

Beijing and Shanghai's Urbanization Differences through Analysis of the Northam Curve and Social Factors

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ABSTRACT

This paper aims to track and explain the spatiotemporal differences between Beijing and Shanghai's urbanization development after 1978. By using the Model of Social Factors and the Northam Curve, the paper compares the urbanization difference between Beijing and Shanghai and why Shanghai is metropolitan while Beijing is nonmetropolitan. The paper also indicates that Shanghai will not "re-urbanize" after reaching the inflection point of the Northam Curve. A future topic would be the prediction of both cities' urbanization during the upcoming decades.

KEYWORDS

Northam Curve; Social Factors; Urbanization Policies; Urbanization Rate.

1. INTRODUCTION

To compare the urbanization differences between dissimilar cities, Beijing and Shanghai, two of China's first-tier cities with ample research data, can be used as sample cities. Beijing represents a Type A city that reached its urbanization inflection point decades ago. In contrast, Shanghai is a typical Type B city with significant urbanization growth, developing toward an international metropolitan area. Researchers suggest that Beijing became "nonmetropolitan," while Shanghai was "metropolitan." (WorldUnion. N.D.).

1.1. Section Headings

The section headings are in boldface capital and lowercase letters. Second level headings are typed as part of the succeeding paragraph (like the subsection heading of this paragraph).

1.2. Comparative Analysis of the Urbanization Rate Growth

Urbanization is the process of migrant populations moving into the city and cities expanding. When thinking of it, land usage and human actions come to mind. Thus, this paper links urbanization with city land use, human activity densities, urban-to-rural ratio, and new migrant populations, the same as Doctor Moll's definition of urbanization (Moll et al. 19).

There are two primary determinants that inspect the deeper meanings of urbanization: the annual growth rate, and the overall urbanization rate. If the second derivative test of the curve ($f''(x)$) is greater than 0, then the urbanization rate is accelerating in comparison to last year. If the derivative ($f'(x)$) is greater than 0, the overall urbanization rate is increasing, and vice versa.

1.2.1. Beijing's Type A Characteristics

Since the founding of the PRC in 1949, Beijing's urbanization rate has experienced a period of rapid boost and eventually attained a calculus “inflection point” in 2002. Since then, the annual growth rate, or the “acceleration”, of urbanization in Beijing has begun to decline year by year. After 2010, Beijing's overall urbanization rate began to slow down. Accordingly, the value of the migrant population obtained saturation (Yutong.14). The curve implies that Beijing has reached a horizontal asymptote of 77.31% (WorldUnion. N.D.).

1.2.2. Shanghai's Type B Characteristics

On the other hand, Shanghai is a “new star” that came into people's minds as “a better city than Beijing” only after the 80s.

Shanghai started off with an urbanization rate of 40%. However, the development of the Pudong District and new policies promoting foreign investments led to Shanghai becoming a metropolitan area. By the start of the century, Shanghai had a 96% above-urbanization rate and a 6% annual growth rate (Weiwen Ren et al. 03). Both cities eventually reached an inflection point, with Beijing in 2002 and Shanghai in the 2010s. The key takeaways are that Shanghai started later than Beijing in terms of development, but Shanghai's growth rate accelerated more than Beijing's during the 1970s and 1980s, and both cities eventually reached their inflection point.

A thesis question for analysis is whether Shanghai will still renew itself and keep growing. Beijing is already falling, but whether Shanghai will be falling is undetermined.

1.3. Metropolitan & Nonmetropolitan

It is essential to classify cities into different categories. In China, it is referred to as “Metropolitan and nonmetropolitan cities”. Two key characteristics that distinguish the two are the city population and the shape (Zhenjiang Federation of Social Science. 20). Metropolitan cities radiate and diffract outward, while nonmetropolitan areas are more concentrated, with a grid pattern. Moreover, metropolitan cities can only develop when there is “Regionally Coordinated Development” occurring (GMW.21).

Shanghai and Beijing, both cities have different functions and operation purposes. For instance, Shanghai is categorized as “metropolitan” in the 90s, after the establishment of the Pudong District in 1992 (Xuan Ma et al. 20). Nevertheless, Beijing only became a “semi-metropolitan area”, or “nonmetropolitan area (YangGuang Net. 22). Thus, a primary difference is that Beijing is not a metropolitan area.

Below is a curve that demonstrates how Beijing failed to meet the urbanization standards for a “metropolitan city” to develop. The red curve is the minimum for a “metropolitan city”, and Beijing is currently following roughly the dark curve under it (Note that the dark curve is merely a prediction, and contains inaccurate though sufficient to estimate Beijing's data).

1.4. Research Questions

Most noticeably, the paper analyses and explains the spatiotemporal differences between Beijing and Shanghai's urbanization development.

In the paper, the primary question is regarding the reasons leading to the difference in the development of Beijing and Shanghai. A sub-question will be answered, analyzing the future growth trend of Shanghai in accordance with current studies and the Northam Curve. By answering those questions, the future of China's growth and economic trend can be predicted and articulated.

2. LITERATURE REVIEW

The most famous work about mathematical analysis is conducted by Ray M. Northam. His work is the keystone and foundation of the study of urbanization. The specific methods for mathematical analysis will be introduced in the later parts of the paper.

2.1. Analyzing the Northam Curve (Metropolitan & Nonmetropolitan)

Ray M. Northam, claims that all large settlements and cities around the world pursue a certain pattern or path. First, those cities will rise and grow, and their urbanization rate usually skyrockets in the form of a logarithmic function. Nevertheless, those cities will attain their inflection point, and their growth will slow down, leading to their urbanization rate curve starting to concave downward (MBA. N.D.). The shape is similar to a stretched “S”.

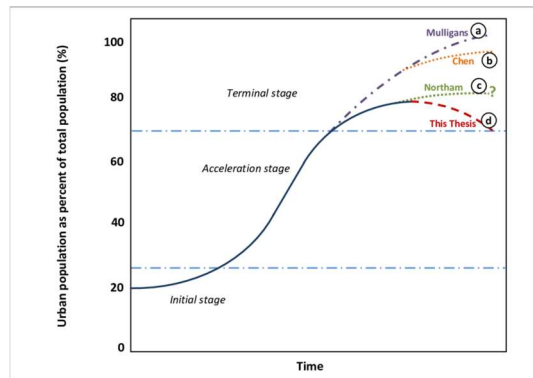


Fig. 1 Model of Northam’s Urbanization Rates (Hussain.19)

After that, two potential paths may be taken. One for metropolitan areas and one for nonmetropolitan areas. For metropolitan cities, the city will renew itself, and replenish its growth rate, even after reaching the inflection point. In simple words, the city will rejuvenate through a process called “re-urbanization”, and the urbanization rate will keep boosting. However, in nonmetropolitan cities, it will decline after reaching the inflection point, and eventually recess as citizens move out (Jin Feng.13).

2.1.1. Addressing Doubts to the Northam Curves in China

While the Northam approach has merits, many Chinese scholars criticized Northam due to various reasons. Some scholars tried to challenge Northam’s validity by claiming that the Northam Curve is merely the product of positivism and dogmatism. Indeed, certain characteristics of Chinese history should not be judged by a single rule. However, the growth of Chinese urbanization still pursues certain characteristics of the Northam curve.



Fig. 2 China’s Urbanization Rate Since 1968 (China State Council.18)

The Northam Curve predicts three phases of urban development, all of which are fulfilled in China. The first period is before the cultural revolution when the first five-year plan took place. There is an 8.7% growth within this period of economic stability, the same as the “initial stage” of the Northam Curve. The second period matches the “growth stage”, as Chinese cities rapidly expand during the 80s and 90s. The last period, 2010-now, fits Northam’s “terminal stage” as cities in China start to reach their inflection value, and are no longer accelerating (Mulligan.13). All of China’s urbanization rate growth after 1978 fits the prediction of Ray M. Northam. Therefore, there’s only one condition in which Northam’s curve does not apply to China, and it is during eras of political instability.

In conclusion, the Northam curve can still be taken as a reference to Chinese urbanization development during peace times.

3. RESEARCH METHOD

Two social theories explain economic and political issues: resource mobilization and human action analysis. The former prioritizes resource allocation and human interactions, whereas the latter emphasizes the importance of the human mind and political ideologies. Scholars worldwide endorse both theories as pillars of sociology.

By combining the cogent ideas from both sides, and also taking into account the distinctiveness of China’s developments, a clearer picture of the issue may be perceived. It is concluded that eight social factors are:

- 1) Economic and political development.
- 2) Lifestyle & cultural (race within a country) differences.
- 3) Social mobility.
- 4) Geopolitical factors.
- 5) Public services (e.g. welfare development and infrastructures).
- 6) Demographics.
- 7) Resource allocations.
- 8) Historical issues& time.

For simplicity, this will be referred to as Method Eight throughout the rest of the paper.

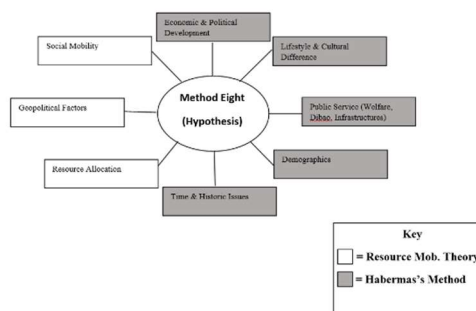


Fig. 3 The Eight Social Factors

Method Eight also emphasizes the importance of government interventions, as Beijing and Shanghai’s urbanization is largely influenced by the presence of socialism collectivism during their early stages. Moreover, China’s policies on Diba, infrastructure building, etc. should also be taken into account, as they are the key solutions to urban sprawl problems (Weston et al. 21).

4. RESEARCH RESULTS & ANALYSIS

All social models have limitations, and so does Method Eight. In particular, some parts of Method Eight do not afflict the big picture and can be ignored to a certain extent. To reduce the complexity, those factors can be dropped and receded from the argument.

In order to deduct a certain factor from Method Eight, the factor must be analyzed through a process of close examination of its logic links. The factor that is undesirable in the current phase of the research must be categorized as an “extraneous factor” (ReviseSociology. N.D.).

4.1. Deducting the One Factor (“Lifestyle Culture”) Out

Culture means how traditions, stereotypes, ethics, and legacies interact with each other. In the passage, ethnicity means solely the domestic 56 races of China. Foreigners are not referred to in this factor. This is because foreigners bring foreign investments and capital, so they are referred to in the “Resource Allocation” factor.

By analyzing the big picture, individual civilians’ actions should not be accounted for. China is classified as an archetypal “elite politic government”, in which decisions are made by connoisseurs and experts. Moreover, both cities are compromises of a single race, Han, 99.27% for Shanghai, and 95.2% for Beijing (SCIO.09). While the culture certainly impacts the development of urbanization, it is neglectable on a macro scale.

The leftover seven pillar factors are the principal factors that depict Beijing and Shanghai’s differences.

4.2. Explanation of the Seven Factors

Now, the rest seven factors are left, which are: public services, demographics, time&historic issues, resource allocation, social mobility, geopolitics, and political development.

All seven factors should, in theory, play a role in determining Beijing and Shanghai’s urbanization differences, as the irrelevant factor has already been canceled out.

In this section, every factor’s logic link must be expanded and explained. The section utilizes a method called social outcome to determine each factor’s importance. First, this evaluates if one city out of the two (Beijing and Shanghai) breaches the factor. If the city is sanctioned because of violating the factor, then the theory is proven indirectly (Herzog. 18).

4.2.1. Factor 1&2: Public Services & Demographics

Looking at every map that shows the number of hospitals, pool services, and publicly run apartments, it is common sense that Shanghai and Beijing have dissimilar welfare policies.

Their index of development is different. Shanghai has a more advanced system of infrastructure and scored 33.44% higher than Beijing’s infrastructure (Xiaoxiang.21). Notably, Shanghai spent more budget on infrastructure building comparatively.

This leads to high population growth. For Shanghai 2022, roughly 10.40 million people moved into Shanghai as long-term residents (TianqiWang.22). On the other hand, for Beijing 2022, the number is merely 8.23 million (LuoBoWenXue.23).

Therefore, Shanghai’s appreciation of infrastructure construction leads to more living capacity for its growing population group and a higher satisfaction rate. Shanghai will receive more external populations coming into the suburbs, leading to a growing population group. Overall, this leads to a virtuous “Dual Circulation” of city expansion (Study Times.20). Nevertheless, Beijing ceased the cycle as fewer and fewer people are willing to come to Beijing due to its lower capacity.

4.2.2. Factor 3: Time & Historic Issues

Shanghai and Beijing share a similar history, but yet in terms of their city expansion, their rates are different.

Historic issues are crucial because they answer how Beijing and Shanghai diverge, and how they develop before the start of the PRC in 1949. A city's land usage, population density, and resource allocations are all direct consequences of city planning. And that is how Factor 3: Time & Historic issues outweigh the importance of the previous factors.

1) Beijing's History

In theory, a city's Northam curve can start for hundreds of years before attaining the "peak", as is the case for Great Britain and many Western European industrial nations (Yali Li.17). The situation is similar for Beijing. Suppositionally, Beijing's urbanization begins during the Late Liao Empire. The time period is around 800 A.D. On the other hand, Beijing's modern urbanization growth period begins before the collapse of the Qing Dynasty. Pestilence and regional warlord conflict caused large areas of the rural population to flee to the outer city of Beijing, resulting in massive expansion and poor city planning. (China Culture Daily.15). As the Qing Dynasty lacks city planning skills, the allocation of space and resources are not considered well. The consequences of poor city planning can be seen even today. For instance, the Haidian district, once part of the "outer city", has reached the point of a "serious shortage" of land, preventing any large-scale development (Zhongfang.15).

2) Shanghai's History

On the other hand, urbanization of Shanghai bolted in 1843, during the Opium War and the Port Opening Events, around 1000 years later than Beijing did (Pengpai.20). Next, Shanghai's high-level growth only started after the 80s during the Opening Up policies (Wenmibang.19). Therefore, it is concluded that Shanghai kicked off much later than Beijing did.

As a result, Shanghai has relatively newer construction of its cities. Modern and western techniques are utilized during its Concession Periods, and it became the leading figure in urbanization after the 80s. As an exemplification, the "Comprehensive Assessment Report of Urban Construction Level Index" ranked Shanghai with 455.87 points, as the most thoroughly planned city. In conclusion, Shanghai has more advanced city planning and is exposed to fewer issues than Beijing. (MingXin Chen et al. 11).

4.2.3. Factor 4&5: Resource Allocation & Social Mobility

Beijing's low land and energy efficiency rank it at the bottom of China's first tier cities (People's Daily. 23). This can be attributed to its resource allocation, as 70% of its firms are public sector and do not obtain profit, unlike Shanghai's 28.5% (State-owned Assets Supervision and Administration Commission. N.D.). Shanghai's foreign firms with imported capital further boost its productivity, making it more competitive. This results in Beijing allocating resources to noncompetitive goods, leading to a 3.73-point lower overall competitive index score than Shanghai's (Soudang.01).

4.2.4. Factor 6: Geopolitics

By definition, geopolitics rethink the geographical explanation behind resource outputs and space availabilities (Koch.18). In other words, in order to prove the validity of this factor, Shanghai should, in theory, have more resources and more space available than Beijing. Therefore, Shanghai should have more growth opportunities and free lands comparatively for urbanization expansions.

1) Natural Barriers and Geological Structures

In order to analyze the geographical components of a city's surroundings, it is better to look from the sky. Therefore, satellite imagery should be taken into consideration.

Through analyzing the satellite imagery of both cities from 2014 to 2022, a key distinctiveness is observed. Beijing is blocked from three sides by Yanshan Mountain (Yulu. 21). The available land use is restricted to its central plains. As a result, it resembles a quadrate shape, with each side about 160 kilometers long (Zhiqiu. 20).

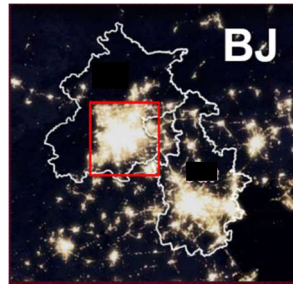


Fig. 4 Satellite Imagery of Beijing and Tianjin City, 2022 (Fanghong He.21)

On the other hand, Shanghai, located near the Yangtze River Delta, and has a wide range of space available for development as nearly four sides are plains. Therefore, it symbolizes the shape of a hendecagon.



Fig. 5 Satellite Imagery of Shanghai City, 2014 (PengPai.16)

In conclusion, Shanghai spreads out in all eight directions, while Beijing is constricted to a cubic shape. Nevertheless, the reasons behind this are yet to be disclosed as of now.

4.2.5. Factor 7: Political Development

Beijing follows strictly a method called “Regionally Driven Development”. This indicates that Beijing should be the first to complete urbanization than its surrounding regions (Tianjin, Baoding, etc.) (Tanlin Ye et al.18).

On the other hand, Shanghai pursues “Regionally Coordinated Development”. Therefore, the surrounding cities have the potential to carry Shanghai and offer potential economical protection to Shanghai.

Only Coordinated Development can result in the merging and combining of multiple cities, leading to a bigger metropolitan city (GMW. 21). Therefore, Shanghai has more potential than Beijing to become a metropolitan city, and this could potentially explain the rapid boost in urbanization rates and how Shanghai surpassed Beijing in its urbanization developments.

4.3. Interaction between the Seven Factors

To construct an even bigger picture of the issue, it is crucial to determine the relationship between the seven factors.

Firstly, factor 1 “public services” forms a cyclical cycle with factor 2 “demographics”. The encouragement of public services leads to more incoming populations, and more incoming populations stimulate new public services. Hence, factor 1 leads to factor 2, and factor 2 leads to factor 1.

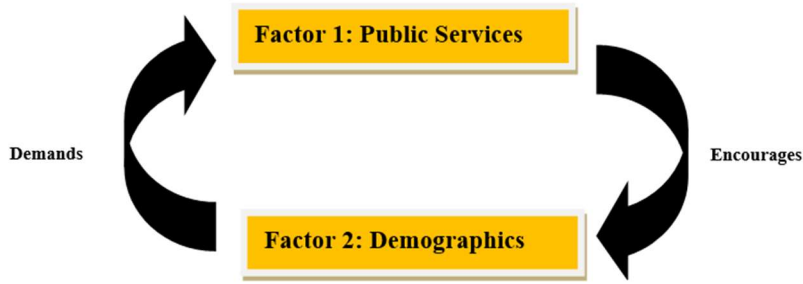


Fig. 6 Relationship Between Factors 1 and 2

Moreover, factor 4 “resource allocation” can lead to higher productivity, and higher mobilities, as more job opportunities are offered, and more capital is available for development. Therefore, factor 4 “resource allocation” leads to factor 5 “social mobility”. In addition, geopolitical developments also lead to new firms coming into Shanghai, which increases “resource allocation”. Therefore, factor 6 links to factor 4, which in turn links to factor 5.

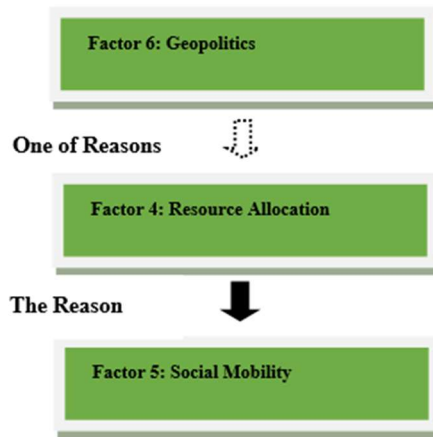


Fig. 7 Relationship Between Factors 6, 4, and 5

In addition, political development results in public service and contributes to the resource allocation. Therefore, an aggregated model of the seven factors is presented.

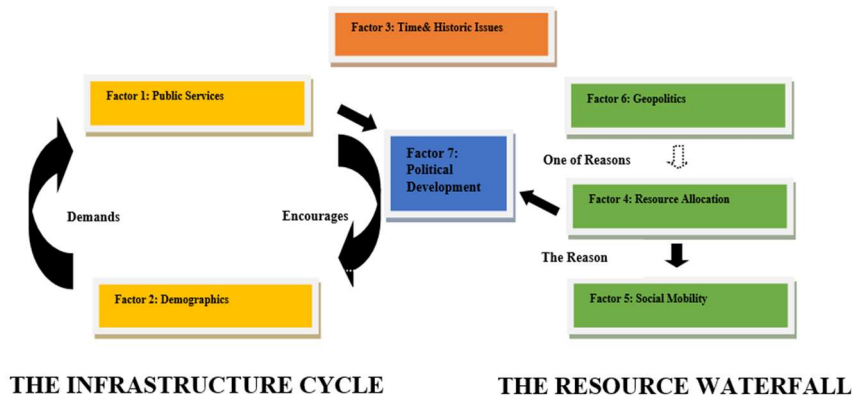


Fig. 8 Relationship Between All Seven Factors

5. CONCLUSION AND FUTURE STUDIES

At the start of the essay, Beijing is characterized as nonmetropolitan while Shanghai is metropolitan. This indicates that Shanghai has more available resources and space than Beijing to develop.

Recall that the seven factors are derived from Method Eight that show how Beijing and Shanghai are different in their development paths, which are public services, demography, time history, resource allocation, geopolitical issues, and political developments.

In conclusion, Beijing has poor city planning, less infrastructure, fewer available resources, more natural barriers isolating it from the outside world, and more political restrictions on development. On the other hand, Shanghai avoided most of Beijing's errors and therefore attained a higher level of growth rates.

5.1. Re-urbanization of the Northam Curve

It is stated that Shanghai will probably go through a period of "re-urbanization" as proposed by Ray M. Northam. In order to determine whether Shanghai will engage in "re-urbanization", the slope of Shanghai must be calculated.

First, plot the data from Guayunfan and Gotohui (Guayunfan.21; Gotohui. N.D.). Then, use the left Riemann sum to calculate the first derivative (growth), and the second derivative (acceleration), and graph all three graphs.



Fig. 9 Shanghai's Annual Urbanization Rates



Fig. 10 Shanghai's Annual Urbanization Growth Rates (First Derivative Test)

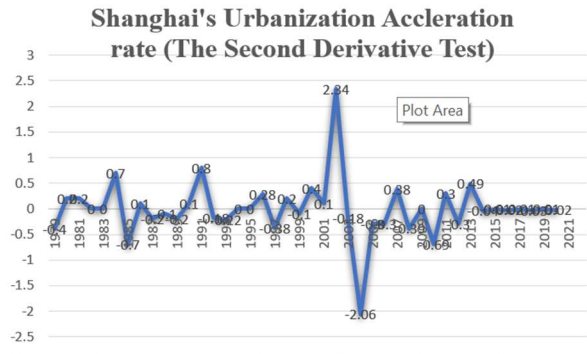


Fig. 11 Shanghai’s Annual Urbanization Acceleration Rates (Second Derivative Test)

Through analyzing the third graph (Second Derivative Test), it is perceived that after 2015, Shanghai’s urbanization growth rates no longer experienced large falls, but only small fluctuations, until the urbanization acceleration rate stables at 0. Therefore, Shanghai will maintain its growth rate.

Secondly, the capacity of a city’s growth is 100%. Shanghai is already 92.91% in 2022 and is still growing at a rate of 0.35% per year, meaning that Shanghai will reach its capacity within 20 years if it is growing at today’s rate. Therefore, it is nearly impossible for Shanghai to “re-urbanize”. Northam’s rule that metropolitan cities usually re-urbanize does not apply to Shanghai.

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