both cities between 2000 and 2010. Finally in this section, we will briefly compare the social and economic structures of Chongqing Shi and Chengdu Shi before and after Chongqing Shi's promotion.

Then in Chapter 4.3 we will show some photos taken in a recent field trip to Sichuan to show the various aspects of the recent urbanization of Sichuan Sheng.

In Chapter 4.4, we will discuss some practical issues related to the use of *e-Geopolis* to estimate urban population statistics in China. We will use the official *xianji* urban population statistics of Chongqing Shi and Chengdu Shi to illustrate that these official statistics could generate some potentially misleading urbanization results. These results suggest the need to use a more reliable way of estimating urban population statistics. While *e-Geopolis* provides a consistent method to count urban population statistics, its application in the Chinese context is complicated by the frequent changes of the *xiangji* divisions.

In Chapter 4.5, we will present the main results based on the urban population statistics estimated by *e-Geopolis*. We will first show the larger agglomerations in Sichuan Sheng and Chongqing Zhixiashi. Then we will compare the two major agglomerations, namely Chengdu Shi and Chongqing Shi. Finally, in Chapter 4.5.4, we will use the *e-Geopolis* urban population statistics to examine the relationship between urbanization, economic development, and migration. This comparison serves the purpose of illustrating how *e-Geopolis* urban population statistics may be used to examine urbanization issues.

A final remark is in order. In the following discussion, sometimes we make explicit distinctions between "Chongqing Zhixiashi" and "Chongqing Shi" (or the "Old Chongqing Shi" or "Original Chongqing Shi"). The former refers to the official Chongqing Shi since it was upgraded to a *zhixiashi* in 1997, while the latter was used to refer to the administrative boundary of the official Chongqing Shi as a *dijishi* before its promotion. The distinction is particularly important when we discuss the *e-Geopolis* urbanization results, because the Chongqing agglomeration was only one of the larger urban agglomerations within Chongqing Zhixiashi, and the Chongqing agglomeration was inside the administrative boundary of the original Chongqing Shi.

4.2. Background

In this section, we will present some background information, including the history and geography of Sichuan Sheng, the development of Chongqing Shi and Chengdu Shi, the promotion of Chongqing Shi from a prefecture-level city (*dijishi*, 地级市) to a centrally administered city (*zhixiashi*, 直辖市) in 1997, the formation of the new Chongqing Zhixiashi, and the administrative structures of Sichuan Sheng, Chongqing Shi and Chengdu Shi since 1997.

4.2.1. Sichuan: Some historical background

History and geography

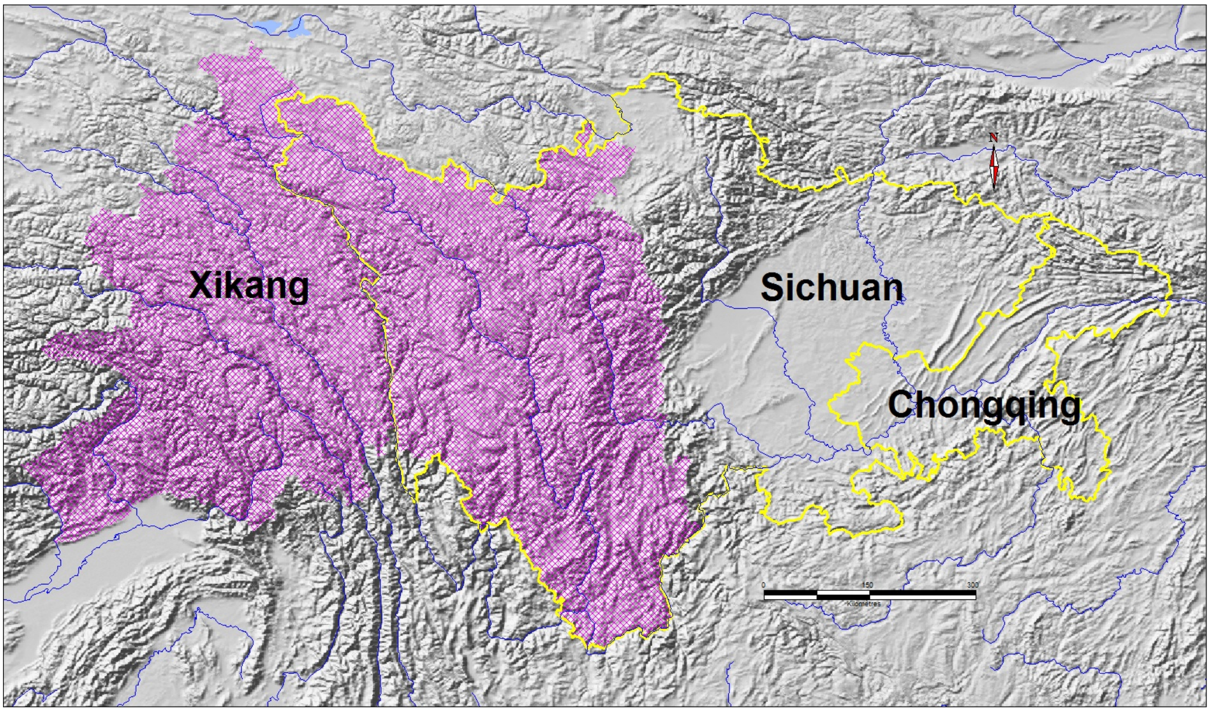
Sichuan is situated in one of the largest basins, known as the Red Basin, in China. In ancient times, Sichuan was referred to as *Bashu* (巴蜀), by combining the names of the two independent kingdoms, *Ba* (巴) and *Shu* (蜀). The southeastern part of Sichuan, including today's Chongqing Shi, formed the *Ba* kingdom while the northwestern part of Sichuan, including today's Chengdu Shi, formed the *Shu* kingdom. Throughout the long history of China, Sichuan was often divided into two or three administrative units where both Chengdu Shi and Chongqing Shi were regarded as the regional political and economic centres. The modern map of Sichuan was basically formed in the Yuan Dynasty, in which Chengdu became the provincial capital and Chongqing a sub-provincial city.

The administrative boundaries of the Sichuan Sheng, as we know today, have undergone various changes over time. During the Republic of China era, part of the current Sichuan Sheng (including Garze Tibetan Zizhizhou, Liangshan Yi Zizhizhou, Panzhihua Shi, and Ya'an Shi) was a part of the Xikang Sheng (西康省). Before formally became a province in 1939, Xikang was known as Chuanbian (川边). The eastern part of the province was inhabited by Han Chinese and a few other ethnic groups. The western part of the province was mainly inhabited by Tibetans. Soon after the establishment of the People's Republic, Xikang Sheng was divided along the Yangtze River into Xikang to the east and Changdu Diqu (昌都地区) to the west. Later Changdu Diqu was merged into the Tibet Zizhiqu in 1965, while Xikang was merged into the Sichuan Sheng in 1955.

In 1997, the Chongqing Shi and part of the Sichuan Sheng (including Wanxian Shi, Fuling Shi, and Qianjiang Qu) merged to form the new Chongqing Shi as a *zhixiashi* (i.e., with the status of a *shengji* division). Figure 4.1 shows the boundaries of the Sichuan Sheng, Chongqing Shi, the old Xikang Sheng (shaded in pink), and the surrounding terrain.

At present, Sichuan Sheng is surrounded by Hubei Sheng, Hunan Sheng, Guizhou Sheng,

Figure 4.1: Sichuan, Chongqing, and the old Xikang



Source: *e-Geopolis*.

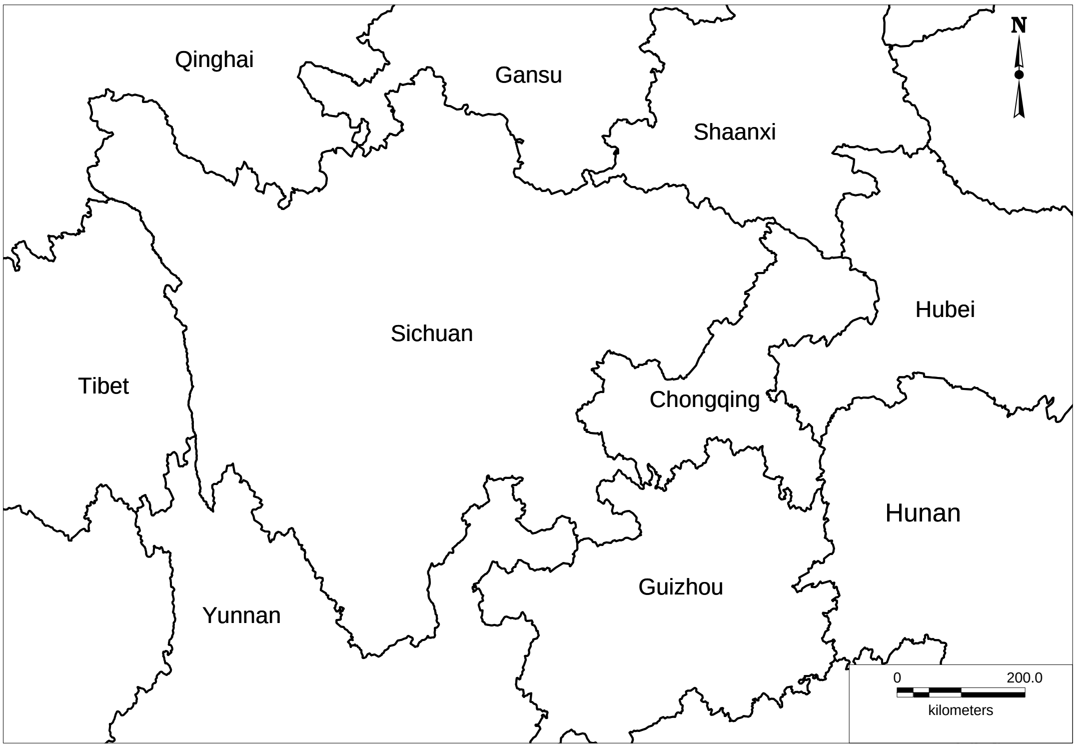
Yunnan Sheng, Tibet Zizhiqu, Qinghai Sheng, Gansu Sheng, Shaanxi Sheng, and Chongqing Shi. Before Chongqing Shi was promoted to a *zhixiashi* and was separated from Sichuan Sheng in 1997, Sichuan Sheng was also surrounded by Hubei Sheng and Hunan Sheng. See Figure 4.2 for the provinces surrounding Sichuan Sheng and Chongqing Shi.

Sichuan is high in the west and low in the east. Chengdu Shi is located in the northwestern part of the basin while Chongqing Shi is a mountainous city situated on the southeastern side of the basin (see also Figure 4.1). Sichuan is known for its abundance of resources. It is one of the major agricultural provinces in China with a huge production of grain, fruits, and pork. It is also rich in natural resources. For example, it has 132 verified mineral resources such as vanadium, titanium, calcium, mirabilite, fluorite, natural gas, and sulfur iron. Besides, it has a large reserve of hydropower of about 150 million kilowatts with a potential expansion of another 100 million kilowatts.[35]

The climate of Sichuan Sheng is highly variable because of the great difference in the terrain. But generally speaking, it has strong monsoonal influence with rainfall concentrated during summer months. The eastern part of Sichuan Sheng usually has long, hot and humid summers but short, mild, dry and cloudy winters; the western areas have mild summers but cool to very cold winters. In Chengdu Shi, the weather is relatively stable and is suitable for

[35] Source: *http://www.china.org.cn/english/features/ProvinceView/156637.htm*.

Figure 4.2: Sichuan Sheng and Chongqing Shi: The surrounding provinces



Source: *e-Geopolis*.

agriculture. However, Chongqing Shi is very humid and heavy fogs are common from October to April.

Due to heavy fogs together with the industrial activities, the air quality of Chongqing Shi between October and April can be very unsatisfactory. According to the World Development Indicators: Air Pollution, compiled by the World Bank, the air pollution of Chongqing Shi is among the most polluted cities in the world.[36] For example, in 2010, the particulate matter micrograms per cubic metre in Chongqing Shi was 98, which was the fifth highest among over 100 cities surveyed.[37] In contrast, the air quality of Chengdu Shi is better but it is still a highly polluted city by the world standard. For example, in 2010, the particulate matter micrograms per cubic metre in Chengdu Shi was 69, which was the 15th highest in the world.

Population growth, 1982-2010

Sichuan Sheng is one of the most populated provinces in China. In Table 4.1, we compare the total populations of Sichuan Sheng, Chongqing Shi and the entire China between 1982 and 2010, using data from the Population Censuses in 1982, 1990, 2000, and 2010.

[36]See *http://wdi.worldbank.org/FileDownloadHandler.ashx?filename=3.14_Air_pollution.pdf&filetype=wdistatic*.

[37]Particulate matter concentration is fine suspended particulates of less than 10 microns in diameter (PM10) that are capable of penetrating deep into the respiratory tract and causing severe health damage.

Table 4.1: Populations of Sichuan Sheng and Chongqing Shi, 1982-2010

	(1) Sichuan Sheng ("Official") (Mn)	(2) Sichuan Sheng (According to 2010 definition) (Mn)	(3) Chongqing Shi (According to 2010 definition) (Mn)	(4) China (Mn)
1982	99.71	72.65	27.06	1,008.18
1990	107.22	78.35	28.87	1,133.68
2000	82.35	82.35	30.51	1,265.83
2010	80.42	80.42	28.85	1,339.72

Source: Population Censuses, 1982, 1990, 2000, and 2010.

In the table, Column (1) shows the population of Sichuan Sheng based on the official administrative boundary in the census year. In Column (2), we fix the administrative boundary of Sichuan Sheng in 2010, i.e., exclude Chongqing Shi, and show its corresponding populations in various census years. In Column (3), we report the populations in various census years of Chongqing Shi (according to the administrative boundary in 2010). In Column (4), we show the total populations of China in various census years for comparison.

Before 1997, Chongqing Shi was part of the Sichuan Sheng. Therefore, the populations of Chongqing Shi in Column (3) in 1982 and 1990 are the corresponding differences of the figures in Columns (1) and (2). After 1997, Chongqing Shi was no longer in Sichuan Sheng and therefore the population figures of Sichuan Sheng in 2000 and 2010 in Columns (1) and (2) were identical. Since the boundary of Sichuan Sheng changed in 1997, it is not meaningful to compare the population figures of the "Official" Sichuan Sheng before and after 1997 reported in Column (1) of the table. Instead, it makes more sense to focus on the population figures of Sichuan Sheng in Column (2) and Chongqing Shi in Column (3), where the boundaries of them are fixed according to the 2010 definitions.

In 1982, Sichuan Sheng (2010 definition) had a population of about 72.65 million, representing about 7.2% of the total population in China. In 1990, its population increased to 78.35 million but its share in the total population in China dropped to 6.9%. In 2000, Sichuan Sheng's population grew to 82.35 million. However, between 2000 and 2010, there was a reduction in population in Sichuan Sheng and by 2010 there were 80.42 million inhabitants. Besides, the shares of Sichuan Sheng's population in the total population of China continued to drop: By 2010, the share reduced to 6.0%.

The situation for Chongqing Shi (based on the 2010 administrative boundary) was similar. In 1982, it had a population of about 27.06 million, which represented about 2.68% of the total population in China. Between 1982 and 1990, there was a huge increase in the population.

By 1990, there were about 28.87 million inhabitants, representing about 2.55% of the total population in China. In 2000, a time after the promotion of Chongqing Shi to a *zhixiashi*, its population increased to about 30.51 million. However, between 2000 and 2010, the total population reduced to 28.85 million, which was close to the 1990 population level. Besides, the share of Chongqing Shi's population in China's total population dropped from 2.55% in 1990 to 2.41% in 2000 and further to 2.15% in 2010.

The trend was similar for the combined population of Sichuan Sheng (2010 definition) and Chongqing Shi (2010 definition), i.e., the population of the whole Sichuan Sheng before Chongqing Shi's promotion in 1997, indicated by the sum of the population figures in Columns (1) and (2). Their total population was about 99.71 million in 1982. It increased to about 107.22 million in 1990 and then to about 112.86 million in 2000. However, in 2010, it dropped to about 109.26 million by 2010. In terms of its share out of total population of China, it was about 9.89% in 1982, which dropped continuously to about 8.16% by 2010.

Next, we compare in Table 4.2 the relative changes of populations of Sichuan Sheng and Chongqing Shi, both based on their 2010 administrative boundaries, between 1982 and 2010. Between two consecutive census years, we also compute the annual change and the annualized growth rate in population.

Table 4.2: Populations of Sichuan Sheng and Chongqing Shi, 1982-2010

	Sichuan Sheng (According to 2010 definition)		Chongqing Shi (According to 2010 definition)		China	
	Annual change (Mn)	Annualized growth (%)	Annual change (Mn)	Annualized growth (%)	Annual change (Mn)	Annualized growth (%)
1982-1990	0.71	0.95	0.23	0.81	15.69	1.48
1990-2000	0.40	0.50	0.16	0.56	16.52	1.11
2000-2010	−0.19	−0.24	−0.17	−0.56	9.24	0.57

Source: Population Censuses, 1982, 1990, 2000, and 2010.

We first consider Sichuan Sheng. Between 1982 and 1990, on average there was an annual increase of 0.71 million inhabitants (or an annualized growth rate of 0.95%). Between 1990 and 2000, the population growths slowed down with an annual increase of 0.40 million inhabitants (or an annualized growth rate of 0.50%). Between 2000 and 2010, there was even a reduction in population: The population dropped by 0.19 million habitants per year (or at an annualized growth rate of −0.19%).

The situation for Chongqing Shi was similar. Between 1982 and 1990, its population increased annually by about 0.23 million inhabitants (or at an annualized growth rate of about

0.81%). Between 1990 and 2000, the annual population increase reduced to 0.16 million and the annualized growth rate reduced to 0.56%. Between 2000 and 2010, the population dropped by 0.17 million annually or at an annualized rate of 0.56%).

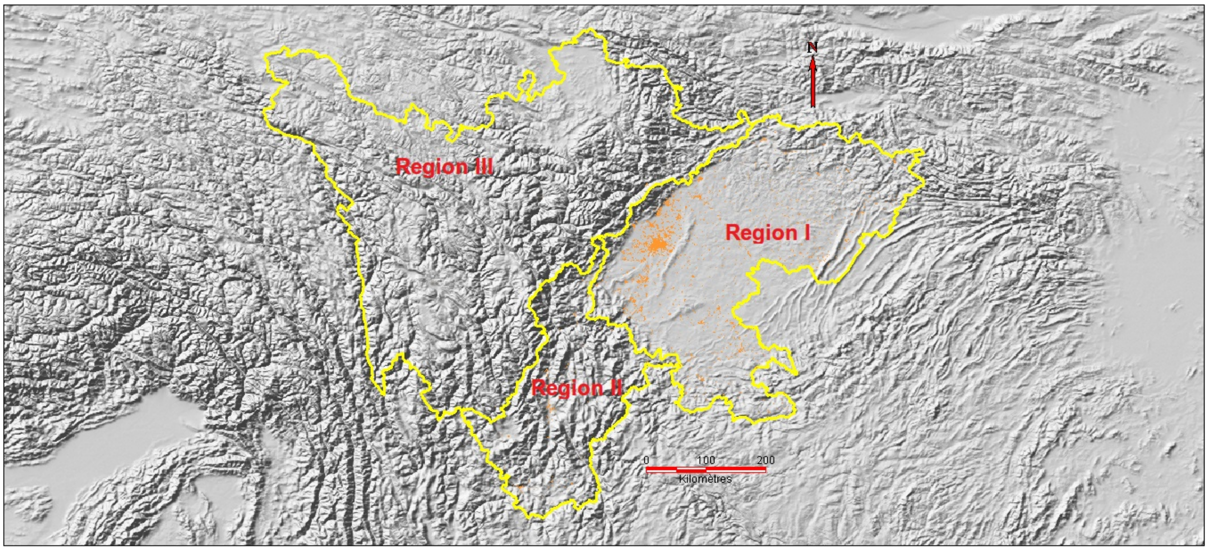
At the national level, the total population increased continuously between 1982 and 2010. In terms of annualized growth rates, the population grew at about 1.48% between 1982 and 1990 and the growth became slower between 1990 and 2000 and between 2000 and 2010, with annualized growth rates of 1.11% and 0.57% respectively. In other words, while the overall population growth of China slowed down between 1982 and 2010, the population growth rates of Sichuan Sheng and Chongqing Shi were still lower than the national averages.

The population growth patterns for Sichuan Sheng and Chongqing Shi are consistent with the inter-provincial migration patterns we discussed in Chapter 3 (see Table 3.16). In particular, in the past 15 to 20 years, there was a net outflow of population in both Sichuan Sheng and Chongqing Shi, partly due to the restructuring of the economy and the workers in these areas migrated to coastal provinces to look for better job opportunities.

Population changes, 1982-2010: Spatial variation

Spatially, the changes in population in Sichuan Sheng and Chongqing Shi displayed substantial variation in the past three decades. In Figure 4.3, we divide Sichuan Sheng into 3 regions. Region I covers the Sichuan Basin. Region II covers the southern part of the province and Region III covers the western part of the province. From the figure we can see that Region II and Region III are the mountainous part of Sichuan Sheng.

Figure 4.3: 3 regions of Sichuan Sheng



Source: *e-Geopolis*.

Table 4.3 shows the populations and the densities of the 3 regions between 1982 and 2010, estimated by *e-Geopolis* based on Population Censuses 1982, 1990, 2000, and 2010, for each of these regions.

Table 4.3: Population of Sichuan Sheng by regions, 1982-2010

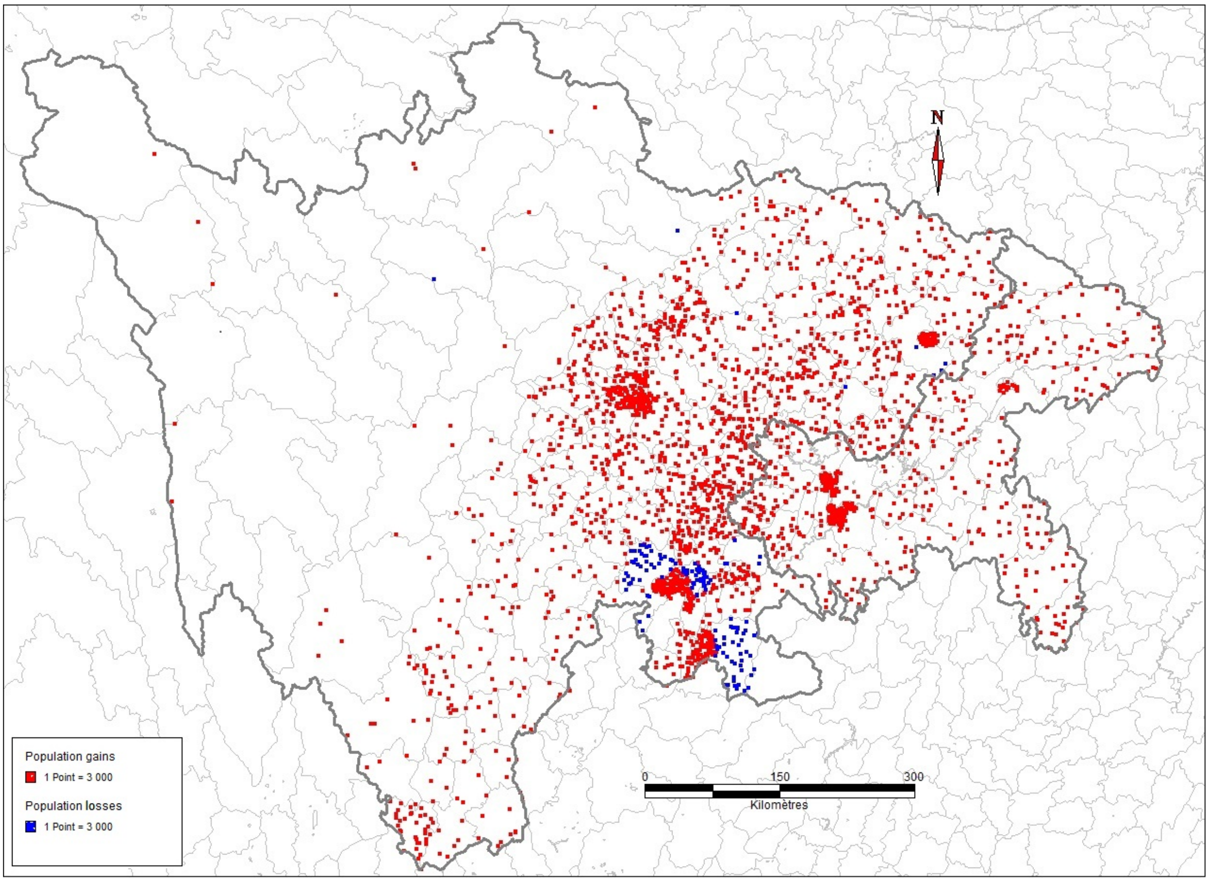
Region	Area (sq km)		Population (Mn)								Density (inhab/sq km)			
			2010		2000		1990		1982		2010	2000	1990	1982
I: Basin	154,000	31.8%	70.5	87.7%	73.3	89.0%	70.0	89.4%	65.2	89.7%	457.8	476.0	454.5	423.4
II: South	73,500	15.2%	7.5	9.3%	6.6	8.0%	5.9	7.5%	5.3	7.3%	102.0	89.8	80.3	72.1
III: West	257,500	53.1%	2.4	3.0%	2.5	3.0%	2.4	3.1%	2.2	3.0%	9.3	9.7	9.3	8.5
Total	485,000	100.0%	80.4	100.0%	82.4	100.0%	78.3	100.0%	72.7	100.0%	165.8	169.9	161.4	149.9

Source: *e-Geopolis* and Population Censuses, 1982, 1990, 2000, and 2010.

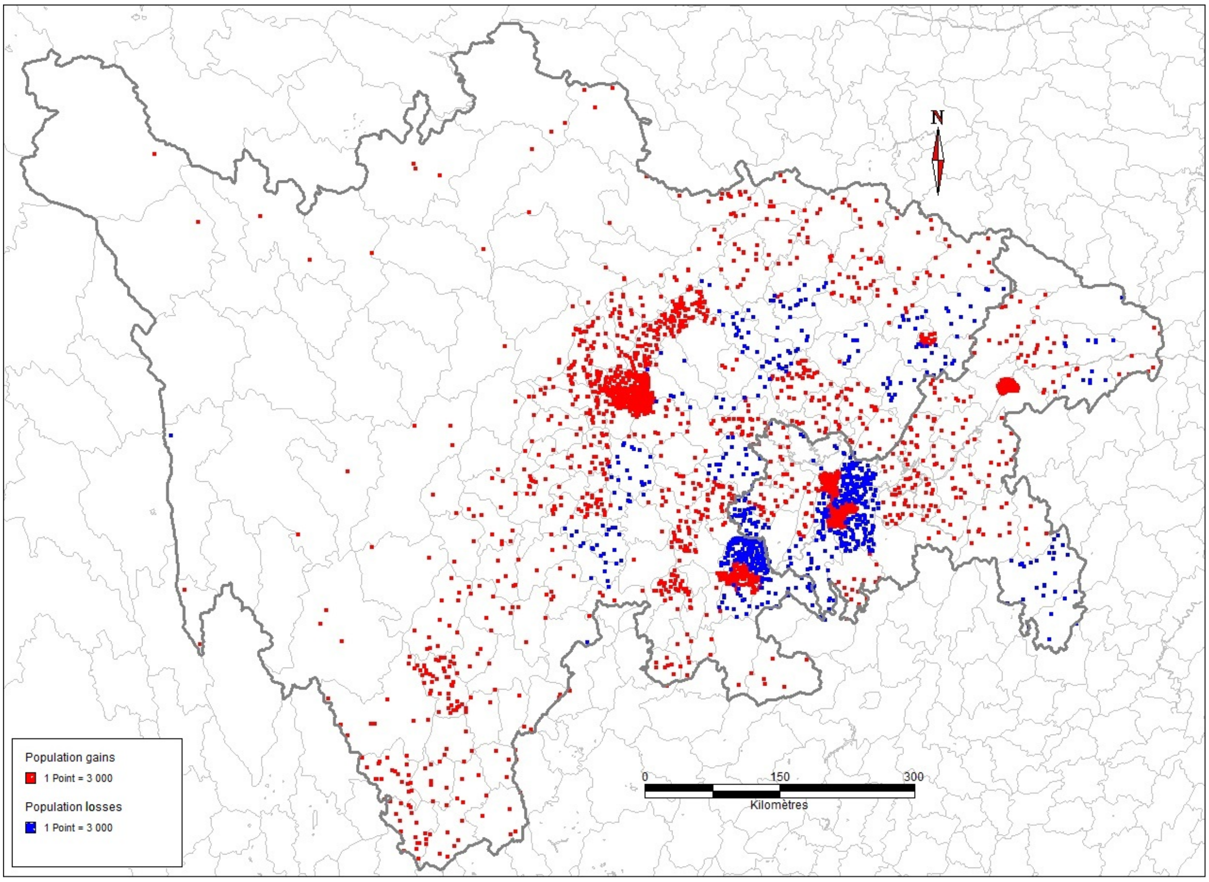
Among these 3 regions, Region III is the largest, occupying about 257,500 square kilometres or about 53.1% of the total area of Sichuan Sheng. The second largest is Region II, with a land area about 154,000 square kilometres or about 31.8% of the total area of Sichuan Sheng. In terms of population, Region I had the largest population in various years. It is not surprising because the capital of Sichuan Sheng, Chengdu Shi, is situated within Region I. Overall, this region contained almost 90% of the total population of Sichuan Sheng in various years. On the other hand, both Region II and Region III were sparsely populated. In particular, Region III only contained around 2% of the total population of Sichuan Sheng in various years. As for population density, we can see that in Region I, the densities in various years were over 400 inhabitants per square kilometre, which was 4 to 5 times higher than that of Region II. As expected, the population density of Region III was low: It was between 8.5 to 9.3 inhabitants per square kilometres in various years. Overtime, both the densities of Region I and Region II increased but that of Region III remained relatively stable.

In Figure 4.4, we show the changes of populations of Sichuan Sheng and Chongqing Zhixiashi between 1982 and 2010 on three maps. Note that before Chongqing Zhixiashi was established in 1997, Chongqing Shi was part of Sichuan Sheng. Therefore, the combined area of Sichuan Sheng and Chongqing Zhixiashi (as of 2010) was identical to the area of Sichuan Sheng before 1997. Panels (a), (b), and (c) represent the changes over the periods 1982-1990, 1990-2000, and 2000-2010 respectively. In each map, a red dot is equivalent to a gain of 3,000 inhabitants over the period while a blue dot is equivalent to a loss of 3,000 inhabitants over the period. These figures are based on the population statistics estimated by *e-Geopolis* using data from the Population Censuses in 1982, 1990, 2000, and 2010.

Figure 4.4: Changes in populations of Sichuan Sheng and Chongqing Zhixiashi, 1982-2010

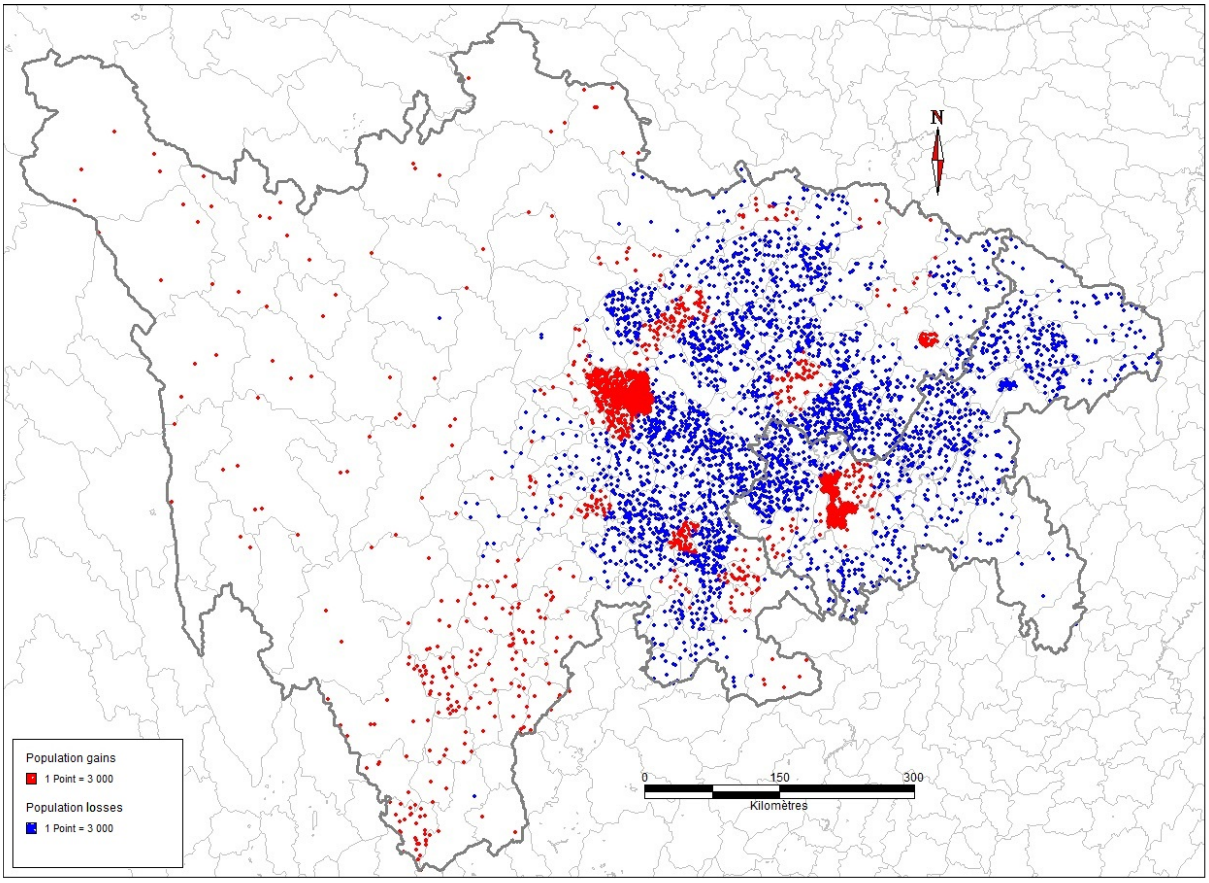


(a) 1982-1990



(b) 1990-2000

Figure 4.4: Changes in populations of Sichuan Sheng and Chongqing Zhixiashi, 1982-2010 (Continued)



(c) 2000-2010

Source: *e-Geopolis*, using data from Population Censuses 1982, 1990, 2000 and 2010.

Between 1982 and 1990, most of the significant changes in populations were population gains whereas the regions with population losses recorded were in the southeastern part of Sichuan Sheng. Between 1990 and 2000, we observe a concentration of population gains in the *shixiaqu* of Chengdu Shi and Chongqing Shi. On the other hand, the losses in population were recorded around Chongqing Shi's *shixiaqu* and in Jintang Xian of Sichuan Sheng. Between 2000 and 2010, while the population gains were again concentrated in the *shixiaqu* of Chengdu Shi and Chongqing Shi, the regions with population losses scattered around Chongqing Shi and the eastern part of Sichuan Sheng. A common feature of these three maps is that there are not many dots in the western part of Sichuan Sheng. It means that, over these three different time periods, the population in the western part of Sichuan Sheng remained relatively stable.

4.2.2. Development of Chongqing Shi and Chengdu Shi

After discussing some historical background of Sichuan Sheng, we will discuss in this section the development of Chongqing Shi and Chengdu Shi from late Qing Dynasty to nowadays.

From late Qing Dynasty to 1949

The developments of Chongqing Shi and Chengdu Shi were somewhat different in modern times. In 1891, under a treaty between the Qing and the British governments, Chongqing Shi was forced to open to the West. Since then Chongqing Shi started the industrialization process, with the help of the convenient water transportation and rich natural resources in the region. By the year of 1911 when the Republic of China was established, Chongqing Shi had 53 modern factories, which accounted for 45% of the provincial total and was over 7 times the number of the provincial capital Chengdu Shi (Zhou, 1989).

The industrialization process of Chongqing Shi went into a different stage when Japan invaded China during the Second World War. In September 1940, the Nationalist government relocated the capital from Nanjing to Chongqing Shi and therefore Chongqing Shi was separated from Sichuan Sheng. During that time, many coastal factories moved to Sichuan Sheng so that the local economy developed rapidly. By 1940, more than 90% of these factories settled in Chongqing Shi. In the next few years, Chongqing Shi became the leader in many different areas including modern military, chemical, metallurgical, engineering, and power industries (see, for example, Zhou, 1989, and Yang, 1990). In contrast, Chengdu Shi did not undergo the same industrialization process as in Chongqing Shi, and the provincial capital was still a city specializing in agriculture, handicrafts, and commerce. However, after the end of the Second World War, the Nationalist government moved back to Nanjing. The industrialization miracle of Chongqing Shi came to an end because many of factories followed the government to go back to the coastal area. By 1947, almost half of the factories left Chongqing Shi and 90% of the engineering industries were no longer in operation (Zhou, 1989).

Development since 1949

Soon after the Second World War and the establishment of the People's Republic, there was a huge difference in the industrial compositions of Chongqing Shi and Chengdu Shi: Chongqing Shi was a national leader in military and many other heavy industries while there was basically no modern industry in Chengdu Shi. However, in the early years since 1949, the modernization processes of Chongqing Shi and Sichuan Sheng were similar. Both cities, like many other in the country, followed the early industrialization programs under the command economy system created a similar industrialization structure in both cities.

Between 1952 and 1965, the gross value of industrial output went up by over 3 times in Chongqing Shi and even over 6 times in Chengdu Shi (Chongqing Statistics Yearbook, 1993 and 1996). The higher growth rate of Chengdu Shi narrowed the gap between the two cities. This higher growth in Chengdu Shi was a result of not just the lower starting point, but also the roles played by the provincial government. During the process of industrialization, Chongqing Shi and Chengdu Shi often competed for limited resources. Whenever conflicts between Chongqing Shi and Chengdu Shi arose, the provincial government usually managed to resolve such conflicts in favor of Chengdu Shi, especially after Chongqing Shi was downgraded to a *dijishi* in 1954.

However, despite being downgraded to a lower administrative ranking, Chongqing Shi still maintained its position as an advanced industrial city and enjoyed special treatment from the central government. Part of it was due to Chongqing Shi's key position in China's military industry and also the province's inability to sustain the industrial development of Chongqing Shi (Hong, 2002). Between 1954 and 1997, Chongqing Shi was centrally managed for 26 years: Between 1950 and 1958, between 1963 and 1968, and between 1984 and 1997 (Hong, 1999).

To a certain extent, even though Chongqing Shi was a *dijishi* before it was promoted to a *zhixiashi*, it was economically independent from the provincial government for most of the time and enjoyed different special privileges. For example, Chongqing Shi was entitled to obtain raw materials for its industry from other parts of China and to sell its products all over the country. Its government officials were allowed to attend national economic planning meetings so that they were able to take part in the decision making process at the central level (Hong, 1999). Chongqing Shi was one of the major cities of the so-called Third Front Project (三线建设), a project for the military industry that the central government implemented in 1964 in response to China's deteriorating international relations. However, Chengdu Shi was not included in this project. Between 1966 and 1978, the central government invested over 5 billion RMB in Chongqing Shi (Yang, 1990). Under this project, there was a large relocation of military enterprises from the coastal area to Chongqing Shi: More than 200 out of a total of 700 projects settled in Chongqing Shi (Yang, 1990).

In 1980, the Chongqing Customs Office was set up with the approval of the State Council. Chongqing Shi became the only inland port city in China that could deal with foreign trade directly without going through Sichuan Sheng. The city government was also allowed to issue passports and visas. In 1983, Chongqing Shi was the first city to undertake comprehensive reforms and was granted a separate status with economic management power equivalent to that granted to a province (Yang, 1990).

During the Cultural Revolution (1966-1976), Chongqing Shi and Chengdu Shi, like many other cities in China, suffered severe damages and underwent important changes in the local political and economic development. But after the Cultural Revolution ended and the economic reform era began, the leader of Sichuan Sheng, Zhao Ziyang, introduced different ambitious policy changes. In 1978, he introduced the responsibility system in the state-owned enterprises (SOEs) in Chongqing Shi and chose 6 enterprises as experiment basis. The number later increased to 14 and the program also expanded to cover several enterprises in Chengdu Shi (Yang, 1990).

The market-oriented policy introduced by Zhao had several features. For example, the selected enterprises were allowed to keep more profits to pay bonuses to the workers and also penalize those workers who brought losses to the factory. These enterprises were also allowed to engage in their own production on top of the state production plan and to market their products as long as the state plan was fulfilled. They could deal with foreign companies directly and were allowed to use part of the foreign exchange earnings to purchase new inputs and other products that could improve their production technology. This policy was further modified and extended to 100 more enterprises in Chongqing Shi and Chengdu Shi in the same year, and another 200 in 1980. In the early stages of the reform era, the leaders of Chongqing Shi worked closely with Zhao and other provincial leaders. The reform experimented in Chongqing Shi brought great successes, and the "Chongqing experience" became well known all over the country.

The development of Chengdu Shi during the reform era was relatively slower and usually lagged behind that of Chongqing Shi. For example, the policy reforms by Zhao Ziyang were introduced in Chengdu Shi only after they were experimented in Chongqing Shi. From 1978 to 1988, the provincial government was responsible to control Chengdu Shi's foreign trade and Chengdu Shi did not have the authority to deal with foreign companies directly. The leaders of Chengdu Shi were allowed to national economic planning meetings only until May 1987 and Chengdu Shi was approved as a separate planning city by the State Council in February 1989 (Hong, 1999).

"Open Up the West" campaign

A more recent policy was the Western development (or "Open Up the West") campaign. The campaign was announced by Jiang Zemin, the then President and General Secretary, and

Zhu Rongji, the then Premier of the State Council, in mid-1999 which started in 2000. This campaign included 12 *shengji* divisions, including Inner Mongolia Zizhiqu, Shaanxi Sheng, Ningxia Hui Zizhiqu, Gansu Sheng, Xinjiang Sheng, Qinghai Sheng, Tibet Zizhiqu, Sichuan Sheng, Chongqing Shi, Yunnan Sheng, Guizhou Sheng, and Guangxi Zhuang Zizhiqu. The aims of this campaign were to foster the social and economic development of the western and interior parts of the country, and to reduce the inequalities between the coastal and inland provinces. These aims were achieved through the development of infrastructure, investment in education, policies to attract foreign investment, etc.[38]

4.2.3. The promotion of Chongqing Shi in 1997

When the People's Republic was established in 1949, Chongqing Shi was one of the *shengji* divisions. In 1954, it was downgraded to a *dijishi* within Sichuan Sheng. Chongqing Shi was promoted back to a *shengji* division as a *zhixiashi* in 1997 and since then it is no longer part of Sichuan Sheng. The background for the promotion of Chongqing Shi is complicated and deserves a discussion.

The relationship between Chongqing Shi and Chengdu Shi has been complicated. Before its promotion in 1997, Chongqing Shi still enjoyed a lot of economic independence from the provincial government of Sichuan Sheng. However, since administratively, Chongqing Shi was under the rule of Sichuan Sheng, the province was able to use its political power to influence the economic policies of Chongqing Shi. As a result, Chongqing Shi sometimes had to follow the instructions from the provincial government while at the same time had to implement the directives from the central government.

The separate political and economic powers between Chongqing Shi and Sichuan Sheng often created tensions between the two entities, especially between Chongqing Shi and the provincial capital, Chengdu Shi. Whenever there were conflicts between Chongqing Shi and Chengdu Shi, the provincial government could make use of its superior administrative ranking to resolve the conflicts in favor of Chengdu Shi and Sichuan Sheng in general. Under this background, some leaders of Chongqing Shi felt that Chongqing Shi had been the victim of the biased policies of Sichuan Sheng after Chongqing Shi was downgraded to a *dijishi* in 1954. The divergence of political and economic power made the separation of Chongqing Shi from Sichuan Sheng inevitable.

The plan for separating Chongqing Shi from Sichuan Sheng began as early as in the 1980s. It was initially rejected by the provincial government because Chongqing Shi had a

[38] For more information about this campaign, see Goodman (2004).

strong industry which was a major source of income for the provincial government. The provincial government was only willing to consider the separation proposal after an agreement was reached to share Chongqing Shi's revenue with the central government.

There were two major reasons for the eventual separation of Chongqing Shi from Sichuan Sheng: The first is the need to reform of the state-owned enterprises (SOEs) in Chongqing Shi. The second is the central government's plan to build a dam in the Three Gorges region.

State-owned enterprises

Like elsewhere in China, SOEs have been playing a key role in the economy of Chongqing Shi. Nevertheless, the case of Chongqing Shi is unique because it was once the capital of the Nationalist government during the Second World War (1937-1945). In the 1940s, the Nationalist government relocated many factories from the coastal areas, many of which were war-related. Between 1938 and 1940, the number of SOEs in Chongqing Shi increased by 360% and from 1940 to 1942, over 80% of the government's investment in Chongqing Shi was in state-owned heavy industry (Han, 1995). After the establishment of the People's Republic, the SOE sector of Chongqing Shi continued to grow. By 1952, the gross value of industrial output of SOEs in Chongqing Shi was over 56%. At the beginning of the reform era in the late 1970s, the share of SOEs in the city's gross value of industrial output grew to over 83%. 20 years after the reform, the SOEs still played a major role in the local economy: In 1997, while they accounted for less than 13% of the total enterprises, they employed over 60% of the city workforce, accounted for 78% of the total fixed assets and had a share of gross value of industrial output of over 70%. Besides, 80% of the tax revenues collected by Chongqing Shi government came from SOEs (Hong, 2002).

In the economic reform era, the central government changed the development strategies by shifting the focus from military to civil production and giving priority to the coastal regions. These new development strategies had a direct impact on the SOEs of Chongqing Shi. In contrast, in the pre-reform era, there was a concentration of military industries in Chongqing Shi especially under the Third Front Project. This project was to strategically develop the industrial sector of the southwestern part of China, where in the event of a war, this area would still be secure. When the central government abandoned the Third Front Project during the reform era, the more military-inclined SOEs in Chongqing Shi had to equip themselves for civil production. Initially some of the more technologically advanced SOEs were able to transform themselves. However, they lost their advantages gradually to the coastal industries because the latter were able to import more sophisticated technologies from the West.

In more recent years, the SOEs under the old Third Front Project found it difficult to main normal operation. The problem was worsened by the non-economic responsibilities of these SOEs. The larger SOEs in Chongqing Shi were not only production units but also had social and political responsibilities. For example, many of these SOEs ran their own schools and hospitals and provided pensions and other social benefits to the retired employees and their family members (Hong, 2002).

The poor performance of SOEs led to massive layoffs which in turn generated social and political instability. For example, in 1992, one of the largest SOEs in Chongqing Shi called the Chongqing Knitting Mill was declared bankrupt and its 2,913 workers became subsequently unemployed. The unemployed workers joined by employees from other factories blocked the main roads of Chongqing Shi to protest. Two city officials were even kidnapped (Hong, 2002). Many of these problems were beyond the control of the provincial government given its limited resources. As a result, there was a need for the direct intervention from the central government through the promotion of Chongqing Shi to a *zhixiashi*.

The Three Gorges Dam

The worldwide-famous Three Gorges Dam is a hydroelectric dam over the Yangtze River situated in Sandouping in Yiling Qu, Yichang Shi, Hubei Sheng. It was first proposed by Dr. Sun Yat-sen in 1919. The proposal had been reassessed and developed for decades until its final approval in 1992. The dam has a normal pool level of 175 metres. The reservoir will stretch 660 kilometres in length and 1.12 kilometres in width covering a total area of over 1,000 square kilometres.

The project also involved a huge resident relocation program. It was first estimated that about 846,500 residents were to be relocated (see Table 4.4). When population growth was taken into account, the number of displaced persons would go up to 1.13 millions to 1.60 millions which could ultimately grow to over 2 millions (Qi, 1998).

Table 4.4: The Three Gorges Dam Project: Resident relocation

Administrative unit	Total Population (1994)	Number of displaced persons	Percentage
3 *xian* in Chongqing Shi	3,270,000	13,500	<1%
3 *xian* in Fuling Shi	2,240,000	126,700	6%
1 *xian* in Qianjiang Qu	470,000	8,400	2%
8 *xian* in Wanxian Shi	7,290,000	571,000	8%
4 *xian* in Hubei Sheng	1,730,000	126,900	7%
Total	15,000,000	846,500	6%

Source: Zhu and Zhao (1996) and Jackson and Sleigh (2000).

When the proposal of the Three Gorges Project was under consideration, the central government had a plan to create a new province called the Sanxia (literally the Three Gorges) Sheng which was responsible for administering the proposed Three Gorges Project. Under the proposal, Chongqing Shi would become the provincial capital, and the new province consisted of 3 *qu* and 1 *shi* and the 30 *xian* therein, including Fuling Qu from Sichuan Sheng (now within Chongqing Shi), Wanxian Qu from Sichuan Sheng (now within Chongqing Shi), Yichang Qu of Hubei Sheng (now Yichang Shi of Hubei Sheng), Yichang Shi of Hubei Sheng (combined with Yichang Qu to form Yichang Shi), and Exi Tujia and Miao Zizhizhou in Hubei Province.

Many of these *xian* were among the poorest in eastern Sichuan Sheng and western Hubei Sheng. Although there was a chance to promote to a higher rank in the administrative hierarchy, the government of Chongqing Shi rejected the proposal mainly because they were unwilling to take up the burden of administering the poor *xian*.

The discussion of setting up the Sanxia Sheng was put on hold with the entire Three Gorges Dam project. But when the National People's Congress approved the dam in 1992, the Sanxia Sheng proposal was brought to the table again. The central government and the governments of Sichuan Sheng, Chongqing Shi, and the areas affected by the dam had different goals to pursue: The central government wanted the provincial and local governments to share the burden and responsibility of the dam project; the provincial government wanted to get rid of the poor *xian* in the eastern part of the *sheng*; the Chongqing Shi government wanted to be separated from Sichuan Sheng yet was unwilling to take charge of the poor *xian* under the new provincial arrangement; and the local governments wanted to seek the maximum amount of compensation from the centre. The negotiation lasted for a few years but no agreement was reached.

In December 1995, the provincial government submitted a proposal to set up a new *sheng*, with Chongqing Shi as the provincial capital, to include several eastern regions of Sichuan Sheng and Yichang Shi of Hubei Sheng and to set up a new Special Economic Zone in the Three Gorges area (Hong, 2002). The proposal was amended substantially: The new Chongqing Shi integrated the original Chongqing Shi as well as the Wanxian Shi and Fuling Shi and the Qianjiang Qu. The proposal was finally approval in June 1996 and the new Chongqing Shi was formed on March 14, 1997.

4.2.4. The formation of Chongqing Zhixiashi

On March 14, 1997, the Eighth National People's Congress passed a motion to separate the original Chongqing Shi from Sichuan Sheng and upgrade it from a *dijishi* to a *zhixiashi*.

The new Chongqing Zhixiashi was formed by combining the following divisions:

Original Chongqing Shi It included 11 *qu* (Yuzhong, Dadukou, Jiangbei, Shapingba, Jiulongbo, Nan'an, Beibei, Wansheng, Shuangqiao, Yubei, Bainan), 3 *shi* (Jiangjin, Hechuan, Yongchuan), and 7 *xian* (Changshou, Qijiang, Tongnan, Tongliang, Dazu, Rongchang, Bishang).

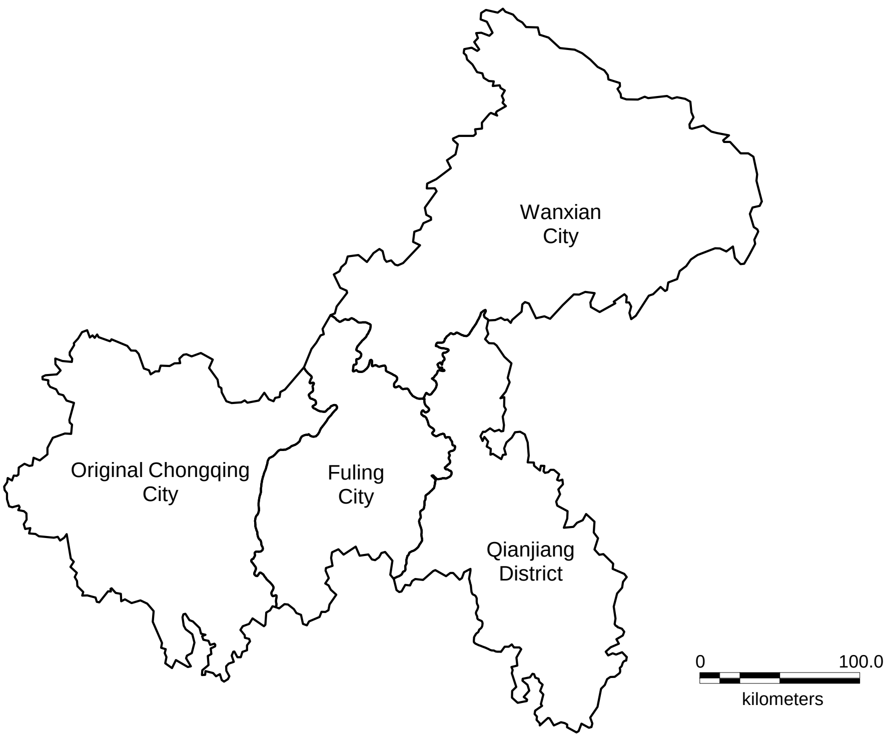
Wanxian Shi It included 3 *qu* (Longbao, Tiancheng, Wuqiao) and 8 *xian* (Kai, Zhong, Liangping, Yuyang, Fengjie, Wushan, Wuxi, Chengkou).

Fuling Shi It included 2 *qu* (Zhicheng, Lidu), 1 *shi* (Nanchuan), and 3 *xian* (Dianjiang, Wulong, Fengdu).

Qianjiang Qu It included 5 *zizhixian* (Qianjiang Tujia and Miao, Shizhu Tujia, Pengshui Miao and Tujia, Youyang Tujia and Miao, Xiushan Tujia and Miao).

After its promotion, the new Chongqing Zhixiashi has 43 *xianji* divisions: 16 *qu*, 4 *xianjishi*, and 23 *xian* and *zizhixian*. Figure 4.5 shows the locations of the original Chongqing Shi, Wanxian Shi, Fuling Shi, and Qianjiang Qu.

Figure 4.5: The formation of New Chongqing Shi



Source: *e-Geopolis*.

Table 4.5: New Chongqing Shi: Some statistics as of end of 1996

	Status	Area (Sq. Km)	Pop. (10K)	Density (Person /Sq. Km)	GDP (Bn)	1st sector (Bn)	2nd sector (Bn)	3rd sector (Bn)
Original Chongqing Shi								
Yuzhong	*shixiaqu*	23	57.58	25,034.78	8.02	0.00	2.22	5.79
Dadukou	*shixiaqu*	103	20.24	1,965.05	2.77	0.10	2.19	0.48
Jiangbei	*shixiaqu*	221	44.28	2,003.62	4.10	0.16	2.94	1.00
Shapingba	*shixiaqu*	383	63.32	1,653.26	6.32	0.41	4.04	1.88
Jiulongpo	*shixiaqu*	432	67.61	1,565.05	6.06	0.57	4.39	1.10
Nan'an	*shixiaqu*	265	42.85	1,616.98	3.83	0.23	2.25	1.35
Beibei	*shixiaqu*	754	62.15	824.27	4.28	0.55	2.19	1.53
Wansheng	*shixiaqu*	566	26.48	467.84	1.14	0.23	0.47	0.43
Shuangqiao	*shixiaqu*	37	4.03	1,089.19	0.43	0.04	0.34	0.05
Yubei	*shixiaqu*	1,415	87.70	619.79	3.68	1.00	1.83	0.85
Banan	*shixiaqu*	1,824	84.98	465.90	3.36	1.42	1.14	0.80
Jiangjin	*xianjishi*	2,178	93.64	429.94	3.26	1.46	1.16	0.65
Hechuan	*xianjishi*	1,452	77.84	536.09	2.71	1.00	1.15	0.55
Yongchuan	*xianjishi*	3,200	144.72	452.25	6.65	2.36	2.51	1.79
Changshou	*xian*	2,356	150.03	636.80	5.82	1.80	1.65	2.37
Qijiang	*xian*	1,594	89.38	560.73	1.97	1.09	0.51	0.37
Tongnan	*xian*	1,334	81.12	608.10	2.51	1.03	0.73	0.75
Tongliang	*xian*	1,576	102.12	647.97	3.23	1.23	0.99	1.01
Dazu	*xian*	1,390	90.76	652.95	2.98	1.04	0.99	0.95
Rongchang	*xian*	1,079	79.39	735.77	2.49	1.01	0.87	0.61
Bishan	*xian*	913	59.47	651.37	2.05	0.70	0.93	0.42
	Subtotal	23,095	1,529.69	662.35	77.64	17.42	35.49	24.73
Wanxian Shi								
Longbao	*shixiaqu*	676	48.51	717.60	1.76	0.23	0.85	0.68
Tiancheng	*shixiaqu*	1,750	59.50	340.00	1.17	0.46	0.40	0.32
Wuqiao	*shixiaqu*	1,031	54.90	532.49	1.79	0.48	0.85	0.46
Kai	*xian*	3,959	144.88	365.95	3.11	1.11	1.14	0.85
Zhong	*xian*	2,184	97.70	447.34	1.90	0.88	0.47	0.54
Liangping	*xian*	1,890	86.44	457.35	1.67	0.67	0.53	0.47
Yuyang	*xian*	3,634	122.52	337.15	1.67	0.91	0.46	0.31
Fengjie	*xian*	4,087	97.49	238.54	2.05	0.92	0.55	0.58
Wushan	*xian*	2,958	57.85	195.57	0.94	0.45	0.21	0.29
Wuxi	*xian*	4,030	49.94	123.92	0.59	0.34	0.11	0.13
Chengkou	*xian*	3,286	21.69	66.01	0.33	0.18	0.07	0.09
	Subtotal	29,485	841.42	285.37	17.00	6.63	5.64	4.73
Fuling Shi								
Zhicheng	*shixiaqu*	1,534	57.89	377.38	3.37	0.35	1.73	1.29
Lidu	*shixiaqu*	1,412	50.05	354.46	1.21	0.41	0.54	0.26
Nanchuan	*xianjishi*	1,518	85.46	562.98	1.57	0.67	0.55	0.34
Dianjiang	*xian*	2,901	75.28	259.50	1.53	0.64	0.46	0.44
Wulong	*xian*	2,901	39.23	135.23	0.87	0.41	0.22	0.23
Fengdu	*xian*	2,602	63.09	242.47	2.43	0.79	1.11	0.53
	Subtotal	12,868	371.00	288.31	10.97	3.27	4.61	3.09
Qianjiang Qu								
Qianjiang Tujia and Miao	*zizhixian*	3,013	48.40	160.64	0.98	0.44	0.30	0.24
Shizhu Tujia	*zizhixian*	2,450	56.15	229.18	1.05	0.55	0.32	0.19
Pengshui Miao and Tujia	*zizhixian*	2,397	47.15	196.70	1.20	0.50	0.48	0.22
Youyang Tujia and Miao	*zizhixian*	5,173	69.49	134.33	0.83	0.49	0.12	0.21
Xiushan Tujia and Miao	*zizhixian*	3,903	59.37	152.11	0.99	0.57	0.23	0.20
	Subtotal	16,936	280.56	165.66	5.05	2.55	1.45	1.05
	Total	82,384	3,022.67	366.90	110.66	29.87	47.19	33.60

Source: Chongqing Statistical Yearbook, 1997.

Table 4.5 shows some population statistics and economic indicators (by the end of 1996) of the original Chongqing Shi and the other divisions from Sichuan Sheng that were to be merged into the Chongqing Zhixiashi. These data are obtained from the 1997 version of Chongqing Statistics Yearbook.

The original Chongqing Shi had an area of about 23,000 square kilometres and a population of about 15 millions. After its promotion, there was a mechanical expansion of land area by over 3 times to 82,000 square kilometres and a doubling of the population to over 30 millions. Half of these increases came from the inclusion of the Wanxian Shi which had a land area of almost 30,000 square kilometres and a population of about 8.4 millions.

As mentioned earlier, the new Chongqing Zhixiashi integrated some of the poorest regions in the eastern part of Sichuan Sheng. Table 4.5 also illustrates this situation by showing the GDP at *xianji* level by the end of 1996. The original Chongqing Shi outperformed the other parts in total GDP and the GDP in the primary, secondary, and tertiary sectors. The GDP per capita for the original Chongqing Shi was 5,075.81 RMB whereas the figures for Wanxian Shi, Fuling Shi, and Qianjiang Qu were 2020.11 RMB, 2,956.53 RMB, and 1,799.46 RMB respectively. Once these poorer regions were considered, the GDP per capita for the new Chongqing Shi dropped by almost 30% to 3,660.97 RMB. In terms of the economic structure, the old Chongqing Shi has large secondary and tertiary sectors which constituted over 75% of the total GDP, whereas the other parts had a relatively larger primary sector.

4.2.5. The administrative structures of Sichuan Sheng and Chongqing Zhixiashi

In Chapter 3, we already mentioned the *shengji* administrative structure of Sichuan Sheng and Chongqing Zhixiashi. In this section, we will first briefly discuss the recent changes of the administrative structure of Sichuan Sheng. Then we will examine the administrative structures of Chongqing Zhixiashi and Chengdu Shi.

Between 2000 and 2010, there were many changes in the *xiangji* divisions in China. This trend was especially noticeable in Sichuan Sheng and Chongqing Shi. As will be explained in greater details later, these changes complicate the estimation of urban population statistics using *e-Geopolis*.

The changes in administrative structures can be due to different reasons. But in any case, these changes have to be subject to the relevant regulations of the central government. In particular, in 2001, the central government promulgated a set of "guiding principles" for the adjustment of the administrative boundaries of *xiang*, *zhen*, and *jiedao*.[39] Essentially, it

[39]See *http://law.people.com.cn/showdetail.action?id=2573937*.

required that changes in the administrative structures should facilitate economic construction, administrative management, and the livelihood of the general public. It is not surprising that many of the changes in the administrative structures during the economic reform era were made to facilitate economic development. For example, in 2002, Chongqing Shi government cancelled Longgang Zhen and Chengnan Xiang in Dazu Xian and at the same time created Longgang Jiedao and Tangxiang Jiedao. According to the Chongqing Shi Government, the purposes of such changes were to "speed up the social and economic development of Dazu Xian and to explore the new avenues for urbanization."[40]

Changes in the administrative structure of Sichuan Sheng and Chengdu Shi

In Tables 4.6 and 4.7, we show the administrative structure of Sichuan Sheng by each *dijishi* in 2000 and 2010, respectively. The information we show includes the number *xianji* units and the number of *xiangji* units.

Table 4.6: Administrative structure of Sichuan Sheng, 2000

	xianji				*xiangji*		
dijishi	*qu*	*xianjishi*	*xian*	*zizhixian*	*xiang**	*zhen*	*jiedao*
Chengdu Shi	7	4	8	0	130	208	74
Zigong Shi	4	0	2	0	51	76	11
Panzhihua Shi	3	0	2	0	58	20	17
Luzhou Shi	3	0	4	0	62	82	9
Deyang Shi	1	3	2	0	29	123	4
Mianyang Shi	2	1	6	0	134	139	12
Guangyuan Shi	3	0	4	0	164	95	8
Suining Shi	1	0	3	0	45	70	5
Neijiang Shi	2	0	3	0	24	87	9
Leshan Shi	4	1	4	2	137	88	4
Nanchong Shi	3	1	5	0	307	174	5
Meishan Shi	1	0	5	0	147	70	0
Yibin Shi	1	0	9	0	97	107	8
Guang'an Shi	1	1	3	0	91	82	6
Dazhou Shi	1	1	5	0	314	75	2
Yaan Shi	1	0	7	0	133	43	4
Bazhong Shi	1	0	3	0	242	43	0
Ziyang Shi	1	1	2	0	76	84	0
Aba Zangzu Zizhizhou	0	0	13	0	195	29	0
Ganzi Zangzu Zizhizhou	0	0	18	0	299	26	0
Liangshan Yizu Zizhizhou	0	1	15	1	536	74	6
Total	40	14	123	3	3,271	1,795	184

Note: * – includes *zizhixiang*.
Source: Population Census, 2000; Sichuan Statistics Yearbook, 2001.

At the *xianji* level, there were 180 units in 2000. These units included 40 *qu*, 14 *xianjishi*,

[40]See Chongqing Government Document No. 68 (2002), *http://law.people.com.cn/showdetail.action?id=2614112*.

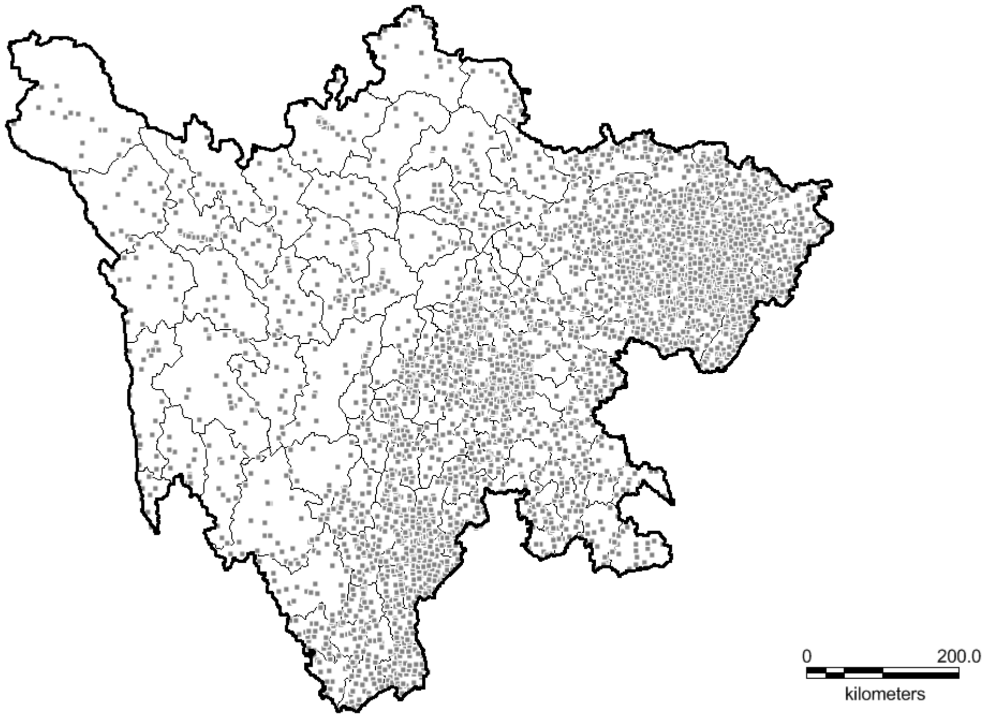
Table 4.7: Administrative structure of Sichuan Sheng, 2010

	xianji				*xiangji*		
dijishi	*qu*	*xianjishi*	*xian*	*zizhixian*	*xiang**	*zhen*	*jiedao*
Chengdu Shi	9	4	6	0	27	196	92
Zigong Shi	4	0	2	0	21	75	12
Panzhihua Shi	3	0	2	0	36	21	16
Luzhou Shi	3	0	4	0	51	85	14
Deyang Shi	1	3	2	0	21	99	7
Mianyang Shi	2	1	5	1	148	144	18
Guangyuan Shi	3	0	4	0	141	91	9
Suining Shi	2	0	3	0	44	68	13
Neijiang Shi	2	0	3	0	24	87	10
Leshan Shi	4	1	4	2	117	96	7
Nanchong Shi	3	1	5	0	229	174	17
Meishan Shi	1	0	5	0	59	69	3
Yibin Shi	1	0	9	0	84	104	10
Guang'an Shi	1	1	3	0	86	86	9
Dazhou Shi	1	1	5	0	212	102	3
Yaan Shi	1	0	7	0	124	42	5
Bazhong Shi	1	0	3	0	123	65	4
Ziyang Shi	1	1	2	0	87	84	4
Aba Zangzu Zizhizhou	0	0	13	0	194	31	0
Ganzi Zangzu Zizhizhou	0	0	18	0	305	27	0
Liangshan Yizu Zizhizhou	0	1	15	1	550	75	9
Total	43	14	120	4	2,683	1,821	262

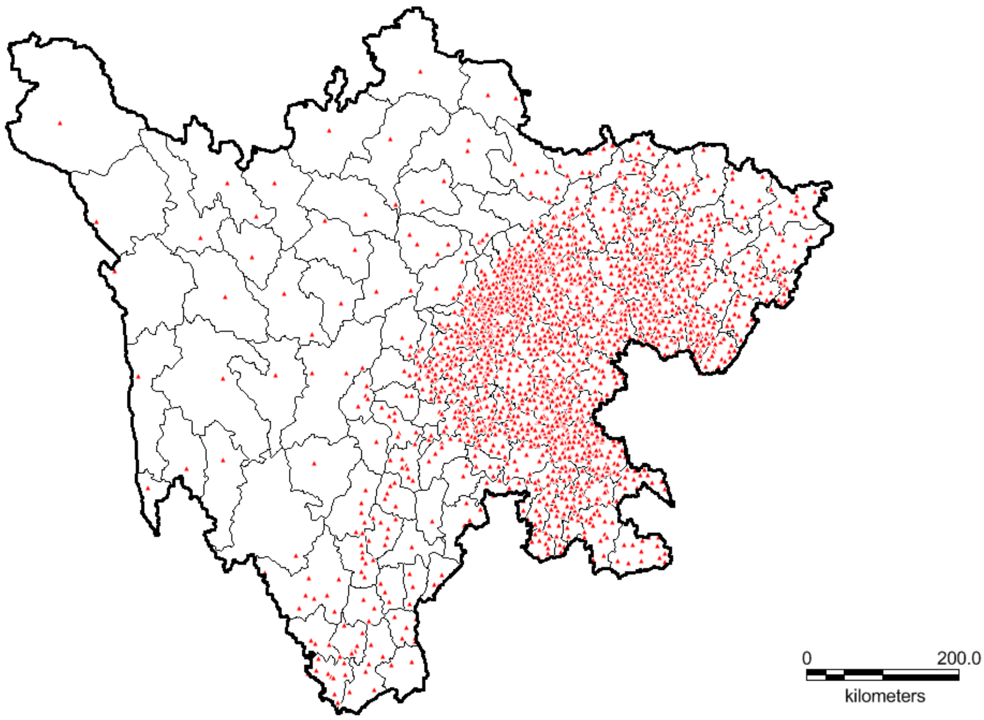
Note: * – includes *zizhixiang*.
Source: Population Census, 2000; Sichuan Statistics Yearbook, 2011.

123 *xian*, and 3 *zizhixian*. At the *xiangji* level, there were 5,250 units in 2000, including 3,271 *xian*, 1,795 *zhen*, and 184 *jiedao*. In 2010, the total number of *xianji* level units increased to 181 units. However, there was not much change in the composition of *xianji* units. In particular, there were 14 *xianjishi* in both years. At the *xiangji* level, the total number of units reduced to 4,668. Among the 3 different types of *xiangji* units, there was a significant reduction in *xiang* while the total numbers of *zhen* and *jiedao* both increased. In Figure 4.6 we show the three types of *xiangji* divisions of Sichuan Sheng in 2000.

Figure 4.6: *Xiangji* divisions of Sichuan Sheng, 2000

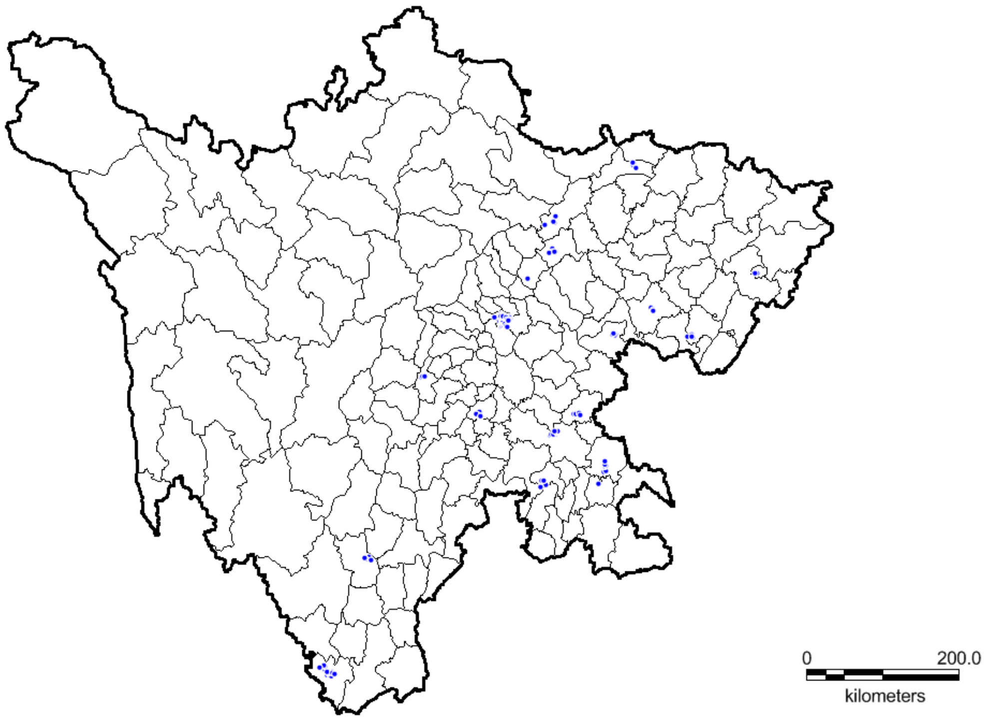


(a) *xiang*



(b) *zhen*

Figure 4.6: *Xiangji* divisions of Sichuan Sheng, 2000 (Continued)



(c) *jiedao*

Source: *e-Geopolis* and Population Census, 2000.

We further examine the changes of the administrative structure of Chengdu Shi, the provincial capital of Sichuan Sheng. The administrative structure of Chengdu Shi has remained relatively stable in recent years. In 1997 (the year Chongqing Shi was upgraded), Chengdu Shi was composed of 19 *xianji* divisions, including 7 *qu* (Jinjiang Qu, Qinyang Qu, Jinniu Qu, Wuhou Qu, Chenghua Qu, Longquanyi Qu, Qingbaijiang Qu), 4 *xianjishi* (Dujiangyan Shi, Pengzhou Shi, Qionglai Shi, Chongzhou Shi), and 8 *xian* (Jintang Xian, Shuangliu Xian, Pujiang Xian, Xinjin Xian, Wenjiang Xian, Pi Xian, Xindu Xian, Dayi Xian). Since then, there were only two major changes of administrative structure in Chongqing Shi: In 2001, Xindu Xian was abolished and re-created as the Xindu Qu under Chengdu Shi. In 2002, Wenjiang Xian was abolished and re-created as the Wenjiang Qu under Chengdu Shi.

In Table 4.8, we compare the administrative structures of Chengdu Shi in 2000 and 2010 by listing the names of the *xianji* divisions and their respective statuses in 2000 and 2010. We observe that Chengdu Shi's *qu* expanded between 2000 and 2010. The map in Figure 4.7 shows the locations of the *xianji* divisions of Chengdu Shi as of 2010.

Table 4.8: *Xianji* divisions of Chengdu Shi in 2000 and 2010

	Status in 2000	Status in 2010
Jinjiang	*shixiaqu*	*shixiaqu*
Qionglai	*xian*	*xian*
Shuangliu	*xian*	*xian*
Qingbaijiang	*shixiaqu*	*shixiaqu*
Pujiang	*xian*	*xian*
Jintang	*xian*	*xian*
Jinniu	*shixiaqu*	*shixiaqu*
Chenghua	*shixiaqu*	*shixiaqu*
Longquanyi	*shixiaqu*	*shixiaqu*
Qingyang	*shixiaqu*	*shixiaqu*
Xindu	*xian*	*shixiaqu*
Xinjin	*xian*	*xian*
Dayi	*xian*	*xian*
Pengzhou	*xian*	*xian*
Pi	*xian*	*xian*
Chongzhou	*xian*	*xian*
Wenjiang	*xian*	*shixiaqu*
Dujiangyan	*xian*	*xian*
Wuhou	*shixiaqu*	*shixiaqu*

Source: China Statistics Yearbook, 2001 and 2011.

Figure 4.7: *Xianji* divisions of Chengdu Shi, 2010

Source: *e-Geopolis*.

As discussed in Chapter 3, there were many changes in the *xiangji* divisions between 2000 and 2010 (see Table 3.14). The changes were especially noticeable in Sichuan Sheng and

Chongqing Shi. In Table 4.9, we show the changes in the *xiangji* divisions in Chengdu Shi between 2000 and 2010. In Chengdu Shi, there were 412 *xiangji* divisions in 2000. The numbers were evenly distributed among *xianji* divisions, ranging from 15 (in Qingbaijiang and Wenjiang) to 34 (in Chongzhou). In 2010, the number of *xiangji* divisions dropped to 315 (a drop of 23.54%) and the reduction was seen in all *xianji* divisions except Wuhou (where there was an additional *xiangji* in 2010).

Table 4.9: Changes in *xiangji* divisions in Chengdu Shi between 2000 and 2010

	2000	2010	Change
Jinjiang	20	16	−4
Qionglai	33	24	−9
Shuangliu	26	25	−1
Qingbaijiang	15	11	−4
Pujiang	19	12	−7
Jintang	24	21	−3
Jinniu	24	15	−9
Chenghua	16	14	−2
Longquanyi	19	12	−7
Qingyang	16	14	−2
Xindu	17	13	−4
Xinjin	16	12	−4
Dayi	27	20	−7
Pengzhou	28	20	−8
Pi	19	15	−4
Chongzhou	34	25	−9
Wenjiang	15	10	−5
Dujiangyan	28	19	−9
Wuhou	16	17	1
Total	412	315	−97

Source: Population Censuses, 2000 and 2010 .

Changes in the administrative structure of Chongqing Shi

Within the same year of Chongqing Shi's promotion in 1997, three changes were made to the administrative structure of Chongqing Shi. First, Wanxian Shi, together with its Longbao Qu, Tiancheng Qu, and Wuqiao Qu, were abolished. At the same time, Wanxian Qu under Chongqing Shi was established. Second, Fuling Shi, together with its Zhicheng Qu and Lidu Qu, were abolished. At the same time, Fuling Qu under Chongqing Shi was established. Effectively, Wanxian Shi and Fuling Shi were merged as *qu* of Chongqing Shi. Third, Qianjiang Qu was abolished and re-established as Qianjiang Development District. After all these changes, Chongqing Shi had 40 *xianji* divisions, including 13 *qu*, 4 *xianjishi*, and 23 *xian* and *zizhixian* by the end of 1997.

The administrative structure of Chongqing Shi remained stable in 1998 and 1999, except that Wanxian Qu was renamed as Wanzhou Qu in 1998. In 2000, Qianjiang Tujia and Miao Zizhixian was abolished and was re-established as the Qianjiang Qu under Chongqing Shi. In 2001, Changshou Xian was converted to the Changshou Qu under Chongqing Shi. In the next 5 years between 2001 and 2005, the administrative structure of Chongqing Shi did not change. But in 2006, the 4 *xianjishi*, namely, Jiangjin Shi, Hechuan Shi, Yongchuan Shi, and Nanchuan Shi, were abolished and were re-established as the districts of Chongqing Shi. Therefore, the Chongqing City's *shixiaqu* expanded substantially since 1997, even though the total number of *xianji* divisions remained unchanged.

In Table 4.10, we compare the administrative structures of Chongqing Shi in 2000 and 2010 by listing the names of the *xianji* divisions and their respective statuses in 2000 and 2010. The map in Figure 4.8 shows the locations of the *xianji* divisions of Chongqing Shi as of 2010.

Figure 4.8: *Xianji* divisions of Chongqing Shi, 2010

Source: *e-Geopolis*.

As for the *xiangji* divisions of Chongqing Shi, according to China Statistics Yearbook, as of the end of 2000, there were 1,630 *xiangji* divisions, including 868 *xiang*, 675 *zhen*, and 87 *jiedao*. By end of 2010, there were 1,014 *xiangji* divisions, including 252 *xiang*, 587 *zhen*, and 175 *jiedao*. Therefore, there were more *jiedao* but fewer *xiang* and *zhen* in Chongqing Shi between 2000 and 2010. In particular, there was a drop of over 70% in the number of *xiang*

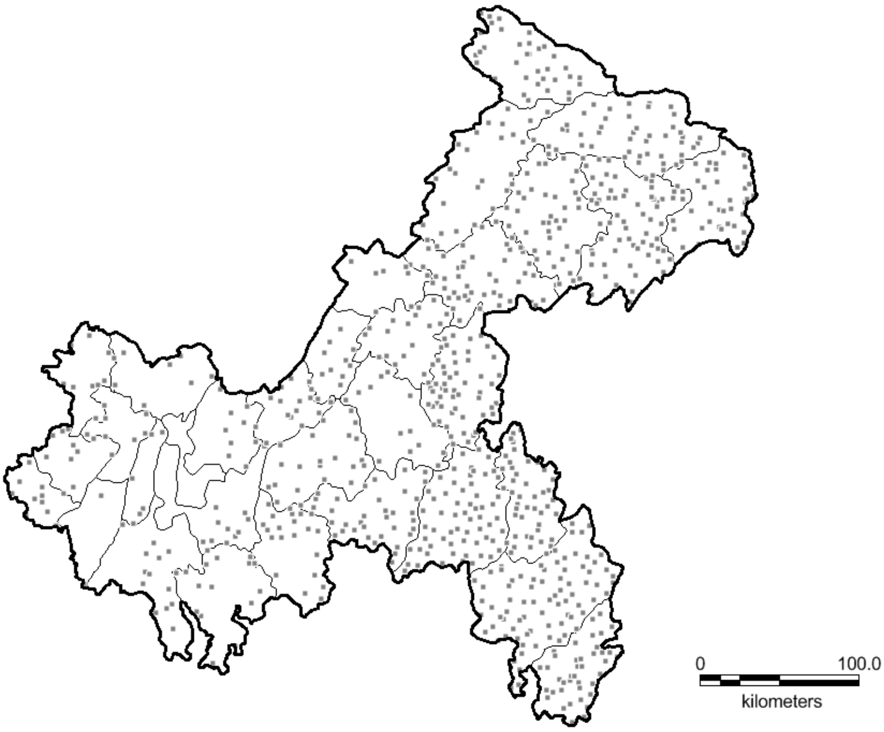
Table 4.10: *Xianji* divisions of Chongqing Shi in 2000 and 2010

	Status in 2000	Status in 2010
Chengkou	*xian*	*xian*
Jiangjin	*xianjishi*	*shixiaqu*
Wulong	*xian*	*xian*
Youyang	*zizhixian*	*zizhixian*
Wanzhou	*shixiaqu*	*shixiaqu*
Jiulongpo	*shixiaqu*	*shixiaqu*
Qijiang	*xian*	*xian*
Yuzhong	*shixiaqu*	*shixiaqu*
Wansheng	*shixiaqu*	*shixiaqu*
Hechuan	*xianjishi*	*shixiaqu*
Fuling	*shixiaqu*	*shixiaqu*
Dazu	*xian*	*xian*
Tongnan	*xian*	*xian*
Xiushan	*zizhixian*	*zizhixian*
Dadukou	*shixiaqu*	*shixiaqu*
Pengshui	*zizhixian*	*zizhixian*
Tongliang	*xian*	*xian*
Dianjiang	*xian*	*xian*
Banan	*shixiaqu*	*shixiaqu*
Yubei	*shixiaqu*	*shixiaqu*
Shizhu	*zizhixian*	*zizhixian*
Yongchuan	*xianjishi*	*shixiaqu*
Zhong	*xian*	*xian*
Jiangbei	*shixiaqu*	*shixiaqu*
Nan'an	*shixiaqu*	*shixiaqu*
Nanchuan	*xianjishi*	*shixiaqu*
Bishan	*xian*	*xian*
Fengdu	*xian*	*xian*
Wushan	*xian*	*xian*
Shuangqiao	*shixiaqu*	*shixiaqu*
Fengjie	*xian*	*xian*
Beibei	*shixiaqu*	*shixiaqu*
Yunyang	*xian*	*xian*
Wuxi	*xian*	*xian*
Rongchang	*xian*	*xian*
Kai	*xian*	*xian*
Shapingba	*shixiaqu*	*shixiaqu*
Changshou	*xian*	*xian*
Qianjiang	*shixiaqu*	*shixiaqu*
Liangping	*xian*	*xian*

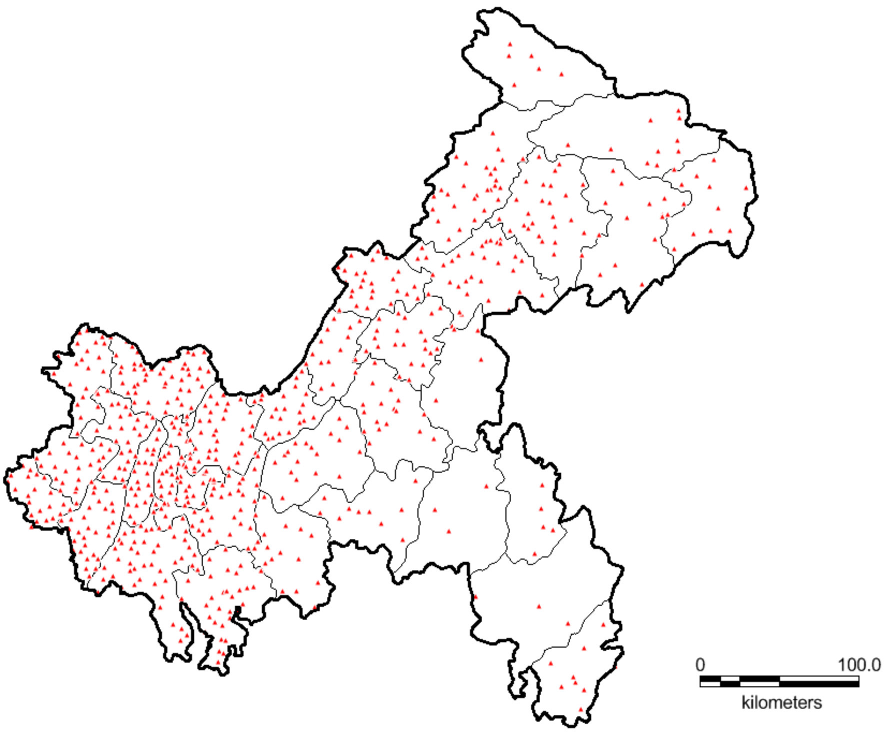
Source: China Statistics Yearbook.

during the period. In Figure 4.9, we show the different types of *xiangji* divisions of Chongqing Shi in 2000.

Figure 4.9: *Xiangji* divisions of Chongqing Shi, 2000

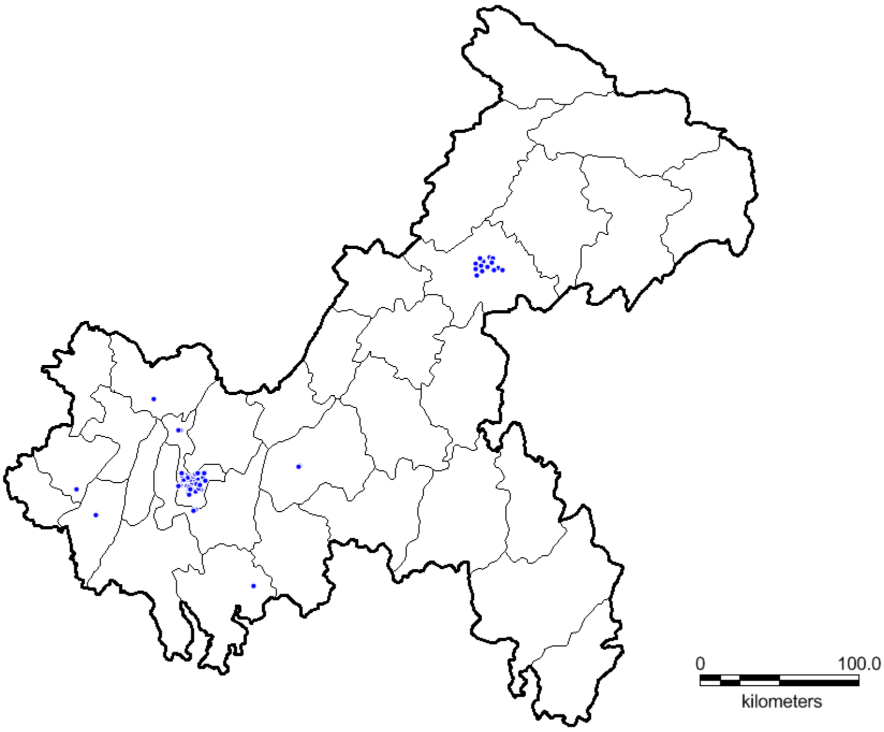


(a) *xiang*



(b) *zhen*

Figure 4.9: *Xiangji* divisions of Chongqing Shi, 2000 (Continued)



(c) *jiedao*

Source: Population Census 2000 and *e-Geopolis*.

In Table 4.11, we show the changes in Chongqing Shi.[41] From the table, we observe that different changes in the numbers of *xiangji* divisions between 2000 and 2010 in different *xianji* divisions. In 2000, there were 1,593 *xiangji* divisions in Chongqing Shi. Among different *xianji* divisions, Wanzhou had the largest number of *xiangji* divisions (91) and Shuangqiao had the fewest number of *xiangji* divisions (3). In general, the differences in the numbers of *xiangji* divisions in different *xianji* divisions reflect differences in population sizes. In 2010, the total number of *xiangji* divisions in Chongqing Shi dropped to 1,025 (a reduction of 35.66%). The reductions were larger in some *xianji* divisions. For example, in Wanzhou, the number dropped from 91 to 52, in Fenjie, the number dropped from 81 to 31, and in Youyang, the number dropped from 82 to 39. In some *xianji* divisions, the reductions were smaller and in some others, the numbers were the same or even increased. For example in Dadukou, the number increased from 7 to 12, and in Shapingba, the number increased from 24 to 36.

[41] Note that the total numbers of *xiangji* divisions were slightly different from those reported in Table 3.14 where the data come from China Statistical Yearbook, because the data contained in Population Census were as of November 1 of the census year while the data in China Statistical Yearbook were as of end of the survey year.

Table 4.11: Changes in *xiangji* divisions in Chongqing Shi between 2000 and 2010

	2000	2010	Change
Chengkou	41	25	−16
Jiangjin	63	27	−36
Wulong	46	26	−20
Youyang	82	39	−43
Wanzhou	91	52	−39
Jiulongpo	18	19	1
Qijiang	37	20	−17
Yuzhong	13	12	−1
Wansheng	10	10	0
Hechuan	64	30	−34
Fuling	46	26	−20
Dazu	32	24	−8
Tongnan	31	23	−8
Xiushan	49	32	−17
Dadukou	7	12	5
Pengshui	64	39	−25
Tongliang	33	28	−5
Dianjiang	25	25	0
Banan	43	23	−20
Yubei	35	26	−9
Shizhu	58	32	−26
Yongchuan	35	23	−12
Zhong	42	28	−14
Jiangbei	12	10	−2
Nan'an	16	14	−2
Nanchuan	37	34	−3
Bishan	27	13	−14
Fengdu	31	30	−1
Wushan	48	26	−22
Shuangqiao	3	4	1
Fengjie	81	31	−50
Beibei	19	18	−1
Yunyang	65	42	−23
Wuxi	57	31	−26
Rongchang	33	21	−12
Kai	55	40	−15
Shapingba	24	26	2
Changshou	36	18	−18
Qianjiang	50	30	−20
Liangping	34	36	2
Total	1,593	1,025	−568

Source: Population Censuses, 2000 and 2010.

4.2.6. Social and economic structures of Chongqing Shi and Chengdu Shi

As the two largest cities in the southwestern part of China, Chongqing Shi and Chengdu Shi have similar social and economic structures. In this section, we compare some social and economic indicators of the two cities before and after Chongqing Shi's promotion in 1997.

Chongqing Shi and Chengdu Shi versus other major cities of China

Prior to Chongqing Shi's promotion to a *zhixiashi*, it was among the 19 major cities at the deputy-provincial level (*fushengji*, 副省级) or above. These cities include 3 *zhixiashi* (including Beijing Shi, Tianjin Shi, and Shanghai Shi) and 16 *fushengjishi* or *dijishi* (including Chongqing Shi, Chengdu Shi, Shenyang Shi, Dalian Shi, Qingdao Shi, Wuhan Shi, Guangzhou Shi, Shenzhen Shi, Xi'an Shi, Harbin Shi, Changchun Shi, Nanjing Shi, Ningbo Shi, Xiamen Shi, Hangzhou Shi, and Jinan Shi).

In Table 4.12, we compare the various social and economic indicators of Chongqing Shi and Chengdu Shi and the other major cities in 1996, a time before Chongqing Shi was promoted. In the table, we compare the areas, populations, GDP, GDP per capita, the sizes of the industrial sectors of these cities. These data are obtained from Chongqing Statistical Yearbook, 1997, Population Censuses 2000 and 2010, and the website of the National Bureau of Statistics. In the table, the figures for GDP and secondary sector GDP have been converted into constant 2010 RMB, using the price index series obtained from *China Data Online*.

Table 4.12: Economic and social indicators of Chongqing Shi, Chengdu Shi, and other major cities in China, 1996

	Area (Sq Km)	Population (Mn)	GDP (Bn RMB)	GDP per capita (1,000 RMB)	2nd sector GDP (Bn RMB)	Share of 2nd sector GDP (%)
Chongqing	23,114	15.30	96.84	6.33	44.27	45.71
Chengdu	12,390	9.81	108.43	11.06	48.04	44.30
Beijing	16,808	10.78	223.17	20.71	89.14	39.94
Tianjin	11,305	8.98	139.94	15.58	75.97	54.29
Shanghai	6,341	13.04	368.90	28.28	199.16	53.99
Shenyang	12,980	6.71	96.27	14.35	41.11	42.70
Dalian	12,574	5.34	91.44	17.11	42.33	46.30
Qingdao	10,654	6.90	88.58	12.83	41.01	46.30
Wuhan	8,467	7.16	97.56	13.63	45.66	46.80
Guangzhou	7,434	6.56	180.23	27.47	84.17	46.70
Shenzhen	2,020	3.58	118.50	33.06	58.42	49.30
Xi'an	9,983	6.55	51.19	7.82	20.12	39.30
Harbin	18,466	9.46	79.50	8.40	25.52	32.10
Changchun	18,881	6.77	60.90	8.99	25.33	41.60
Nanjing	6,516	5.25	84.18	16.02	42.85	50.90
Ningbo	9,365	5.30	99.27	18.73	56.19	56.60
Xiamen	1,516	1.23	38.48	31.28	20.78	54.00
Hangzhou	16,596	6.03	113.08	18.75	59.60	52.70
Jinan	8,227	5.43	76.32	14.04	36.56	47.90
China	9,572,900	1,236.26	8,748.92	7.08	4,221.38	48.25

Note: GDP and secondary sector GDP are converted into constant 2010 RMB.
Source: Chongqing Statistical Yearbook, 1997; Population Censuses 2000 and 2010; the National Bureau of Statistics Website (*http://data.stats.gov.cn/*).

Even before its promotion, Chongqing Shi was already the largest, in terms of land area (about 23,000 square kilometres) and population (about 15 millions), among these 19 cities. In contrast, Chengdu Shi was much smaller: It was only about half in size (about 12,000 square kilometres) and about two thirds in population (about 9.7 millions). As for the size of economy measured by GDP, both Chongqing Shi and Chengdu Shi were similar: The GDP of Chongqing Shi was about 96.84 billion RMBs and that of Chengdu Shi was about 108.43 billion RMBs. Compared with other major cities, the economies of Chongqing Shi and Chengdu Shi were smaller than the other *zhixiashi* and some other coastal cities (such as Guangzhou Shi, Shenzhen Shi, and Hangzhou Shi). Due to its large population, Chongqing Shi had the lowest GDP per capita. On the other hand, the GDP per capita of Chengdu Shi was about 11,000 RMBs, which was close to double of that of Chongqing Shi. The GDP per capita of both cities were substantially lower than those of the other *zhixiashi* and coastal cities. The relative sizes of the industrial sectors of Chongqing Shi and Chengdu Shi (as indicated by their shares of secondary sector GDP out of total GDP) were also smaller than those of the other *zhixiashi* and most of the other cities.

The figures shown in Table 4.12 indicate that the social and economic developments of Chongqing Shi and Chengdu Shi were similar and were behind other major cities of China. The inequality between these two cities and the other major cities can partly be explained by the central government's emphasis to develop the coastal areas during the initial years of economic reform.

In Tables 4.13 and 4.14, we compare the same social and economic indicators for these 19 cities in 2000 and 2010, i.e., after Chongqing Shi was promoted to a *zhixiashi*. Mechanically, the land area of Chongqing Shi increased from about 23,000 square kilometres to over 83,000 square kilometres after its promotion. Therefore, the "New" Chongqing Shi included the total population and GDP of the "Original" Chongqing Shi as well as those of the cities that were merged into the "New" Chongqing Shi. In other words, the social and economic indicators for Chongqing Shi in 2000 and 2010 accounted for not only the changes of these indicators within the "Original" Chongqing Shi but also the changes within the "New" Chongqing Shi. We should keep this issue in mind when we compare the social and economic indicators.

In 2000, Chongqing Shi continued to be the largest among these 19 cities, with a population of over 30.51 million. As for Chengdu Shi, it had roughy one third the population of Chongqing Shi (about 11.11 million). The GDP of Chongqing Shi was about 221.29 billion RMBs, which ranked 4th among the 19 cities, after Shanghai Shi, Beijing Shi, and Guangzhou Shi. In other words, its economy became bigger and was comparable to those of the other

Table 4.13: Economic and social indicators of Chongqing Shi, Chengdu Shi, and other major cities in China, 2000

	Area (Sq Km)	Population (Mn)	GDP (Bn RMB)	GDP per capita (1,000 RMB)	2nd sector GDP (Bn RMB)	Share of 2nd sector GDP (%)
Chongqing	82,384	30.51	221.29	7.25	93.90	42.44
Chengdu	12,390	11.11	162.23	14.60	72.52	44.70
Beijing	16,808	13.57	390.64	28.79	127.67	32.68
Tianjin	11,305	9.85	210.27	21.35	106.73	50.76
Shanghai	6,341	16.41	589.50	**35.93**	272.76	46.27
Shenyang	12,980	7.20	138.27	19.19	61.12	44.20
Dalian	12,574	5.89	137.24	23.29	63.95	46.60
Qingdao	10,654	7.49	142.10	18.96	69.20	48.70
Wuhan	8,467	8.31	149.11	17.94	65.91	44.20
Guangzhou	7,434	9.94	293.55	29.53	127.40	43.40
Shenzhen	2,020	7.01	205.75	29.36	108.02	52.50
Xi'an	9,983	7.27	85.07	**11.69**	40.58	47.70
Harbin	18,466	9.41	123.89	13.16	42.00	33.90
Changchun	18,881	7.14	106.38	14.91	45.96	43.20
Nanjing	6,516	6.13	126.19	20.60	61.07	48.40
Ningbo	9,365	5.96	145.27	24.36	81.35	56.00
Xiamen	1,516	2.05	62.01	30.20	32.74	52.80
Hangzhou	16,596	6.88	170.82	24.83	87.63	51.30
Jinan	8,227	5.92	117.65	19.87	51.77	44.00
China	9,572,900	1,267.43	12,108.38	9.55	5,628.62	46.49

Note: GDP and secondary sector GDP are converted into constant 2010 RMB.
Source: Population Censuses 2000 and 2010; the National Bureau of Statistics Website (*http://data.stats.gov.cn/*).

major cities situated along the coast. On the other hand, the GDP of Chengdu Shi was just about 162.23 billion RMBs, and was smaller than that of Chongqing Shi and many other major cities.

Despite its large GDP, Chongqing Shi still had the lowest level of GDP per capita (about 7,000 RMBs) among the 19 major cities. It is because the official definition of the boundaries for measuring the GDP of Chongqing Shi does not reflect the "urban" dynamic. As a result, a huge rural population was included which drove down the GDP per capita for Chongqing Shi. Its GDP per capita level was only about 60% of the level of Xi'an Shi (which had the second lowest GDP per capita, about 11,000 RMBs) and was merely 20% of the level of Shanghai Shi (which had the highest GDP per capita, about 35,000 RMBs). In contrast, the GDP per capita of Chengdu Shi was more than double of that of Chongqing Shi (about 14,000 RMBs). Nevertheless, its level of GDP per capita was relatively low among these 19 major cities. Moreover, the sizes of the industrial sectors of Chongqing Shi and Chengdu Shi were also small, relative to the other *zhixiashi* and many coastal cities: In both cities, the secondary sectors accounted

Table 4.14: Economic and social indicators of Chongqing Shi, Chengdu Shi, and other major cities in China, 2010

	Area (Sq Km)	Population (Mn)	GDP (Bn RMB)	GDP per capita (1,000 RMB)	2nd sector GDP (Bn RMB)	Share of 2nd sector GDP (%)
Chongqing	82,384	28.85	792.56	27.48	435.91	55.00
Chengdu	12,390	14.05	555.13	39.52	248.09	44.69
Beijing	16,808	19.61	1,411.36	71.96	338.84	24.01
Tianjin	11,305	12.94	922.45	71.29	484.02	52.47
Shanghai	6,341	23.02	1,716.60	74.57	721.83	42.05
Shenyang	12,980	8.11	501.75	61.90	252.99	50.42
Dalian	12,574	6.69	515.82	77.10	262.45	50.88
Qingdao	10,654	8.72	566.62	65.02	275.89	48.69
Wuhan	8,467	9.79	556.59	56.88	253.31	45.51
Guangzhou	7,434	12.70	1,074.83	84.62	400.27	37.24
Shenzhen	2,020	10.36	958.15	**92.50**	452.34	47.21
Xi'an	9,983	8.47	324.15	38.28	140.94	43.48
Harbin	18,466	10.64	366.49	**34.46**	138.46	37.78
Changchun	18,881	7.67	332.90	43.38	171.98	51.66
Nanjing	6,516	8.00	513.07	64.10	232.78	45.37
Ningbo	9,365	7.61	516.30	67.88	287.06	**55.60**
Xiamen	1,516	3.53	206.01	58.34	102.45	49.73
Hangzhou	16,596	8.70	594.92	68.38	284.43	47.81
Jinan	8,227	6.81	391.05	57.39	163.73	41.87
China	9,572,900	1,340.91	39,985.95	13.97	18,738.32	46.86

Note: GDP and secondary sector GDP are converted into constant 2010 RMB.
Source: Population Censuses 2000 and 2010; the National Bureau of Statistics Website (*http://data.stats.gov.cn/*).

for roughly 40% of their respective total GDP.

Between 2000 and 2010, all of these major cities, except Chongqing Shi, experienced an expansion on total population. On the other hand, the GDP of these cities all increased substantially. But in terms of the ranking of GDP, there was not much change in the relative positions of Chongqing Shi and Chengdu Shi among these cities. As for GDP per capita, Chongqing Shi still had the lowest level by 2010. Its GDP per capita was about 80% of the level of Harbin (which had the second lowest GDP per capita) and it was about 30% of the level of Shenzhen (which had the highest GDP per capita). In other words, compared with other major cities, the level of GDP per capita of Chongqing Shi caught up quite substantially between 2000 and 2010. One noticeable difference is that by 2010, the share of the secondary sector GDP of Chongqing Shi was 55.00% and was second highest (only after Ningbo Shi) among the 19 major cities. In other words, between 2000 and 2010 the size of Chongqing Shi's industrial sector expanded and surpassed many of the coastal cities. On the other hand, the relative size of the secondary sector of Chengdu Shi did not change much between 2000 and 2010.

4.3. Photos from a recent field trip to Sichuan

To obtain a first-hand impression about the recent status of urbanization, the author conducted a field trip to Sichuan Sheng in January and February 2014. The photos shown below illustrate various aspects of the recent urbanization of Sichuan Sheng. The main message delivered by these photos is that while the smaller regions outside Chengdu Shi were still not much urbanized, the suburbs of Chengdu Shi were highly developed, with a mixture of commercial and residential areas and an extensive road network.

The two photos in Figure 4.10 were taken in Renshou Xian, Meishan Shi. Recall from Table 4.19 that Meishan agglomeration was the second largest urban agglomeration in Sichuan Sheng, with agglomeration population of 905,000 inhabitants (as of 2010). This area was well developed and the living standard of the residents was quite high. It was not uncommon to see them drive fancy cars on the road.

Figure 4.10: Photos from a field trip to Sichuan (1)

Photography: Hui Cao, January 14, 2014.

These photos show a local market which was near a low-density residential area. It was a typical market where nearby farmers sell their produces such as vegetables and poultry. This market was not an organized one; sometimes *chengguan* (officers from the City Urban Administrative and Law Enforcement Bureau) would come to maintain the order of this market, although their operations were not very effective.

The following two photos were also taken from Renshou Xian, Meishan Shi. This place was outside the central long-distance bus station in the city centre.

Figure 4.11: Photos from a field trip to Sichuan (2)

Photography: Hui Cao, January 14, 2014.

Renshou Xian had neither a metro system nor an airport. Therefore, long-distance bus was the major form of transportation for the residents to go to other places such as Chengdu Shi. From the photos, we could see more people and traffic. Besides, there were more commercial activities (e.g., hotels and restaurants etc.).

Figure 4.12 shows a local hospital situated at the edge of Renshou Xian. While this *xian* looked relatively less developed and we could still see some farmland behind the hospital, in fact it was expanding outwards quickly in recent years.

Figure 4.12: Photos from a field trip to Sichuan (3)

Photography: Hui Cao, January 13, 2014.

The photo in Figure 4.13 shows a nice highway connecting Renshou Xian and Chengdu Shi. It allowed people to commute between Renshou Xian and Chengdu Shi very quickly.

Figure 4.13: Photos from a field trip to Sichuan (4)

Photography: Hui Cao, January 13, 2014.

The photos in Figure 4.14 were taken in Zhonghe Jie Dao of Chengdu Gaoxin Qu (also known as the Chengdu Hi-tech Industrial Development Zone). (Author's home is located in this area.) This area used to be Zhonghe Zhen of Shuangliu Xian. Recall from Figure 4.19(b), many urban agglomerations were identified by *e-Geopolis* within the administrative boundary of Chengdu Shi. Some of them were quite far away from the *qu* of Chengdu. Note, however, that many of the apartment units in this area were not yet occupied.

These photos exactly illustrate the rapid development of the suburbs of Chengdu Shi. These photos show a large and dense residential area with blocks of apartment buildings, each of which had over 30 storeys. This residential area also had other amenities and facilities.

Indeed, this area looked over-urbanized and living in this type of dense residential area could be stressful. The last photo shows a small garden in the middle of an apartment building. In a way, it shows that the residents also treasure a more relaxing environment in their neighborhood.

Figure 4.14: Photos from a field trip to Sichuan (5)

Figure 4.14: Photos from a field trip to Sichuan (5) (Continued)

Photography: Hui Cao, January 16, 2014.

The photos in Figure 4.15 were also taken in the same area as in Figure 4.14. The photo on the top shows a low-density residential area with houses of 3 or 4 storeys, and the photo on the bottom shows a nearby clock tower. The design of the buildings and the landscape of this low-density residential area followed the western style, which was very common in many parts of China.

Figure 4.15: Photos from a field trip to Sichuan (6)

Photography: Hui Cao, January 16, 2014.

The photo in Figure 4.16 shows that another residential area was under construction in the same area. When completed, it should be of comparable size of that shown in Figure 4.14. Apart from this site, there were many other similar construction sites in the same region. Note that the white house next to the construction site was the police station.

Figure 4.16: Photos from a field trip to Sichuan (7)

Photography: Hui Cao, February 2, 2014.

The following photo shows that a bridge was being built in the same area. Behind the construction site, we can see another dense residential area. The road network in this area was being improved.

Figure 4.17: Photos from a field trip to Sichuan (8)

Photography: Hui Cao, January 26, 2014.

Finally, the photo in Figure 4.18 was also taken in a suburb of Chengdu Shi. While it is away from the Chengdu city centre, we could still see a newly-developed business district with many official buildings and a shopping mall.

Figure 4.18: Photos from a field trip to Sichuan (9)

Photography: Hui Cao, January 16, 2014.

4.4. Using *e-Geopolis* to estimate urban population statistics in China: Some practical issues

In Chapters 1 and 2, we already explained the problems of using the urban population statistics compiled by the national statistical agencies and the advantages of using *e-Geopolis* to estimate urban population statistics. In Chapter 3, we discussed several additional issues of measuring urban population in China. The differences between the official and the *e-Geopolis* urban population statistics can be easily seen when we conduct a cross-country analysis. In fact, as we will show in this section, by comparing these urban population statistics at the sub-national level in China, we can also see differences between the two sets of urban population statistics. Since *e-Geopolis* uses a harmonized way to estimate urban population, these differences suggest that the official statistics can be misleading. Therefore, using the urban population statistics estimated by *e-Geopolis*, rather than those estimated by the National Bureau of Statistics, should allow us to understand better the actual extent of urbanization of China. Nevertheless, there are some practical issues related to the application of *e-Geopolis* to estimate the urban population statistics in China. In this section, we will discuss these practical issues.

4.4.1. The problems of Chinese official urban population statistics revisited

The National Bureau of Statistics of China publishes annual population statistics (including total population and urban population) at the national level in the China Statistics Yearbooks. Besides, it also publishes *xianji* urban population statistics (which can be aggregated to *shengji*) in the 2000 and 2010 Population Censuses.

In the China Statistics Yearbooks, "urban population" refers to the people residing in cities and towns (whereas "rural population" refers to the population other than urban population). Apart from this simple description, there is no further explanation about how urban population is actually calculated.

In the population censuses, the definition of urban population, as discussed in Chapter 3.2, is more complicated yet better explained. In our analysis, we focus on the official urban population statistics from the 2000 and 2010 Population Censuses. The definitions of urban population in these two population censuses were very similar. In terms of spatial coverage, the basic unit for counting urban population was urban districts with population density over 1,500 persons per square kilometre. In areas with density below 1,500 persons per square kilometre, the basic units for counting urban population were *xiang*, *zhen*, and *jiedao*. The 2010

Population Census included all urban residents meeting the criteria for the 2000 Population Census, plus the residents living in villages or towns in outer urban and suburban areas that were directly connected to municipal infrastructure and receive public services. In terms of population coverage, both 2000 and 2010 Population Censuses counted as urban population all the agricultural population in *cunmin weiyuanhui* in cities that were wholly covered. Besides, it also included the non-*hukou* population that had left their place of registration over half a year.

What do the sub-national level urban population statistics estimated by the National Bureau of Statistics tell us about the extent of urbanization?

If we assume that the urban population statistics estimated by the National Bureau of Statistics are accurate, what do these official statistics tell us about the extent of urbanization? Let us first examine the population statistics, including total populations, urban populations, and urbanization rates, for Chongqing Zhixiashi, Sichuan Sheng, and Chengdu Shi reported in Table 4.15. These data are obtained from the 2000 and 2010 Population Censuses. We should keep in mind, however, that the urban population compiled by the National Bureau of Statistics do not necessarily refer to the urban population of an agglomeration under the *e-Geopolis* definition.

Table 4.15: Chongqing Zhixiashi, Sichuan Sheng, and Chengdu Shi: Population and urbanization in 2000 and 2010

	Population (Mn)			Urban population (Mn)			Urbanization rate (%)		
	2000	2010	Annualized Growth	2000	2010	Annualized Growth	2000	2010	Change
Chongqing Zhixiashi	30.51	28.85	−0.56%	10.10	15.30	4.24%	33.10	53.03	19.93
Sichuan Sheng	82.35	80.42	−0.24%	22.31	32.34	3.78%	27.09	40.21	13.12
Chengdu Shi	11.11	14.05	2.38%	5.97	9.24	4.46%	53.74	65.77	12.03

Source: Population Censuses, 2000 and 2010.

This table shows that, between 2000 and 2010, while the total populations for Chongqing Zhixiashi and Sichuan Sheng decreased, both of their urban populations increased. Overall, the urbanization rates of Chongqing Zhixiashi, Sichuan Sheng, and Chengdu Shi all increased between 2000 and 2010, by 19.93 percentage points, 13.12 percentage points, and 12.03 percentage points, respectively. These figures suggest that, overall, Chongqing Zhixiashi and Sichuan Sheng (including Chengdu Shi) became more urbanized between 2000 and 2010.

Sometimes, in addition to the overall urbanization of a *sheng* or a *shi*, we are also interested in understanding the urbanization patterns of certain parts of a *sheng* or a *shi*. For instance, we may want to compare the urbanization patterns of the city districts (*qu*) of Chongqing Zhixiashi and Chengdu Shi. These *qu* are at the *xianji* level, which is a lower level of the administrative hierarchy. The urbanization rates reported in Table 4.15, however, do not tell us about the urbanization patterns at this lower level of the administrative hierarchy.

To obtain a better idea about the *xianji* urbanization rates, we examine the *xianji* population statistics for Chongqing Zhixiashi and Chengdu Shi. In Table 4.16, we show the *xianji* population statistics for Chongqing Zhixiashi. These statistics are taken from the 2000 and 2010 Population Censuses. For each *xian*, we also show the total population, the urban population, and the implied urbanization rate.

In Chongqing Zhixiashi, between 2000 and 2010, the total populations of 12 out of 40 *xian* divisions increased and those of the other 28 *xian* divisions dropped. This reduction was partly due to the resettlement program of the Three Gorges Dam Project. According to Chongqing Statistics Yearbook, 2011, within Chongqing Zhixiashi, 15 *xian* were within the Reservoir Area of the project (including Jiangjin Xian, Wulong Xian, Wanzhou Xian, Fuling Xian, Banan Xian, Yubei Xian Shizhu Xian, Zhong Xian, Fengdu Xian, Wushan Xian, Fenjie Xian, Yunyang Xian, Wuxi Xian, Kai Xian, and Changshou Xian). Among these divisions, eight were within the Key Reservoir Area which were key districts and counties of migration (including Wanzho Xian, Fuling Xian, Zhong Xian, Fengdu Xian, Wushan Xian, Fengjie Xian, Yunyang Xian, and Kai Xian). As we can see from Table 4.16, the population in these 8 divisions all dropped between 2000 and 2010.

If we believe that the urban population statistics from the population censuses are accurate, then we would observe the following trends: The urban populations of all divisions (except Yuzhong) increased, and the annualized growth rates for some divisions were about 10% (as in Youyang, Xiushan, Pengshui, Yubei, Shizhu, and Wuxi). Given the general decrease in total population in many of these divisions, the urbanization rates of most *xian* increased over this 10-year period. In some divisions, the increases in urbanization rates were above 20 percentage points (the increase in Yubei was even more than 30 percentage points).

However, the cases with reduced urbanization rates between 2000 and 2010 deserve attention. In 2000, six divisions of Chongqing Zhixiashi, namely, Jiulongpo, Yuzhong, Dadukou, Jiangbei, Nan'an, and Shapingba, were fully urbanized, and these divisions were all *qu* of Chongqing Zhixiashi. However, according to the 2010 Population Census, the urbanization rates for five of them (Jiulongpo, Dadukou, Jiangbei, Nan'an, and Shapingba) actually dropped. They were the only five divisions where lower urbanization rates were observed. The

Table 4.16: Chongqing Zhixiashi: *xianji* population and urbanization in 2000 and 2010

	Population (Mn)			Urban population (Mn)			Urbanization rate (%)		
	2000	2010	Annualized Growth	2000	2010	Annualized Growth	2000	2010	Change
Chengkou	0.23	0.19	−1.89%	0.02	0.05	9.60%	9.95	25.41	15.46
Jiangjin	1.32	1.23	−0.70%	0.48	0.69	3.70%	36.28	55.65	19.37
Wulong	0.40	0.35	−1.33%	0.06	0.12	7.18%	15.29	32.99	17.70
Youyang	0.59	0.58	−0.17%	0.05	0.14	10.84%	7.68	23.81	16.13
Wanzhou	1.65	1.56	−0.56%	0.57	0.86	4.20%	34.81	55.00	20.19
Jiulongpo	0.88	1.08	2.07%	0.88	0.94	0.66%	100.00	86.62	**−13.38**
Qijiang	0.96	0.80	−1.81%	0.22	0.33	4.14%	22.82	41.02	18.20
Yuzhong	0.66	0.63	−0.46%	0.66	0.63	−0.46%	100.00	100.00	0.00
Wansheng	0.27	0.26	−0.38%	0.14	0.19	3.10%	53.65	72.47	18.82
Hechuan	1.42	1.29	−0.96%	0.46	0.72	4.58%	32.52	55.82	23.30
Fuling	1.13	1.07	−0.54%	0.43	0.60	3.39%	37.55	55.80	18.25
Dazu	0.91	0.67	−3.02%	0.16	0.27	5.37%	18.19	40.01	21.82
Tongnan	0.86	0.64	−2.91%	0.11	0.25	8.56%	12.43	38.61	26.18
Xiushan	0.51	0.50	−0.20%	0.05	0.15	11.61%	10.52	30.02	19.50
Dadukou	0.25	0.30	1.84%	0.25	0.28	1.14%	100.00	93.18	**−6.82**
Pengshui	0.59	0.55	−0.70%	0.04	0.14	13.35%	7.17	25.21	18.04
Tongliang	0.79	0.60	−2.71%	0.10	0.25	9.60%	12.98	41.49	28.51
Dianjiang	0.86	0.70	−2.04%	0.14	0.24	5.54%	16.13	34.27	18.14
Banan	0.89	0.92	0.33%	0.44	0.67	4.29%	49.70	72.85	23.15
Yubei	0.84	1.35	4.86%	0.35	0.99	10.96%	41.11	73.28	32.17
Shizhu	0.48	0.42	−1.33%	0.05	0.13	10.03%	10.26	32.33	22.07
Yongchuan	0.98	1.02	0.40%	0.36	0.58	4.88%	36.80	56.87	20.07
Zhong	0.95	0.75	−2.34%	0.15	0.25	5.24%	15.20	32.92	17.72
Jiangbei	0.61	0.74	1.95%	0.61	0.67	0.94%	100.00	91.13	**−8.87**
Nan'an	0.59	0.76	2.56%	0.59	0.68	1.43%	100.00	90.01	**−9.99**
Nanchuan	0.63	0.53	−1.71%	0.18	0.26	3.75%	28.46	47.73	19.27
Bishan	0.61	0.59	−0.33%	0.12	0.25	7.62%	18.93	42.05	23.12
Fengdu	0.77	0.65	−1.68%	0.11	0.22	7.18%	14.44	34.51	20.07
Wushan	0.57	0.50	−1.30%	0.06	0.15	9.60%	10.73	30.02	19.29
Shuangqiao	0.04	0.05	2.26%	0.03	0.05	5.24%	75.89	93.05	17.16
Fengjie	0.87	0.83	−0.47%	0.11	0.27	9.39%	13.09	32.28	19.19
Beibei	0.65	0.68	0.45%	0.34	0.50	3.93%	53.07	73.76	20.69
Yunyang	1.22	0.91	−2.89%	0.15	0.29	6.81%	12.37	32.16	19.79
Wuxi	0.48	0.41	−1.56%	0.04	0.11	10.65%	7.47	25.38	17.91
Rongchang	0.66	0.66	0.00%	0.13	0.27	7.58%	20.08	41.02	20.94
Kai	1.41	1.16	−1.93%	0.18	0.42	8.84%	12.97	35.89	22.92
Shapingba	0.79	1.00	2.39%	0.79	0.90	1.31%	100.00	90.06	**−9.94**
Changshou	0.87	0.77	−1.21%	0.26	0.41	4.66%	30.23	53.02	22.79
Qianjiang	0.44	0.45	0.22%	0.09	0.17	6.57%	19.75	39.10	19.35
Liangping	0.85	0.69	−2.06%	0.12	0.24	7.18%	13.56	34.29	20.73

Source: Population Censuses, 2000 and 2010.

largest reduction was observed in Jiulongpo where the share of urban population dropped to 86.62%. Therefore, the official population statistics suggest that between 2000 and 2010, some of the *qu* of Chongqing Zhixiashi became de-urbanized, which was a puzzling pattern given that overall, the urbanization rate of Chongqing Zhixiashi increased.

In Table 4.17, we show the *xianji* population statistics for Chengdu Shi. Again, for each *xian*, we show the total population, urban population, and the implied urbanization rate. These data are also taken from the 2000 and 2010 Population Censuses.

Table 4.17: Chengdu Shi: *xianji* population and urbanization in 2000 and 2010

	Population (Mn)			Urban population (Mn)			Urbanization rate (%)		
	2000	2010	Annualized growth	2000	2010	Annualized growth	2000	2010	Change
Jinjiang	0.44	0.69	4.60%	0.44	0.69	4.60%	100.00	100.00	0.00
Qionglai	0.63	0.61	−0.32%	0.24	0.19	−2.31%	37.89	31.02	−6.87
Shuangliu	0.87	1.28	3.94%	0.16	0.80	17.46%	17.82	62.12	44.30
Qingbaijiang	0.38	0.38	0.00%	0.14	0.18	2.54%	37.19	45.95	8.76
Pujiang	0.25	0.24	−0.41%	0.07	0.07	0.00%	30.29	30.50	0.21
Jintang	0.77	0.72	−0.67%	0.14	0.19	3.10%	17.56	26.05	8.49
Jinniu	0.92	1.20	2.69%	0.92	1.20	2.69%	100.00	100.00	0.00
Chenghua	0.73	0.94	2.56%	0.73	0.87	1.77%	100.00	93.13	**−6.87**
Longquanyi	0.48	0.77	4.84%	0.34	0.47	3.29%	71.72	60.75	−10.97
Qingyang	0.55	0.83	4.20%	0.55	0.83	4.20%	100.00	100.00	0.00
Xindu	0.61	0.78	2.49%	0.20	0.43	7.96%	33.15	55.16	22.01
Xinjin	0.29	0.30	0.34%	0.07	0.12	5.54%	24.23	40.42	16.19
Dayi	0.49	0.50	0.20%	0.12	0.18	4.14%	23.52	35.03	11.51
Pengzhou	0.77	0.76	−0.13%	0.25	0.26	0.39%	31.90	34.50	2.60
Pi	0.49	0.90	6.27%	0.25	0.59	8.97%	50.44	65.80	15.36
Chongzhou	0.65	0.66	0.15%	0.15	0.21	3.42%	22.66	31.23	8.57
Wenjiang	0.32	0.46	3.70%	0.11	0.28	9.79%	35.26	61.02	25.76
Dujiangyan	0.62	0.66	0.63%	0.26	0.32	2.10%	42.19	48.27	6.08
Wuhou	0.82	1.38	5.34%	0.82	1.38	5.34%	100.00	100.00	0.00

Source: Population Censuses, 2000 and 2010.

Unlike the case in Chongqing Zhixiashi, the total populations of many *xian* of Chengdu Shi were quite stable over the 10-year period. The divisions with higher annualized growth rates in populations included Jinjiang, Shuangliu, Jinniu, Lonquangyi, Qingyang, Xindu, Pi, Wenjiang, and Wuhou. The official urban population statistics indicate that only one division (Qionglai) in Chengdu Shi registered a slight decrease in urban population. For the other divisions, there were positive annualized growth in urban population, ranging from a very small increase of 0.39% (Pengzhou) to 17.46% (for Shuangliu). The shares of urban population in most divisions increased, except Qionglai, Chenghua, and Longquanyi. Specifically, the case for Chenghua was similar to the ones in Chongqing Zhixiashi where the division was fully urbanized in 2000 but the urbanization rate dropped in 2010.

We can see that, even though Chongqing Zhixiashi and Chengdu Shi overall have become more urbanized over time, the official population statistics indicate that some *qu* are far from being urbanized, and some *xian* even became de-urbanized between 2000 and 2010.

Urban population of Chongqing Shi and Chengdu Shi in 2000 and 2010 by *qu* and non-*qu*

We further analyze the official urban population statistics of Chongqing Shi and Chengdu Shi by aggregating the *xian* statistics to *qu*, non-*qu*, and *shi* levels. Table 4.18 shows these aggregated figures. Note that in the table, we consider two different definitions of Chongqing Shi: The "New" Chongqing Shi (or Chongqing Zhixiashi) and the "Original" Chongqing Shi. The "Original" Chongqing Shi includes the *qu* and *xian* of Chongqing Shi before it was upgraded to a *zhixiashi* in 1997. Chongqing Zhixiashi, on the other hand, includes the "Original" Chongqing Shi. This distinction is useful because, as mentioned earlier, some of the changes in social and economic indicators for Chongqing Shi before and after its promotion are affected mechanically by the inclusion of the new *qu* and *xian* after 1997. As an example, in 1996, the "Original" Chongqing Shi had a population of around 15.3 million. After merging with the other *qu* and *xian* from Sichuan Sheng to form the Chongqing Zhixiashi, the population almost doubled to over 30 million. But within the "Original" Chongqing Shi, the population only changes moderately over time, from 15.3 million in 1996 to about 16 million in 2010.

Table 4.18: Chongqing Shi versus Chengdu Shi: Population and urbanization in 2000 and 2010 by *qu* and non-*qu*

	Chongqing Zhixiashi			Original Chongqing Shi			Chengdu Shi		
	2000	2010	Annualized Growth	2000	2010	Annualized Growth	2000	2010	Annualized Growth
Population (Mn)									
qu	9.69	14.92	4.41%	6.47	11.31	5.74%	4.33	7.42	5.53%
Non-*qu*	20.82	13.92	−3.95%	9.39	4.73	−6.63%	6.77	6.63	−0.21%
All	30.51	28.85	−0.56%	15.86	16.04	0.11%	11.11	14.05	2.38%
Urban population (Mn)									
qu	6.17	10.37	5.33%	5.09	8.49	5.25%	3.96	6.32	4.79%
Non-*qu*	3.92	4.93	2.32%	2.41	2.02	−1.75%	2.01	2.92	3.81%
All	10.10	16.30	4.90%	7.50	10.51	3.43%	5.97	9.24	4.46%
	Chongqing Zhixiashi			Original Chongqing Shi			Chengdu Shi		
	2000	2010	Change	2000	2010	Change	2000	2010	Change
Urbanization rate (%)									
qu	63.67	69.50	5.83	78.67	75.07	−3.60	91.45	85.18	−6.27
Non-*qu*	18.83	35.42	16.59	25.67	42.71	17.04	29.69	44.04	14.35
All	33.10	56.50	23.40	47.29	65.52	18.23	53.74	65.77	12.03

Source: Population Censuses, 2000 and 2010.

The official statistics indicate that, in 2000, the urban population of Chongqing Shi was 7.50 million (according to the Original definition) and 10.10 million (according to the New definition, i.e., the Chongqing Zhixiashi). In contrast, there were about 5.97 million people living in urban areas in Chengdu Shi in 2000. Between 2000 and 2010, the sizes of the urban population of the two cities grew rapidly. For Chongqing Shi, the annualized growth rates were about 3.43% (Original definition) and about 4.90% (New definition) whereas that for Chengdu Shi was about 4.46%. By 2010, the urban populations in Chongqing Shi (according to the Original definition) was 10.51 million and that in Chongqing Shi (according to the New definition) was 16.30 million. For Chengdu Shi, the urban population was 9.24 million in 2010. In other words, according to the official statistics, Chongqing Shi (under both the Original and the New definitions) had a larger urban population than Chengdu Shi had in both census years.

However, in terms of urbanization rate, Chengdu Shi was relatively more urbanized than Chongqing Shi in both years: In 2000, the urban population in Chengdu Shi constituted about 53.74% of the total population, whereas the corresponding figures in Chongqing Shi were 47.29% (according to the Original definition) and 33.10% (according to the New definition). In 2010, the urbanization rate of Chengdu Shi increased to 65.77% while those in Chongqing Shi increased to 65.52% (Original definition) and 56.50% (New definition). The increase in Chongqing Shi's urbanization rate was more spectacular in non-*qu*: The urbanization rate of non-*qu* of Chongqing Shi grew from 25.67% to 42.71% (according to the Original definition) and from 18.83% to 35.42% (according to the New definition). This pattern is due to the large reduction in total population in non-*qu*. Furthermore, the urbanization rates in the *qu* of Chengdu Shi and Chongqing Shi (Original definition) actually dropped between 2000 and 2010. In particular, for Chengdu Shi, the *qu* were highly urbanized at 91.45% in 2000 but the urbanization rate dropped to 85.18% in 2010.

What do we learn from examining the urban population statistics estimated by the National Bureau of Statistics?

To summarize, the above discussion highlights the potential problem of using official urban population statistics, especially at a disaggregate level, to study urbanization issues, that is, the official urban population statistics can generate some urbanization patterns which can hardly be explained. Overall, both Chongqing Zhixiashi and Chengdu Shi became more urbanized between 2000 and 2010, which looked reasonable. But when we examine the more detailed urban population statistics at *xianji* level, in both Chongqing Zhixiashi and Chengdu Shi, the official statistics suggest that the urbanization rates of some *xian* reduced between 2000 and 2010.

There are at least two possibilities for the observed reductions in urbanization rates for some of the *xian*. First, those *xian* indeed became less urbanized. However, to the best of our knowledge, currently there are no studies (neither in the academia nor in the popular press) examining the "de-urbanization" of Chongqing Zhixiashi and Chengdu Shi. Second, the official population statistics published in the 2000 and 2010 Population Censuses were not directly comparable. For example, using the 2000 definition of "urban population," the urban population in 2010 could have been higher; on the other hand, using the 2010 definition of "urban population," the urban population in 2000 could have been lower. We believe that the second possibility is more likely the reason why we observe the de-urbanization of some *xian* in Chongqing Zhixiashi and Chengdu Shi. To overcome this problem, we propose to use our preferred method, the *e-Geopolis* approach, to calculate urban population statistics.

4.4.2. Challenges of using *e-Geopolis* in the Chinese context

As explained in Chapter 2, *e-Geopolis* uses a standardized way to estimate urban population, and in principle this method can be used in different countries to obtain comparable urban population statistics. However, in practice, the application of *e-Geoplis* to estimate urban population in China is not straightforward.

In our analysis, we use the *xiangji* level population statistics to compute the *e-Geopolis* urban population statistics. One of the challenges we encounter is that there were many changes in the number of *xiangji* divisions and the compositions of *xiang*, *zhen*, and *jiedao* over time. In both Sichuan Sheng and Chongqing Zhixiashi, there were fewer *xiang* in 2010 than in 2000. In Sichuan Sheng, there were more *zhen* and *jiedao* whereas in Chongqing Zhixiashi, there were fewer *zhen* but more *jiedao*.

The changes in the *xiangji* divisions during this period can be classified into different types.

First, some divisions in 2000 were converted to another type of *xiangji* divisons. Most of these conversions were from *xiang* to *zhen* or *jiedao*, or from *zhen* to *jiedao*. For example, in 2009, Qin Jia Gang Zhen (覃家岗镇) of Shapingba Qu of Chongqing Shi was converted to Qin Jia Gang Jie Dao (覃家岗街道).[42]

Second, some divisions in 2000 were renamed. For example, according to Chongqing Government Document No. 193 (2004), Tang Jia Tuo Jie Dao (唐家沱街道) in Jiangbei Qu of Chongqing Shi was renamed as Tie Shan Ping Jie Dao (铁山坪街道) in 2004.[43]

Third, some divisions in 2000 were cancelled and was merged into existing divisions. For example, according to Chongqing Government Document No. 178 (2005), Feng Yi Xiang (凤

[42]Source: *http://www.cqqjg.gov.cn/about/about.asp*.
[43]Source: *http://govinfo.nlc.gov.cn/cqfz/xxgk/cqi/201104/t20110412_584740.shtml?classid=456*.

仪乡) in Wangzhou Qu of Chongqing Shi was cancelled and was merged into Heng He Tu Jia Zu Xiang (恒合土家族乡) in 2005.[44]

Fourth, some divisions in 2000 were merged to form new divisions. For example, according to Chongqing Government Document No. 161 (2003), Qi Qiao Zhen (七桥镇) and Ping Jin Zhen (屏锦镇) of Chongqing Shi were cancelled in 2003. Then a new division Ping Jin Zhen (屏锦镇) was created to administer the areas under Qi Qiao Zhen and the original Ping Jin Zhen.[45]

These different scenarios complicate the estimation of urban population in *e-Geopolis*. In China, the *xiangji* divisions are the basic administrative units used in the estimation of urban population statistics under *e-Geopolis*. When there are changes in the names and/or the administrative boundaries of these *xiangji* divisions, we need to check carefully these changes in order to link the 2000 and the 2010 *xiangji* divisions.

The first type of changes was relatively easy to detect since the geographical names of these divisions were the same.

For the second type of changes, we need to trace manually the name changes in order to link together the same division under two different names in the 2000 and 2010 Population Censuses.

For the third and fourth types of changes, manual check was also needed. In the example of the third type, the official population statistics from the 2010 Population Census for Heng He Tu Jia Zu Xiang should have included the population of the cancelled Feng Yi Xiang. Similarly, in the example of the fourth type, the official population statistics from the 2010 Population Census for the new Ping Jin Zhen should have included the population of Qi Qiao Zhen and the original Ping Jin Zhen. The changes of these two types required extra attention.

As shown in the above examples, many of these changes were promulgated through government documents which can in general be found in the internet. However, there are cases in which online government documents cannot be located. In such cases, we have to rely on other unofficial internet resources (such as Baidu.com, the popular search engine in China) to trace the changes.

Given the complexity of the changes in *xiangji* divisions and the time required for a thorough manual check for the consistency of the official population statistics from the Population Censuses 2000 and 2010, we will not attempt to present complete *e-Geopolis* urban population statistics for the entire Sichuan Sheng and Chongqing Shi in years 2000 and 2010 in this thesis. Instead, we will mainly focus on the larger agglomerations (with population above 200,000 in-

[44]Source: *http://govinfo.nlc.gov.cn/cqfz/xxgk/cqi/201104/t20110412_584034.shtml?classid=456*.

[45]Source: *http://law.people.com.cn/showdetail.action?id=2614274*.

habitants as of 2010) in Sichuan Sheng and Chongqing Shi. We will also do a more elaborated comparison of the Chongqing agglomeration and the Chengdu agglomeration to illustrate how the *e-Geopolis* method is used in the Chinese context.

4.5. The urbanization of Sichuan and Chongqing, 2000-2010

In this section, we will present our main analysis of the urban population statistics estimated by *e-Geopolis*. First, we will give an overview about the urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi (i.e., the Chongqing Shi with the official administrative boundary after its promotion in 1997).

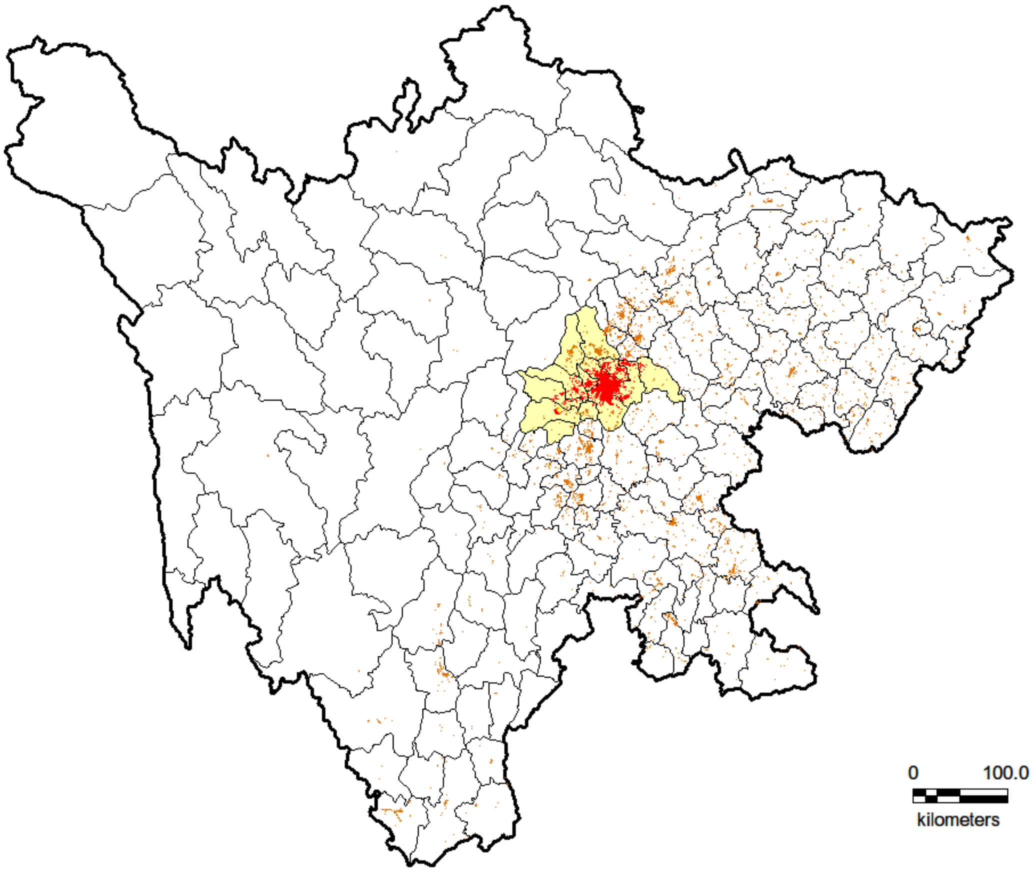
We will then focus on those agglomerations in Sichuan Sheng and Chongqing Zhixiashi with populations of at least 200,000 inhabitants as of 2010. Our analysis consists of several comparisons. We will compare the urban populations of these agglomerations estimated by *e-Geopolis* and those obtained from official statistics published by the National Bureau of Statistics. The purpose of this comparison is to show the possible differences between the *e-Geopolis* urban population and the official statistics. Since the official statistics have been used extensively by researchers and policy makers, if the two sets of statistics display substantial differences, then we may need to take extra care in interpreting the results of the urbanization studies based on the official statistics. We will then compare the urban agglomerations of Chongqing (which covers part of the *qu* of the Chongqing Zhixiashi) and Chengdu, which were the two largest urban agglomerations. We will also compare these two agglomerations with the largest urban agglomerations of the world. Finally, we will use the urban population statistics estimated by *e-Geopolis* to examine the relationship between urbanization, economic development, and migration.

4.5.1. Urban agglomerations in Sichuan Sheng

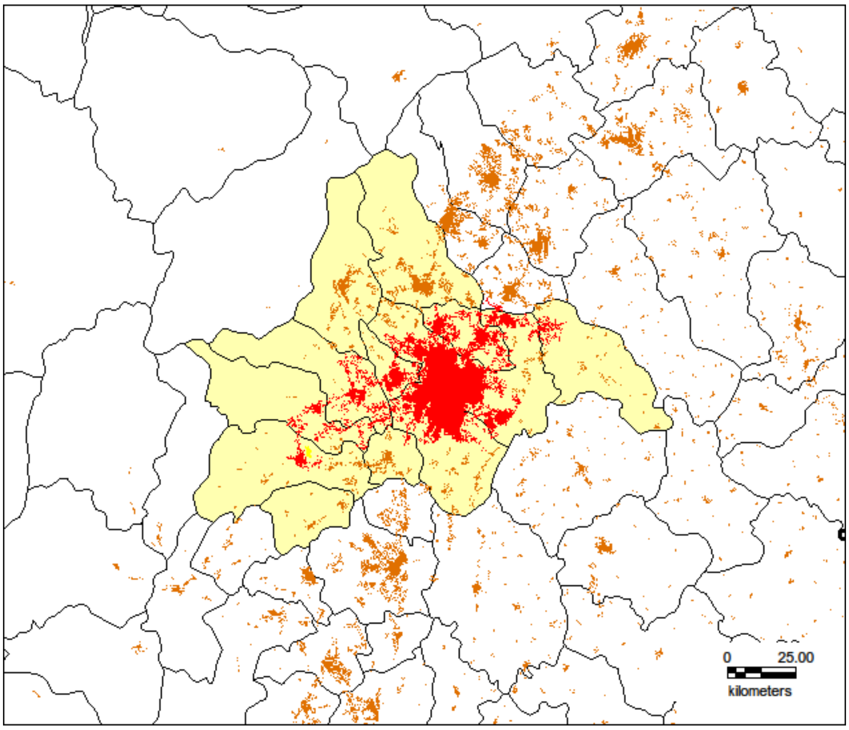
Locations of the urban agglomerations

The map in Panel (a) of Figure 4.19 shows the urban agglomerations of Sichuan Sheng as of 2010, based on the estimation of *e-Geopolis*. The urban agglomerations around Chengdu Shi can be seen more clearly in Panel (b) of Figure 4.19. In both maps, the official administrative boundary of Chengdu Shi, the provincial capital of Sichuan Sheng, is indicated by the yellow regions. These two maps show that the urban agglomerations of Sichuan Sheng were mostly concentrated within the administrative boundary of Chengdu Shi and the eastern parts of the province, where these areas were close to Chongqing Shi. On the other hand, there were almost no urban agglomerations in the western part of the province, which should be expected because of the mountainous landscape of the region.

Figure 4.19: Urban agglomerations of Sichuan Sheng, 2010



(a) All agglomerations



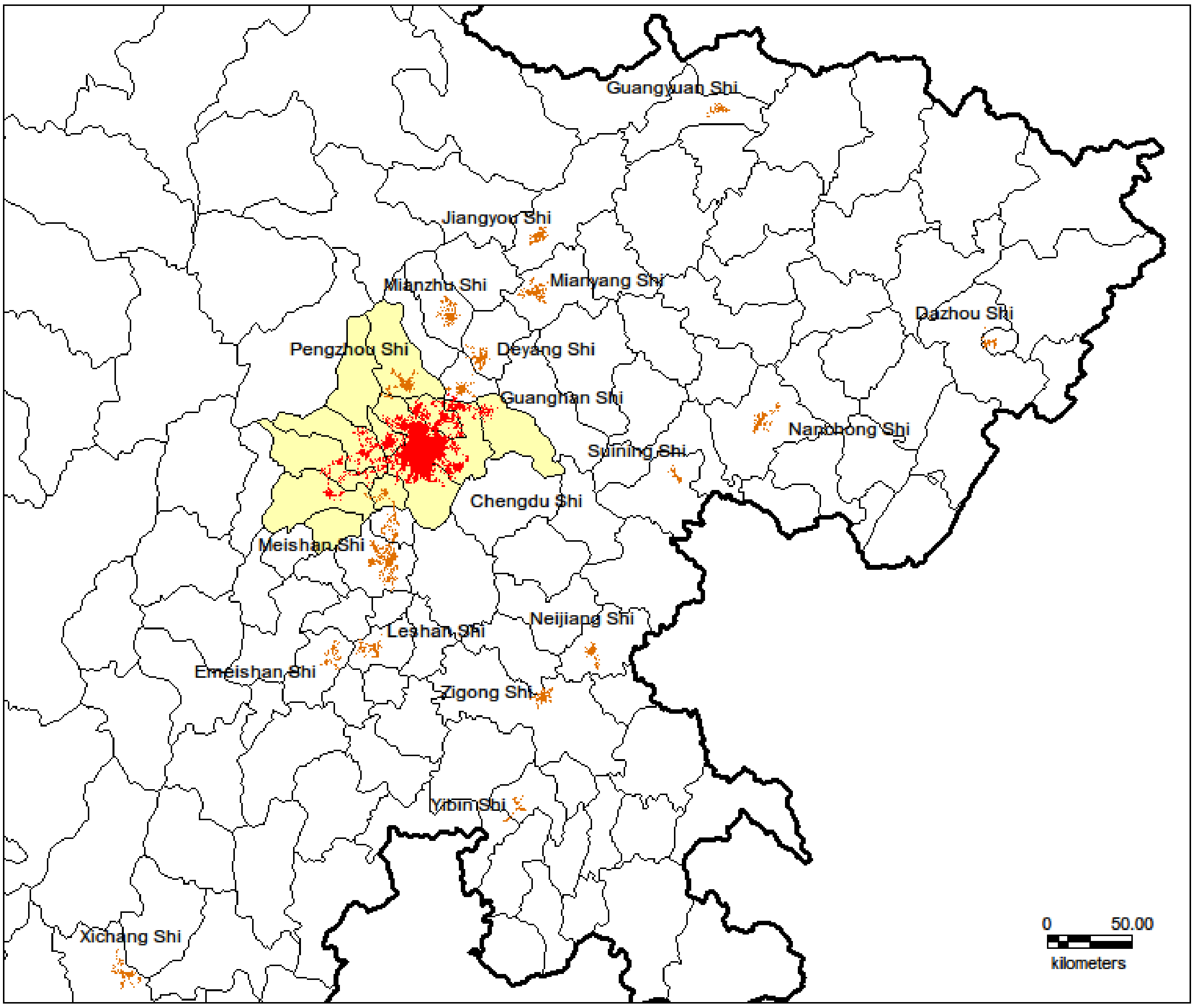
(b) Agglomerations around Chengdu Shi

Note: The official administrative boundary of Chengdu Shi is indicated by the yellow regions.
Source: *e-Geopolis*.

Urban populations of the larger agglomerations in Sichuan Sheng

Note that the maps in Figure 4.19 only show the area of each agglomeration but do not provide any information about its population. Using *e-Geopolis* and the data from the 2010 Population Census, we identify 18 agglomerations in Sichuan Sheng with populations over 200,000 inhabitants in 2010. The locations of these agglomerations are shown in Figure 4.20. Again, in this map, the official administrative boundary of Chengdu Shi is indicated by the yellow regions.

Figure 4.20: 18 urban agglomerations (with population over 200,000) of Sichuan Sheng, 2010



Note: The names of the agglomerations are inserted next to the respective agglomerations. The official administrative boundary Chengdu Shi is indicated by the yellow regions.
Source: *e-Geopolis*.

This map shows that two urban agglomerations, namely Chengdu Shi and Pengzhou Shi, were located within the official administrative boundary of Chengdu Shi. Many of the other agglomerations were close to the official Chengdu Shi, such as the agglomerations of Meishan

Shi, Mianzhu Shi, Guanghan Shi, and Deyang Shi. The rest of the agglomerations scattered around the eastern and southeastern parts of Sichuan Sheng.

In Table 4.19, we list these 18 agglomerations together with two sets of urban population statistics in 2000 and 2010. The first set of statistics is estimated by *e-Geopolis*, and the second set is the corresponding official population statistics obtained from the 2000 and 2010 Population Censuses. As explained earlier, due to the complexity of the changes in the *xiangji* divisions between 2000 and 2010, the population statistics in 2010 estimated by *e-Geopolis* are provisional and are subject to revisions.

Table 4.19: Urban population of Sichuan Sheng: *e-Geopolis* versus official statistics

	e-Geopolis			Official statistics		
	2000	2010*	Annualized growth	2000	2010	Annualized growth
Chengdu Shi	7,033,115	9,730,000	3.30%	5,967,819	9,237,015	4.47%
Meishan Shi	940,924	905,000	−0.39%	602,180	975,556	4.94%
Mianyang Shi	645,542	750,000	1.51%	1,684,709	1,838,667	0.88%
Zigong Shi	522,882	630,000	1.88%	860,349	1,098,902	2.48%
Yibin Shi	533,945	550,000	0.30%	1,202,136	1,500,544	2.24%
Dazhou Shi	362,397	450,000	2.19%	895,104	1,788,418	7.17%
Leshan Shi	376,363	440,000	1.57%	865,753	1,277,315	3.97%
Xichang Shi	379,751	440,000	1.48%	245,848	466,732	6.62%
Deyang Shi	388,818	425,000	0.89%	1,202,464	1,493,992	2.19%
Pengzhou Shi	401,552	397,000	−0.11%	245,869	263,199	0.68%
Neijiang Shi	437,887	395,000	−1.03%	1,189,181	1,401,041	1.65%
Guanghan Shi	332,463	340,000	0.22%	222,043	235,872	0.61%
Nanchong Shi	300,341	330,000	0.95%	1,402,881	2,254,665	4.86%
Suining Shi	335,023	320,000	−0.46%	892,445	1,199,558	3.00%
Emeishan Shi	292,571	300,000	0.25%	128,874	220,349	5.51%
Guangyuan Shi	256,503	285,000	1.06%	735,489	819,206	1.08%
Jiangyou Shi	315,957	285,000	−1.03%	366,716	312,154	−1.60%
Mianzhu Shi	241,751	205,000	−1.64%	168,713	192,001	1.30%

Note: * – Estimate.
Source: *e-Geopolis* and 2000 and 2010 Population Censuses.

Among the 18 agglomerations in the table, 6 of them are *xianjishi* (located within other *dijishi*) and the other 12 are *dijishi*. The *xianjishi* include Xichang Shi (in Liangshan Yizu Zizhizhou), Pengzhou Shi (in Chengdu Shi), Guanghan Shi (in Deyang Shi), Emeishan Shi (in Leshan Shi), Jiangyou Shi (in Mianyang Shi), and Mianzhu Shi (in Deyang Shi).

Based on the estimates of *e-Geopolis*, Chengdu agglomeration had the largest population, with population increasing from 7.03 million in 2000 to 9.73 million in 2010 or an annualized growth rate of 3.30%. Its growth rate was the highest among these urban agglomerations. The other agglomerations in Sichuan Sheng were much smaller than Chengdu agglomeration. The second largest urban agglomeration in 2010 was Meishan. It had a population of about

905,000, which was less than 10% of that of Chengdu agglomeration. In other words, the primacy index (obtained by dividing the population of the largest agglomeration by that of the second largest population) was 10.75. In fact, Meishan agglomeration was also the second largest agglomeration in 2000 with a population of about 940,000. The implied primacy index in 2000 was 7.47.

As for the changes in the populations of these agglomerations, 12 out of the 18 agglomerations had larger populations between 2000 and 2010. The agglomeration with the highest annualized growth rate was Chengdu agglomeration. On the other hand, 6 agglomerations registered a reduction in population between 2000 and 2010. These agglomerations were Meishan, Pengzhou, Neijiang, Suining, Jiangyou, and Mianzhu. Apart from Meishan agglomeration (the second largest agglomeration), the others were smaller agglomerations. In fact, many of the smaller agglomerations had very small or even negative population growth rates.

These estimates indicate that the populations of some of the medium-sized agglomerations (with 200,000 to 1,000,000 inhabitants) reduced while the Chengdu agglomeration reinforced its primacy. This phenomenon can be explained by the fact that Chengdu is the capital of Sichuan Sheng, one of the biggest and most populated provinces in China.

These 18 agglomerations together had a population of about 17.18 million in 2010, which was about 21.35% of the total population in Sichuan Sheng. In 2000, the total population of these agglomerations was about 14.10 million and was about 16.93% of the total population in Sichuan Sheng. Therefore, these urban agglomerations accounted for a larger share of the total population during this 10-year period.

Comparing the *e-Geopolis* and the official urban population statistics

In Table 4.19, we also show the official urban population estimated by the National Bureau of Statistics. Note that the geographical boundaries of the *e-Geopolis* agglomerations do not necessarily overlap with the official administrative boundaries of the corresponding cities. A comparison of the urban population statistics estimated by *e-Geopolis* and the official statistics from the population censuses shows a number of differences. In 2010, apart from the two largest agglomerations where the two sets of statistics were similar, the statistics for the other agglomerations were substantially different.

In general, the official statistics tend to over-estimate the actual urban population, sometimes by a huge margin. For example, according to *e-Geopolis*, the population of Nanchong Shi in 2010 was about 330,000; but its urban population according to the 2010 Population Census was over 2.2 million or almost seven times larger. On the other hand, there are other cases where the *e-Geopolis* urban populations are larger. For instance, in 2010, the *e-Geopolis* urban populations for Emeishan Shi and Mianzhu Shi were 300,000 and 205,000 respectively whereas the official urban populations for these two cities were 220,349 and 192,001 respectively.

Besides, the official statistics tend to over-estimate the population growth of these urban agglomerations. According to *e-Geopolis*, 6 out of 18 of the agglomerations registered a reduction in population between 2000 and 2010. On the other hand, according to official statistics, only one city (Jiangyou Shi) had a smaller urban population during the period. The difference was the largest for the case of Meishan Shi: According to *e-Geopolis*, the annualized growth rate of its population was -0.39% while according to the official statistics, the annualized growth rate was 4.94%.

Note that in some cases, the overestimation of the official urban population is inevitable. Consider the case of Deyang Shi. It is a *dijishi* and its official population statistics include those of Guanghan Shi and Mianzhu Shi, which are two *xianjishi* within Deyang Shi. However, under *e-Geopolis*, Deyang, Guanghan, and Mianzhu are considered as three separate urban agglomerations. Therefore, it is very likely that, by construction, the official urban population of Deyang Shi is larger than the *e-Geopolis* population of Deyang agglomeration.

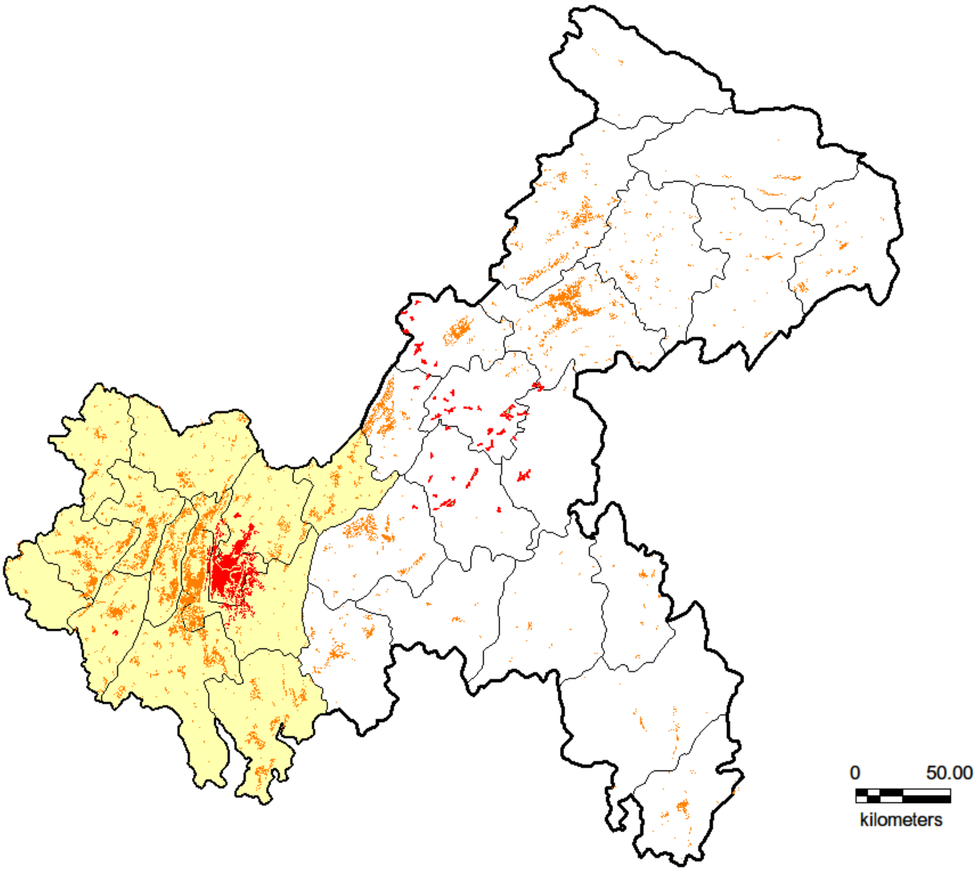
Overall, the smaller cities of Sichuan Sheng display different urbanization patterns: Some of them grew bigger while some others reduced in size between 2000 and 2010; but in any case, the sizes of these smaller cities were in no way close to the biggest city of the province, Chengdu Shi.

4.5.2. Urban agglomerations in Chongqing Zhixiashi

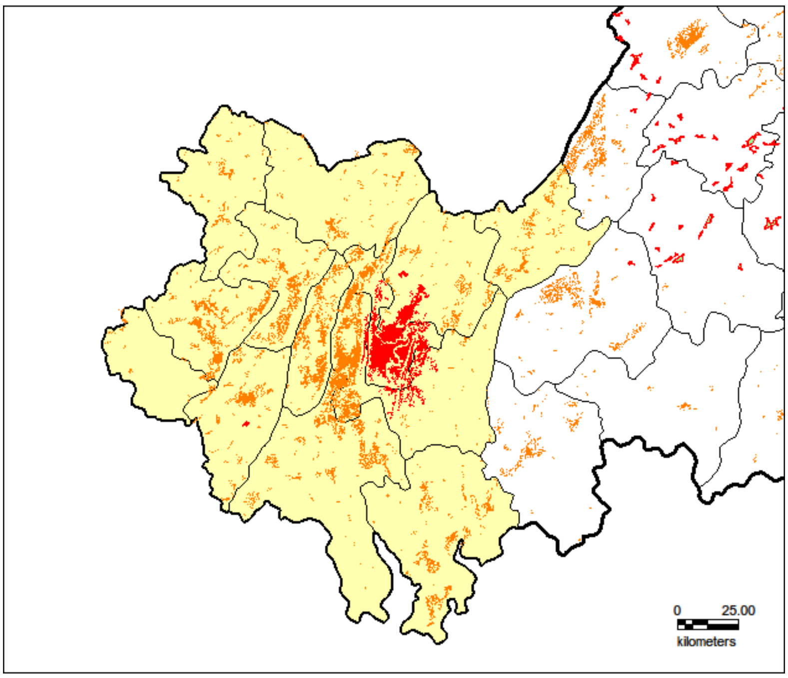
Locations of the urban agglomerations

We apply the same methodology of *e-Geopolis* to identify the urban agglomerations in Chongqing Zhixiashi and estimate their populations. Panel (a) of Figure 4.21 is a map showing the urban agglomerations of Chongqing Zhixiashi as of 2010. In Panel (b), we show the urban agglomerations within the "Old" Chongqing Shi (i.e., the administrative boundary of the Chongqing Shi before it was promoted in 1997) more clearly. In these two maps, the yellow regions indicate the "Old" Chongqing Shi. These two maps show that the urban agglomerations of Chongqing Zhixiashi are concentrated within the administrative boundary of the "Old" Chongqing Shi; nevertheless, some other agglomerations can also be found in the northeastern part of Chongqing Zhixiashi.

Figure 4.21: Urban agglomerations of Chongqing Zhixiashi, 2010



(a) All agglomerations



(b) Agglomerations around "Old" Chongqing Shi

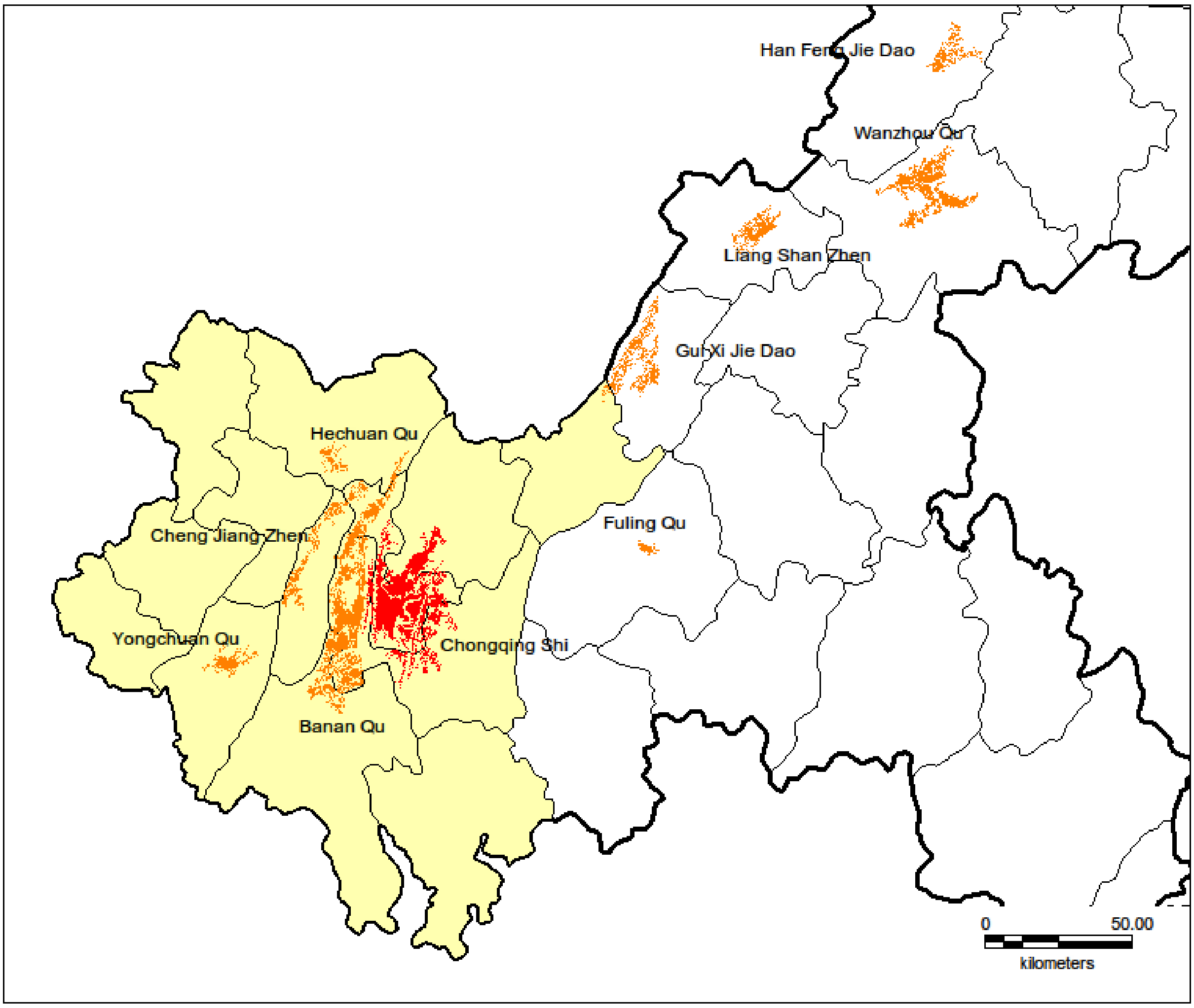
Note: The "Old" Chongqing Shi is indicated by the yellow regions.

Source: *e-Geopolis*.

Urban population of the larger agglomerations in Chongqing Zhixiashi

Again, the maps in Figure 4.21 do not provide information about the population of each urban agglomeration. Based on *e-Geopolis* and the data from the 2010 Population Census, we identify 10 urban agglomerations in Chongqing Zhixiashi, each of which had a population over 200,000 inhabitants in 2010. The locations of these agglomerations are shown in Figure 4.22. From this map, we can see that there were five urban agglomerations within the "Old" Chongqing Shi, including the agglomerations of Chongqing, Banan, Yongchuan, Hechuan, and Cheng Jiang.

Figure 4.22: 10 urban agglomerations (with population over 200,000) of Chongqing Zhixiashi, 2010



Note: The names of the agglomerations are inserted next to the respective agglomerations. The "Old" Chongqing Shi is indicated by the yellow regions.

Source: *e-Geopolis*.

By now, it should be clear that the "Chongqing Shi" agglomeration is different from

Chongqing Zhixiashi or the "Old" Chongqing Shi (the Chongqing Shi before its promotion). The Chongqing agglomeration identified by *e-Geopolis* covered a substantial part of the *qu* of the official Chongqing Zhixiashi. Besides, Banan Qu, Yongchuan Qu, and Hechuan Qu were the *qu* of Chongqing Zhixiashi while Cheng Jiang Zhen was a *xiangji* division within Beibei Qu of Chongqing Zhixiashi. Note that two other agglomerations were *qu* of Chongqing Zhixiashi (namely Fuling Qu and Wanzhou Qu). However, these two agglomerations were outside the "Old" Chongqing Shi.

Table 4.20 lists these 10 urban agglomerations and their corresponding populations, based on *e-Geopolis* estimation and official statistics. Note again that the *e-Geopolis* estimates of 2010 are provisional and are subject to revision.

Table 4.20: Urban population of Chongqing Zhixiashi: *e-Geopolis* versus official statistics

	e-Geopolis			Official statistics		
	2000	2010*	Annualized growth	2000	2010	Annualized growth
Chongqing Shi	4,150,367	5,025,000	1.93%	10,095,512	15,295,803	4.24%
Banan Qu	1,028,448	1,075,000	0.44%	440,538	669,269	4.27%
Wanzhou Qu	726,230	690,000	−0.51%	574,033	859,662	4.12%
Yongchuan Qu	342,643	355,000	0.35%	362,379	582,769	4.87%
Gui Xi Jie Dao**	429,877	350,000	−2.03%	112,336	63,096	−5.61%
Liang Shan Zhen**	343,444	280,000	−2.02%	89,029	94,062	0.55%
Han Feng Jie Dao**	328,400	270,000	−1.94%	92,054	85,107	−0.78%
Fuling Qu	275,247	260,000	−0.57%	425,807	595,224	3.41%
Hechuan Qu	275,944	250,000	−0.98%	461,985	721,753	4.56%
Cheng Jiang Zhen**	254,183	245,000	−0.37%	38,974	28,056	−3.23%

Note: * – Estimate; ** – Official urban population statistics are not available; the official statistics for these agglomerations refer to total population.
Source: *e-Geopolis* and 2000 and 2010 Population Censuses.

As mentioned above, Banan Qu, Wanzhou Qu, Yongchuan Qu, Fuling Qu, and Hechuan Qu are *qu* of Chongqing Zhixiashi, Gui Xi Jie Dao is within Dianjiang Xian, Liang Shan Zhen is within Liangping Xian, Han Feng Jie Dao is within Kai Xian, and Cheng Jiang Zhen is within Beibei Qu of Chongqing Zhixiashi. Since the official urban population statistics are not available at the *xiangji* level, the official statistics for Gui Xi Jie Dao, Liang Shan Zhen, Han Feng Jie Dao, and Cheng Jiang Zhen refer to the total population.

According to the estimates of *e-Geopolis*, the largest urban agglomeration in 2010 was Chongqing agglomeration. It had a population of over 5.03 million in 2010, an increase from 4.15 million in 2000. This increase is equivalent to an annualized growth rate of about 1.93%. The second largest agglomeration in 2010 was Banan agglomeration, with a population of about 1.08 million. In 2000, this agglomeration had a population of about 1.03 million. In other words, the population of this agglomeration increased at an annualized growth rate of just 0.44% between 2000 and 2010, which was much lower than that of the Chongqing agglomeration.

The primacy index for Chongqing agglomeration in 2010 was 4.67 while that in 2000 was 4.04. In other words, there was a slight increase in the primacy index during this 10-year period. The other agglomerations were relatively smaller in sizes, having populations in 2010 ranging from about 690,000 (for Wanzhou agglomeration) to 245,000 (for Cheng Jiang agglomeration).

Among these agglomerations, Wanzhou, Gui Xi, Liang Shan, Han Feng, Fuling, Hechuan, and Cheng Jiang had reduced populations between 2000 and 2010. The largest reduction, in terms of annualized growth rate, was Gui Xi. Its population reduced from 429,877 in 2000 to 350,000 in 2010.

Therefore, in Chongqing Zhixiashi, the largest agglomeration (Chongqing) gained population whereas many of the other smaller agglomerations had reduced populations between 2000 and 2010. Recall that Chongqing agglomeration was located inside the administrative boundary of the "Old" Chongqing Shi, the phenomenon that Chongqing agglomeration reinforced its primacy can be explained by the fact that the "Old" Chongqing Shi remained the most important region of Chongqing Zhixiashi after its promotion.

Overall, these 10 agglomerations had about 8.80 million population in 2010, representing about 30% of the total population of the entire Chongqing Zhixiashi. In 2000, there were roughly 8.15 million people living in these agglomerations, representing about 26.7% of the total population of the entire Chongqing Zhixiashi. Note that among these 10 agglomerations, only 3 of them (Chongqing agglomeration, Banan agglomeration, and Yongchuan agglomeration) registered increases in populations, and the populations for the other agglomerations reduced between 2000 and 2010.

Comparing the *e-Geopolis* and the official urban population statistics

We can also compare the populations of Chongqing Shi's agglomerations estimated by *e-Geopolis* and according to the official statistics. The official urban population statistics of Chongqing Shi include the whole official Chongqing Zhixiashi Therefore, the official statistics inevitably over-estimate the population of the agglomeration of Chongqing Shi. If we focus on the "Old" Chongqing Shi, we find that its urban populations based on official statistics were about 7.50 million in 2000 and 10.51 million in 2010. Even these figures were still much larger than those of the agglomeration populations estimated by *e-Geopolis*.

The difference between the *e-Geopolis* and official urban population statistics for "Chongqing" is particularly obvious. The official urban population statistics only consider their administrative boundaries of "cities" whereas the *e-Geopolis* urban population statistics consider "agglomerations" under a harmonized definition. In the case of Chongqing Zhixiashi, its administrative boundary covers not only the "Old" Chongqing but also other regions that were previously under Sichuan Sheng. Therefore, the urban population in all these different regions would be counted towards the urban population of Chongqing in official statistical publications. On the other hand, the *e-Geopolis* urban population of Chongqing agglomeration only covers part of the "Old" Chongqing. Therefore, the analysis of urbanization based on official urban population statistics is limited by the administrative boundaries of "cities," whereas using *e-Geopolis* urban population statistics allows us to understand more accurately the extent of urbanization of "agglomerations."

As for the other agglomerations, the official statistics sometimes over-estimated the urban population while sometimes underestimated. For example, the official urban population for Banan Qu in 2010 was 669,269, which was much smaller than its *e-Geopolis* urban population (about 1.08 million). This case is possible because morphological agglomeration includes the administrative boundaries and built-up areas which are located outside the administrative Banan Qu. In contrast, the official urban populations for Fuling Qu and Hechuan Qu in 2010 were 595,224 and 721,753 respectively whereas the corresponding *e-Geopolis* urban populations were merely 260,000 and 250,000 respectively.

Between 2000 and 2010, 7 out of the 10 agglomerations had reductions in urban populations according to the *e-Geopolis* estimates, including Wanzhou, Gui Xi, Liang Shan, Han Feng, Fuling, Hechuan, and Cheng Jiang. If we focus on the agglomerations where both *e-Geopolis* and official urban population statistics were available, we still observed that the official statistics over-estimated the population growth rates, sometimes by a huge margin.

4.5.3. Comparing the Chengdu and Chongqing agglomerations

After presenting the general urbanization patterns in Sichuan Sheng and Chongqing Zhixiashi and comparing the *e-Geopolis* and official urban population statistics, we now compare the two major urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi, the Chengdu and Chongqing agglomerations.

Chengdu agglomeration versus Chongqing agglomeration

In Table 4.21, we compare the land areas, populations, and population densities (as of 2010) of the agglomerations of Chengdu and Chongqing.

Table 4.21: Chengdu agglomeration versus Chongqing agglomeration

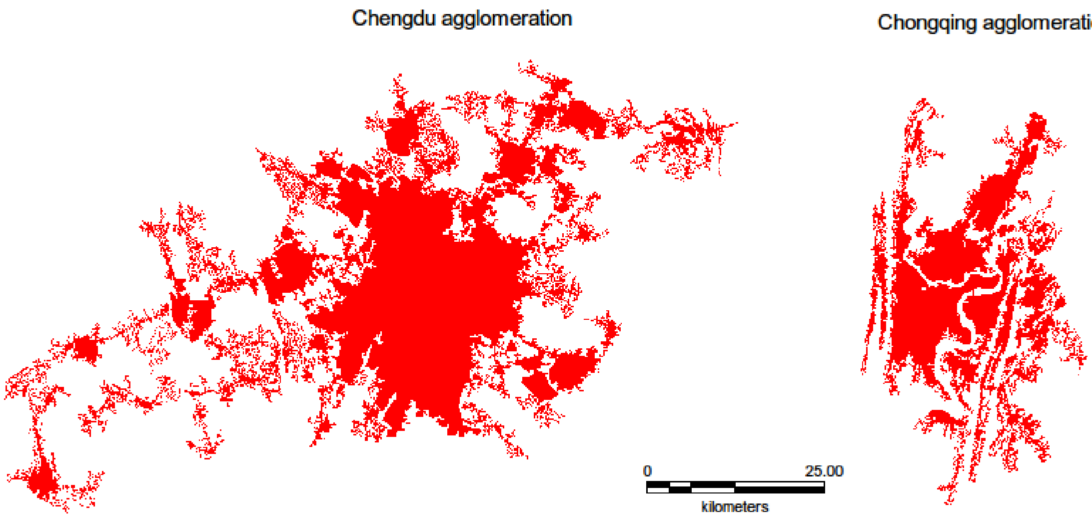
	Area	Population			Density (Person/Sq. Km)
	(Sq. Km)	2000	2010*	Ann. growth	(2010)
Chengdu	1,411.25	7,033,115	9,730,000	3.30%	6,894.60
Chongqing	538.55	4,150,367	5,025,000	1.93%	9,330.61

Note: * – Estimate.
Source: *e-Geopolis* and 2000 and 2010 Population Censuses.

From this table we can see that the total area of Chengdu agglomeration was almost 3 times larger than that of Chongqing agglomeration: Chengdu agglomeration occupied a land area of about 1,411.25 square kilometre while Chongqing agglomeration occupied a land area of about 538.55 square kilometre. Moreover, Chengdu agglomeration also had more inhabitants than that of Chongqing agglomeration and a higher population growth between 2000 and 2010. In terms of the growth of the agglomeration population, the population of Chongqing agglomeration grew from about 4.15 million to 5.03 million with an annualized growth rate of about 1.93% while the population of Chengdu agglomeration grew from about 7.03 million to 9.73 million with an annualized growth rate of about 3.30%. However, the population density of Chongqing agglomeration in 2010 was over 30% higher than that of Chengdu agglomeration: The population density of Chongqing agglomeration in 2010 was about 9,330 inhabitants per square kilometre while that of Chengdu agglomeration in 2010 was just about 6,894 inhabitants per square kilometre. The map in Figure 4.23 shows these two agglomerations side-by-side using the same scale. These two maps show that the sprawl of the Chengdu agglomeration was much obvious than that of the Chongqing agglomeration. While the two agglomerations have similar "heights," the Chengdu agglomeration had more than double the "width" of that of the Chongqing agglomeration.

Recall from Figure 4.22 (on page 209) that many urban agglomerations of Chongqing Zhixiashi were located within the administrative boundary of the "Old" Chongqing Shi. Therefore, the agglomeration area of Chongqing Shi was smaller partly because some of the *qu* within the "Old" Chongqing Shi administrative boundary were themselves urban agglomerations under the *e-Geopolis* definition. In other words, in Chengdu Shi the urban population was more concentrated within two large urban agglomerations whereas in Chongqing Zhixiashi, the urban population was distributed among several large urban agglomerations, mainly within the "Old" Chongqing Shi administrative boundary.

Figure 4.23: Chengdu and Chongqing agglomerations on a map with the same scale



Source: *e-Geopolis*.

From Tables 4.19 (on page 205) and 4.20 (on page 210) we can see that in Sichuan Sheng, apart from the Chengdu agglomeration, there was only one other large urban agglomeration within the jurisdiction of the official Chengdu Shi (i.e., the Pengzhou Shi agglomeration). On the other hand, in Chongqing Zhixiashi, apart from the Chongqing agglomeration, there were four other large agglomerations within the jurisdiction of the "Old" Chongqing Shi, including the agglomerations of Banan Qu, Yongchuan Qu, Hechuan Qu, and Cheng Jiang Zhen (which was within Beibei Qu). While these latter agglomerations were officially within the "Old" Chongqing Shi, they were considered as separate agglomerations under the *e-Geopolis* definition. In other words, the urban agglomerations of Chongqing Shi were not as concentrated as the urban agglomerations in Chengdu Shi. According to the estimation of *e-Geopolis*, the areas of the agglomerations of Banan Qu, Yongchuan Qu, Hechuan Qu, and Cheng Jiang Zhen were respectively 413.92 square kilometre, 49.82 square kilometre, 28.81 square kilometre, and 91.35 square kilometre, respectively. The populations of these agglomerations are 1,075,000, 355,000, 250,000, and 245,000 respectively. If we include these agglomerations in the Chongqing agglomeration, the combined area would have been 1,122.45 square kilometre and the combined population would have been about 6.96 million. This combined agglomeration would not be much smaller than that of the Chengdu agglomeration.

Although we have not generated any urban population forecasts, it is reasonable to expect that the urban agglomerations of Chongqing Shi and Chengdu Shi will continue to grow in the future. Specifically, the current urban agglomerations within the *qu* of Chongqing Shi are likely to merge to form a larger agglomeration, and by that time, the land area of the Chongqing agglomeration should be close to that of Chengdu agglomeration.

Chengdu and Chongqing agglomerations versus other urban agglomerations of the world

How do the agglomerations of Chengdu and Chongqing compare with the other large urban agglomerations of the world? In Table 2.2 we already discussed the 30 most populated urban agglomerations of the world, using *e-Geopolis* estimates. We add Chengdu agglomeration and Chongqing agglomeration to the list, as in Table 4.22. Since all these urban agglomerations listed in this table are identified in a consistent way under *e-Geopolis*, we can compare directly the populations of these different urban agglomerations.

This table shows that Chongqing agglomeration was not very large, in terms of both population and agglomeration area, relative to the other large agglomerations around the world. Therefore, Chongqing agglomeration was still far from being a “megacity.” As discussed earlier, even if we include other *qu* of the “official” Chongqing Shi which were themselves agglomerations according to the *e-Geopolis* definition, the combined agglomeration had a population of about 7.91 million and an agglomeration of about 1,324.91 square kilometre. Again, this combined agglomeration still was not “mega” relative to the other large agglomerations of the world.

On the other hand, the Chengdu agglomeration was just slightly smaller, in terms of population, than the 30th largest agglomeration of the world. Its agglomeration area was smaller than the median size of these agglomerations. If its agglomeration continues to grow, then we can expect that it will soon among the top 30 largest agglomeration of the world in the near future.

4.5.4. Urbanization, economic development, and migration

Having generated some urban population statistics for Sichuan Sheng and Chongqing Zhixiashi using *e-Geopolis*, in this section we employ these urban population statistics to investigate the relationship between urbanization, economic development, and migration.

As discussed in Chapter 1, urbanization is closely related to economic development and migration because when the urban areas are more developed, the rural-urban income inequality becomes wider so that workers from rural areas are attracted to the urban areas, raising the urbanization rate. Many current studies about the urbanization of China in fact also examine

Table 4.22: Chengdu and Chongqing agglomerations versus the 30 most populated urban agglomerations of the world

Rank	Name	Country	Pop. (1,000)	Agglo. area (Sq.km)	Pop. density (Person /Sq.km)	Last source used for the estimates (Year)
	Chengdu	China	9,730	1,411	6,895	2010
	Chongqing	China	5,025	539	9,331	2010
1	**Shanghai**[(1)]	**China**	**94,500**	**22,630**	**4,176**	**2010**
2	**Shenzhen**[(2)]	**China**	**44,409**	**5,321**	**8,346**	**2010**
3	Tokyo[(3)]	Japan	39,800	4,201	9,474	2010
4	New York[(4)]	U.S.	27,764	20,388	1,362	2010
5	Delhi[(5)]	India	23,300	1,411	16,513	2011
6	Jakarta	Indonesia	22,551	2,199	10,255	2010
7	Seoul	Korea	20,500	1,179	17,388	2010
8	Manila	Philippines	20,078	1,092	18,386	2010
9	Karachi	Pakistan	19,589	807	24,274	2010
10	São Paulo	Brazil	18,890	2,008	9,407	2010
11	Mexico City	Mexico	18,050	1,746	10,338	2010
12	Thiruvananthapuram[(6)]	India	17,950	9,033	1,987	2011
13	Kolkata	India	17,200	1,852	9,287	2011
14	**Beijing**	**China**	**16,700**	**2,400**	**6,958**	**2010**
15	Mumbai	India	16,500	465	35,484	2011
16	Cairo	Egypt	15,691	1,328	11,816	2006
17	Dhaka	Bangladesh	15,680	1,077	14,559	2011
18	Los Angeles	U.S.	15,449	7,099	2,176	2010
19	Osaka	Japan	14,500	2,900	5,000	2010
20	Bangkok	Thailand	14,160	3,150	4,495	2010
21	Moscow	Russia	14,009	1,901	7,369	2010
22	Hochiminh[(7)]	Vietnam	13,750	3,000	4,583	2009
23	Istanbul	Turkey	13,460	1,126	11,954	2011
24	Tehran	Iran	12,135	1,917	6,330	2011
25	Rio de Janeiro	Brazil	11,350	1,568	7,239	2010
26	Buenos Aires	Argentina	11,200	2,500	4,480	2010
27	Lagos	Nigeria	10,590	863	12,271	2006
28	Paris	France	10,518	1,867	5,634	2009
29	London	U.K.	10,223	2,190	4,668	2011
30	Lahore	Pakistan	10,000	367	27,248	1998
	Total		610,496	109,585	5,571	2010
	Rest of World Population		6,220,091	135,890,415	46	2010

Note: Total population figures were calculated on July 1, 2010. (1): Include Hangzhou and Nanjing. (2): Include Guangzhou and north of Hong Kong Special Administrative Region. (3): Include Yokohama, Kawasaki and Chiba. (4): Include Philadelphia. (5): Include parts of Utta Pradesh and Haryana. (6): Include a large part of Kerala coast. (7): Include a large part of Mekong delta.
Source: Moriconi-Ebrard and Chatel (2013), using *e-Geopolis*.

similar issues.

Our discussion here aims at illustrating how the *e-Geopolis* urban population statistics may be used to study various urbanization issues. However, we would like to caution the readers that the *e-Geopolis* urban population statistics and the measures of economic development and migration obtained from the National Bureau of Statistics do not cover exactly identical geographical boundaries. For example, for Chengdu Shi, the *e-Geopolis* urban population statistics are estimated for the "Chengdu agglomeration," whereas the measures of economic development and migration from the National Bureau of Statistics cover the official Chengdu Shi, i.e., the city according to its official administrative boundary. In this case, the Chengdu agglomeration has a smaller land area than the official Chengdu Shi, so that the economic indicators and migration measures overestimate the true values for Chengdu agglomeration. On the other hand, in some other cases, the measures of economic development and migration are simply absent. For instance, some *e-Geopolis* agglomerations for Chongqing Zhixiashi are at the *jiedao* level. However, the National Bureau of Statistics does not publish economic development and migration measures at this level.

Unless we have the measures of economic development and migration for the *e-Geopolis* agglomerations, the comparison can only provide a general yet imperfect extent of the relationship between urbanization, economic development, and migration. These limitations should be kept in mind when the results of our analyses are interpreted.

Urbanization and economic development

In this section, we first examine the relationship between urbanization and economic development. In Table 4.23, we show the urban population statistics of the *e-Geopolis* agglomerations in Sichuan Sheng and Chongqing Zhixiashi. For each agglomeration, we show the corresponding GDP, secondary sector GDP and the shares of secondary sector GDP, obtained from Sichuan Statistics Yearbook and Chongqing Statistics Yearbook, respectively. Note that we could have computed the GDP per capita for these agglomerations. Nevertheless, we refrained from doing so because we may not be able to obtain accurate figures for GDP per capita since, as explained above, the geographical boundaries of the *e-Geopolis* urban agglomerations and those used for calculating GDP do not necessarily overlap.

In the table, the *e-Geopolis* agglomerations are listed in descending orders of their respective populations within Sichuan Sheng and Chongqing Zhixiashi (as in Tables 4.19 and 4.20, respectively); the figures for GDP and secondary sector GDP are all expressed in 2010 RMB.

In Sichuan Sheng, the largest agglomeration (Chengdu Shi) also had the largest GDP in 2000 and 2010. The same was true in Chongqing Zhixiashi, where the Chongqing agglomeration had the largest GDP. Note that the economic indicators for Chongqing Shi referred to the whole Chongqing Zhixiashi so that overestimation was inevitable. According to the Chongqing Statistics Yearbook and Sichuan Statistics Yearbook, if we focus on the "Old" Chongqing Shi,

Table 4.23: GDP of urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi, 2000 and 2010

	GDP (Bn RMB)			2nd sector GDP (Bn RMB)			Share of 2nd sector (%)		
	2000	2010	Ann. growth	2000	2010	Ann. growth	2000	2010	Ann. change
Sichuan Sheng									
Chengdu Shi	153.09	516.39	12.93%	53.70	223.03	15.30%	35.08	43.19	0.81
Meishan Shi	15.29	54.70	13.60%	5.32	29.89	18.85%	34.77	54.65	1.99
Mianyang Shi	40.13	96.89	9.22%	16.63	47.66	11.10%	41.44	49.19	0.77
Zigong Shi	18.55	64.83	13.33%	7.96	37.08	16.63%	42.93	57.19	1.43
Yibin Shi	23.42	87.23	14.05%	10.40	51.68	17.39%	44.39	59.25	1.49
Dazhou Shi	23.37	81.93	13.36%	8.20	40.96	17.45%	35.10	50.00	1.49
Leshan Shi	18.18	74.39	15.13%	7.94	44.24	18.74%	43.66	59.48	1.58
Xichang Shi	5.15	22.83	16.05%	1.66	10.38	20.10%	32.26	45.47	1.32
Deyang Shi	32.88	92.90	10.95%	6.35	52.68	23.55%	19.33	56.70	3.74
Pengzhou Shi	7.63	14.92	6.94%	2.66	7.23	10.50%	34.93	48.45	1.35
Neijiang Shi	17.62	69.04	14.63%	6.95	41.96	19.71%	39.42	60.77	2.14
Guanghan Shi	5.87	18.00	11.86%	2.66	10.26	14.44%	45.38	57.01	1.16
Nanchong Shi	22.60	82.78	13.86%	6.35	40.05	20.21%	28.12	48.38	2.03
Suining Shi	14.91	49.63	12.78%	5.08	25.76	17.63%	34.05	51.90	1.78
Emeishan Shi	2.91	11.96	15.16%	1.38	6.99	17.61%	47.39	58.47	1.11
Guangyuan Shi	10.34	32.35	12.08%	2.72	12.95	16.90%	26.27	40.04	9.16
Jiangyou Shi	8.12	17.80	8.17%	3.44	8.62	9.63%	42.34	48.43	0.61
Mianzhu Shi	6.35	11.81	6.40%	3.34	7.13	7.86%	52.63	60.35	0.77
Chongqing Zhixiashi									
Chongqing Shi	187.81	803.25	15.64%	80.03	390.63	17.18%	42.61	48.63	0.60
Banan Qu	5.93	30.87	17.94%	2.47	16.06	20.59%	41.65	52.02	1.04
Wanzhou Qu	8.02	50.01	20.08%	3.86	27.37	21.64%	48.13	54.73	0.66
Yongchuan Qu	6.92	30.00	15.80%	2.48	16.48	20.85%	35.84	54.93	1.91
Gui Xi Jie Dao**									
Liang Shan Zhen**									
Han Feng Jie Dao**									
Fuling Qu	8.57	43.45	17.63%	4.39	25.62	19.29%	51.23	58.96	0.77
Hechuan Qu	9.56	24.45	9.85%	3.48	11.02	12.22%	36.40	45.07	0.87
Cheng Jiang Zhen**									

Note: GDP and secondary sector GDP are converted into constant 2010 RMB. ** – Official economic indicators are not available.
Source: *e-Geopolis*; Population Censuses, 2000 and 2010; Chongqing Statistics Yearbook and Sichuan Statistics Yearbook, 2001 and 2011.

i.e., the official administrative boundary of Chongqing Shi before its promotion in 1997, we found that the GDP in 2000 and 2010 were respectively 132.39 billion and 565.42 billion (in constant 2010 RMBs). In other words, we still reached the same conclusion that the Chongqing agglomeration had the largest GDP within Chongqing Zhixiashi.

However, once we focus our attention on the remaining smaller agglomerations, we found that they had much smaller GDP. Besides, there was no clear pattern about the association of urban agglomeration size and GDP and smaller agglomerations could have larger GDP. For instance, in Chongqing Zhixiashi, the second largest agglomeration, Banan Qu, had a GDP of 30.87 billion RMBs in 2010; but the eighth largest agglomeration, Fuling Qu, had an even larger GDP of 43.45 billion RMBs in 2010.

Comparing the agglomerations of Chongqing Shi and Chengdu Shi, we found that the former had larger GDP in 2010. It was true even when we consider the GDP of the "Old" Chongqing Shi. Recall that in 2010, the official urban populations for "Old" Chongqing Shi and Chengdu Shi were 10.51 million and 9.24 million respectively. On the other hand, the *e-Geopolis* urban populations for Chongqing agglomeration and Chengdu agglomeration in 2010 were about 5.03 million and 9.73 million respectively. Therefore, using the official urban population statistics, we could have observed that urban population is positively associated with economic development (measured by GDP). However, this conclusion is not supported when we use *e-Geopolis* urban population statistics, since the smaller agglomeration of Chongqing Shi had a larger GDP.

The patterns for secondary sector GDP, a proxy for the size of the industrial sector, were similar: The largest agglomerations in Sichuan Sheng and Chongqing Zhixiashi also had the largest secondary sectors; the secondary sectors for the other agglomerations, however, were much smaller. Besides, between Chongqing agglomeration and Chengdu agglomeration, we also observed that the former had a larger secondary sector in 2010 (both in terms of absolute value and percentage), suggesting that smaller agglomerations could have larger secondary sector. These conclusions remain when we only consider the secondary sector of the "Old" Chongqing (which had a GDP of 59.88 million and 276.29 million in 2000 and 2010, respectively). However, the largest urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi did not have the largest shares of the secondary sector. In fact, most of the smaller urban agglomerations had larger shares. For example, in Sichuan Sheng, the smallest agglomeration in the list (Mianzhu Shi) had a larger share of secondary sector (60.35%) than that of Chengdu Shi (43.19%) in 2010.

For the entire country, the GDP in 2000 was 12,258 billion RMB and that in 2010 was about 40,151 billion RMB, which was equivalent to an increase of about 12.60% annually. The secondary sector GDP in 2000 was about 5,629 billion RMB and that in 2010 was 18,738 billion RMB, or an annualized growth rate of about 12.78%. Therefore, in terms of growth rates, the growth rates of GDP and secondary sector GDP of both Chongqing Shi (under the New and Original definitions) and Chengdu Shi were higher than the national average. These differences show some support of the effectiveness of the "Open Up the West" campaign we discussed earlier.

Urbanization and migration

Next, we examine the relationship between urbanization and migration. The migration data we use are obtained from the 2000 and 2010 Population Censuses. We consider two measures of migration: Migration within the same *shi*, and migration from outside the same *shi*. To illustrate the meanings of these two measures, consider the case of Zigong Shi. The first measure "Migration within the same *shi*" is the number of inhabitants who relocate within Zigong Shi. "Migration from outside the same *shi*" is the number of migrants coming from outside Zigong Shi. There are two possibilities: First, the migrant may come from other parts of the same *sheng*, i.e., Sichuan Sheng. Second, the migrant may come from elsewhere such as Chongqing Zhixiashi. Put it another way, the first measure refers to internal migration (within the same *shi*) and the second measure refers to external migration (from outside the same *shi*). Note that the population censuses neither provide information about the origins of the migrants nor indicate whether the direction of migration is from rural areas to urban areas.

We first consider internal migration. Table 4.24 shows the relevant statistics for the *e-Geopolis* agglomerations in Sichuan Sheng and Chongqing Zhixiashi. Note that in the table, the migration statistics for Gui Xi Jie Dao, Liang Shan Zhen, Han Feng Jie Dao, and Cheng Jiang Zhen were missing because such *xiangji* level migration statistics were not published by the National Bureau of Statistics.

In Sichuan Sheng, the largest urban agglomeration, Chengdu Shi, had the largest internal migration flows in both 2000 and 2010, which were about 0.87 million and 0.82 million respectively. In Chongqing Zhixiashi, the pattern was similar. The largest agglomeration, Chongqing agglomeration, had the largest internal migration flows in 2000 and 2010. As before, the figures reported in the table represent the internal migration flows for the entire Chongqing Zhixiashi. If we only consider the "Old" Chongqing Shi, the internal migration flows were about 1.16 million and 1.57 million in 2000 and 2010, respectively. Therefore, we could still observe that the Chongqing agglomeration had the largest internal migration.

As for the other smaller agglomerations, the magnitudes of the internal migration flows were much smaller. In Sichuan Sheng, many of the agglomerations experienced reductions in internal migration between 2000 and 2010, including Chengdu Shi. One exception was Xichang Shi. Its internal migration increased from about 17,000 to over 117,000 between 2000 and 2010, i.e., at an annualized growth rate of about 20.68%. On the other hand, the agglomerations in Chongqing Zhixiashi had larger internal migration between 2000 and 2010. In particular, the internal migration for Chongqing agglomeration increased at an annualized growth rate of about 4.24% (or 3.08% when we consider the migration flows in "Old"

Table 4.24: Internal migration of urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi, 2000 and 2010

	Migration within the same *shi* (1,000)		
	2000	2,010.00	Annualized growth
Sichuan Sheng			
Chengdu Shi	874.14	824.36	−0.58%
Meishan Shi	240.31	218.03	−0.97%
Mianyang Shi	213.49	276.20	2.61%
Zigong Shi	149.71	142.31	−0.51%
Yibin Shi	402.50	250.49	−4.63%
Dazhou Shi	224.66	355.36	4.69%
Leshan Shi	166.87	234.60	3.47%
Xichang Shi	17.90	117.25	20.68%
Deyang Shi	172.37	239.78	3.36%
Pengzhou Shi	50.00	38.81	−2.50%
Neijiang Shi	247.67	171.74	−3.59%
Guanghan Shi	23.82	32.05	3.01%
Nanchong Shi	168.09	352.45	7.68%
Suining Shi	136.10	188.08	3.29%
Emeishan Shi	21.27	40.35	6.61%
Guangyuan Shi	121.12	150.32	2.18%
Jiangyou Shi	26.22	53.97	7.49%
Mianzhu Shi	31.59	41.92	2.87%
Chongqing Zhixiashi			
Chongqing Shi	1,740.46	2,636.64	4.24%
Banan Qu	55.66	81.31	3.86%
Wanzhou Qu	111.12	188.49	5.43%
Yongchuan Qu	62.14	108.22	5.70%
Gui Xi Jie Dao**			
Liang Shan Zhen**			
Han Feng Jie Dao**			
Fuling Qu	117.67	121.69	0.34%
Hechuan Qu	55.58	114.94	7.54%
Cheng Jiang Zhen**			

Note: ** – Official migration statistics are not available.
Source: *e-Geopolis*; Population Censuses, 2000 and 2010.

Chongqing Shi).

In Table 4.25, we show the external migration patterns for the *e-Geopolis* agglomerations in Sichuan Sheng and Chongqing Zhixiashi. Again, the migration statistics for Gui Xi Jie Dao, Liang Shan Zhen, Han Feng Jie Dao, and Cheng Jiang Zhen were unavailable.

Similar to internal migration, the largest urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi also had the largest external migration flows in 2000 and 2010. For Chengdu agglomeration, the migrations from outside were about 1.26 million and 3.87 million in 2000 and 2010 respectively; for Chongqing agglomeration, the corresponding figures were

Table 4.25: External migration of urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi, 2000 and 2010

	Migration from outside the same *shi* (1,000)		
	2000	2,010.00	Annualized growth
Sichuan Sheng			
Chengdu Shi	1,257.39	3,873.09	11.91%
Meishan Shi	50.14	96.37	6.75%
Mianyang Shi	173.53	427.17	9.43%
Zigong Shi	38.67	132.56	13.11%
Yibin Shi	114.99	212.26	6.32%
Dazhou Shi	103.23	174.74	5.40%
Leshan Shi	89.13	186.87	7.68%
Xichang Shi	43.94	145.96	12.75%
Deyang Shi	114.97	225.53	6.97%
Pengzhou Shi	10.58	25.67	9.27%
Neijiang Shi	65.89	96.12	3.85%
Guanghan Shi	20.82	39.05	6.49%
Nanchong Shi	57.44	196.22	13.07%
Suining Shi	153.58	70.67	−7.47%
Emeishan Shi	17.07	30.38	5.94%
Guangyuan Shi	56.81	124.50	8.16%
Jiangyou Shi	15.86	31.45	7.09%
Mianzhu Shi	12.74	20.27	4.76%
Chongqing Zhixiashi			
Chongqing Shi	884.64	2,804.13	12.23%
Banan Qu	22.31	119.54	18.28%
Wanzhou Qu	27.75	59.52	7.93%
Yongchuan Qu	24.81	98.78	14.82%
Gui Xi Jie Dao**			
Liang Shan Zhen**			
Han Feng Jie Dao**			
Fuling Qu	22.70	41.65	6.26%
Hechuan Qu	22.37	68.41	11.82%
Cheng Jiang Zhen**			

Note: ** – Official migration statistics are not available.
Source: *e-Geopolis*; Population Censuses, 2000 and 2010.

0.88 million and 2.80 million respectively (or 0.75 million and 2.02 million respectively when we use the migration statistics for the "Old" Chongqing Shi).

Between 2000 and 2010, all the urban agglomerations in Sichuan Sheng (except Suining Shi) recorded increases in the number of migrants coming from outside. The annualized growth rates of external migrants for Chengdu Shi and some smaller cities like Zigong Shi, Xichang Shi, and Nanchong Shi were over 10%. Moreover, the growth rates of external migrants for these smaller cities were higher than that of Chengdu Shi. In Chongqing Zhixiashi, the annualized growth rates of external migrants for Chongqing Shi, Banan Qu, Yongchuan Qu, and

Hechuan Qu were all above 10%. When we use the migration statistics for the "Old" Chongqing Shi, we found that the annualized growth rate of external migrant was about 10.42%. In other words, the smaller agglomerations in Chongqing Zhixiashi also had larger growth rates of external migrants than that of Chongqing agglomeration.

Interestingly, those urban agglomerations with larger increases in urban agglomeration populations also tended to have larger increases in migration from outside. For example, the agglomeration population of Chengdu increased at an annualized rate by about 3.30% while its migration from outside increased at an annualized rate by about 11.91%; on the other hand, the agglomeration population of Mianzhu Shi decreased at an annualized rate by about 1.64% and its migration from outside only increased by 4.76%, which was one of the lowest among these different agglomerations.

One may ask whether some of the migration flows we observed, especially in Chongqing Zhixiashi, were due to the resident relocation program (see the discussion on 164). We believe that the resident relocation program is one of the factors. Indeed, we have examined some statistics about the migration flows at *xianji* level in Chongqing Zhixiashi obtained from the 2000 and 2010 Population Censuses. We found that many *xianji* divisions (especially *qu*) had more migrants moving in from outside while some *xianji* divisions within the Key Reservoir Area of the Three Gorges Dam project had fewer internal migrations. However, since we do not know the origins of these migrants, we cannot tell where the migrants from the affected areas moved to.

4.6. Conclusion

In this Chapter, we focused on the urbanization patterns of Sichuan Sheng and Chongqing Zhixiashi. We discussed some history and geography about Sichuan Sheng, the province that contains Chongqing Shi (before 1997) and Chengdu Shi. We also discussed some background information about the administrative, social and economic structures of Chongqing Shi and Chengdu Shi.

We already discussed in Chapters 2 and 3 that the official urban population statistics compiled by national statistical agencies could be inaccurate. We further illustrated this issue in this Chapter using some urban population statistics of *xianji* divisions of Chongqing Zhixiashi and Chengdu Shi drawn from the 2000 and 2010 Population Censuses. If we take these urban population statistics as accurate, then we would observe that between 2000 and 2010, some *qu* of Chongqing Zhixiashi and Chengdu Shi became de-urbanized. There could be two explanations. First, those *qu* indeed became less urbanized. However, there did not seem to be any studies examining the "de-urbanization" of Chongqing Zhixiashi and Chengdu Shi. Second, the official population statistics published in the 2000 and 2010 Population Censuses were not directly comparable because their definitions of "urban population" were different. We believe that the second possibility was more reasonable to explain the de-urbanization of some *qu* in Chongqing Shi and Chengdu Shi. Based on our analysis, we argued that the sub-national official population statistics from population censuses and statistical yearbooks could be misleading and a better way to estimate urban population statistics in China, especially at a sub-national level, is to follow the *e-Geopolis* approach since it uses a harmonized definition of "urban population."

We then presented the results about the large urban agglomerations in Sichuan Sheng and Chongqing Zhixiashi. We found that the agglomerations displayed different urbanization patterns between 2000 and 2010. The two largest agglomerations, Chengdu and Chongqing agglomerations, had more populations. However, some of the smaller agglomerations grew bigger while some other became smaller. But in any case, the populations of these smaller agglomerations were in no way close to the largest agglomerations.

We compared the urban population statistics estimated by *e-Geopolis* and those from published by the National Bureau of Statistics. The lesson we learnt from this comparison is that, even though we only focus on one single country, there can still be huge differences between the urban population statistics estimated by *e-Geopolis* and those provided by official national statistical agency. These differences are more substantial when we make the comparison at a more microscopic level.

Our main analysis focused on the two largest urban agglomerations in Chengdu Shi and Chongqing Zhixiashi in 2010, namely the Chengdu agglomeration and the Chongqing agglomeration. We found that Chengdu agglomeration was larger than the Chongqing agglomeration, in terms of population and land area. On the other hand, in Chengdu Shi the urban population was more concentrated within two large urban agglomerations whereas in Chongqing Zhixiashi, the urban population was distributed among several large urban agglomerations, mainly within the "Old" Chongqing Shi administrative boundary.

Using the *e-Geopolis* urban population statistics, we also examined the relationship between urbanization, economic development, and migration. This analysis was preliminary and was for illustrative purpose, mainly because, strictly speaking, the geographical boundaries of the *e-Geopolis* agglomerations and the official administrative boundaries of the cities were not identical, so that the economic indicators and migration measures obtained from the National Bureau of Statistics did not apply accurately to the *e-Geopolis* agglomerations. Nevertheless, our analysis suggested that the larger urban agglomerations did not necessarily have larger GDP or secondary sectors. On the other hand, we found that faster growing urban agglomerations seemed to attract more external migrants.

Based on the *e-Geopolis* urban population statistics, we found that the primacy index at *shengji* is higher. This situation can be explained by the concentration of capital in a labor-intensive economy where economies of agglomerations can reduce the costs of production. However, we cannot see the same patterns when we use the urban population statistics provided by the official statistical agency, the National Bureau of Statistics.

Urbanization in China is linked to industrialization (i.e., the secondary sector). This relationship holds exactly like everywhere in the world since the 19th century. But the high concentration of urban population in certain agglomeration is a different problem. This problem may be explained by the concentration of services at a high degree of specialization which generates an intensive value-added. It is because the Chinese economy is characterized by a big private sector (big firms) and an equally sizable public sector (the government) which has an active involvement in infrastructure such as railways, airports, and hospital, etc.

Chapter 5
Conclusion

In this thesis, we examined the new urbanization trends in Sichuan Sheng and Chongqing Zhixiashi, the two largest *shengji* divisions in the southwestern part of China between 2000 and 2010. The main purpose of this comparison was to illustrate how the *e-Geopolis* approach of measuring urban population developed by François Moriconi-Ebrard can be applied in the context of China, a country with the largest population and the second largest economy in the world.

Most of the existing urbanization studies employ the urban population statistics provided by the national statistics agencies of the countries studied. It has been a well-known problem that these official urban population statistics can hardly be compared across countries, mainly because the definitions of "urban population" used in different countries can be different. In the case of China, the urban population statistics compiled by the National Bureau of Statistics, the official statistical agency of China, may also be incomparable over time. For instance, the definitions of "urban population" adopted in different Population Censuses were different and we need to adjust these population statistics in order that they can be compared over time. At the sub-national level (such as *shengji* or *xianji*), the official urban population statistics can also be incomparable over time so that these statistics can be misleading and can lead to inaccurate conclusions.

To overcome the above data problem, we based our analysis on the urban population statistics estimated by *e-Geopolis* instead of using the official population statistics. *e-Geopolis* follows a harmonized definition of "urban population," irrespective of the actual definitions of "urban population" used by different national statistical agencies. Therefore, the urban population statistics estimated by *e-Geopolis* are more reliable and can help us understand better the national and sub-national urbanization patterns of China.

Main findings

Before we studied the urbanization trends in Sichuan Sheng and Chongqing Zhixiashi, we first examined the official urban population statistics of Chongqing Zhixiashi and Chengdu Shi (the provincial capital of Sichuan Sheng), drawn from the 2000 and 2010 Population Censuses. Based on these data, we observed that between 2000 and 2010, the overall urbanization rates of Chongqing Zhixiashi and Chengdu Shi were higher. However, when we focused on the *xianji* level statistics, we found that some *qu* of Chongqing Zhixiashi and Chengdu Shi became less urbanized.

Two possibilities may explain this phenomenon. First, those *qu* indeed became less urbanized between 2000 and 2010. However, to the best of our knowledge, there did not seem to be any studies examining the reduced urbanization of Chongqing Zhixiashi and Chengdu Shi. Second, the official population statistics from the 2000 and 2010 Population Censuses were not directly comparable because their definitions of "urban population" were different. We tend to believe that the second possibility was more reasonable to explain the reduced urbanization of some *qu* in Chongqing Zhixiashi and Chengdu Shi. Therefore, to provide a better understanding of the urbanization patterns of Sichuan Sheng and Chongqing Zhixiashi, we proposed to use the *e-Geopolis* urban population statistics instead of using the official population statistics.

Our analysis showed that the sub-national urban population statistics estimated by *e-Geopolis* can be very different from the urban population statistics reported by the National Bureau of Statistics, where both under-estimation and over-estimation were possible. For example, in 2010, the urban population of Chongqing agglomeration, estimated by *e-Geopolis*, was about 5.03 million whereas the urban population of Chongqing Shi compiled by the National Bureau of Statistics were 15.30 million (for Chongqing Zhixiashi) and 10.51 million (for the "Old" Chongqing Shi, i.e., according to the administrative boundary before its promotion in 1997), indicating that the official statistics over-estimated the actual urban population. On the other hand, in 2010, the urban population of Chengdu agglomeration, estimated by *e-Geopolis*, was about 9.73 million while that estimated by the National Bureau of Statistics was about 9.24 million, suggesting that the official urban population statistics under-estimated the actual urban population.

Besides, based on the *e-Geopolis* urban population statistics, we found that the primacy index at *shengji* is higher. This situation can be explained by the concentration of capital in a labor-intensive economy where economies of agglomerations can reduce the costs of production. However, we cannot see the same patterns when we use the urban population statistics provided by the official statistical agency, the National Bureau of Statistics. Since the urban population statistics estimated by *e-Geopolis* are based on a harmonized definition of "urban population," our comparison of these two sets of urban population statistics suggested that the official statistics can be misleading and can portrait an inaccurate picture of the actual extent of urbanization in China. In a broader perspective, the difference between the official and *e-Geopolis* urban population statistics suggest that urbanization studies using official urbanization data are limited by the administrative boundaries of cities, whereas using *e-Geopolis* data allows us to uncover new trends of urbanization of agglomerations (rather than "cities").

Our analysis also indicated that the urbanization patterns of Chongqing Zhixiashi and Chengdu Shi between 2000 and 2010 were somewhat different, even though they were the two largest cities in the southwestern part of China and shared similar histories and had comparable social and economic development. In particular, we found that the Chongqing agglomeration was smaller than the Chengdu agglomeration, both in terms of agglomeration population and land area. Between 2000 and 2010, the population of Chongqing agglomeration grew at a lower pace than that of Chengdu agglomeration. Moreover, Chengdu agglomeration's urban population was more concentrated within the *qu* whereas Chongqing Zhixiashi's urban population scattered around different regions of the *qu*.

We further used the *e-Geopolis* urban population statistics to examine the relationship between urbanization, economic development, and migration. Our analysis suggested that the larger urban agglomerations did not necessarily have larger GDP or secondary sectors. Specifically, the Chongqing agglomeration, being smaller than the Chengdu agglomeration, had a larger GDP as well as a larger secondary sector. On the other hand, we found that faster growing urban agglomerations seemed to attract more external migrants.

The findings in this thesis have important policy implications because China's urbanization has attracted a lot of attention from researchers in different disciplines and international organizations who study such issues about China's urbanization as the underlying mechanisms of urbanization, the migration patterns, the institutions that facilitate or deter the realization of urbanization, the relationship between urbanization and economic development or the relationship between urbanization and the environment. Many of these studies make use of the urban population statistics published by the National Bureau of Statistics. As we showed, these official population statistics can be misleading and so studies using these statistics may lead to inaccurate conclusions. We argued that the use of the more consistent urban population statistics estimated by *e-Geopolis*, instead of the urban population statistics published by the National Bureau of Statistics, could provide new insights to the above issues.

Limitations

We view the findings presented in this thesis as the first step of understanding the urbanization patterns of China using the urban population statistics estimated by the novel approach of *e-Geopolis*. Certainly, our analysis is not without limitations. First of all, the 2010 *e-Geopolis* urban population estimates we used were provisional and were subject to revisions. It was because there were too many changes in the *xiangji* divisions as reported in the 2000 and 2010 Population Censuses. These changes involved tedious manual checks to ensure that the divisions in 2000 could be linked to those in 2010 so that *e-Geopolis* urban population statistics could be estimated. Due to the same reason, we only used data from the 2000 and 2010 Population Censuses but did not consider earlier censuses; and our analysis did not cover the entire country. Moreover, we did not provide forecasts of the population changes, at both the national and sub-national levels. Nevertheless, in principle, all of these limitations can be addressed, after which a complete set of *e-Geopolis* urban population statistics for China can be compiled.

Another limitation of our analysis is that the *e-Geopolis* database only produces urban population statistics. Other demographic and socio-economic indicators that are commonly considered in urbanization studies, such as age, employment, education, income, marital status, and migration etc., are missing from the *e-Geopolis* database. This limitation affected our analysis of the relationship between urbanization (measured by the *e-Geopolis* urban population), economic development (measured by GDP provided by the National Bureau of Statistics), and migration (measured by migration statistics provided by the National Bureau of Statistics). Strictly speaking, the geographical boundaries of the *e-Geopolis* agglomerations and the official administrative boundaries of the cities were not identical, so that the economic indicators and migration measures obtained from the National Bureau of Statistics did not apply accurately to the *e-Geopolis* agglomerations. As a result, the comparison was less than perfect. Whether or not we can overcome this limitation depends on the level of aggregation of the data provided by the National Bureau of Statistics. For instance, if we observe migration data at *xiangji* level, then theoretically we can use the same methodology to incorporate these information into the *e-Geopolis* database. However, the National Bureau of Statistics currently only publishes migration data down to the *xian* level so that we cannot integrate these migration data perfectly into the *e-Geopolis* database.

Possible future extensions

We believe that the *e-Geopolis* urban population statistics for China, once completely estimated, should be very useful for researchers and policy makers to better understand China's urbanization. At the very least, we can evaluate whether the conclusions from previous urbanization studies using official urban population statistics from the National Bureau of Statistics are still valid when the analyses are based on a set of more consistent urban population statistics estimated by *e-Geopolis*. On the other hand, we can also compare the urbanization experiences of China and other countries in the world, based *e-Geopolis* statistics that cover different parts of the world such as *Europolis* and *Africapolis*.

Due to the huge differences among different cities and regions across China, we anticipate that the urbanization patterns of different parts of the country can be very different. A natural question to ask is: What factors can explain these differences? In this thesis, we discussed two institutional factors in China, namely the administrative hierarchy and the *hukou* system, that can affect the urbanization process of a city. Are these two factors indeed relevant for explaining the differences in the urbanization patterns of different cities? If it is the case, the how can these factors actually affect the urbanization process? For example, do cities that are higher in the administrative hierarchy urbanize faster relative to those cities that are lower in the administrative hierarchy? Once we understand the underlying mechanisms of the urbanization process of China, we can also address other questions which can be of policy relevance. For instance, can the government reform the current administrative hierarchy and *hukou* system in order to accelerate or limit the urbanization of a city? While these questions are out of scope of this thesis, they certainly deserve serious research and they are left as future work.

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Abstract

**New trends of urbanization in Sichuan and Chongqing:
Urban agglomerations and administrative boundaries of cities**

Keywords: Urbanization, Sichuan, Chongqing, Chengdu, China, *e-Geopolis*.

Measuring and comparing urban population in different countries, including China, have been a well-known problem because the national statistical agencies of different countries may use different definitions of "urban populations." In this thesis, we use the *e-Geopolis* urban population statistics to uncover new trends of urbanization in Sichuan and Chongqing, two *shengji* divisions situated in the southwestern part of China, between 2000 and 2010. A novel approach of estimating population statistics, *e-Geopolis* uses a harmonized definition of urban population and thus its population estimates can be compared across different countries over time, irrespective of the actual definitions of urban population used by the national statistical agencies.

Our analysis shows that the urban population statistics estimated by *e-Geopolis* are very different from those reported by the National Bureau of Statistics, the official statistical agency of China. This comparison suggests that the official statistics can be misleading and can portrait an inaccurate picture of the actual extent of urbanization in China. For example, based on the *e-Geopolis* urban population statistics for Chongqing Zhixiashi and Sichuan Sheng, we find that the primacy index at *shengji* is higher. This situation can be explained by the concentration of capital in a labor-intensive economy where economies of agglomerations can reduce the costs of production. However, we cannot see the same patterns when we use the official urban population statistics provided by the National Bureau of Statistics.

Using *e-Geopolis*, we identify the larger urban agglomerations in Chongqing Zhixiashi and Sichuan Sheng and compare the urbanization patterns of the two largest urban agglomerations, Chongqing and Chengdu, between 2000 and 2010. We find that the Chongqing agglomeration was smaller than the Chengdu agglomeration, both in terms of agglomeration population and land area. Besides, between 2000 and 2010, the agglomeration population of Chongqing grew at a lower pace than that of Chengdu. Moreover, Chengdu's urban population was more concentrated within the *qu* whereas Chongqing's urban population scattered around different regions of the *qu*.

We also use the *e-Geopolis* urban population statistics to examine the relationship between urbanization, economic development, and migration. We find that the larger urban agglomerations did not necessarily have larger GDP or secondary sectors. In particular, the Chongqing agglomeration had a smaller population than the Chengdu agglomeration; nevertheless the former had a larger GDP as well as a larger secondary sector. On the other hand, we find that faster growing urban agglomerations seemed to attract more external migrants.

We view our results as the first step of using *e-Geopolis* to understand the urbanization patterns of China. When the complete set of *e-Geopolis* urban population statistics of China is available, it should be very useful for researchers and policy makers to better measure China's urbanization and also compare the urbanization experiences of China and other countries in the world.

Résumé

**Nouvelles tendances de l'urbanisation au Sichuan et à Chongqing:
Agglomérations urbaines et périmètres administratifs des villes**

Mots-clefs : Urbanisation, Sichuan, Chongqing, Chengdu, Chine, *e-Geopolis*.

Mesurer et comparer la population urbaine dans différents pays, dont la Chine, est un problème récurrent lié au fait que les agences statistiques nationales des pays peuvent utiliser différentes définitions des termes « populations urbaines ». Dans cette thèse, nous utilisons la base de données *e-Geopolis* pour découvrir, entre 2000 et 2010, les nouvelles tendances de l'urbanisation au Sichuan et à Chongqing, les deux divisions *shengji* situées dans le sud-ouest de la Chine. Par une nouvelle approche de l'estimation de la population, *e-Geopolis* utilise une définition harmonisée de la population urbaine. Ses estimations de population peuvent être comparées dans différents pays et à différentes périodes, quelles que soient les actuelles définitions de la population urbaine utilisées par les organismes statistiques nationaux.

Notre analyse démontre que l'estimation statistique de la population urbaine réalisée par *e-Geopolis* est très différente des statistiques de la population urbaine réalisées par le National Bureau of Statistics, agence statistique Chinoise officielle. Cette comparaison laisse à penser que les statistiques officielles peuvent être trompeuses et donner une image inexacte de la réalité de l'urbanisation en Chine. Par exemple, selon les statistiques *e-Geopolis* de la population urbaine de Chongqing Zhixiashi et Sichuan Sheng, nous trouvons que l'indice de la primauté à *shengji* est plus élevé. Cette situation peut s'expliquer par la concentration du capital dans une économie de main-d'œuvre où les économies d'agglomérations peuvent réduire les coûts de production. Cependant, il n'est pas possible de retrouver les mêmes modèles, lorsque nous utilisons les statistiques officielles de population urbaine fournies par le National Bureau of Statistics.

En utilisant *e-Geopolis*, nous identifions les grandes zones d'agglomération urbaine à Chongqing Zhixiashi et Sichuan Sheng et comparons les modèles d'urbanisation des deux plus grandes zones d'agglomération urbaine, Chongqing et Chengdu, entre 2000 et 2010. Nous constatons que l'agglomération de Chongqing est plus réduite que celle de Chengdu, à la fois en termes de population et de superficie. Par ailleurs, entre 2000 et 2010, la population de l'agglomération de Chongqing a augmenté à un rythme inférieur à celui de Chengdu. En outre, la population urbaine de Chengdu était plus concentrée dans le *qu* tandis que celle de Chongqing était dispersée dans différentes régions du *qu*.

Nous utilisons également les statistiques de population urbaine *e-Geopolis* pour examiner la relation entre urbanisation, développement économique, et migration. Nous trouvons que les grandes agglomérations urbaines n'ont pas nécessairement un PIB ou un secteur secondaire plus développé. En particulier, l'agglomération de Chongqing avait une population plus réduite que celle de Chengdu alors que la première avait un PIB supérieur ainsi qu'un secteur secondaire plus développé. D'un autre côté, nous constatons que les agglomérations urbaines en croissance rapide semblent attirer plus de migrants externes.

Nous considérons nos résultats comme la première étape d'une utilisation de *e-Geopolis* pour comprendre les modèles d'urbanisation en Chine. Nous pensons que l'ensemble des statistiques *e-Geopolis* de la population urbaine en Chine devrait être très utile aux chercheurs et aux décideurs afin de mieux mesurer l'urbanisation chinoise et de comparer les expériences d'urbanisation de la Chine avec celles d'autres pays.