A First Glance at China's 2010 Census: Urbanization and Regional Dynamics

Douglas Webster, Jianming Cai, and Larissa Muller

Lincoln Institute of Land Policy
Working Paper

Lincoln Institute Product Code: WP14DW14

Abstract

This monograph focuses on identification of ongoing urban and regional dynamics shaping China's national spatial system, based on the recent partial release of 2010 population census data. Using time series comparisons of China's population censuses between 1990–2000 and 2000–2010, this paper objectively looks at the recently Chinese census data from the view of: (1) key emerging socio-economic drivers, e.g., the pursuit of amenity, (2) key policy initiatives, e.g., policies such as the "Go West" program introduced in 1999, and (3) emerging spatial phenomena, e.g., the rapid emergence of megapolitan regions.

Keywords: Urban and Regional Planning, development, economic development, growth management, planning, public policy, spatial order, urban development, urban sprawl

About the Author(s)

Douglas Webster
Professor
Schools of Geographical Sciences and Urban Planning, Sustainability,
and Global Studies and Politics
Arizona State University
douglas.webster@asu.edu

Cai Jianming
Professor
Institute of Geographical Sciences and Natural Resources Research (IGSNRR)
The Chinese Academy of Science
Caijm@igsnrr.ac.cn

Wen Ting
PhD student
IGSNRR
Tingwen111@gmail.com

Larissa Muller
Associate Professor
Faculty of Environmental Design
University of Calgary, Canada
Larissa.muller@gmail.com

Acknowledgements

The authors gratefully acknowledge research funding from the Lincoln Institute of Land Policy in support of this research.

Table of Contents

Figures, Maps, and Tables

A First Glance at China's 2010 Census: Urbanization and Regional Dynamics

Introduction

This monograph focuses on identification of ongoing urban and regional dynamics shaping China's national spatial system, based on the recent partial release of 2010 population census data.[1] Much of the analysis is based on time series comparisons between 1990–2000 (the period covered by the previous 2000 national census) and 2000–2010, the subject of the latest 2010 census. Unfortunately, there has been late release of 2010 census results, especially county and urban district level data, delaying completion of this monograph, and resulting in prefecture level data being the dominant unit of analysis in this report.

Our objective is not to present a conventional "business as usual" analysis, e.g., analyzing changes in the rank-order of cities, presenting tables on net migration by province. Rather, the objective is to look at the recently released Chinese census data from the point of view of: (1) key emerging socio-economic drivers, e.g., the pursuit of amenity, (2) key policy initiatives, e.g., policies such as the "Go West" program introduced in 1999, and (3) emerging spatial phenomena, e.g., the rapid emergence of megapolitan regions.

In particular, the prisms through which we analyze the 2010 census data are:

1. Emergence of megapolitan regions
2. Amenity as a driver of population movement (amenity migration)
3. Regional demographic performance vis-à-vis regional development policy
4. The relationship between urban economic function & population growth
5. The relationship between level of urbanization & population growth

Unless otherwise noted, populations are "real", counting people where they actually live,[2] as per the 2000 and 2010 censuses. Thus populations referenced are not hukou population counts, which are based on where people are registered, but more useful "real" population counts.

Prefecture data is the basic unit of analysis in this report, urban refers to "Prefecture Level Cities", and excludes "Prefecture Level Regions". (There are two types of prefectures—essentially urban and rural dominated). Since Prefecture Level Cities contain rural population as well as urban (and conversely Prefecture Level Regions contain small urban settlements), the classification we use yields a significantly higher level of urbanization in China than the official urbanization level. Using our definition, in 2010, 1.24 billion people lived in urban regions (Prefecture Level Cities) in China out of a total population of 1.34 billion, or 92.5% of the population. Since China's urbanization level is 51.3% (2011), the differential between the two measures is obvious. In Prefecture

[1] The analysis and maps are based on Mainland China only. Taiwan, Hong Kong, Macau, and offshore islands (with the exception of Hainan) are not included in the analysis or the maps.

[2] A migrant who had lived in a place for >6 months was deemed to live in that place in the 2010 (and 2000) census.

Level Cities, residents who are not officially classed as urban tend to view themselves as in the hinterland of the dominant city or cities, expecting urban type services from the dominant cities (where the Prefecture Government is located, may undertake non-agricultural work, and often live in what would be termed towns or even small cities in other countries. Thus China's official urbanization level is an undercount, whereas the Prefecture Level Cities count is an over count. In some ways, there are similarities between Prefecture Level Cities and United States Standard Metropolitan Statistical Areas (SMSAs).

China's overall population growth has slowed from 1.11% per annum in the 1990–2000 period to 0.34% per annum in 2000–2010.[3] Findings indicated below should be interpreted in the context of this dramatic slowing of overall population growth, e.g., when a megapolitan area significantly increases its population growth rate in the post 2000 period, it is especially significant given this dramatic slowing of the national population growth.

National Scale Distribution of Population Growth

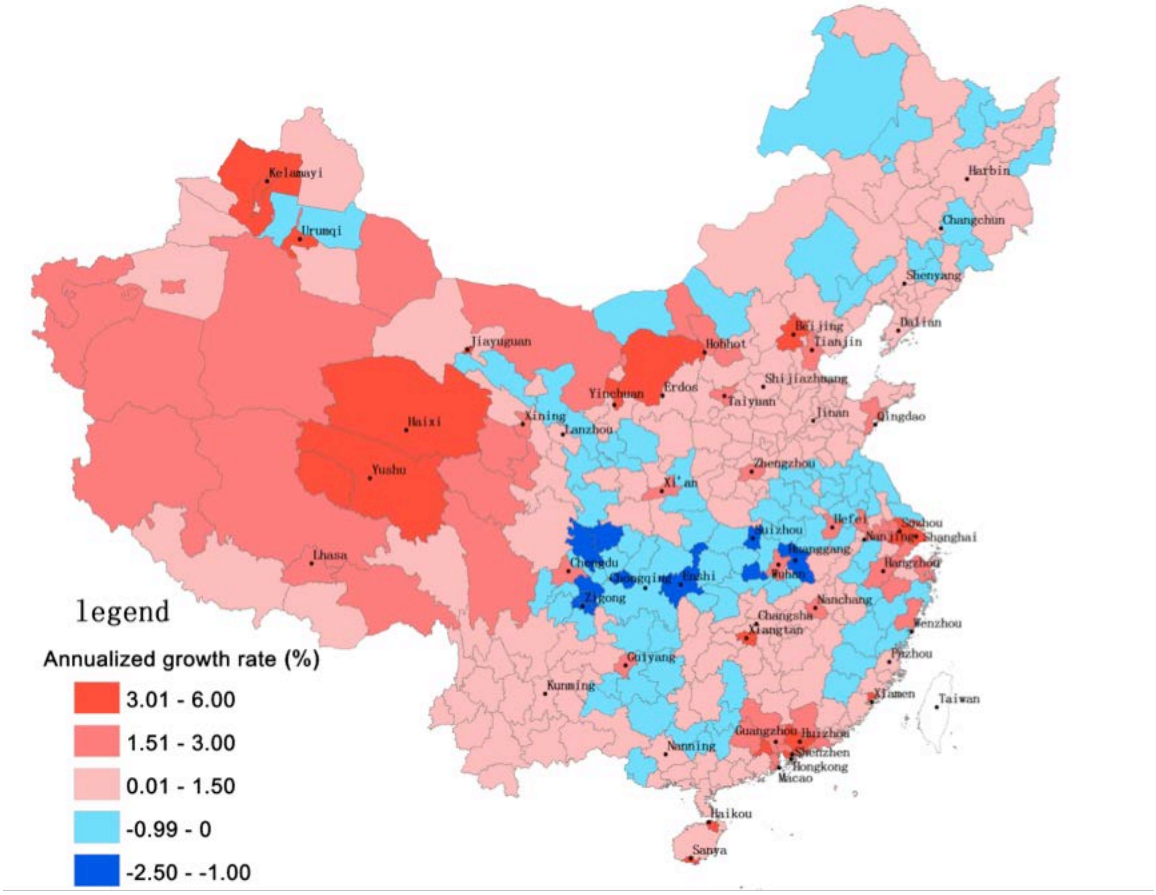
Map 1 describes annualized population growth rates by prefecture for China for 2000–2010. Map 2 describes absolute population gains / losses 2000–2010, again by prefecture. As in the United States, much of the central region lost population over the decade to 2010. The eight fastest growing large cities are all on the coast (see Appendix 1 which describes growth rates by major city). High population growth is found around major cities along the coast from Qingdao to Haikou. However, a number of free-standing urban municipalities (prefectures) in the slower growing Central Region also show relatively high rates of growth. From a population perspective, the fastest growing is Zhengzhou which ranked ninth in population growth rate between 2000–2010; 29.58% growth over the period, an increase of 8.71 percentage basis points over the 1990–2000 period. Heifei was the second best performing central region city, ranked eleventh in population growth rate from 1990–2000, growing at 27.52%, up 11.71 percentage basis points from the previous inter-census period. Wuhan ranks 18th in 2000–2010 population growth rate, ranking eighteenth, growing at 17.81% over the latest census period, actually a decline of 2.62 percentage basis points relative to the previous inter-census period. Xi'an ranks right behind Wuhan at nineteenth, growing at 16.51% over the decade to 2010, a decline of 1.13 percentage basis points over the previous period. The much better population performance of Zhengzhou over Wuhan is somewhat surprising; given the popular perception that Wuhan is catching up to Zhengzhou, given the former's geo-strategic hub position on the HSR rail network, its diverse knowledge-based economy, etc. The 2020 census will shed light on the status of this rivalry between the two dominant central region hubs, competing for the "Chicago" role.

High growth rates in the far west are largely from low population bases. One of the most striking findings from the 2010 census, as indicated by Maps 1 and 2 is the higher population growth in the Yellow River Corridor compared with the Middle and Upper

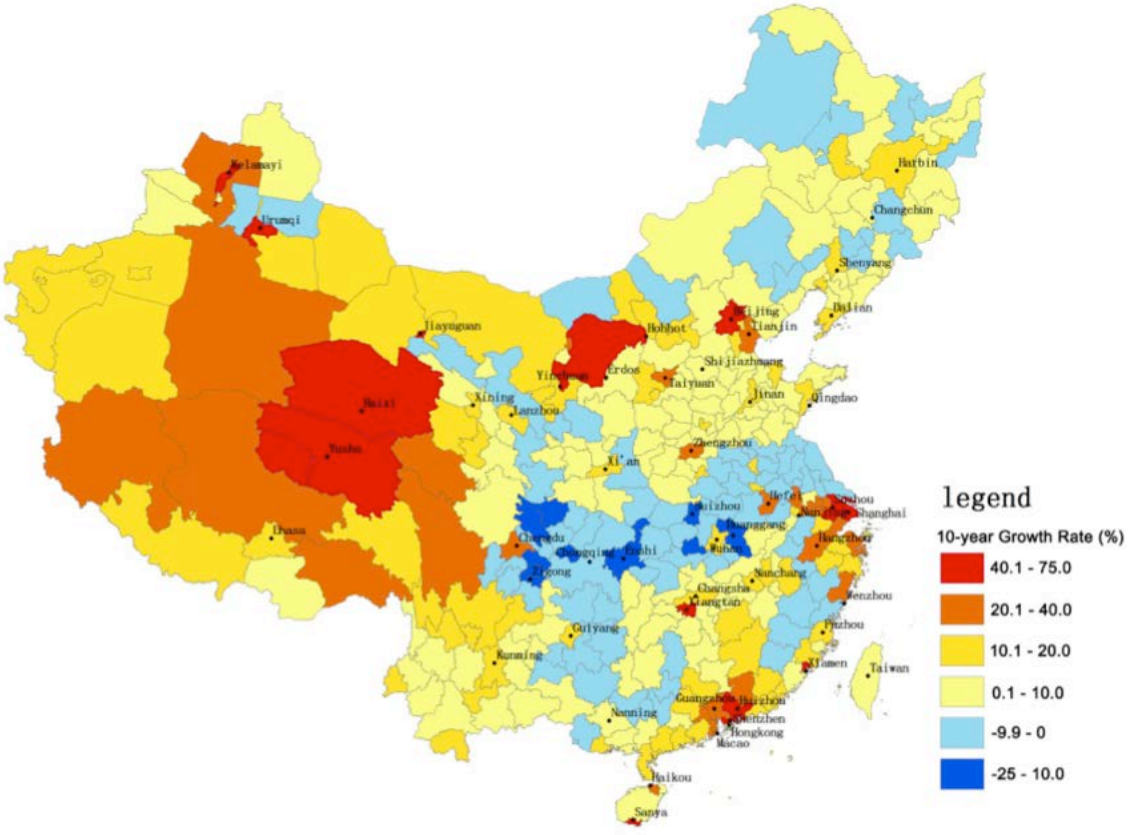
[3] In this monograph, unless indicated to the contrary, annual growth rates are compound annual growth rates (CAGR).

Yangtze Corridor. In fact, much of the Middle and Upper Yangtze Corridor is experiencing significant absolute population loss (see Map 2), the most in China in absolute terms. The dramatic loss of population in the Middle and Upper Yangtze Corridor can be attributed to the fact that there was considerable low-end industry (e.g., textiles, shoes) in this corridor, which is now under threat, and by the abundance of "too small" farms (smaller than those in the Yellow River Corridor to the north); these are strong "push" factors driving migrants out of the Middle and Upper Yangtze Corridor.

Map 1: Annualized Growth / Decline Rates by Prefecture: 2000–2010



Map 2: Absolute Population Gain/Loss by Prefecture: 2000–2010



The high rates of growth in the far west can be attributed to natural resource development, and high natural population growth (especially in rural areas). In most of China, high population growth emanates from cities as hubs or growth poles, rather than being regionally diffuse or corridor oriented. A number of factors explain this pattern, particularly past local economic protectionism (which continues in a milder form) that discouraged interaction among neighboring cities, and strong spatially oriented security policies, especially the "third line" policy (in the 1970s) of Chairman Mao which led to much more rapid development of free-standing remote cities (essentially disconnected from the national grid), especially Chengdu, than would otherwise have been the case. A lack of a national infrastructure system, particularly a national highway/expressway network until recently, and a national economy that is still not well integrated in a spatial sense,[4] has further contributed to the development of China's constellation-like urban system. China's fast growing cities still constitute a "constellation" rather than corridors —although with the rapid growth of motorization in China there is some movement toward urban corridor development in China.[5] (The United States urban system is largely organized around interstate highway corridors, e.g., the I-5 Corridor.) However, the rapid development of the High Speed Rail (HSR) system in China may act as a counter-force.

[4] The Economist Intelligence Unit argues that the Chinese spatial economy is rapidly becoming more economically integrated. See: Economist Intelligence Unit, "How Big is the Middle Class?", *China in Focus* Series, November 2011

[5] Frequent tolls along expressways, which are highly compartmentalized in terms of toll collection, discourage long-distance travel by private vehicle. Total costs of long-distance travel by vehicle are usually higher than by air.

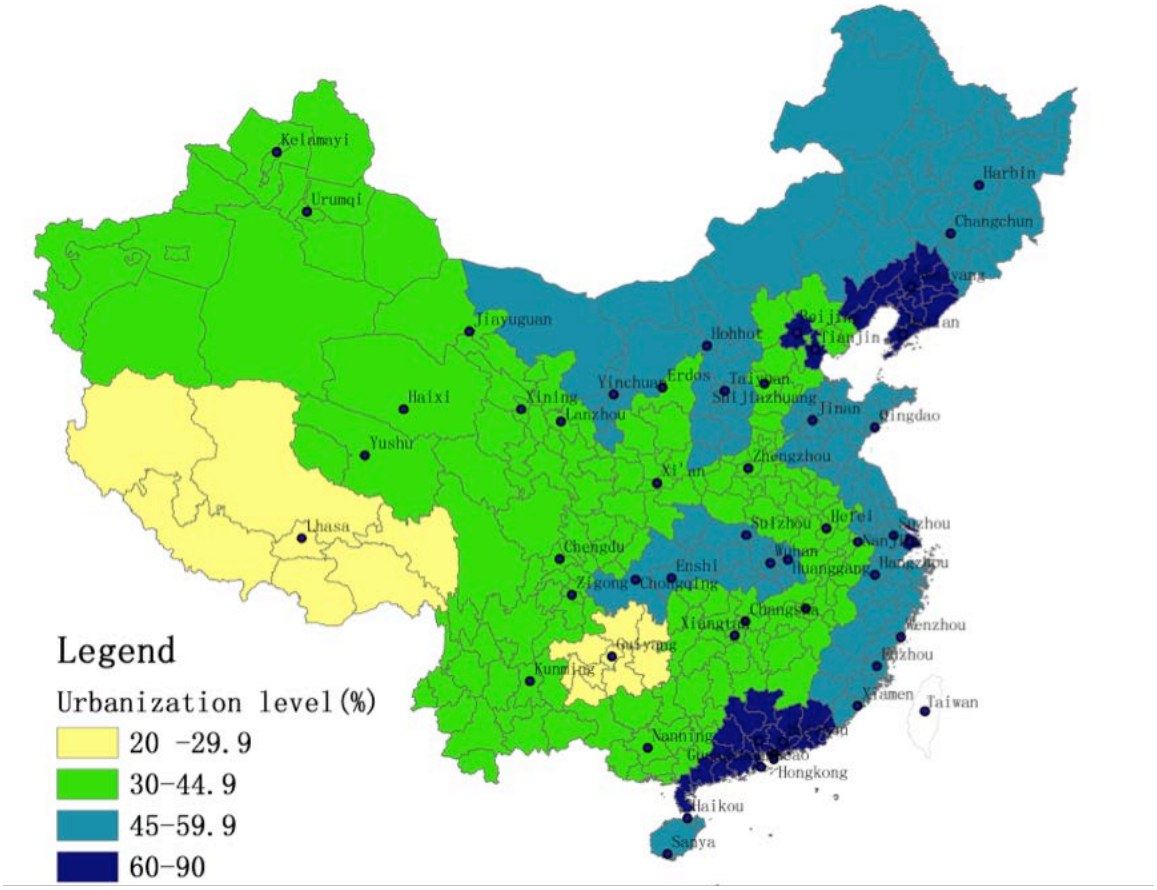
High Speed trains stop infrequently reinforcing relatively widely spaced cities, reinforcing the constellation pattern. Also, Mainland China has a relatively limited number of commercial airports (175) compared with other continental sized countries such as the United States, which further feeds the constellation pattern, although 55 more commercial airports are scheduled to be built during the current 12th national development plan period (2011–2015).

Urbanization Dynamics

Map 3 describes the level of urbanization by province in 2010. The high level of urbanization along the East Coast is not surprising, nor is the low level of urbanization in the West. More surprising is the high-level of urbanization in the Northeast, associated with larger farms, and early industrialization—in fact, in the early Communist (planned economy) period (1949 to the early 1970s), the Northeast was China's industrial core. The high level of urbanization along China's northern tier is attributable to a relatively hostile natural environment, resulting in essentially low carrying capacity of the rural land—a situation akin to Australia, which has the highest urbanization level of any continental sized country. The non-agricultural, resource extraction (coal, and other energy) economy is a second, and related, significant explanatory of the high level of urbanization in China's northern tier. A third patch of high urbanization is found in the Middle and Upper Yangtze Corridor, essentially from Wuhan to Chongqing, reflecting past industrial development along the river, including "third line" industrialization, located there for security purposes.

Appendices 2 and 3 describe the level of urbanization by province in 1990 and 2000 respectively. As indicated by the maps, over the twenty-year period, illustrated by map 1 and appendices 2 and 3, there has been a relatively high degree of path dependency in the spatial pattern of China's urbanization.

Map 3: Level of Urbanization by Province 2010

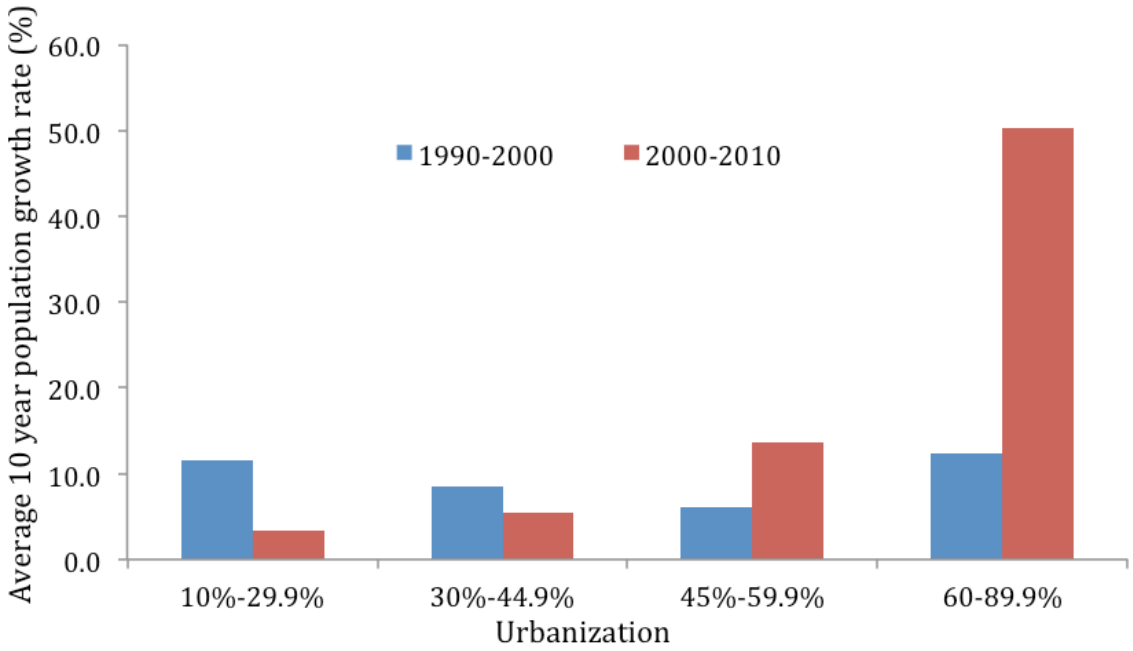


Overall, the current wide range in urbanization levels across provinces is striking, a pattern seen in developing countries, rather than developed ones. For example, in the U.S., Canada, or Western Europe, urbanization levels across states and provinces show much less variation. As China's rapid economic development continues, it is likely that variation in urbanization levels by province will decrease.

As indicated by figure 1, based on population growth rates 2000–2010, provinces with the highest levels of urbanization continue to experience dramatically higher population growth. Since this cannot be accounted for by natural growth (natural population growth rates are lower in cities, especially larger cities, than in rural areas), the largest metropolitan areas are magnets attracting inter-provincial migrants. This finding is not surprising, the vast majority of migrants in China are rural-urban, thus provinces with a higher level of urbanization, offer more opportunities for migrants; secondly, China's urbanization is more skewed to super large cities (over 5 million) than the global norm—provinces with high levels of urbanization are likely to have a very large city or cities. Of interest is the significant shift in this dynamic between 1990–2000 and 2000–2010. In the latter census period, the higher the level of provincial scale urbanization (across all four categories), the faster the provincial population growth rate. However, in the earlier census period there was less variation in population growth by level of urbanization and

provinces with low levels of urbanization (10–29.9% urbanized) were growing almost as fast as those with high levels (60 to 89.9% urbanized).

Figure 1: Population Growth Rates & Level of Urbanization 2010



Map 4 describes China's well-known official regional development zones—the basis of macro regional development policy.[6] As indicated by figure 2, despite massive interventions (involving direct investment, loans to local governments, loan guarantees, lobbying domestic and foreign MNCs to locate, steering multilateral development projects, etc.) to improve the performance of non-coastal (peripheral) China, in population terms (2000–2010), the East Coast Region continues to grow much faster than the peripheral regions. In fact the coastal population is growing 3.7 times faster than the Northeast, the second fastest growing region, 4 times faster than the Central Region, and 5.5 times faster than the West Region. (For detailed data, see appendix 4.) The population primacy of China's East Coast is increasing; in 2000, 35.6% of China's population lived on the East Coast, with the remainder distributed among the three peripheral provinces. By 2010, the East Coast had increased its share of China's population to 38%. The fact that the Coast contains a strong and diverse manufacturing and modern services economy (close to developed country status), but also possesses China's best climates (which will be increasingly important in attracting population and investment—discussed below) indicates that the East Coast is unlikely to see its population primacy threatened. Unlike in the United States, Canada, or Australia, there is no second coast in China to challenge the primacy of China's East Coast development.

[6] The patch of green (meaning Western) in the Northeast Region on Map 4 is not a misprint. This area was targeted by the national government for increased regional development assistance, and thus was designated to receive the more generous Western development package.

What is surprising is that the Northeast is currently the second fastest growing region in population terms. Its prospects in the early 1990s, at the peak of State Owned Enterprise (SOE) restructuring looked dismal. The relatively strong 2000–2010 demographic (and associated economic) performance of the Northeast is possibly attributable to strong formal revitalization efforts, e.g., formation of revitalization committees at the provincial level (China's regional development policies stress *in situ*, i.e., place-based redevelopment; western countries rely more on factor flows [migration, capital], e.g., out-migration to remedy regional adversity.) Based on the 2010 census results, it would appear that the "Go West" policy (introduced in 1999) has not resulted in rapid population growth in the West Region, although there has been somewhat rapid demographic growth in a few cities, particularly Chengdu, which grew 26.46% over the 2000–2010 period (up 6.61 percentage basis points over the 1990–2000 period, ranking it fourteenth in this regard among major Chinese cities. Chongqing, on the other hand, experienced disappointing population growth during the 2000–2010 period, declining in population by 5.44%, a drop of -68.95 percentage basis points from the very fast growth of the 1990–2000 period.[7] This mediocre (at best) demographic performance of West Region cities is somewhat surprising, given that the "Go West" regional development program was urban-centered, attempting to position the major cities of the West as effective agents of regional development (growth poles). Part of the explanation is that even rapid population growth in the core cities (*cities proper* composed of *urban districts*) cannot compensate for very high rates of rural and small town out-migration within the municipalities in question, particularly in the Middle and Upper Yangtze Corridor, as discussed above. Cities such as Zhengzhou (in particular) & Wuhan (to a lesser extent) in the Central Region are exceptions to generally slow regional population growth in that Region, as discussed above.

[7] The data for Chongqing is somewhat misleading in that its rural hinterland, the source of significant out-migration from Chongqing jurisdiction is extremely large.

Map 4: National Regional Development Policy Regions in China

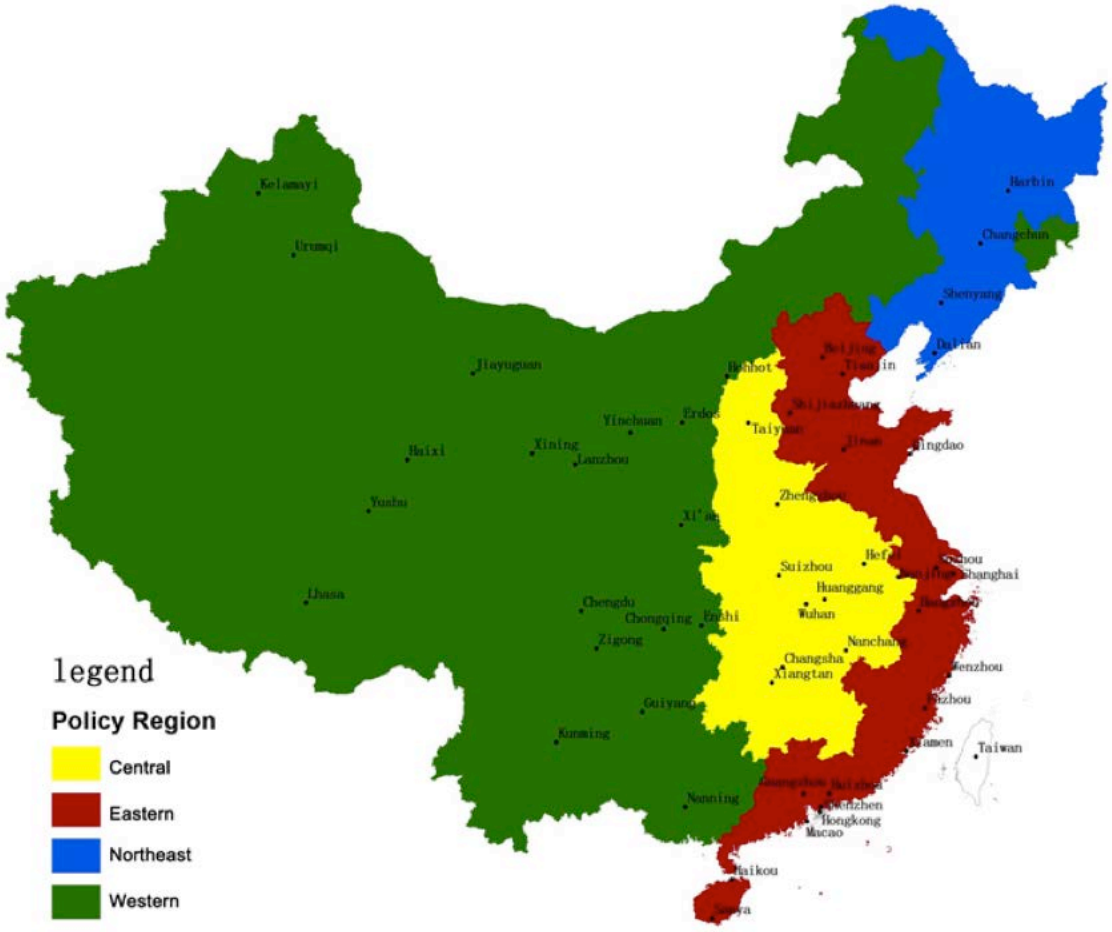


Figure 2: Population Growth Rates by Policy Regions: 1990–2000 & 2000–2010

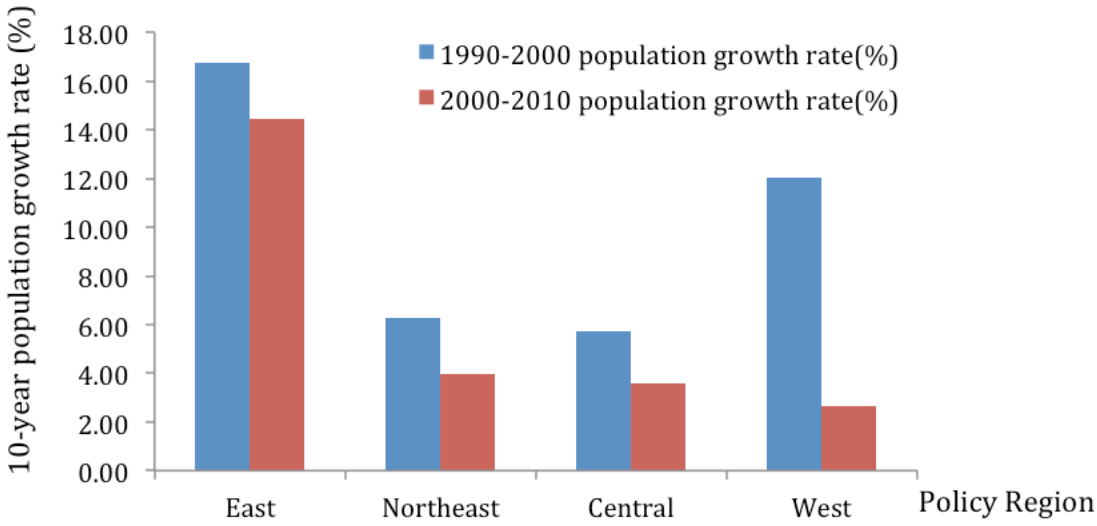


Table 1 describes Chinese urbanization parameters by size class using prefecture level data. As a continental sized country, with the world's largest population, China has a balanced urban system, not a primate one. In fact, the 286 prefecture level cities are almost equally balanced across the four size classes. However, a much higher percentage of China's urban population lives in super large cities than is the global norm—globally, intermediate and smaller cities dominate demographically.[8] The 2010 census indicates that 39% of the Chinese urban population lives in cities greater than 5 million in size; on the other hand, UN data indicates that 18% of the world's urban population lives in cities larger than five million—less than half the Chinese level. This high concentration of China's urban population in very large cities provides China with economic and environmental / sustainability advantages. As indicated by Table 1, the super large and small sized cities are currently (2010) growing the fastest (9.24% and 9.19% respectively over the 2000–2010 period); however, compared with the 1990–2000 period the growth rate of the smallest cities has fallen dramatically—in the 1990–2000 period they were by far the fastest growing category of cities in China, growing 26.85% over that ten year period compared with 9.71% for the super large cities. In other words, the super large cities have maintained their rate of growth between the two census periods (despite a massive drop off in China's overall demographic growth), while there has been a dramatic fall in the growth rates of the smallest cities. The super large cities are now in the fast growing urban category, growing slightly faster than the smallest cities. The rapidly increasing allure of the very largest cities can be explained by their dominance of economic activity, both peri-urban manufacturing, and more recently, modern and cultural services, both of which are generally found in (services, the cultural economy) or around (manufacturing) the super large cities. The rapid growth of modern services in China in the early twenty-first century, which is even more highly spatially concentrated than manufacturing, is driving the increasing pull of the super large cities. The super large cities tend to be globally connected. However, the smallest cities tend to be dependent on bottom-up dynamics, e.g., local agricultural production or natural resources. An increasing tendency toward shorter migration (closer to home) may benefit the smaller and medium sized cities, as well as a movement down the urban hierarchy of investment in retailing and property development. However, our interpretation is that migrants, although migrating shorter distances, are often choosing the *nearest* super large or large city rather than small cities as a destination, even as they attempt to work closer to their roots. Certain smaller cities are benefiting from natural resource development in their hinterlands, e.g., Urumqi, or rapidly increasing value of hinterland agricultural production. The latter has a double effect of creating push forces off the land (as farms become larger), while at the same time making nearby cities wealthier, e.g., Qiqihar.

[8] United Nations, *World Urbanization Prospects: The 2011 Revision*, New York: United Nations Population Division, 2012, Pg. 5, Figure 2

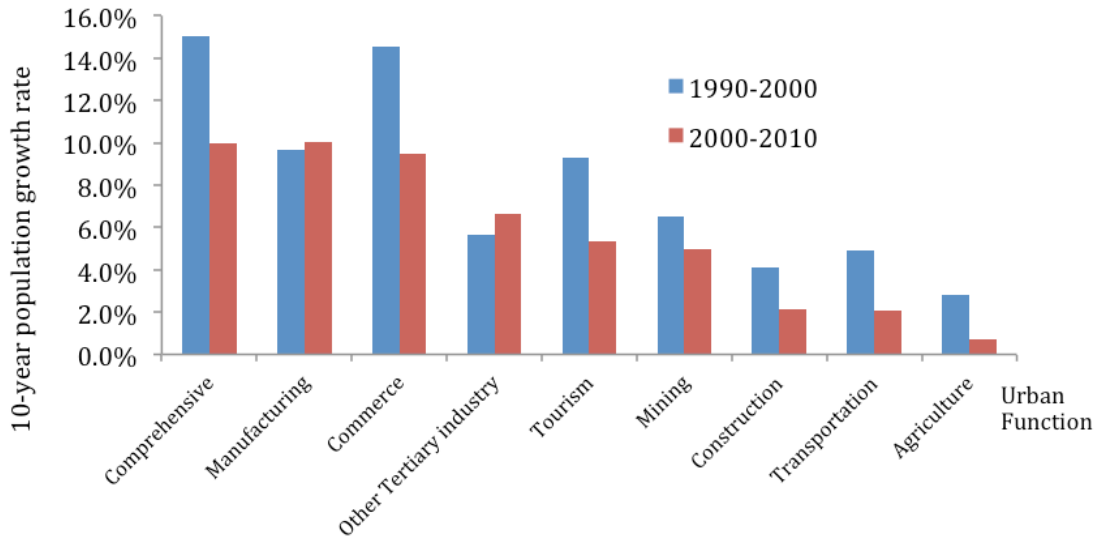
Table 1: Chinese Urbanization Parameters by Size Class

City size	Size category (million)	Number of cities			Total Population(million)			Every 10 year population growth rate (%)	
		1990	2000	2010	1990	2000	2010	1990-2000	2000-2010
Small sized	<2	70	56	53	84	69.7	68.8	26.85	9.19
Medium sized	2~3	67	65	64	168.7	159.9	160.5	7.25	5.43
Large sized	3~5	83	80	82	328	310.4	324.4	7.70	3.55
Super large	>5	66	85	87	461.5	612.7	684.2	9.71	9.24
Total		286	286	286	1042.1	1152.6	1238.0	10.60	7.41

Note: 10 Years Growth Rates are calculated based on the Size Category a City was in at the beginning of the period in question. Some cities "graduate" to the next category, especially fast-growing ones, accounting for the seeming discrepancy between 1990, 2000, and 2010 urban populations by size category and the 10 year growth rates.

Figure 3 ranks urban population growth rates (1990–2000 and 2000–2010) by urban function. As indicated by figure 3, manufacturing cities are currently the fastest growing. However, manufacturing cities are being challenged by commercial cities specializing in modern services and consumption, and by cities with diversified economies. Surprisingly, given the rapid growth of China's tourism economy of late, tourist oriented cities display relatively slow growth. However, this may change over the next decade. Hainan appears to be the front-runner in this regard, growing very fast, becoming a global beach resort, and currently attracting more tourists than the previous East Asian leader, Phuket, Thailand.

Figure 3: Urban Population Growth Rates 1990–2000 & 2000–2010 by Urban Function



Megapolitan China

Map 5 and table 2 describe population change in China's 21 officially designated megapolitan regions for the 1990–2000 and 2000–2010 periods.[9] [10] Chinese megapolitan regions are arguably the most populous in the world,[11] and China has more megapolitan regions than any other country. Thus the performance of Chinese megapolitan regions in economic and population terms has global implications; they account for the vast majority of China's economic output, in excess of 80%. As indicated by map 5 and table 2, there has been a dramatic change in the fates of China's megapolitan regions over the last twenty years. In the 1990s, the Pearl River Delta Megapolis was at its peak, the "factory of the world". In the twenty-first century, the Yangtze River Delta, more oriented to modern services and finance has taken off, as has the Bohai Rim Megapolitan region (which includes Beijing, Tianjin, Qingdao, Dalian, and Shenyang) as a global political / government center, as well as a high-value manufacturing and service region. The three main Chinese Megapolitan areas (PRD, YRD, Bohai Rim) tower over most other megapolitan areas in China in terms of population growth rates. It would appear that the Beijing – Tianjin (the urban core of the Bohai Rim) Region and Shanghai, which anchors the YRD, are beginning to "break away" from the rest of the Chinese urban system (see figure 4) in economic terms, consistent with population trends apparent in the 2010 census. Increasingly the Chinese economic and population heartland is the coastal region running from Sanya to Shenyang as indicated on Map 5. The list of China's megapolitan regions is color coded to the megapolitan regions displayed on the map.

[9] The commonly accepted definition of a Megapolitan Region is a Region with more than 10 million urban residents, consisting of at least two identifiable Metropolitan urban agglomerations, with significant travel, business, and communication linkages among the metropolitan areas that constitute the Megapolitan Region.

[10] China's megapolitan regions were officially designated by the National Development Reform Commission (NDRC) for the 12th National Development Plan (2011-2015).

[11] Outside China, the world's most populous megapolitan regions are Tokyo, Mumbai, Delhi, New York, Mexico City, and Sao Paulo).

Map 5: Megapolitan Region Population Growth Rates: 1990–2000 Versus 2000–2010

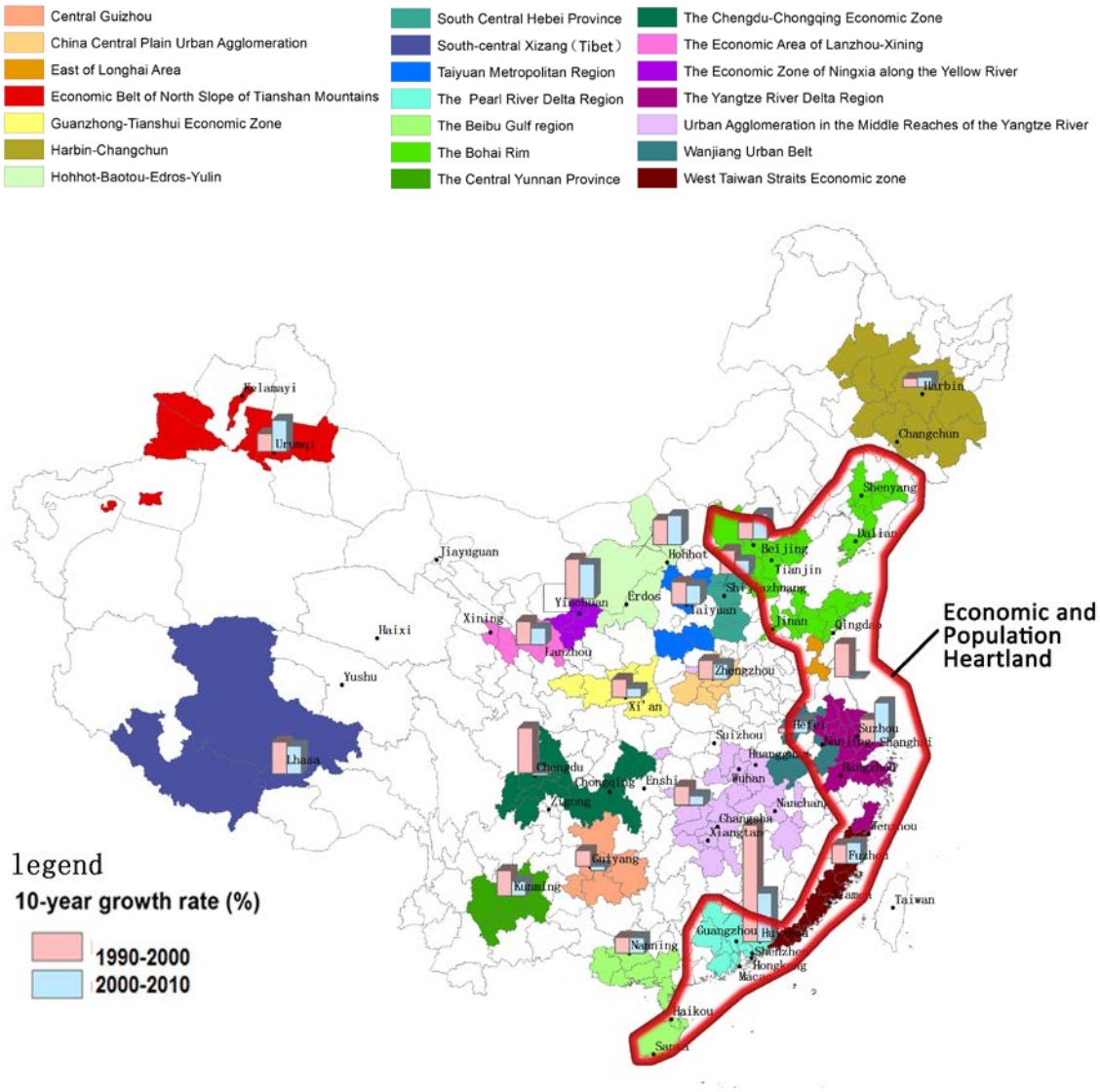
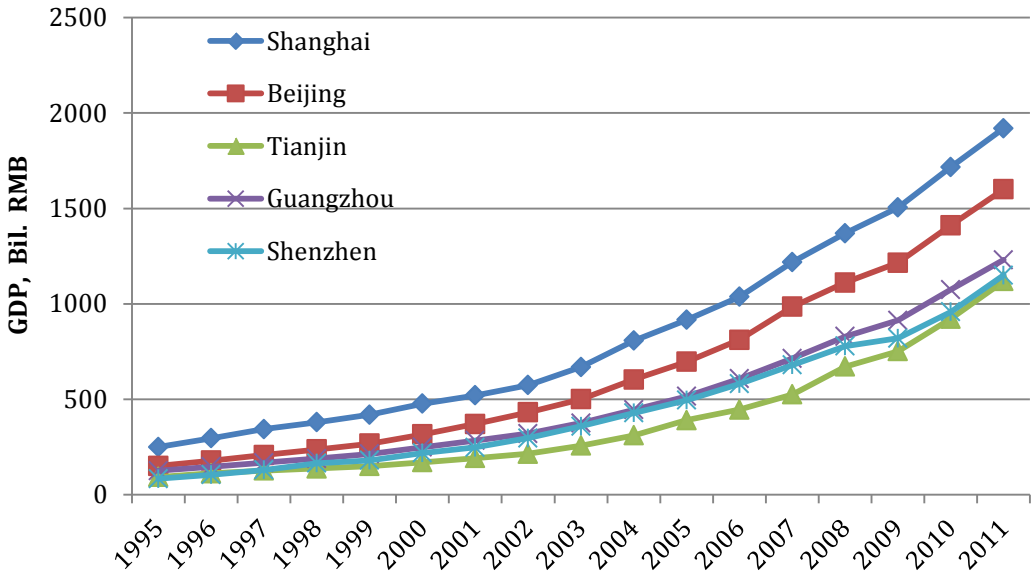


Figure 4: Title: Shanghai and Beijing Breaking from Pack Economically



Source: China Statistical Yearbook 1996–2011; Web site of the national bureau of statistics

Apparent in the results of the 2010 census is the rise of a "Yellow River Band". The Yellow River Band, the cradle of Chinese civilization, appears to be re-emerging demographically and economically. As indicated by table 2, the Economic Zone of Ningxia along the Yellow River is the third fastest growing megapolitan region in China (after the PRD and YRD), while the Hohhot-Baotou-Edros-Yulin Megapolitan Region (also in the Yellow River Band) is the fifth growing megapolitan region (out of 21 Megapolitan Region). In many ways, the Yellow River Band is taking over some of the functions formerly associated with the PRD, YRD, and the Bohai Rim, e.g., heavy machinery manufacturing, particularly equipment associated with mineral and oil production. (In the Tenth Development Plan [2000–2005]), heavy industry was encouraged, which benefited the Yellow River Band.) On the other hand, surprisingly, and contrary to common public perception, the Middle and Upper Yangtze Corridor, Wuhan – Chongqing – Chengdu, appears to be underperforming, at least in population terms. In fact, out of 21 megapolitan regions in China, the "Chengdu-Chongqing Economic Zone" ranks 20th in population growth rate and the "Urban Agglomeration in the Middle Reaches of the Yangtze River" ranks 17th. In the Central Region, Zhengzhou continues to outperform Wuhan, ranking twelfth, in the middle of the pack among megapolitan regions in population growth in the 2010 census, but it may be increasingly challenged by Wuhan for leadership in the Central Region, the latter increasingly benefiting from its role as the national hub of the HSR system and a more diversified manufacturing economy. (Zhengzhou is the national hub of the conventional rail system.)

Table 2 ranks population growth by megapolitan area in China for 2000–2010, and presents comparative data for population growth in the 1990–2000 period. Change (and direction) in growth rates between the two census periods are noted (percentage basis points spreads) by megapolitan region. Megapolitan regions dominate China's economy.

As indicated by the 2010 census, there is considerable divergence in the demographic performance of these regions at present, and there have been very significant shifts in the ranking of the population growth rates of the megapolitan regions between the two census periods, indicating the impacts of major structural shifts (both rural-urban and within urban economies) in the Chinese economy. Of note has been the strong performance of seven regions that substantially increased their demographic growth rates between 1990–2000 and 2000–2010, despite a significant overall slowing in China's population growth rate, namely, the Yangtze River Delta, the Bohai Rim, the West Taiwan Straits Economic Zone, the Harbin – Changchun Region, the Hohhot-Baotou-Edros-Yulin Region, the Wanjiang Urban Belt,[12] and the Economic Belt of the North Slope of the Tianshan Mountains. The coastal mega-belt composed of the West Taiwan Straits, YRD, and Bohai Bay megapolitan regions will increasingly drive China's future development. From a resource development point of view, the Hohhot-Baotou-Edros-Yulin and North Slope of the Tianshan Mountains megapolitan regions will become increasingly important. The industrial revival of the Northeast is increasing the importance of the Harbin – Changchun Region, a role that could be mimicked by the Wanjiang Urban, especially since that region constitutes the nationally designated, "State Level Demonstration Zone to Undertake the Transfer of Industries", designated in 2010, the only such zone of the national government.[13]

On the other hand, and very surprising even to Chinese urban experts, has been the poor inter-census (2000 versus 2010) performance of the "Go West" megapolitan regions, with the Chengdu – Chongqing Economic Zone (ranked 20 of 21 in terms of current population growth rates), Central Yunnan (ranked 13 out of 21), and Central Guizhou (ranked 21 out of 21) all exhibiting very substantial drops in their demographic growth rates relative to the previous census period, and low current growth rates (rankings in parentheses above). National policy favors these western urban regions and the popular perception is that they are booming, yet this does not appear to be the reality based on the latest census data.

The Pearl River Delta is an exceptional case. The inter-census fall in its population growth rate has been dramatic; however, it is still the fastest growing megapolitan region in China, outperforming the Yangtze River Delta. However, population growth in the YRD is rapidly catching up with the PRD. In the 1990–2000 period the PRD population growth rate was 57.69 percentage basis points higher than that of the YRD, in the 2000–2010 period this differential declined to 5.64. The PRD's relative decline is related to the diminishing relative importance of export-oriented consumer products manufacturing in the Chinese economy.

[12] In the case of Wangjiang Urban Belt, although population growth increased from the first census period, population growth rate remained relatively low during the second census period.

[13] The "State Level Demonstration Zone to Undertake the Transfer of Industries" has been given priority by the national government (Ministry of Finance, NDRC), e.g., allocated World Bank funding and technical assistance.

Table 2: Megapolitan Region Population Growth Rates & Change: 1990–2000 to 2000–2010

Rank	Megapolitan Regions	10-year population growth rate (%)		Change
		1990-2000	2000-2010	
1	The Pearl River Delta Region	71.88	29.96	-41.92
2	The Yangtze River Delta Region	14.19	24.32	+10.13
3	The Economic Zone of Ningxia along the Yellow River	24.28	21.44	-2.84
4	Economic Belt of North Slope of Tianshan Mountains	10.88	19.2	+8.32
5	Hohhot-Baotou-Edros-Yulin	15.58	18.07	+2.49
6	South central Xizang (Tibet)	20.54	16.86	-3.68
7	The Bohai Rim	10.55	15.61	+5.06
8	West Taiwan Straits Economic zone	11.76	12.86	+1.1
9	Taiyuan Metropolitan Region	13.66	11.57	-2.09
10	The Economic Area of Lanzhou-Xining	14.54	10.2	-4.34
11	The Beibu Gulf region	10	9.76	-0.24
12	China Central Plain Urban Agglomeration	11.71	9.16	-2.55
13	The Central Yunnan Province	15.64	8.9	-6.74
14	South Central Hebei Province	14.37	8.32	-6.05
15	Wanjiang Urban Belt	2.97	7.14	+4.17
16	Harbin-Changchun	5.33	6.27	+0.94
17	Urban Agglomeration in the Middle Reaches of the Yangtze River	12.03	5.36	-6.67
18	Guanzhong-Tianshui Economic Zone	11.05	5.29	-5.76
19	East of Longhai Area	20.45	-0.84	-21.29
20	The Chengdu-Chongqing Economic Zone	27.63	-1.6	-29.23
21	Central Guizhou	9.66	-2.74	-12.4
22	Non-megapolitan area	4.28	1.42	-2.86

Note: Megapolitan Regions are ranked by 2000–2010 population growth rate

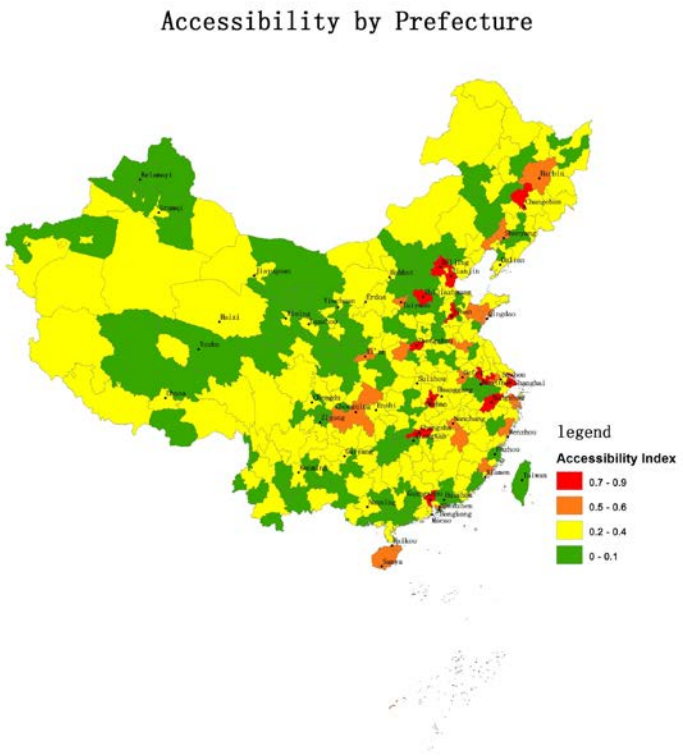
Accessibility

High accessibility is associated with urban agglomerations in China, as elsewhere. Causality cuts both ways, highly accessible places are likely to experience more rapid urbanization (e.g., Zhengzhou is an historical railroad hub), but rapid urbanization driven by bottom up forces may attract transport investment, particularly in expressways and high-level airports. Map 6 describes accessibility in China by prefecture. The index utilized (developed by the authors) is based on local access to HSR (existence of a HSR station), number of expressways serving the prefecture, and the official level of the prefecture airport.[14] Based on map 6, high access is also very constellation-like, e.g., Wuhan is a free-standing point of high accessibility. Even along the coast between Shenzhen and the YRD, high accessibility is concentrated in a limited number of

[14] In the index, HSR access is weighted 0.5, expressways 0.2, and level of airport 0.3.

prefectures. Interestingly, a high access interior corridor seems to be emerging along an axis from Harbin to Chongqing.

Map 6: Accessibility by Prefecture: China (2011)



Note: A higher value on the index indicates higher accessibility

The Role of Amenity

In developed countries, particularly in North America, amenity (the attractiveness of place) is an increasingly strong driver of migration (amenity migration), investment, and tourism, all of which have resulted in rapid population growth in amenity regions. For example, in the United States, a substantial portion of the population moved from the Northeast and the Midwest to the South and West, over the last eighty years, largely for amenity reasons. (In 1930, the Industrial Midwest Heartland of the US constituted 31.43% of the population; in 2010 it constituted 21.68%.) In Canada, amenity factors have driven population movement to the climatically superior west coast (Vancouver and Victoria). With the establishment of the European Union, there is increasing migration (permanent or seasonal) to warmer climes in the south of the European continent. Many factors contribute to amenity, e.g., scenery, cuisine, culture, but climate is among the most important.[15] We have used climate as a surrogate for regional amenity in China because overall amenity indices (urban, regional) do not yet exist. As China's households

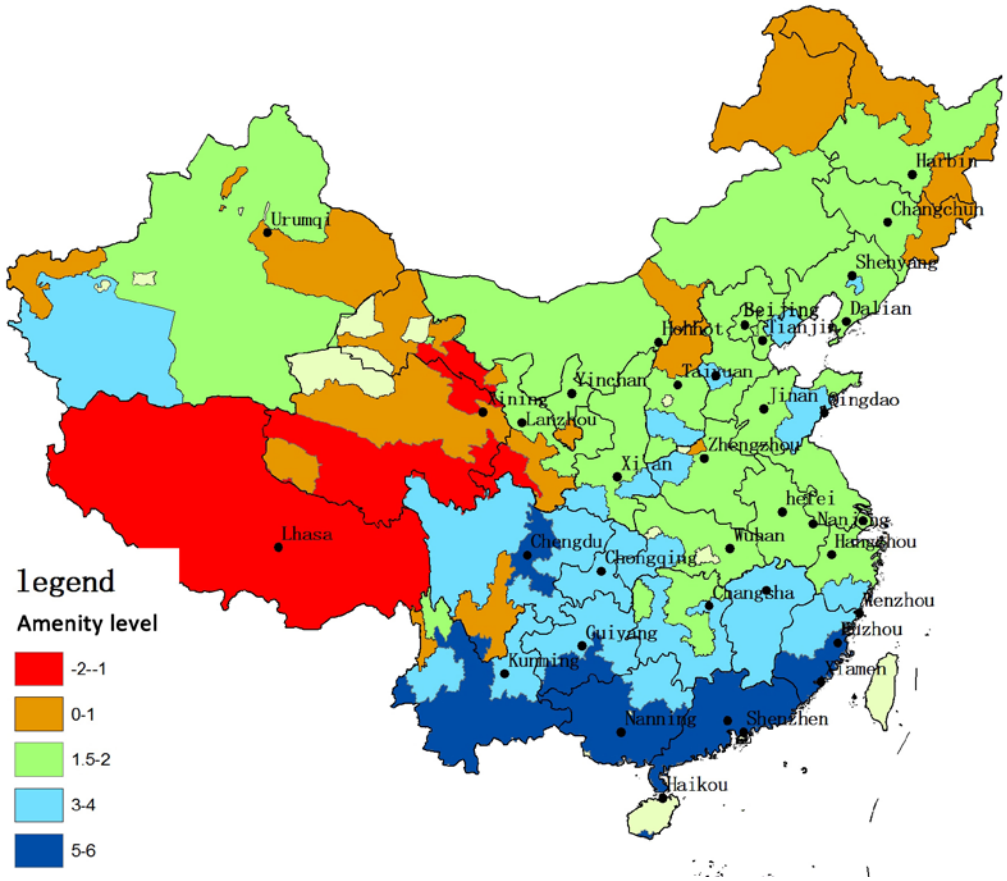
[15] Countries often develop a composite amenity indicator for cities or regions. China has not yet done this.

become wealthier, we would expect that amenity will be a more important factor in migration and investment decisions.

Map 7 describes China's climate amenity zones, utilizing an index developed by Tang *et al*.[16] Figure 5 describes population growth from 2000 to 2010 by type of climate amenity zone. Causality, of course, cannot be established (without undertaking complex statistical analysis) between climate and population growth, even if a relationship seems to exist. Based on figure 5, there appears not to be a strong relationship between climate amenity and population growth rate. Areas with the second worst climate, are the second fastest growing. Figure 5 does indicate that southern China, which has the best climate, is the fastest growing region demographically, however, a myriad of other factors are involved, particularly the more cosmopolitan character of the region (because it is coastal), which has positioned it well for globalization. Even if a more sophisticated amenity indicator were developed, scenic areas such as Yunnan (which would rank high in amenity) are not currently indicating especially high population growth, as noted above (the Central Yunnan Megapolitan Region ranks 13 out of 21 such regions in China in terms of population growth) . Although, as noted, other amenity areas, especially Hainan, are experiencing rapid population growth. (Haikou, the largest city in Hainan Province, experienced 267.8% population growth from 1990–2000 and 35.7% (still fast, but obviously much slower) growth from 2000–2010. In sum, amenity does not yet appear to be a major determinant of differential sub-national population growth in China (although causality is very difficult to establish); migrants appear still largely motivated by the opportunity of short-term economic gains (at all levels: unskilled, semi-skilled and high-level "talent"), especially career and business opportunities. However, we do expect to see amenity be a major determinant of population growth in future censuses, unfolding in a sequential trajectory from current amenity cities such as Hainan and Xiamen to other places over time, replicating the spatial systems trajectory of virtually all countries as they became rich. More applied research on this topic is needed in China.

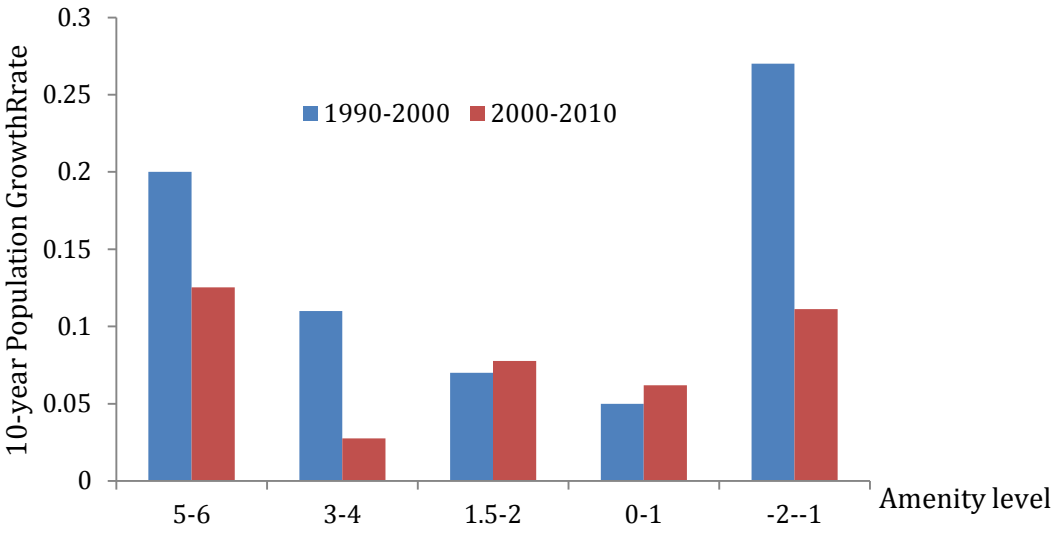
[16] Tang, Yan, Feng, Z, Yang, Y, "Evaluation of Climate Suitability for Human Settlement in China", *Resources Science*, 2008,30(5):648-653.

Map 7: Climate Amenity Zones in China



Source: Tang, Yan, Feng, Z, Yang, Y, "Evaluation of Climate Suitability for Human Settlement in China", *Resources Science*, 2008,30(5), pp648–653

Figure 5: Climate Amenity Values and Population Growth 1990–2000 & 2000–2010



Summary

In summary, the 2010 census describes a country that is far from static spatially. A sizeable proportion of the population continues to seek out opportunity by migrating. This process continues to increase the proportion of the country's population living on the East Coast. Within the East Coast Region itself, there is considerable churn, with the "factory of the world" PRD increasingly being challenged population wise by the YRD and the Bohai Rim. Market factors are obviously playing a strong role in shaping the spatial system of China through factor flows (people, capital). The policy framework of the government on the one hand emphasizes *in situ* development, i.e., tries to revitalize existing regions that are in economic trouble (e.g., the Northeast in the 1990s and early twenty-first century). However, at the same time, especially since the Tenth Plan (2000–2005), the Chinese government, almost uniquely initially among developing countries, has encouraged rural-urban migration, with migrants essentially chasing opportunity across the spatial system.

China's spatial dynamics 2000–2010 occurred in the context of a significant slowing in China's overall population growth rate from 1.11% per annum in the 1990–2000 time period to 1.11% between 2000 and 2010.

China's spatial system remains constellation like, reflecting historical factors such as local protectionism, lack of a national expressway system until recently, spatial policies related to security, e.g., the third line of the 1970s, etc. Although the national expressway system is almost completed and has a route network equivalent to the US system (although there are many gaps because of institutional factors),[17] the fragmented and expensive toll system discourages long-distance use of the system, especially by private vehicles. China's HSR network, the longest in the world, supports constellation type development, as does the relatively small number of commercial airports. And, importantly, Chinese companies, whether in production or consumption (retailing), often have less of a national integrated presence than in other continental sized countries. Furthermore, some inter-governmental protectionism still exists in areas such as procurement, highway investment, industrial relocation, etc. Nevertheless, we expect to see a much more integrated economy in the future, which may be reflected in more pronounced corridor development.

A surprising finding is the apparent re-emergence of much of northern China, including the Yellow River Corridor, outperforming population-wise the Middle and Upper Yangtze Corridor. This is difficult to explain, but may be partially a product of the emerging importance of medium and heavy industry during the 2000–2010 period. This re-industrialization of the north is associated with the shift northward in expressway construction, etc., during the 2000–2010 period. Northeast China, the country's industrial core from 1949 until the early 1970s, shows a surprising rebound in population growth

[17] Breaks in expressway systems in China result from provinces and municipalities, who finance or co-finance expressway links through their territory, operating in their own (rather than national) interest. It is a serious problem throughout China. See: Xin Dingding, "Gaps Mean Freeways Can Often be Road to Frustration", *China Daily*, September 27 2012, p 1

over the last census period (compared with the previous census period)—the region's prognosis for population growth was dismal during the severe SOE restructuring, which occurred during the early 1990s. Many analysts foresaw "rustbelt" population dynamics, such as have occurred in much of the United States Midwest.

With the exception of Hainan, amenity does not yet seem a major driver of population growth. Amenity cities along the coast are growing quickly, e.g., Xiamen (in the highest ranked climate zone) and Qingdao (in the second highest ranked climate zone); however, it is difficult to distinguish the role of climate in the success of these cities, given their location on the economically dynamic and cosmopolitan East Coast.

Manufacturing dominated prefectures are currently the fastest growing, however this may change by the 2020 census, given the increased external (global market) and internal (rapidly increasing costs, particularly labor) stresses facing Chinese manufacturers. However, even if Chinese manufacturing continues its highly successful trajectory, the link with population is likely to become looser as manufacturing moves to higher-value capital (rather than labor) intensive activity and automation / robotization (replacing workers) grows very quickly. Currently manufacturing employs 225 million people in China or 29.6% of China's 761 million (2010) labor force; services now employ 290 million.[18] The manufacturing labor force will likely decline as a percentage of the population or total labor force, with implications for manufacturing based cities and regions. Giving the enormous role of manufacturing in the labor force, especially when economic linkages and household dependents of manufacturing workers are taken into account, shifts in the geography of manufacturing in China will continue to have a very substantial impact on the distribution of population, and population growth rates in China.

Despite many policy initiatives to develop the peripheral regions of China (West, Central, Northeast), the allure of the East Coast for migrants has not lessened; in fact, the proportion of China's population living in the Coast Region has increased in from 35.6% in 2000 to 38% in 2010. There appears to be no correlation between regional development policies and population growth. Especially difficult to explain is the dramatic fall in population growth rates in the West (relative to other regions) after the introduction of the 1999 "Go West" program. Surprising even to urban experts has been the poor population growth performance of the "Go West" megapolitan regions in the post 2000 period, with the "Chengdu – Chongqing Economic Zone", Central Yunnan, and Central Guizhou megapolitan regions all exhibiting very substantial drops in their demographic growth rates. (One explanation may be that there was a surge of entrepreneurs / adventurers to the West when China opened up in the early 1990s that subsequently dissipated.) The one exception to the apparent lack of fit between regional development policy and population growth may be the Northeast. Surprisingly, the Northeast (despite its rustbelt reputation in the 1990s) has become the fastest growing region in China after the East Coast.

[18] Hille, K and Jacob, R, "Beyond the Conveyor Belt", *Financial Times*, October 15 2012, pg 7

Megapolitan regions dominate China's economy. As indicated by the 2010 census, there is considerable divergence in the demographic performance of these regions and churn in terms of demographic growth rankings over the last twenty years. Seven of the Megapolitan regions have increased their demographic growth rates between 1990–2000 and 2000–2010, despite a significant overall slowing in China's population growth rate. The three megapolitan regions that anchor the coast north of the YRD (the West Taiwan Straits, YRD, and Bohai Bay megapolitan regions) are emerging as the spearhead of the Chinese economy and demographic system, with the PRD no longer exceptionally dominant in demographic growth terms, as its "factory of the world" economic model comes under increasing stress.

Policy implications of the foregoing are discussed in a complementary monograph entitled, *China's 2010 Census Results: Sub-National Dynamics: Policy Implications***.**

Appendix A: Population Growth Rates: Major Cities: 1990–2000 & 2000– 2010

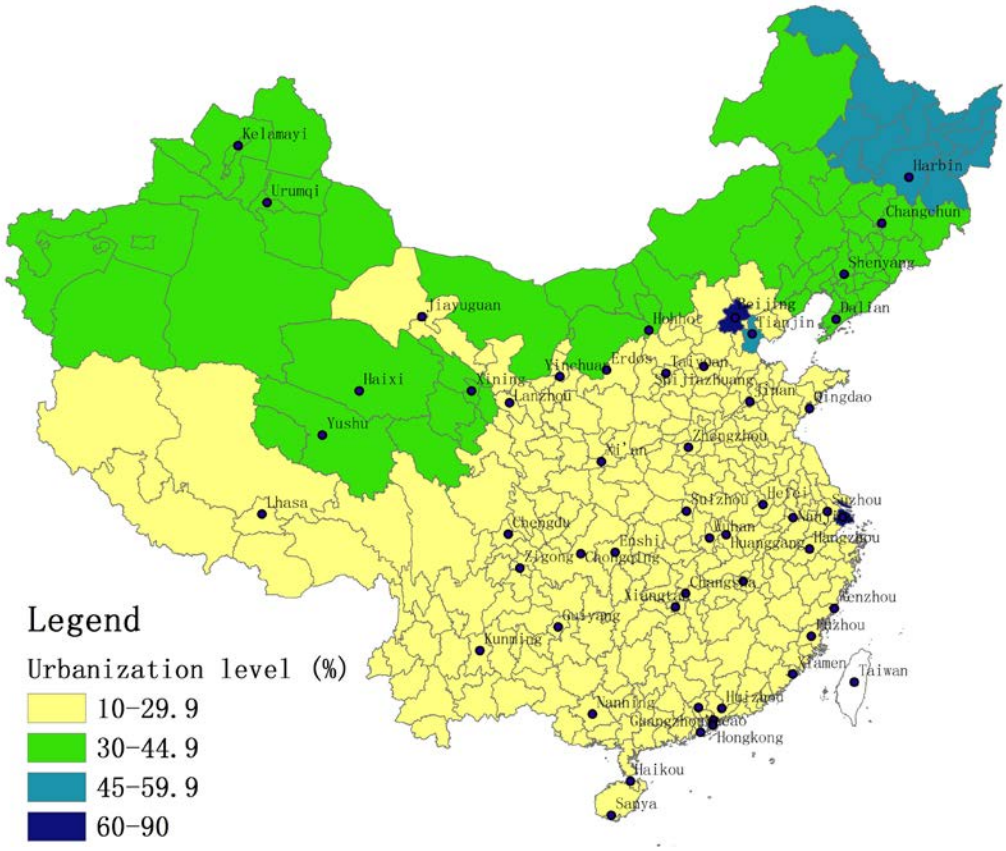
Rank	Prefecture	Population (millions)			10-year population growth rate (%)		Change
		1990	2000	2010	1990-2000	2000-2010	
1	Suzhou	5.64	6.79	10.47	20.39	54.2	33.81
2	Shenzhen	1.67	7.01	10.36	319.76	47.79	-271.97
3	Beijing	10.82	13.57	19.61	25.42	44.51	19.09
4	Shanghai	13.34	16.41	23.02	23.01	40.28	17.27
5	Haikou	0.41	1.51	2.05	268.29	35.76	-232.53
6	Foshan	3	5.34	7.19	78	34.64	-43.36
7	Tianjin	8.79	9.85	12.94	12.06	31.37	19.31
8	Nanjing	5.17	6.13	8	18.57	30.51	11.94
9	Zhengzhou	5.51	6.66	8.63	20.87	29.58	8.71
10	Guangzhou	6.3	9.94	12.7	57.78	27.77	-30.01
11	Hefei	3.86	4.47	5.7	15.8	27.52	11.71
12	Dongguan	1.74	6.45	8.22	270.69	27.44	-243.25
13	Ningbo	5.09	5.96	7.61	17.09	27.68	10.59
14	Chengdu	9.27	11.11	14.05	19.85	26.46	6.61
15	Hangzhou	5.83	6.88	8.7	18.01	26.45	8.44
16	Taiyuan	2.71	3.34	4.2	23.25	25.75	2.5
17	Wenzhou	6.33	7.56	9.12	19.43	20.63	1.2
18	Wuhan	6.9	8.31	9.79	20.43	17.81	-2.62
19	Xi'an	6.18	7.27	8.47	17.64	16.51	-1.13
20	Qingdao	6.66	7.49	8.72	12.46	16.42	3.96
21	Guiyang	2.52	3.72	4.32	47.62	16.13	-31.49
22	Zhanjiang	5.4	6.07	6.99	12.41	15.16	2.75
23	Ji'nan	5.29	5.92	6.81	11.91	15.03	3.12
24	Changsha	5.49	6.14	7.04	11.84	14.66	2.82
25	Dalian	5.25	5.89	6.69	12.19	13.58	1.39
26	Ganzhou	7.07	7.4	8.37	4.67	13.11	8.44
27	Harbin	8.58	9.41	10.64	9.67	13.07	3.4
28	Shenyang	6.59	7.2	8.11	9.26	12.64	3.38
29	Quanzhou	5.73	7.28	8.13	27.05	11.68	-15.37
30	Fuzhou	3.31	6.39	7.12	93.05	11.42	-81.63
31	Shijiazhuang	8.06	9.24	10.16	14.64	9.96	-4.68
32	Handan	6.74	8.39	9.17	24.48	9.3	-15.18
33	Changchun	6.42	7.14	7.68	11.21	7.56	-3.65
34	Tangshan	6.59	7.04	7.58	6.83	7.67	0.84
35	Cangzhou	6.04	6.64	7.13	9.93	7.38	-2.55
36	Nanning	5.63	6.21	6.66	10.3	7.25	-3.06
37	Nanyang	9.76	9.58	10.26	-1.84	7.1	8.94
38	Weifang	8.07	8.5	9.09	5.33	6.94	1.61

39	Baoding	9.61	10.47	11.19	8.95	6.88	-2.07
40	Xingtai	5.98	6.65	7.1	11.2	6.77	-4.44
41	Hengyang	6.45	6.78	7.14	5.12	5.31	0.19
42	Yantai	6.26	6.64	6.97	6.07	4.97	-1.1
43	Jining	7.27	7.74	8.08	6.46	4.39	-2.07
44	Heze	7.81	8.1	8.29	3.71	2.35	-1.37
45	Shaoyang	6.62	6.96	7.07	5.14	1.58	-3.56
46	Linyi	9.3	9.94	10.04	6.88	1.01	-5.88
47	Zhumadian	7.38	7.45	7.23	0.95	-2.95	-3.9
48	Nantong	7.67	7.51	7.28	-2.09	-3.06	-0.98
49	Xuzhou	8.16	8.91	8.58	9.19	-3.7	-12.89
50	Fuyang	7.63	8	7.6	4.85	-5	-9.85
51	Shangqiu	7.08	7.75	7.36	9.46	-5.03	-14.5
52	Chongqing	18.66	30.51	28.85	63.5	-5.44	-68.95
53	Zhoukou	9.24	9.74	8.95	5.41	-8.11	-13.52
54	Yancheng	7.74	7.95	7.26	2.71	-8.68	-11.39

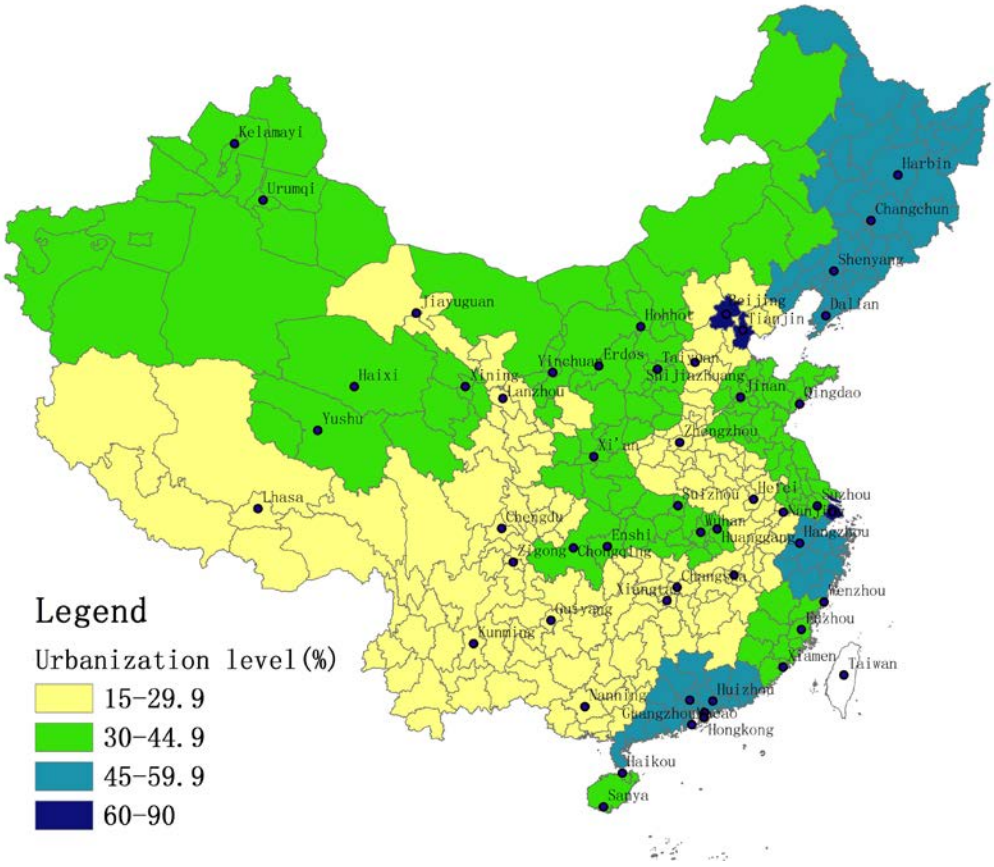
Legend:

East Coast Region
Northeast Region
Central Region
West Region

Appendix B: Level of Urbanization by Province 1990



Appendix C: Level of Urbanization by Province 2000



Appendix D: Population Growth by Policy Regions

	East	Northeast	Central	West
Population in 1999(millions)	378.84	108.54	321.30	309.32
Population in 2000(millions)	442.34	115.37	339.65	346.49
Population in 2010(millions)	506.17	119.92	351.89	355.59
1990-2000 population growth rate (%)	16.76	6.30	5.71	12.02
2000-2010 population growth rate (%)	14.43	3.94	3.60	2.63